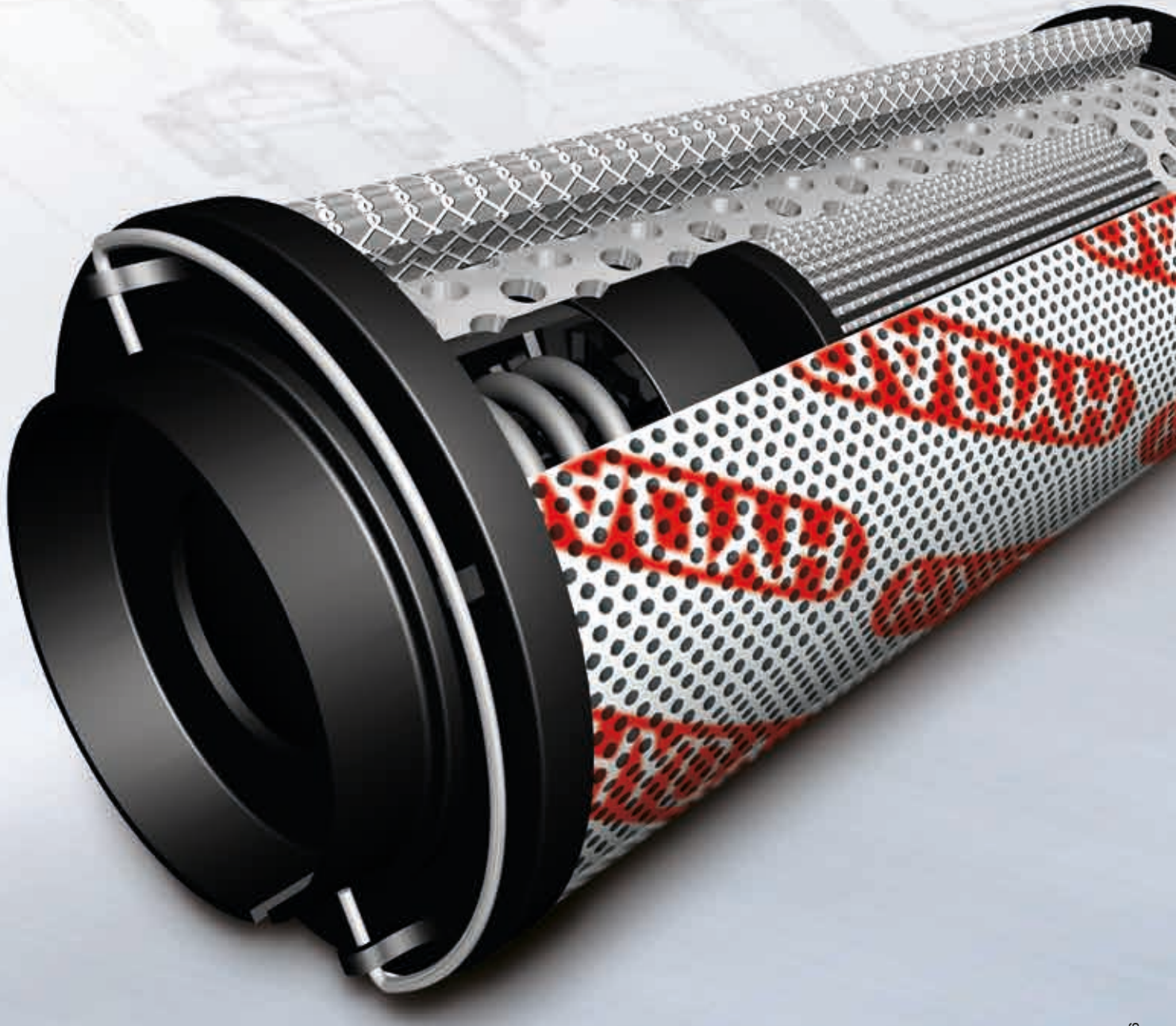
HYDAC INTERNATIONAL

Fluid Filters.
Product catalogue.



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HYDAC Filtration Technology...

...the name you can trust for Filtration.

HYDAC filtration technology is the culmination of rigorous laboratory testing as well as practical field-testing. It offers a complete range of filters for liquid and gaseous media.

The HYDAC Filter Division manufactures products tailored to market requirements and to the highest quality standards, backed by modern machinery and a large production capacity.

HYDAC Filtration Technology is based on intensive basic research, technical problem solving, specific customer requirements, and international standardization.

Development, Design, Production, Quality, Service and Distribution...

... are equally important to HYDAC. The concentration of all these functions in our independent filter division guarantees continuity in processing, optimum price/performance ratio, and a consistent quality standard.

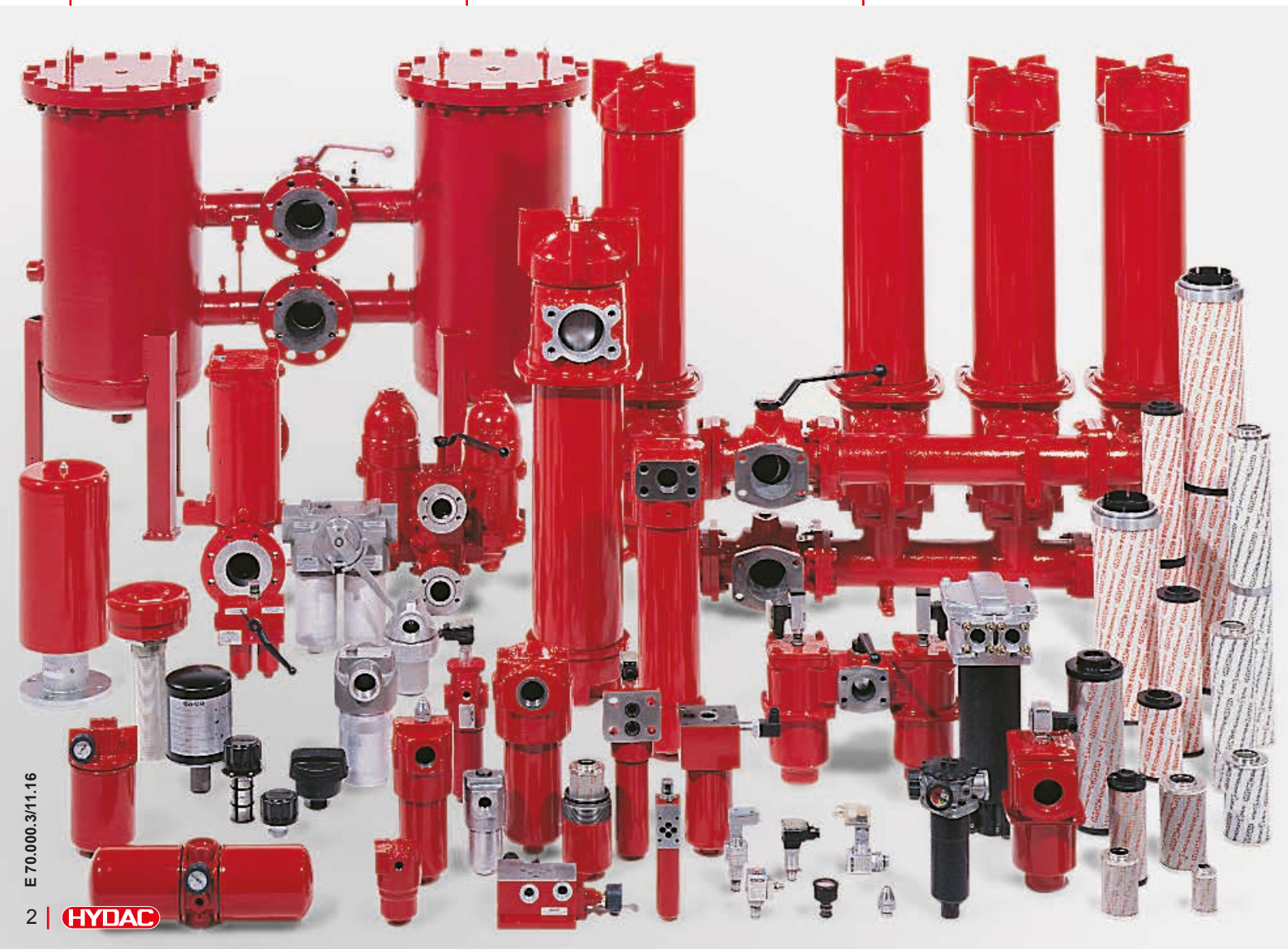
Development at HYDAC means designing application-orientated filtration systems based on test results from our research and test laboratories as well as on-site measurements and analysis, taking into account the requirements of the user and the manufacturer.

A skilled development team, using computer-aided analysis, measuring and testing equipment and test rigs, ensures rapid implementation of test results.

Production at HYDAC means large production capacity coupled with modern machinery and, in conjunction with rational manufacturing processes, ensures an optimum price/performance ratio.

Quality has absolute priority at HYDAC. It is guaranteed by continuous production control and systematic laboratory tests. Service and distribution – worldwide – through our international network of sales offices and production centres.

- Many years of experience coupled with fast CAD design,
- supported by intensive research and testing,
- result in a market-orientated product range.
- Quality and safety guaranteed by consistent clean room production.
- Every piece a quality product: NC controlled processing,
- semi and fully automatic manufacturing plant,
- strict controls, careful packaging, rapid despatch.



HYDAC Filters: Efficiency with Performance.

HYDAC Filters...

...Their quality guarantees reliable performance and increases the service life of components, systems and machinery.

Due to their design and application-orientated characteristics, HYDAC filters provide superior performance, such as:

- high beta value stability across a wide differential pressure range
- high pressure stability
- high contamination retention capacity
- long service life
- low pressure drops
- wide selection of filtration ratings
- extensive model range
- optimum filter materials for specific applications
- wide range of applications

and therefore increase the protection of components and reduce the downtime of machinery and systems.

HYDAC Servicenter

The HYDAC Servicenter, together with its service partners, offers you a complete package of services.

After in-depth consultation, you can create a service package tailored to your needs.

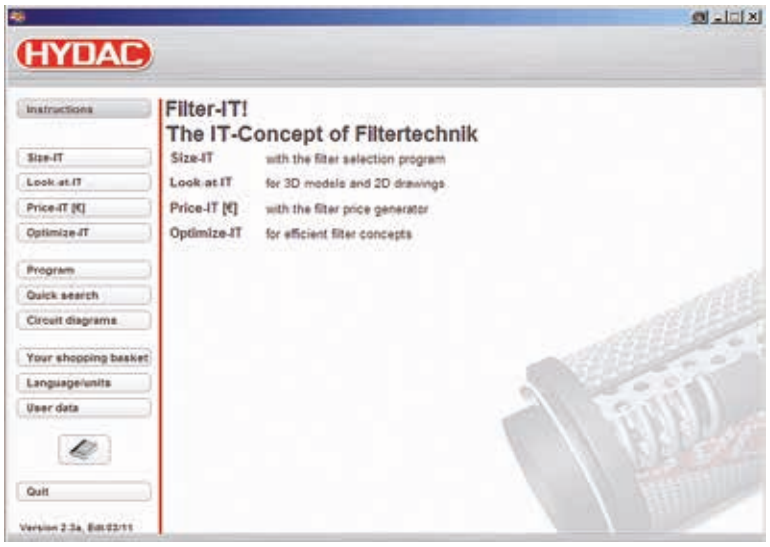
Whether it be support of existing in-house maintenance or sub-contracting the complete package, we will always find the best solution for you.

...more about Filtration?

Filters for Process Engineering
Working pressure: up to 600 bar
Working temperature: up to 400 °C
Filter elements: from 1µm absolute

Units for in-house servicing
Oil sampling and other laboratory units, portable and stationary filter pump transfer units, combined oil transportation and filtration units, dewatering units.

Filter-IT! – The Electronic Filter Catalogue.



Here you will find the whole HYDAC Filtration Technology product range incorporated in one location:
from technical data to product benefits, from brochures to spare part lists and parts explosion drawings for every filter size and type of connection.

In addition, using the "**Look-at-IT**" function, it is possible to download the 3-D models and 2-D drawings for all filters in any format.

The sizing program **"Size-IT"** further provides computer-aided filter sizing, specific to your particular system and application profile

The electronic filter catalogue (Filter-IT) can be found on our website **www.hydac.com.**

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Mobile Filters

Return Line (/Suction Boost) Filters - Tank Mounted

Inline Filters

Suction Filters

Industrial Filters

	up to P_{max} [bar]	up to Q_{max} [l/min]	Brochure No.	Page
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RFN – Return Line Filter - Tank Mounted - to DIN 24550	10	490	7.560../..	341
RF – Return Line Filters - Tank Mounted	25	15,000	7.116../..	345
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RFND – Change-Over Return Line Filter, Tank Mounted, to DIN 24550	10	480	7.570../..	355
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NF – Inline Filter	25	3,500	7.112../..	367
LPFR – Inline Filter with Flow from Inside to Outside	25	250	7.573../..	377
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AFLS – Inline Filter to API 614	40	1,700	7.584../..	391
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LFNF – Inline Filter for Reversible Oil Flow to DIN 24550	100	100	7.557../..	407
LFR – Inline Filter with Flow from Inside to Outside	120	250	7.573../..	377
MDFR – Inline Filter with Flow from Inside to Outside	250	250	7.573../..	377
MDF – Inline Filter	280	280	7.502../..	411
HDF – Inline Filter	280 (420)	380	7.581../..	415
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DFPF – Pressure Filter for Reversible Flow and for Manifold Mounting	315	620	7.551../..	499

In the following pages you will find the basic principles of filtration illustrated and explained using simple examples.

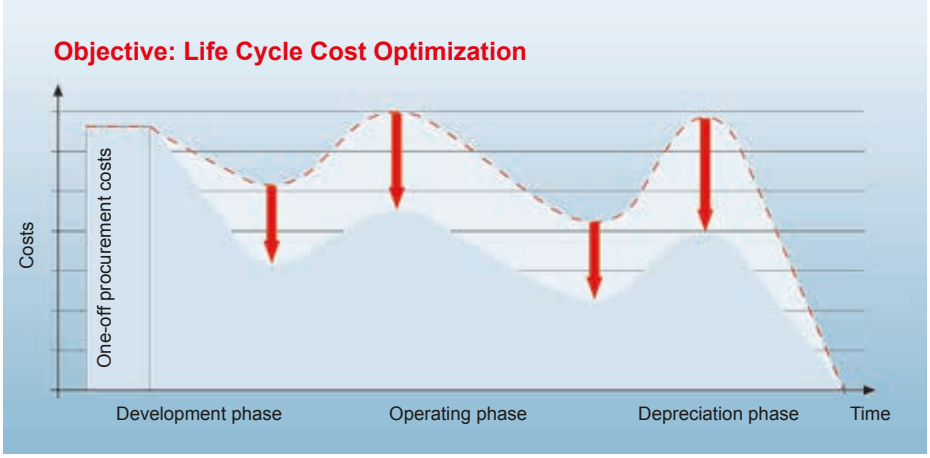
For filtration and hydraulics specialists requiring more detailed information, we recommend downloading our complete filter handbook (www.hydac.com).

If you have any questions about the contents of this brochure or if you have a specific problem to solve, we will be happy to help you in person. Please contact your nearest HYDAC representative or contact our headquarters.

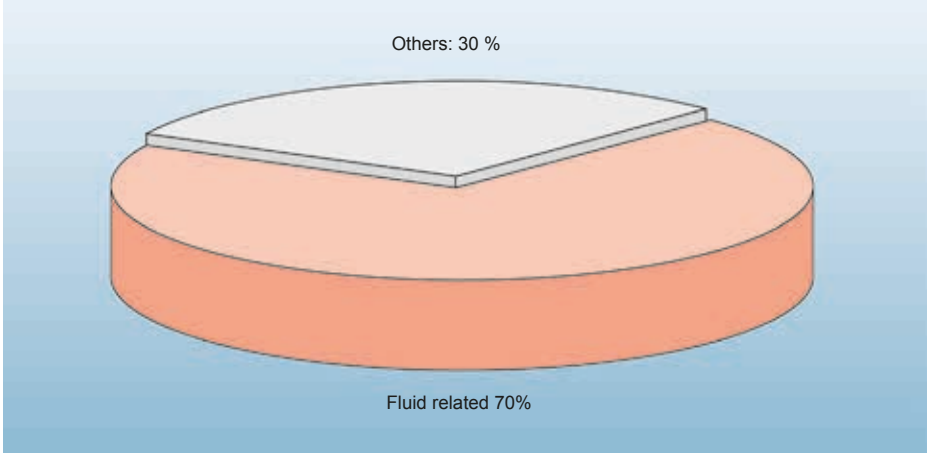
Awareness of fluids

As a manufacturer or operator of machines or systems in today's fast-moving and globalised market in Central Europe, we must make use of every possible means to continually improve competitiveness.

Primarily, this implies reduction in costs, not only of the purchase cost but of all costs generated during the **whole lifetime** of the system (Life Cycle Cost Reduction).



The condition of the operating fluid plays a key role in this objective since approximately **70 % of all breakdowns of hydraulic and lubrication systems can be attributed to the condition of the oil** – with proven detrimental effects on the efficiency and profitability of systems and equipment.



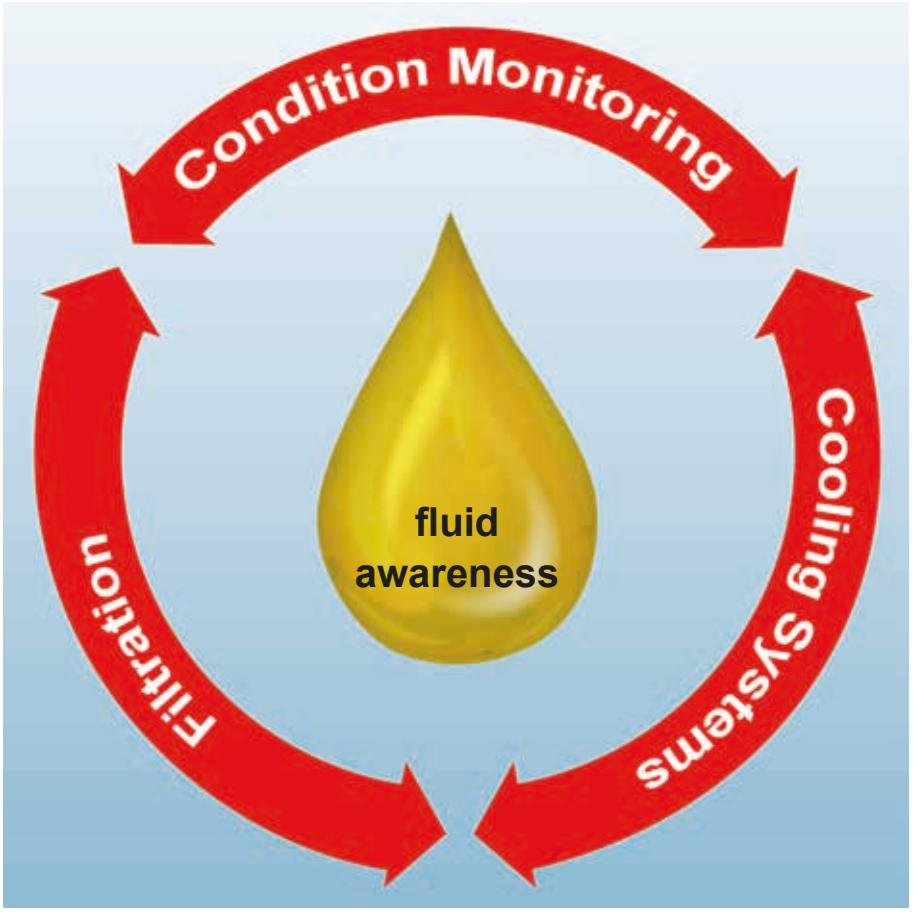
Causes of breakdowns in hydraulic and lubrication systems

Once the direct connection between fluid condition and the profitability of hydraulic and lubrication systems is recognised, the action required becomes obvious: cooling, continuous online monitoring and a well-engineered filtration concept, which guarantee the efficiency and operational reliability of the entire system.

Although this filtration handbook - as the name suggests - deals primarily with the "filter" component, HYDAC experts will also provide you with modern solutions which are specific to your system in the areas of cooling and condition monitoring.

Only by taking an integrated approach is it possible to improve the condition of the fluid used and to reduce the Life Cycle Costs.

As HYDAC's hydraulic experts, we want to focus attention on **fluid awareness** and we would like to share our experience with you. The following pages relate to filtration, but we can also help you in relation to cooling and condition monitoring if required.



Why is filtration so important?

Selecting the optimum filtration solution contributes significantly to preventing damage caused by contamination, to increasing the availability of the system and therefore to increasing productivity considerably.

The new filter element technology Betamicron®4 has been specially developed for the reduction of the Life Cycle Cost. The previous glass fibre elements from HYDAC (Betamicron®3 generation) provided complete security: a high level of fluid cleanliness and long-term stability for your hydraulic or lubrication system.

The new generation goes one better: with further improvements to the performance data the elements with Betamicron®4 technology ensure the highest fluid cleanliness. By optimizing the filter media structure both the separation performance and the contamination retention capacity have increased to a large extent. This means that sensitive components are protected over the long term and the filter element has a significantly longer service life.

Furthermore, even fluids with extremely low conductivity can be filtered without electrostatic discharge taking place within the filter element, due to a special feature of the filter mesh pack. This is another benefit therefore in the area of operating reliability and gives HYDAC the cutting edge in the area of element innovation.

The table on the right summarizes the positive effect of the new element technology, Betamicron®4, on the Life Cycle Cost of your machine or system.

		Optimised mesh-pack structure	Optimised longitudinal seam	Zinc-free composition	Spiral lock support tube	Protective outer sleeve	Electr. discharge capability
		minimises					
energy	costs	●					
Manpower		●	●			●	●
Logistics				●	●		
Failure		●	●	●		●	●
Production		●	●				●
Repair		●	●	●		●	●
Maintenance		●	●	●		●	●
Spare parts		●	●	●		●	●
Waste disposal					●		

More detailed information such as technical specifications and customer benefits can be found in the brochure **"Filter Elements Betamicron®4. For Reduced Life Cycle Cost".**

What kinds of damage does contamination cause?

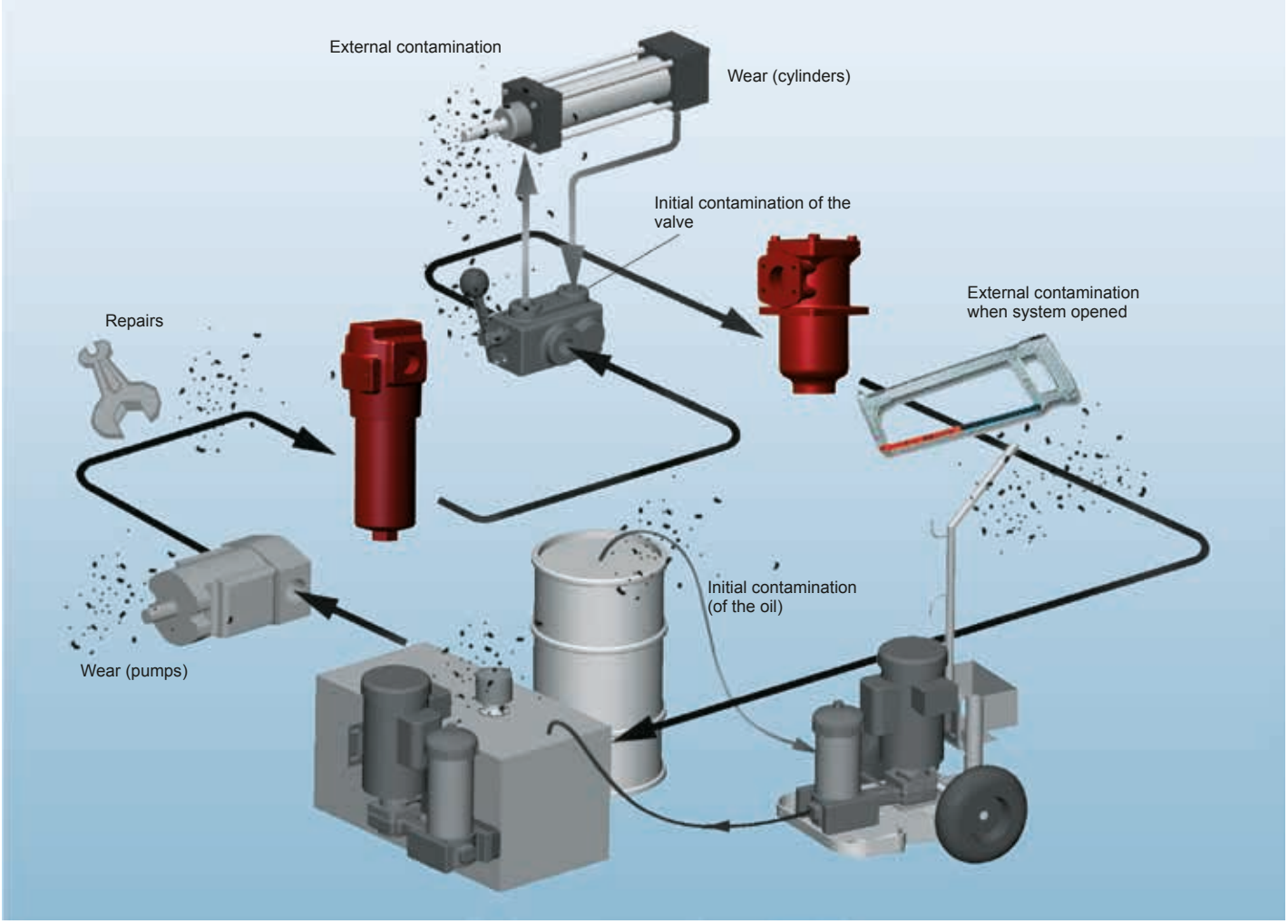
Contamination has a detrimental effect on the function of hydraulic and lubricating fluids, e.g. the transfer of heat and energy, even to the point of system failure.

Subsequent damage analyses have shown that approx. 75% of system failures are attributed to damage to the components used - caused by contamination in the operating fluid.

Causes of contamination

What are the causes of contamination and which mechanisms can lead to a rise in the costs outlined above?

The following illustration indicates possible contamination sources:



Origin / formation of contamination:

Built-in contamination from integrated components (e.g. valves, fluids, cylinders, pumps, tanks, hydraulic motors, hoses, pipes)

Contamination produced during assembly of the system, by opening the system, during system operation and during fluid-related system failure.

Contamination entering from outside the system, through:
- tank breathing
- cylinders, seals

Contamination entering the system during maintenance procedures
- system assembly/disassembly
- opening the system
- filling with oil

If these, usually high-value components are damaged by solid contamination in the hydraulic and lubricating media, system faults, including unplanned shutdowns can occur.

The severity of the component damage depends on the material of the contamination, the operating pressure, the nature (round or sharp-edged) and size and quantity of particles.

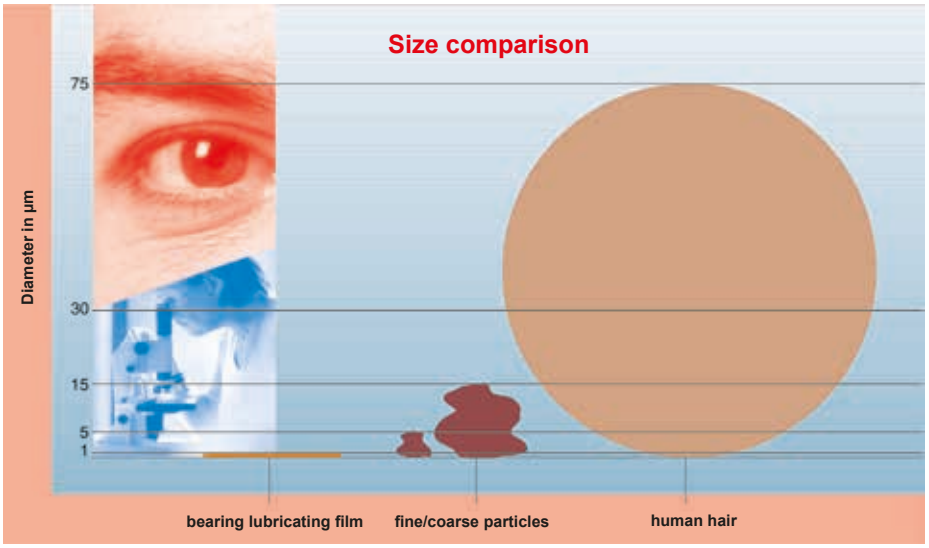
As a rule of thumb: the harder the particles, the more extensive the component damage and the higher the operating pressure, the more forcefully the particles become lodged in the lubrication clearance.

It often goes unrecognized that the majority of these solid particles is smaller than 30 µm and therefore they are not visible to the naked eye. This means an apparently clean fluid can, in fact, be badly contaminated.

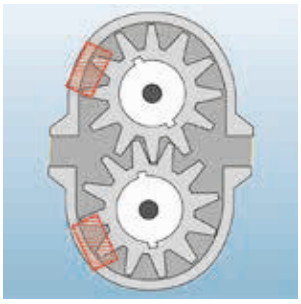
Particularly critical are particles which are the same size as the clearance between moving parts.

This is compounded by the fact that hydraulic users are constantly demanding smaller and lighter, high-performance components, which reduces the clearance even further.

In the following diagrams you will find the typical clearances.

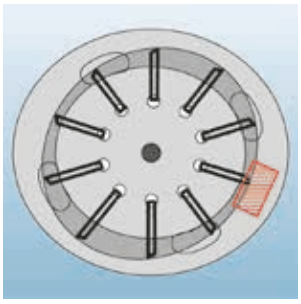


On hydraulic pumps:



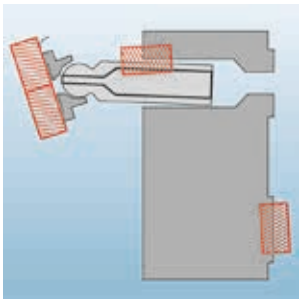
Gear pump
Dynamic clearance

Tooth to side panel: 0.5-5 µm
Tooth point to housing: 0.5-5 µm



Vane pump
Dynamic clearance

Vane rim: 5-13 µm
Vane duct: 0.5-1 µm

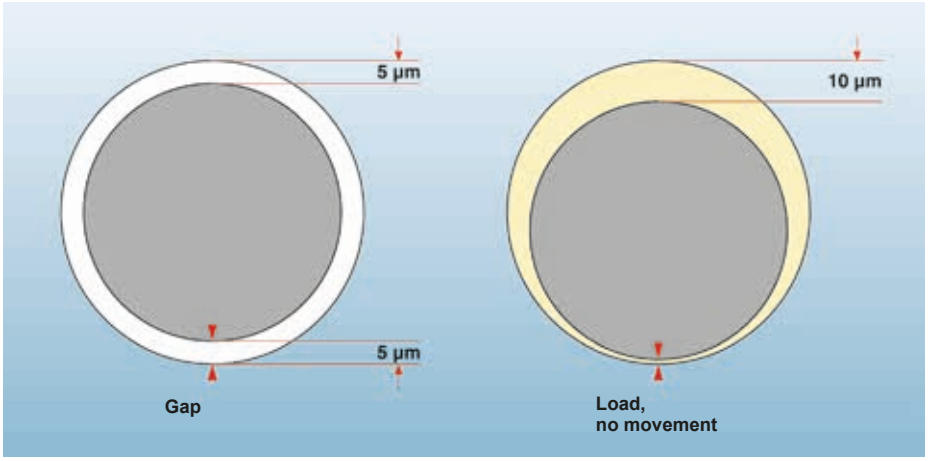


Piston pump
Dynamic clearance

Piston to bore: 5-40 µm
Valve plate to cylinder: 0.5-5 µm

On valves:

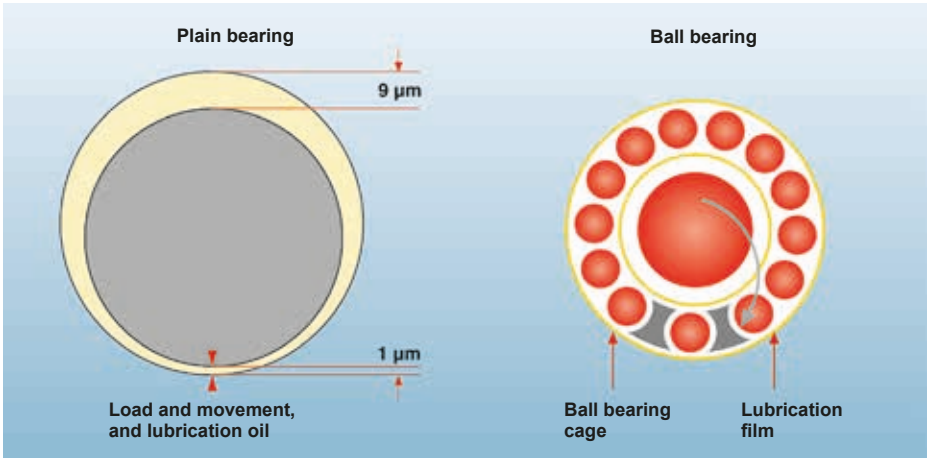
Servo valve	1 - 4 µm
Proportional valve	1 - 6 µm
Directional control valve	2 - 8 µm



The operational or dynamic lubricating film is not the same as the machine clearance and is dependent on the force, speed and viscosity of the lubrication oil.

Therefore the lubricating film separates the moving surfaces in order to prevent metal-to-metal contact.

Components	Clearance (µm)
Plain bearing	0.5-100
Ball bearing	0.1-3
Hydrostatic ball bearing	1-25



What types of wear are there?

1. Abrasion
caused by particles between reciprocating surfaces.

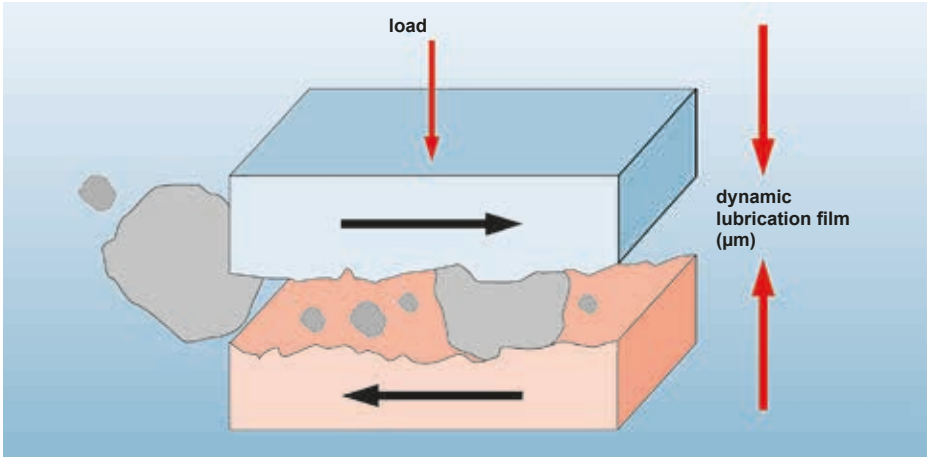
2. Erosion
caused by particles and high fluid velocity.

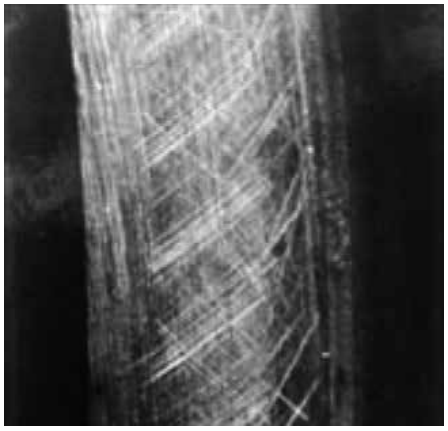
3. Adhesion
caused by metal-to-metal friction (loss of fluid).

4. Surface fatigue
surfaces damaged by particles are subjected to repeated stress.

5. Corrosion
caused by water or chemicals (not examined below).

1. Abrasion





Abrasion caused by foreign bodies

Effects of abrasion:
- Changes to tolerances
- Leakage
- Reduced efficiency
- Particles produced in the system create more wear!

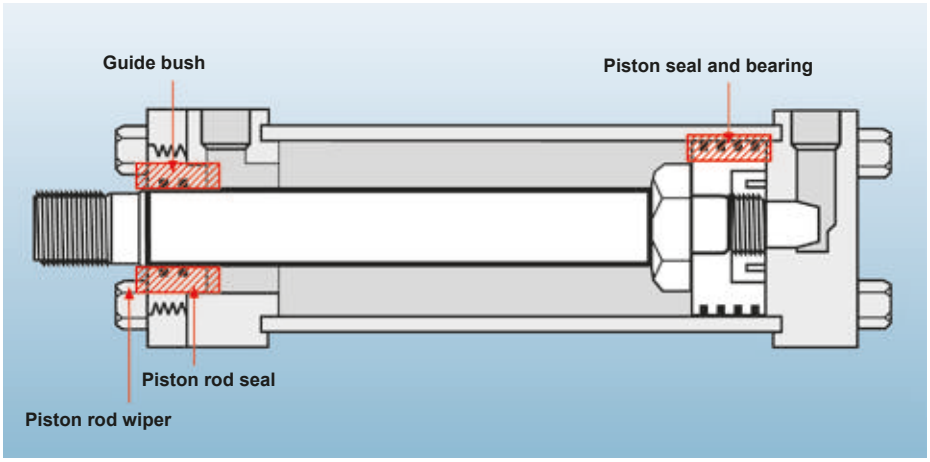
Effects of wear in the case of a hydraulic cylinder:

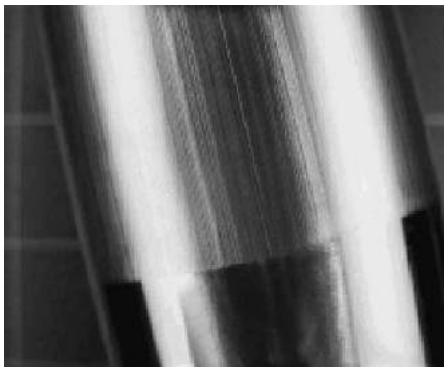
Rod seal wear
➡ External oil leak

Guide bush wear
➡ Loss of rod alignment

Piston seal wear
➡ Loss of cylinder speed
➡ Loss of holding ability

Piston bearing wear
➡ Loss of rod alignment



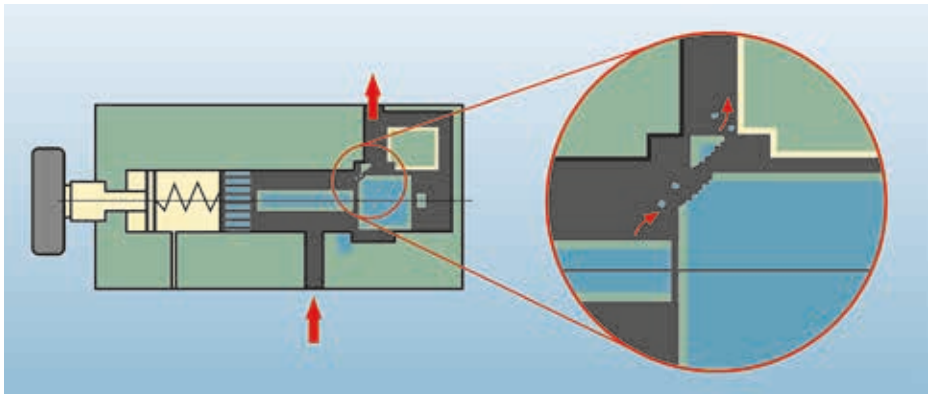


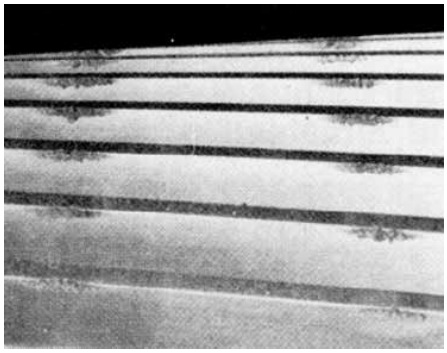
Damaged piston rod

Effects of erosion:

The high velocity of the fluid forces existing particles against the corners and edges of the system.
Other coarse and fine particles therefore become detached from the surface and there is a gradual attack on the surfaces in the system.

2. Erosion



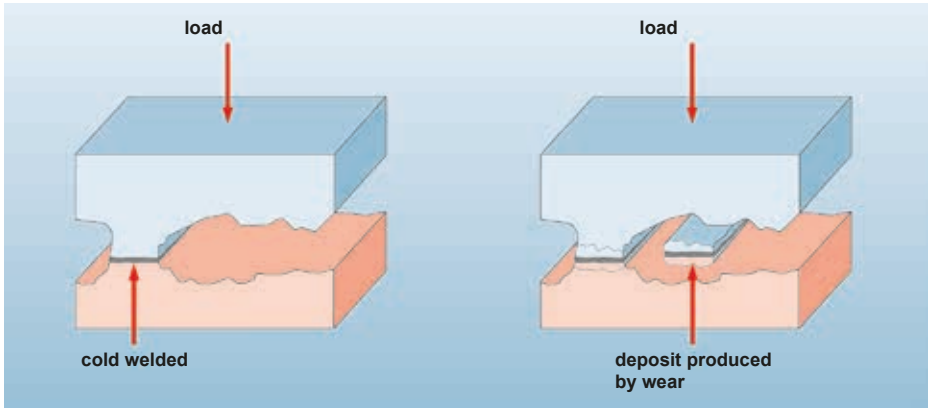


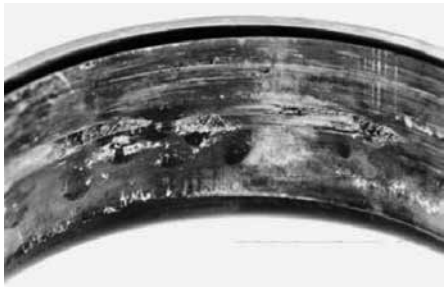
Erosion damage on the cog wheel

Effects of adhesion:

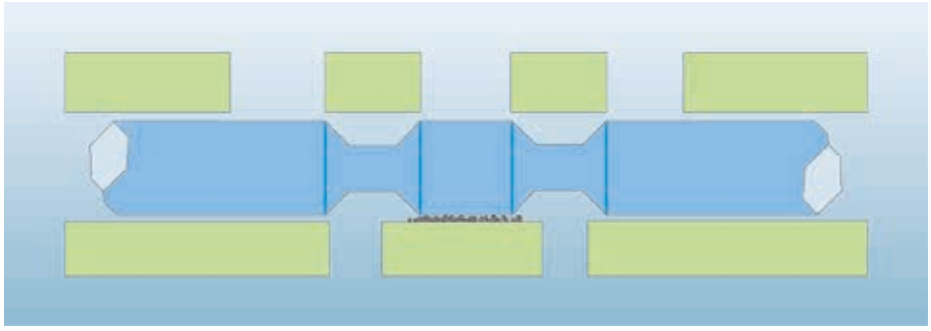
Low speed, excessive load and/or a reduction in fluid viscosity can reduce the oil film thickness.
This can result in metal-to-metal contact, and also possible shearing.

3. Adhesion



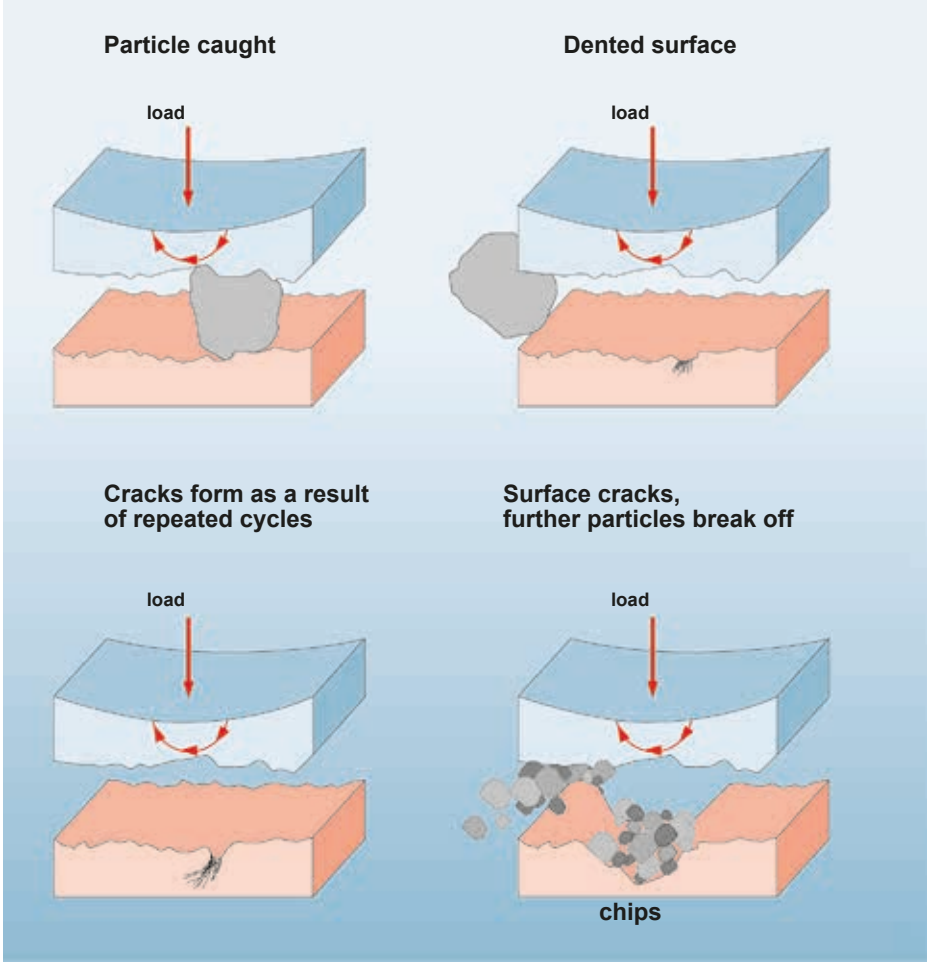


Adhesion on ball bearing



The smallest cracks in the surface are hollowed out causing material to break off, therefore creating new particles. This action causes an increase in wear.

4. Surface fatigue



Surface fatigue on ball bearing

How clean should the fluid be?

Classification of the solid particle contamination

Solid particle contamination in lubrication and hydraulic fluid is classified according to ISO 4406/1999.

To determine the cleanliness level the solid particles present in 100 ml fluid are counted, sorted according to size & quantity and classified into particle ranges.

Depending on the method of particle counting, there are 2 or 3 ranges:

Particle counting method	Particle sizes (Code no.)		
Automatic particle counter	>4 µm$_{(c)}$	> 6 µm$_{(C)}$	> 14 µm$_{(C)}$
Microscopic counting	---	> 5 µm	> 15 µm

The ISO Code can be "translated" into a maximum particle quantity for each particle size range with the aid of the adjacent table.

This code is specified for each size range.

The oil cleanliness level determined by electronic particle counters is expressed as a combination of three numbers, e.g. 21/18/15; the particle quantity determined by microscopic counting is expressed as a combination of two numbers, e.g. -/18/15.

ISO Code (to ISO 4406)	Particle quantity/100ml from	to
5	16	32
6	32	64
7	64	130
8	130	250
9	250	500
10	500	1000
11	1000	2000
12	2000	4000
13	4000	8000
14	8000	16000
15	16000	32000
16	32000	64000
17	64000	130000
18	130000	260000
19	260000	500000
20	500000	1000000
21	1000000	2000000
22	2000000	4000000
23	4000000	8000000
24	8000000	16000000
25	16000000	32000000
26	32000000	64000000
27	64000000	130000000
28	130000000	250000000

Determined using...

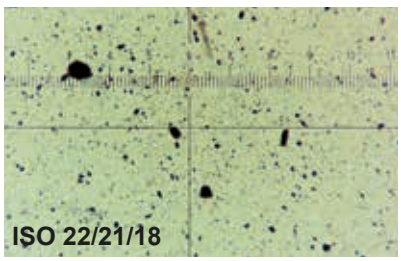
...electronic particle counter

21 / 18 / 15
>4µm$_c$ >6µm$_c$ 14µm$_c$

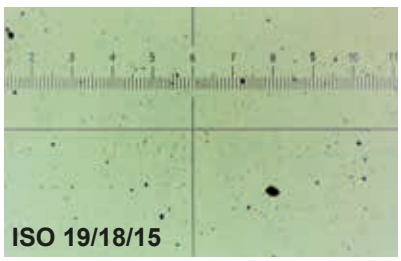
...microscopic counting

– / 18 / 15
>5µm$_c$ 15µm$_c$

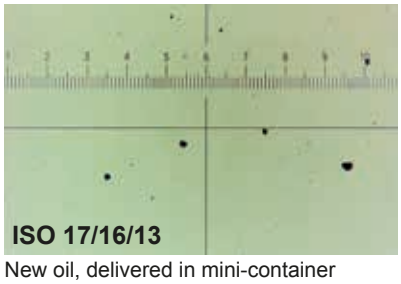
Typical cleanliness level:



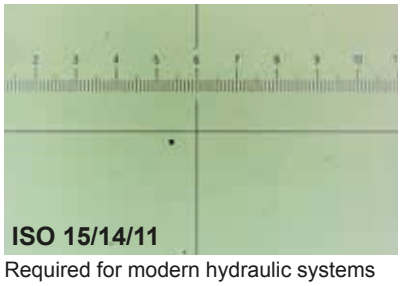
New oil, delivered in drums



New oil, delivered in road tanker



New oil, delivered in mini-container



Required for modern hydraulic systems

Cleanliness requirements for lubricating and hydraulic components

The cleanliness level required in lubricating and hydraulic systems is determined by the most sensitive component.

Numerous manufacturers of components for lubrication, industrial and mobile hydraulics specify the optimum cleanliness requirements for their components. If more heavily contaminated, the fluid can lead to a significant reduction in service life of those components. Therefore, we recommend contacting the particular manufacturer for written recommendations concerning the cleanliness of the fluid.

In the case of warranty claims, this information is important in order to reject claims for damages. If the component manufacturers do not have specific data concerning the required cleanliness level, the following table can be used:

Type of system/Area of application/ Components	Recommended cleanliness class
Systems with servo hydraulics sensitive to fine contamination	15/13/10
Industrial hydraulics ● Proportional technology ● High pressure systems	17/15/12
Industrial and mobile hydraulics ● Solenoid control valve technology ● Medium pressure and low pressure systems	 18/15/12 19/16/14
Industrial and mobile hydraulics with low requirement for wear protection	20/18/15
Forced-feed circulatory lubrication on transmissions	18/16/13
New oil	21/19/16
Pumps/motors ● Axial piston pump ● Radial piston pump ● Gear pump ● Vane pump	 18/16/13 19/17/13 20/18/15 19/17/14
Valves ● Directional valves ● Pressure valves ● Flow control valves ● Check valves ● Proportional valves ● Servo valves	 20/18/15 19/17/14 19/17/14 20/18/15 18/16/13 17/15/12
Cylinders	20/18/15

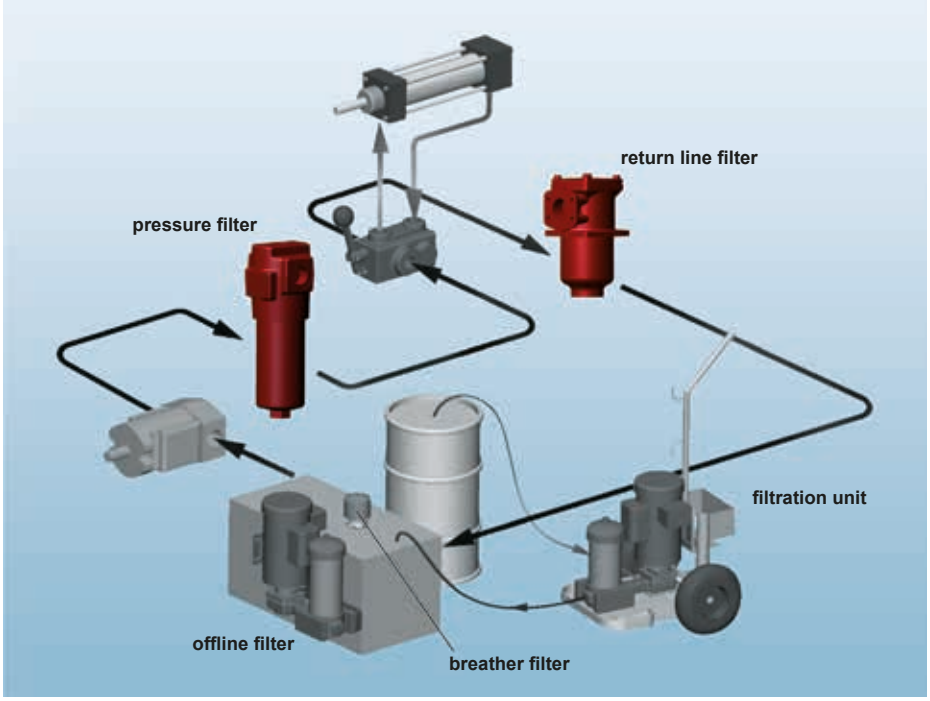
The cleanliness levels shown in the table are based on an operating pressure from 100 to 160 bar, a normal level of ambient contamination and normal system availability.

Therefore, the following criteria must be taken into account when determining the required cleanliness class of the fluid:

		Correction factor for the recommended cleanliness
Operating pressure	less than 100 bar more than 160 bar	1 class worse 1 class better
Expected service life of the machine	up to 10 years over 10 years	no correction 1 class better
Repair and spare part costs	high	1 class better
Downtime costs due to shutdown	up to €10,000/hr. over €10,000/hr.	no correction 1 class better
Pilot system (system which significantly affects the manufacturing process or cycle)		1 class better

What kinds of filters are there and when are they used?

Installation location of a filter



Suction filters

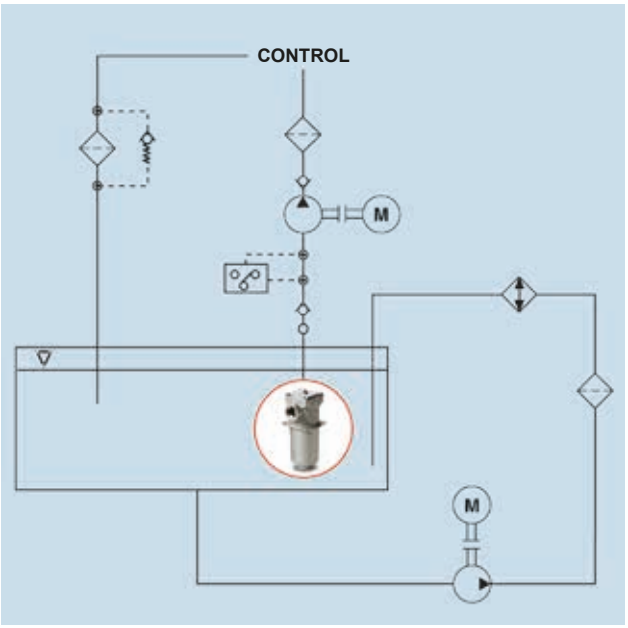
These filters are installed between the tank and the booster pump to protect the pump from coarse contamination which can cause a high level of wear in the pump.

They can be installed inline, at the intake port in the tank or below the tank.

To prevent hazardous operating conditions for the pump, we recommend using a vacuum gauge between the filter and pump.

Due to the risk of pump cavitation, relatively coarse filter materials with a filtration rating of > 25 µm are used.

For this reason, suction filters are **not** suitable for ensuring the component protection necessary for the economical operation of the system.



SF, SFM, suction filter element

Extract from product range

Suction filters	
Advantages	Please note
● Protects the pump against coarse contamination	● Fine filtration not possible ● Pump must be protected against cavitation (vacuum switch) ● Risk of cavitation, particularly at low temperatures (cold start) ● To guarantee protection from wear, other filters must be installed

Pressure filters

This type of filter is defined in the DIN 24550 standard as an inline filter designed for a specific nominal pressure. It can be installed before or after the boost pump, but also in the return line between components and tank.

Wherever the filter is installed, the housing must be sized in accordance with the system pressure, the pressure pulsations and the flow rate.

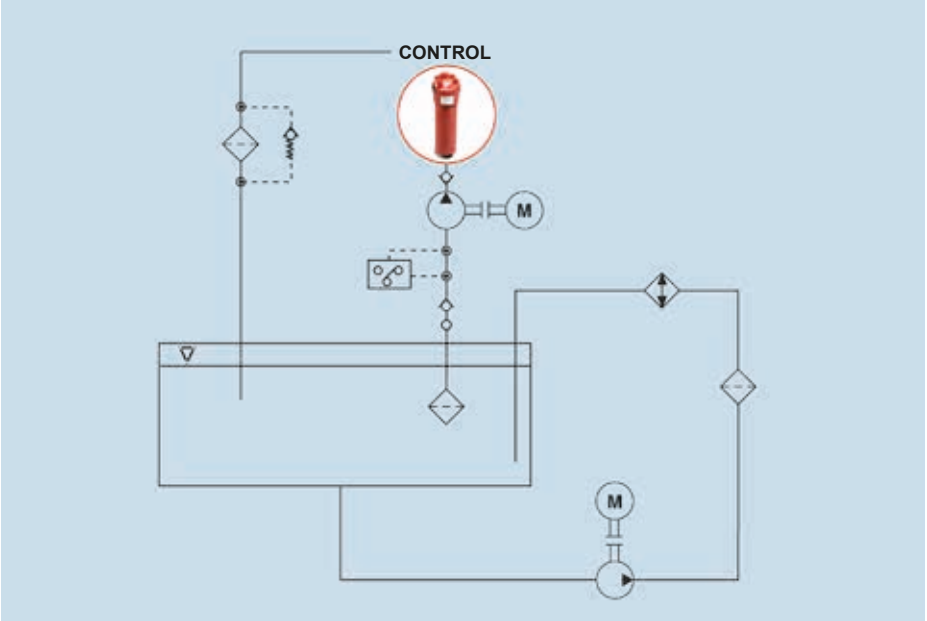
To enhance the reliability of the whole hydraulic and lubrication system, filter housings are designed to have high fatigue strength. The filter housings are flow-optimized to be able to achieve a low pressure drop and a compact, space-saving design. They therefore make a significant contribution to the economy of the whole system. On mobile machines which comply with the latest regulations, the space-saving housing concept offers considerable advantages. To reduce the risk of unwanted leaks from the inline filter during operation, these can be integrated into a cost-optimized hydraulic or lubrication module. To protect particularly sensitive components, such as servo and proportional valves, we recommend installing this type of filter immediately before the component. However, in particular, the high dynamics in the control circuits must be taken into account in this case.

Inline filters which are fitted with filter elements where the flow is from out to in, should preferably be installed in systems which have high pressure pulsations and where the filter housing has no bypass valve.

On systems with a high contamination load, as with cooling lubricants, for which additional effective filtration of metallic particles is required, HYDAC recommends installing filter housings in which the flow through the filter elements is from in to out.

Depending on where the inline filter is installed in the machine, this type of housing offers advantages for element change.

Pressure filters must always be fitted with a clogging indicator. Before particularly critical components, only inline filters without bypass valves should be used. Such filters must be fitted with a filter element which must itself be able to withstand higher differential pressures, without sustaining any damage.



Inline filter

DF 420 bar

MFM 280 bar

LPF 50 bar

Extract from product range

Manifold-mounted filters

DFZ 315 bar

DF...M A 250 bar
DF...Q E 315 bar

DFP 315 bar

Extract from product range

Pressure filters	
Advantages	Please note
● Filtration is directly upstream of the components which need protection ● Required cleanliness level is guaranteed	● More expensive filter housing and element due to pressure load ● Complex element construction as a result of the necessary differential pressure resistance ● Pump is not protected ● In the case of single filters, the system has to be shut down to change the element.

Return line filters

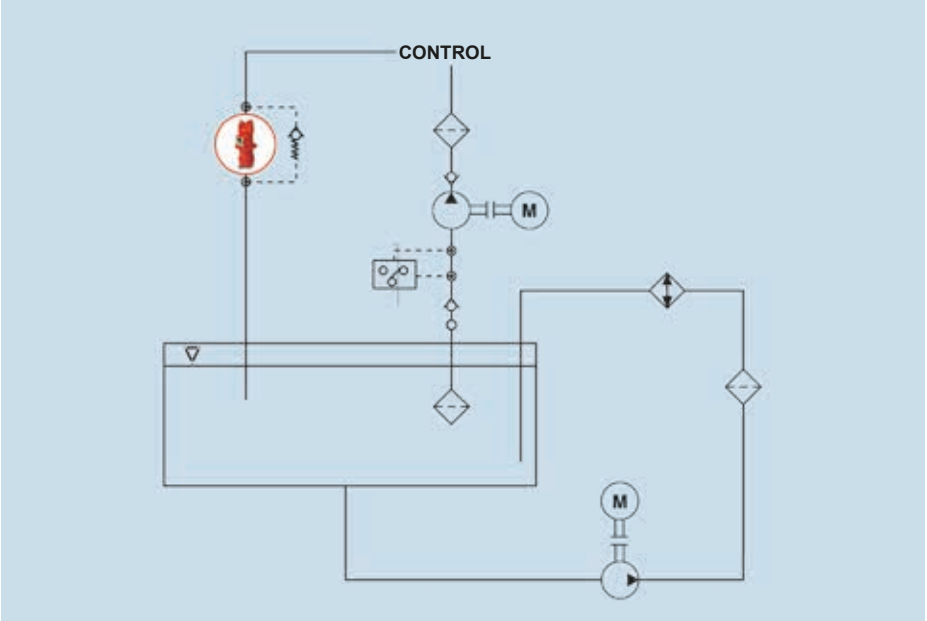
This type of filter can either be installed inline (in the hydraulic tank line) or as a tank-mounted filter (on top of the hydraulic tank).

To prevent dangerous malfunctions in hydraulic components as a result of excessive back-pressure in the return line, return line filters are usually fitted with a bypass valve. For systems which are operated around the clock, the filter housing must be of the change-over type so that the system does not need to be shut down for filter maintenance. So that the oil flow is not interrupted during the change-over process, causing undersupply to the lubrication points, the change-over valve is designed with negative overlap.

When selecting the correct filter size, the maximum possible flow rate must be taken into account. This corresponds to the area ratio of piston to piston minus the rod of hydraulic cylinders and can be greater than the flow rate generated by the pumps.

In order to prevent possible foaming of the fluid in the tank, make absolutely sure that the fluid outlet from the filter is always below the fluid level in all operating conditions. It may be necessary to fit a pipe or flow rate diffuser in the filter outlet. It is important that the distance between the floor of the tank and the end of the pipe is no less than two to three times the pipe diameter.

Return line filters can be fitted with breather filters as additional equipment.



Return line filters


RF


NF


RFN

Extract from product range

Return line filters	
Advantages	Please note
● All fluid flowing back to tank is filtered ● No system contamination reaches the tank ● Filter housing and element are excellent value	● In the case of high-value components a pressure filter must be used in addition ● It is advisable to fit a bypass valve ● In the case of elements with low differential pressure resistance, it is possible for the element to burst as a result of multiple pulsations ● In the case of single filters, the system has to be shut down to change the element ● Large filters are required for high flow rates (area conversion for differential cylinders)

Return line & Suction Boost Filters

This type of filter has the advantage that the pump capacity (pressure and flow rate) installed in the steering and working hydraulics is implemented to supply the usually high-value drive hydraulics, which have a strict requirement for oil cleanliness, exclusively with filtered hydraulic oil.

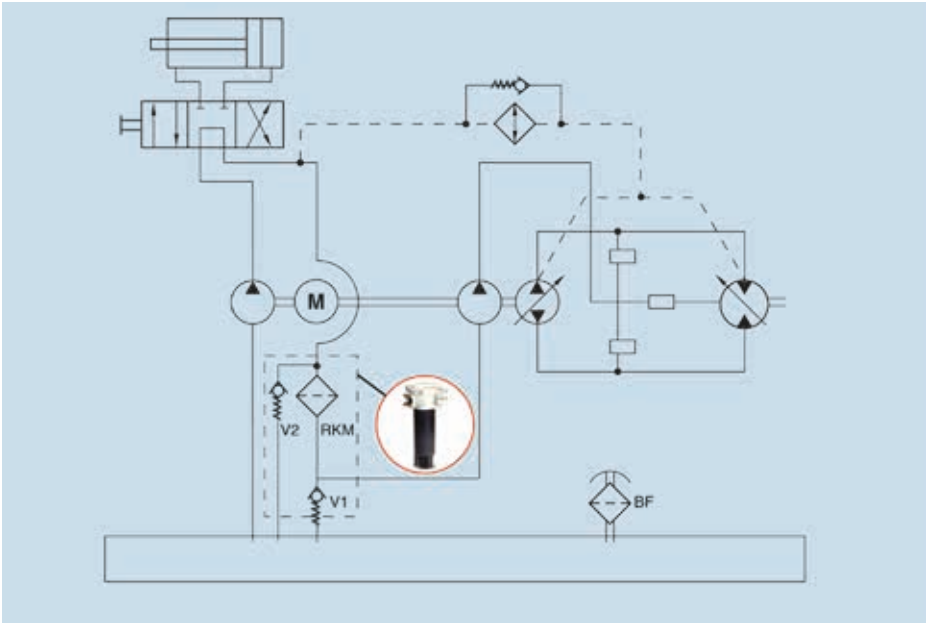
In addition, dangerous operating conditions where negative pressure occurs on the suction side for the boost pump, is reduced to a minimum. Excellent cold start characteristics for the whole unit are the result.

To enhance the economy of the whole unit, this space-saving return line & suction boost filter, which is usually installed as a "return line filter" on the hydraulic tank, provides the means of reducing the oil circulation volume by installing a smaller tank.

In order to maintain the initial load of approx. 0.5 bar at the connection to the charge pump, a surplus of at least 10% between the return line volume and the suction volume is required under all operating conditions.

Through the use of a pressure relief valve, when the Δp reaches 2.5 bar, the oil flows directly into the tank (no bypass to the closed circuit).

If, in addition to the flow from the open circuit, the leakage oil from the hydrostatic drive also goes through the filter, then the permitted pressure of the leakage oil at the filter must not be exceeded (taking into account the pressure drop of the leakage oil lines, of the oil cooler and the pressure relief valve) to protect the radial shaft seal rings.



Return line & Suction Boost Filters

RKM

Return line & Suction Boost Filters	
Advantages	Please note
● Finely filtered oil supplied to consumer (increases the availability) ● Oil is pre-charged in the suction connection (0.5 bar) (prevents cavitation, less wear) ● Replaces several filters (lower fitting costs, only ONE spare element) ● Extremely low pressure drop (full filtration at low temperatures) ● Various options (thermal bypass valve, multi port)	● Useful if under operating conditions the return line volume is greater than the volume needed on the suction side

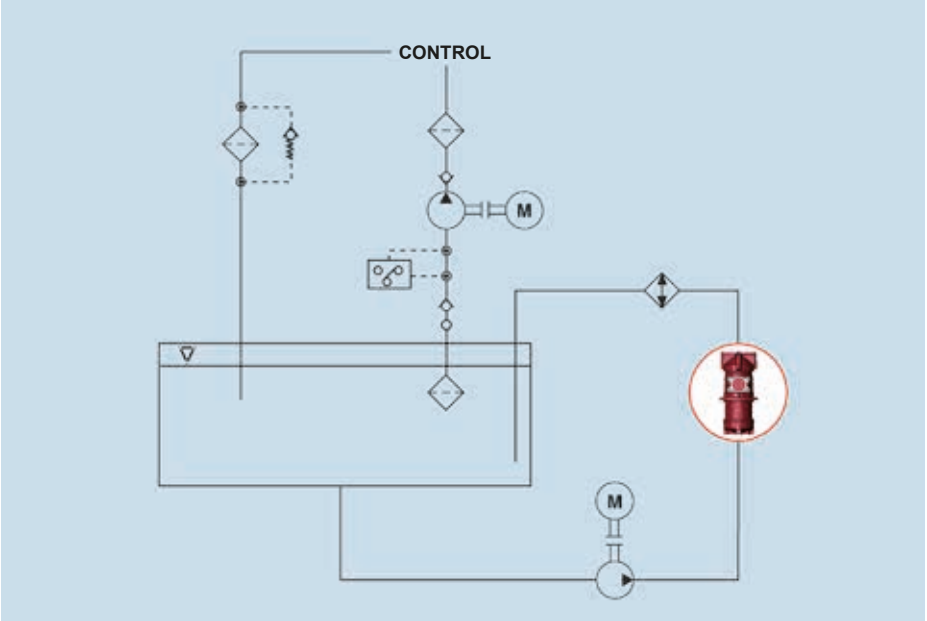
Offline filters

In hydraulic systems with heavy loads, additional offline filters are used increasingly to avoid the accumulation of fine particles.

In contrast to main filters, only part of the whole flow in the system is filtered by offline filters.

Excellent oil cleanliness levels can be achieved through continual filtration, regardless of the operating cycle of the machine. In addition, the main filters are relieved, meaning that element changing intervals can be extended.

Offline filter systems should be used in addition to main filters. In this case the main filter should be sized as a protective filter, i.e. filtering less finely and without a bypass valve.



Offline filters

Extract from product range

NF

Offline filters
Advantages
● Excellent cleanliness classes ● Filtration independent of the system ● High contamination retention capacity of filter elements as a result of pulsation-free, low and constant flow through the filter elements ● Element change possible without stopping the machine ● Cost savings as a result of lower material costs ● Less time spent on maintenance ● Fewer downtimes ● Cost-effective filter elements ● Possible to fill hydraulic system ● Can be easily retrofitted in systems with insufficient filtration ● Dewatering of the fluid is possible ● Service life of fluid in the system is extended

Generally speaking, offline filters should be installed:

- if a high rate of contamination is expected, e. g. on production test rigs, large-scale systems in dusty areas, cleaning systems
- when installing a separate cooling circuit
- when there are vigorous changes in system flow rate

Tank breather filters

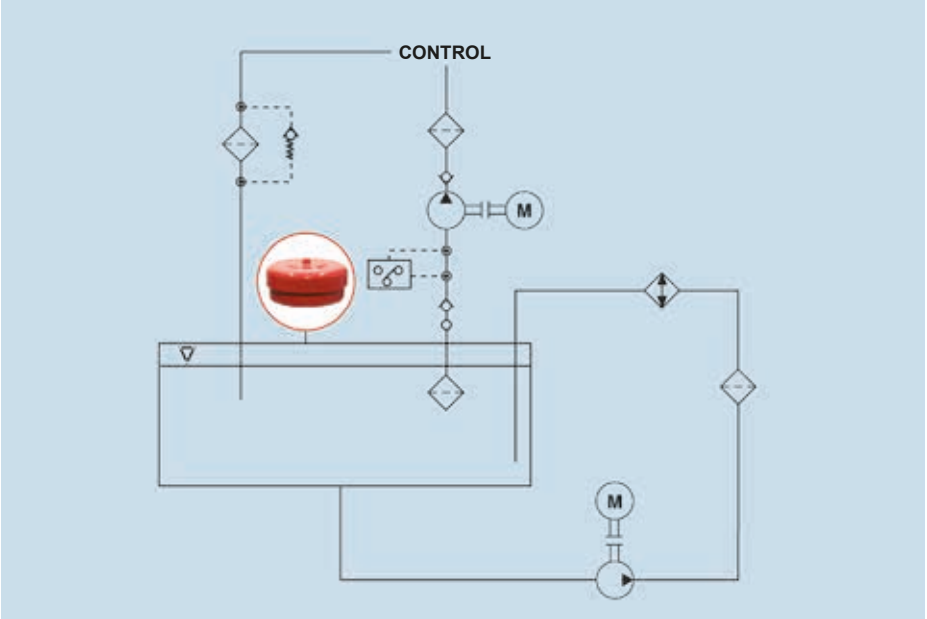
Tank breather filters are one of the most important, yet neglected, components in filter design.

As a result of changes in temperature and of using cylinders or accumulators, the oil level in the tanks of hydraulic and lubrication systems is subject to constant fluctuations.

The resulting pressure differential to the ambient is equalized by an exchange of air which means contamination can get into the tanks.

Breather filters can prevent contamination from entering. Ideally the breathers should be of at least the same filtration rating as the system filter in the hydraulic circuit. By using breather filters with double check valves, the air exchange between the tank and the ambient can be significantly reduced, minimizing the amount of contamination and dust entering the tank and increasing the service life of the breather filter.

Where there are high temperature changes and high humidity, water also enters the tank. HYDAC BD filters prevent water from entering and therefore improve the fluid performance.



Tank breather filters

BF

ELF/L

BDE

Extract from product range

Breather filters	
Advantages	Please note
● Relieves the system filter by preventing contamination from entering the tank during tank breathing ● High air flow rate ● Cost-effective ● Environmentally-friendly	● If the filter is incorrectly sized, damage may occur to the tank and the pump.

Summary

Filter location	Advantages	Please note	Filter designation
Breather filters	● Relieves the system filter by preventing contamination from entering the tank during tank breathing ● High air flow rate ● Cost-effective ● Environmentally-friendly	● If the filter is incorrectly sized, damage may occur to the tank and the pump.	BDL, BDE, BDM, BF, BL, BLT, ELF, ELFL
In the suction line	● Pump protection	● Coarse filtration only ● Due to the pump suction conditions, generously sized filters with a low differential pressure are required ● No protection of components further downstream from pump wear ● Unsuitable for many control pumps ● Minimum system protection ● It is essential to protect the pump against vacuum pressure	LF, LPF, MF, MFD, RFL, RFLN, SF, SFE, SFF, SFM, SFAR
In the pressure line	● Direct protection of the components ● Contributes to the general cleanliness of the system ● Highly efficient fine filter elements can be used ● Filters pump drive systems	● Housing and element expensive since they must be sized for the max. system pressure ● Does not filter contamination from components further downstream ● High energy costs	DF, DF...M A, DF...Q E, DF...MHA, DF...MHE, DFDK, DFF, DFG, DFM, DFN, DFNF, DFP, DFZ, HDF, HDFF, HFM, ILF, ILFR, LF, LFDK, LFF, LFM, LFN, LFNF, LFR, LPF, LPF...D A, LPFR, MDF, MDFR, MF, MFD, MFX
In the return line	● Filters the contamination which has entered the system as a result of component wear and worn wipers before it can reach the hydraulic tank ● Low pressure sizing of the filter housing enables costs to be reduced ● Can be installed inline or in the tank	● No protection of the pump ● Return line flow rate fluctuations can reduce the filtration efficiency ● No direct component protection ● Large filters may be required, since the return flow is often larger than the pump flow	AFLD, AFLS RF, RFM, RKM, RFL, RFLD, RFN, RFD, RFND, RFLN, RFLR, RKMR, RMER, RMTR, RPER
Offline e.g. cooling circuit	● Continuous cleaning of the hydraulic fluid, also when system is shut down ● Maintenance can be carried out when system is running ● Filtering action is not impaired by fluctuations in flow and provides optimum service life and efficiency of filter elements ● Possible to fill the tank with filtered new oil ● Particular cleanliness level can be achieved and maintained accurately. ● Possible to install fluid cooling easily	● High investment costs ● Additional space-requirement ● No direct component protection	NF, NFD, LF, MF

Filter selection

Filter efficiency is the most important but not the only factor involved when evaluating the filter design. A filter can be ineffective if it is installed in the wrong place and if it is given the wrong job.

When creating a filtration concept, some **fundamental rules** play a crucial role.

For example, the function of a hydraulic filter is always to reduce wear which means it should filter to a finer level than the critical tolerances. Filters should be used with the highest possible flow rate. Suitable seals on cylinders and on breather filters should prevent contamination from entering the system etc.

Therefore we can distinguish between **protective filters** and **working filters**.

Protective filter	Working filter
● Component protection	● Cleaning function
● No bypass valve	● Flow with least possible pulsations where filter installed
● Does not prevent long-term wear	● Bypass valve available as an option
● Filters more coarsely than working filter	● Differential pressure indicator is recommended
● High differential pressure resistant filter elements	● Use of low differential pressure resistant elements is possible

Restricting the flow velocity

Since specific flow velocities in the connection lines must not be exceeded, depending on the filter type, we recommend only special maximum flow rates.

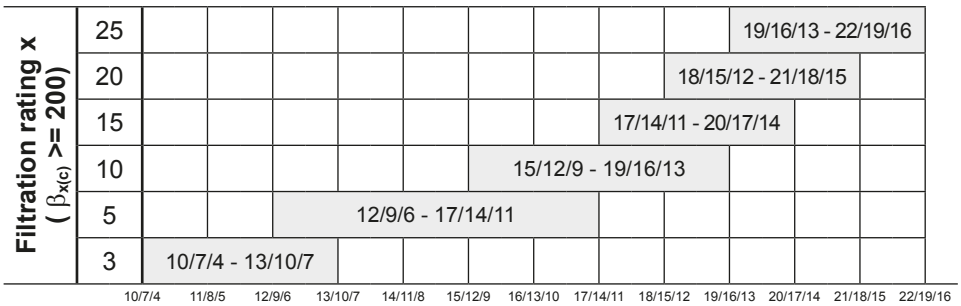
Here we give guideline values which are based on our experience. Exceptions, depending on the application, are of course possible and reasonable.

	Maximum recommended flow rate in l/min				
Threaded connection	Suction filter 1.5 m/s	Return line filter 4.5 m/s	Pressure filter up to 100 bar 4.5 m/s	Pressure filter up to 280 bar 8 m/s	Pressure filter up to 420 bar 12 m/s
G ½	14	42	42	46	68
G ¾	23	69	69	74	111
G 1	37	112	112	119	178
G 1 ¼	59	178	178	182	274
G 1 ½	92	275	275	295	443
DN50	175	525	725	950	1425
DN65	296	887	1225	1606	2408
DN80	448	1344	1856	2432	3648
DN100	700	2100	2900	3800	5700
DN125	1094	3281	4531	5937	8906
DN150	1575	4725	6525	8550	12825
DN200	2800	8400	11600	15200	22800
DN250	4375	13125	18125	23750	35625

Determining the appropriate filter element

Depending on the conditions of the system and the environment, filters with the same filtration rating perform differently.

The following cleanliness classes are typical for HYDAC elements:



Oil cleanliness to ISO 4406

Selection of the appropriate filter material

The variety of applications of HYDAC filters has given rise to different element models, each specifically optimized for particular requirements. We are therefore in a position to provide you with the type of element most technically and economically appropriate for your special application. The following table outlines the most important filtration media. Our sales team is always available to help you select the filtration media which is most appropriate for your application.

	Element designation	Construction of filter mesh pack	Typical features
	Synthetic fine filtration materials		
	Optimicron® ON (20 bar)	Multiple-layer, supported, pleated (Helios pleat geometry) filter mesh pack with glass fibre	● Low rise in differential pressure ● New "Helios" pleat geometry to stabilise the pleats and increase available area of incident flow ● First class filtration efficiency ● Outer wrap with improved diffuser effect
	Optimicron® Power ON/PO (10 bar)	Multi-layer, supported, pleated filter mesh pack with glass fibre	● Low pressure drop ● Filtration performance defined according to API specifications ● Homogeneous flow of the fluid ● Stat-Free® technology inclusive
	Optimicron® Pulse ON/PS (20 bar) OH/PS (210 bar)	Single-layer, supported, pleated (Helios pleat geometry) filter mesh pack with glass fibre	● Particularly high fatigue strength ● Low rise in differential pressure ● Integrated Stat-Free® technology
	Optimicron® Pulp & Paper ON/PP (10 bar)	Multiple-layer, supported, pleated (Helios pleat geometry) filter mesh pack with glass fibre	● Differential pressure greatly reduced ● Significantly increased contamination retention capacity ● Exclusive micro-glass media ● Outer wrap with improved diffuser effect
	Betamicron® BN4HC (20 bar) BH4HC (210 bar)	Multi-layer, supported, pleated filter mesh pack with glass fibre	● High contamination retention ● High rate of particle separation over a wide differential pressure range ● High resistance to pressure and flow rate fluctuations
	Mobilemicron MM	Multi-layer, supported, pleated filter mesh pack with synthetic fibre	● High rate of particle separation ● Low pressure drop ● Sufficient contamination retention ● First class filtration in the suction range possible
	Ecomicron ECON2	Multi-layer, supported, pleated filter mesh pack with glass fibre, support tube and end caps in electrically conductive synthetic material	● High rate of particle separation ● Low pressure drop ● High contamination retention ● Uses first class synthetic materials which can easily be disposed of ● Low weight ● Free of steel and iron
	Paper		
	Paper P/HC	Simply supported, pleated, organic paper (usually impregnated with phenolic resin)	● Cheap element ● Low level of particle removal and contamination retention (Multipass usually not possible) ● Low pressure drop ● Low pressure stability (bypass absolutely necessary)
	Stainless steel and wire mesh materials		
	Wire mesh or dutch weave W/HC or T/HC	Multi-layer or single-layer, supported, pleated square mesh in stainless steel or dutch weave	● Protective filter with low filtration performance and contamination retention
	Chemicron and Metal fibre V	Multi-layer, pleated mesh pack with sintered stainless steel fibre	● All the components used in the element are in stainless steel. ● On the element type "metal fibre V" the components are bonded using a 2-component adhesive (max. temperature 100 °C). ● On the "Chemicron" element the element components are bonded without the use of adhesive.

Filter sizing

Once the element material, the required filtration rating and the filter construction have been established, the size of the filter can be determined.

Here we can assume that the initial pressure drop of a filter does not exceed a specific value, or that it comes as close as possible to this value (see adjacent table).

Use as	Filter type	Total initial differential pressure (with new filter element)
Working filter	Return line filter, Pressure filter with bypass valve	0.15 to 0.2 • Pressure setting of clogging indicator ($P_{indicator}$)
	Offline filter, Inline filter, Separate units	0.15 to 0.2 bar
Protective filter	Pressure filters without bypass valve	$_{0.3} \cdot P_{display}$
	Suction filter	0.04 bar

The total pressure drop of a filter (at a specific flow rate Q) is the sum of the housing Δp and the element Δp and is calculated as follows:

$$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$$

$$\Delta p_{housing} = \text{please refer to housing curve (see brochure)}$$

$$\Delta p_{element} = Q \cdot \frac{\text{element gradient coefficient}}{1000} \cdot \frac{\text{operating viscosity}}{30}$$

Example

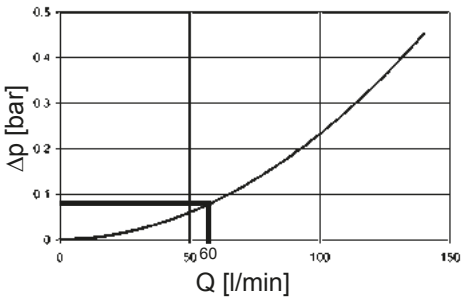
Sizing a return line filter, tank mounted, type RFM 150, element material Betamicron®4,
10 µm filtration rating,
Flow rate in the return line: 60 l/min, operating fluid: ISO VG 46, operating temperature: 40 °C.

Note:
At 40 °C this oil has an operating viscosity of approx. 46 mm²/s (always take manufacturer's data into account).

Max. initial differential pressure: 1 bar (=0.2 • $P_{indicator}$ = 0.2 • 2 bar = 0.4 bar)

$\Delta p_{housing}$:
(please refer to "RFM" brochure)

RFM 90, 150



$\Delta p_{element}$:
(for gradient coefficients for element 0150 R 010 BN4HC please refer to "Filter Elements" brochure or "RFM" brochure)

$$60 \text{ l/min} \cdot \frac{4.0}{1000} \cdot \frac{46 \text{ mm}^2/\text{s}}{30} = 0.368$$

$$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$$
$$0.09 + 0.368 = 0.458 \text{ bar}$$

What is the procedure in practice?

If you calculate on the generous side, i.e. choosing the larger filter, this will provide a longer service life, and will probably cost more. But if the sizing is only just adequate, i.e. you select the smallest possible filter, you risk a shorter service life and reduced component protection despite lower purchase costs.

The aim, of course, is to find the most economical filter whilst taking into consideration the total system life cycle (reduction of the Life Cycle Cost).

The size of the filter can be determined with the help of

- Housing and element pressure drop curves in the brochures (= manual filter sizing)
- Filter sizing program **Size-IT** (= computer-aided filter sizing)
- Concept creation tool **Optimize-IT** (= computer-aided system optimization)

Computer-aided filter sizing using Filter Sizing Program "Size-IT".

Size-IT enables computer-aided filter sizing, specific to the particular system and application profile.

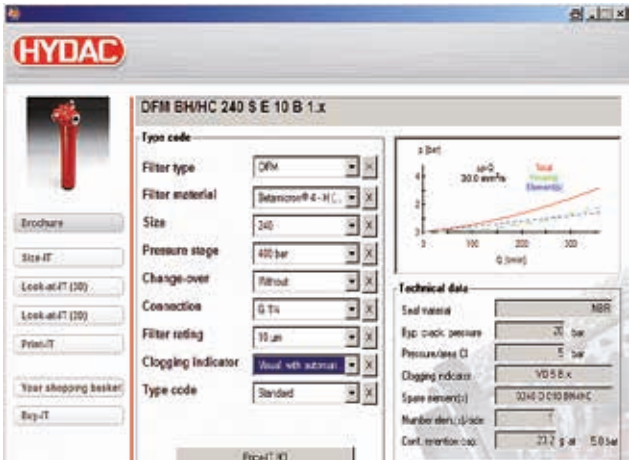
Size-IT is a component of our electronic product catalogue, **Filter-IT**.

We will, of course, be pleased to send you a copy. Alternatively the program is available on our website (www.hydac.com).

Size-IT automatically computes all calculations, which in the previous example, had to be carried out painstakingly step by step.

Possible errors when reading graph data are avoided; the time saving is considerable.

Example of a filter calculation using sizing software "Size-IT".



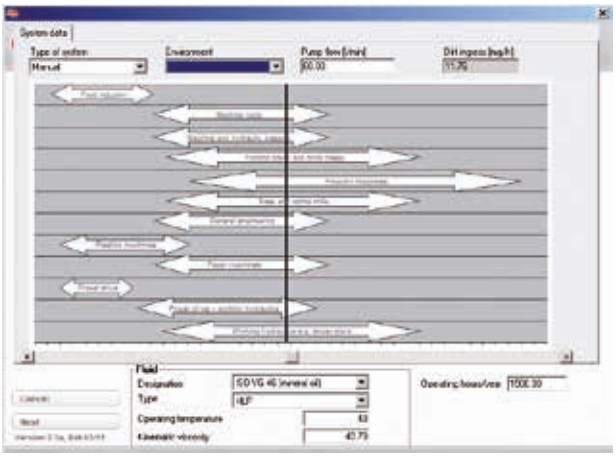
Filter calculation according to the expected contamination rate using the concept creation tool "Optimize-IT"

This electronic tool, called **"Optimize-IT"**, is also a component of our electronic product catalogue, but is only available to our filter specialists.

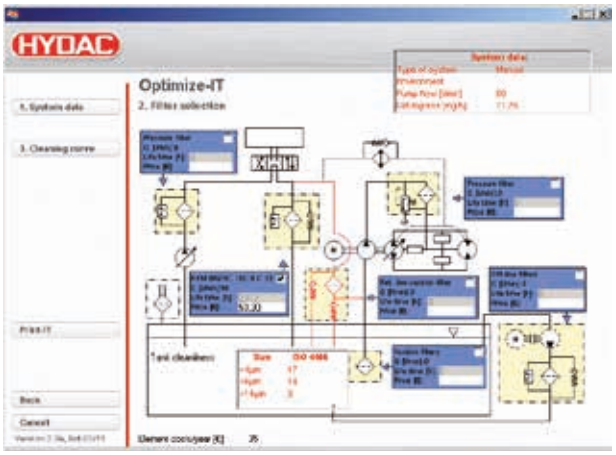
Cleanliness classes and achievable service lives for different filter designs can be identified and compared using this tool.

Based on the expected contamination, the optimum filter combination and filter size combination can be determined, right down to a specific calculation of the element costs per year.

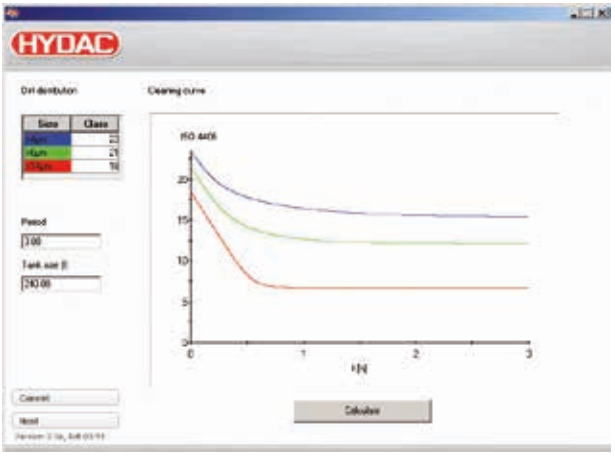
Example of concept optimization using the electronic tool "Optimize-IT":



Determining the expected contamination for a particular system



Calculation of the service lives and element costs/year

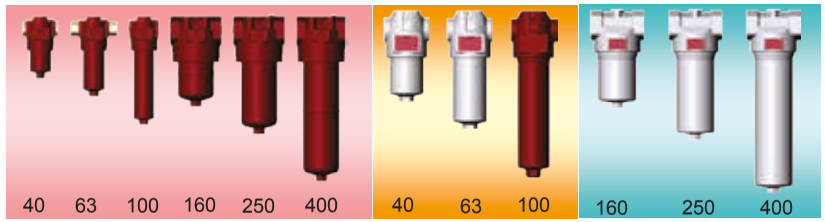


Graph showing cleaning

Preferred Range: Filters to DIN 24550 Standard

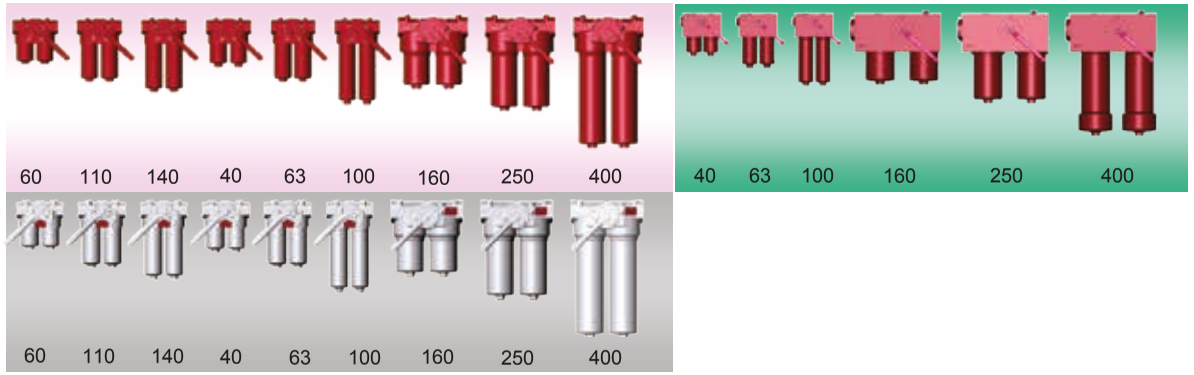
Pressure line filters single

DFN/DFNF	400 bar
LFN/LFNF	100 bar
FLN	25 bar



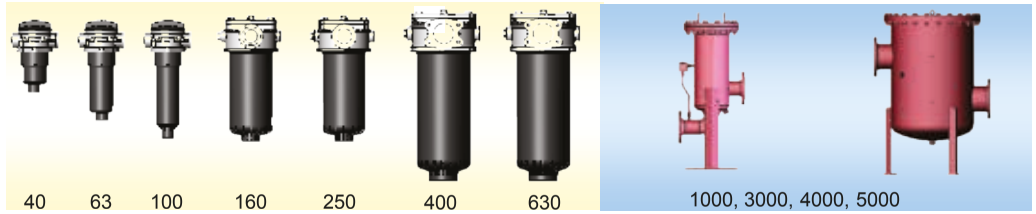
Pressure line filters change-over

DFDKN	315 bar
FMND	210 bar
FLND	25 bar



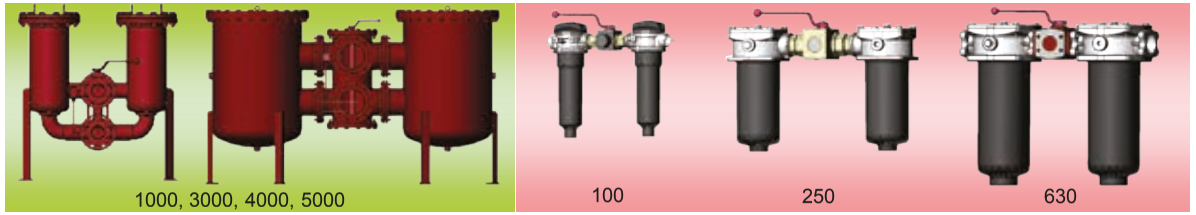
Return line filters single

RFLN	16 bar
RFN	10 bar



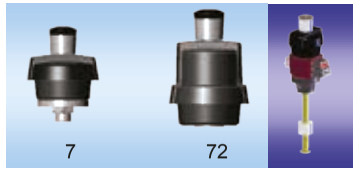
Return line filters change-over

RFND	25 bar
RFLND	16 bar



Breather filters

BF	---
TC (TankConditioner)	



Clogging indicators


VD...LE...


VMF...LE...


VR...LE...


VD...LZ...


VMF...LZ...


VR...LZ...

HYDAC INTERNATIONAL
Preferred Range: Mining

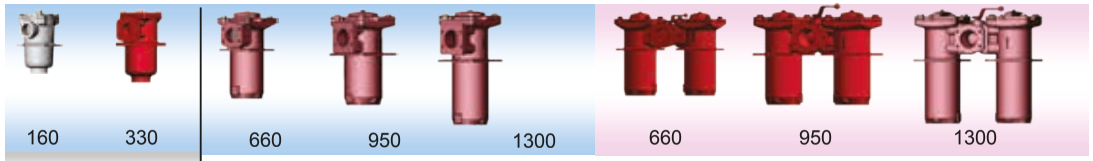
Pressure line filters Working hydraulics

DF	420 bar
HDF	280 bar

HDF in L-configuration flow path

Return line filters Working hydraulics

RF	25 bar
RFD	25 bar



Version -SO 136

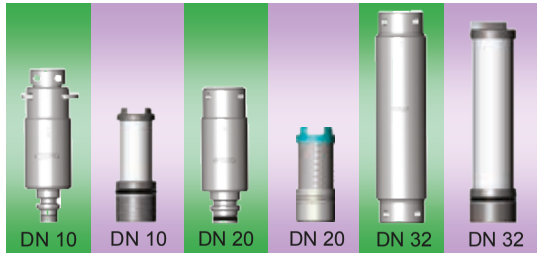
Pressure line filters HFA Hydraulics

DF	420 bar
DFF	420 bar

Protective filters and protective elements

ILF	420 bar
Last-chance elements	420 bar

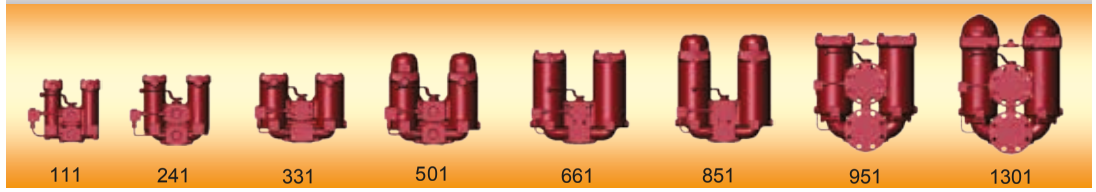
With staple-lock connection



Offline filtration Transmission filtration

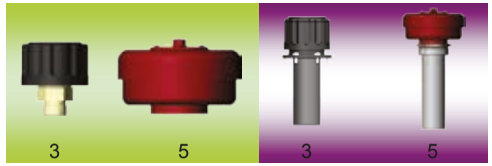
RFLD	25 bar

Cast version



Breather filters

BF	---
ELF	---



HYDAC INTERNATIONAL

Preferred Range: Mobile

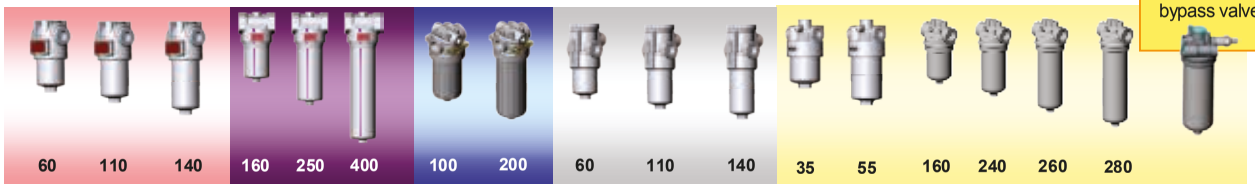
Pressure line filters – Working hydraulics

DF	420 bar
HDF/HDFF	420 bar
HFM	400 bar
DFM*	400 bar
ILF	350 bar
MFM	280 bar
MDF	280 bar

***Filter with safety valve,** to supply the sensitive control unit with finely filtered oil.

Pressure line filters – Feed pump

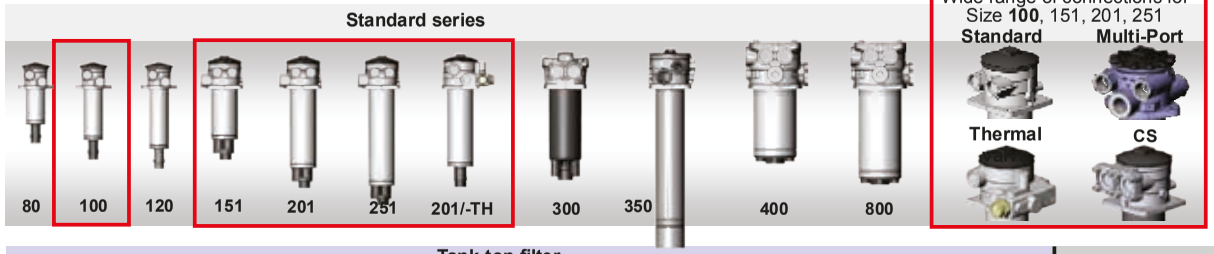
LF	100 bar
LFM*	63 bar
LPF	50 bar
MFX	40 bar
FLN	25 bar



Return line suction filter

Combined circuits	
RKM	10 bar

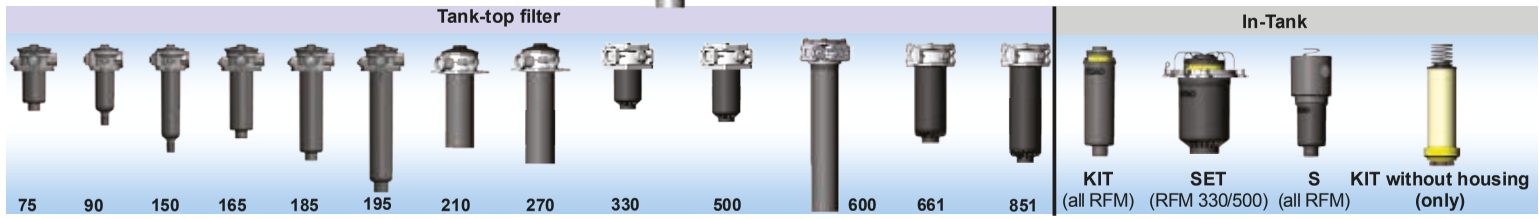
RKM Series is also available in service-optimised design!



Return line filters

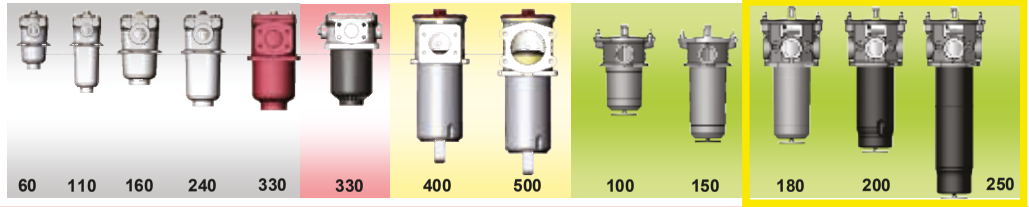
In-Tank or Tank-Top	
RFM	10 bar

Quality Protection and 4-hole flange mounting available for selected sizes!



Suction filters

SF	---
SFM	---
SFF	---
SFAR	---



Diesel Filtration

HYDAC Diesel PreCare HDP

HighTech HT BestCost BC

Multiple module

Change-over HYDAC Diesel PreCare HDPD

HYDAC Diesel MainCare HDM

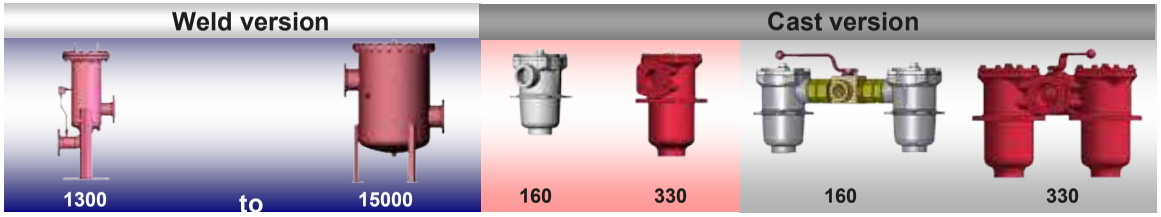
HYDAC INTERNATIONAL

Preferred Range: Onshore - Offshore - Marine

Return line filters single/change-over

RF	25 bar
RFD	25 bar
RFL	16 bar

RFL also in cast version up to size 1321 and pmax. 40 bar



ATEX Differential pressure indicator
VD..C.1 /-2GEXDIIC
IP 66

Standard filters with special offshore paint

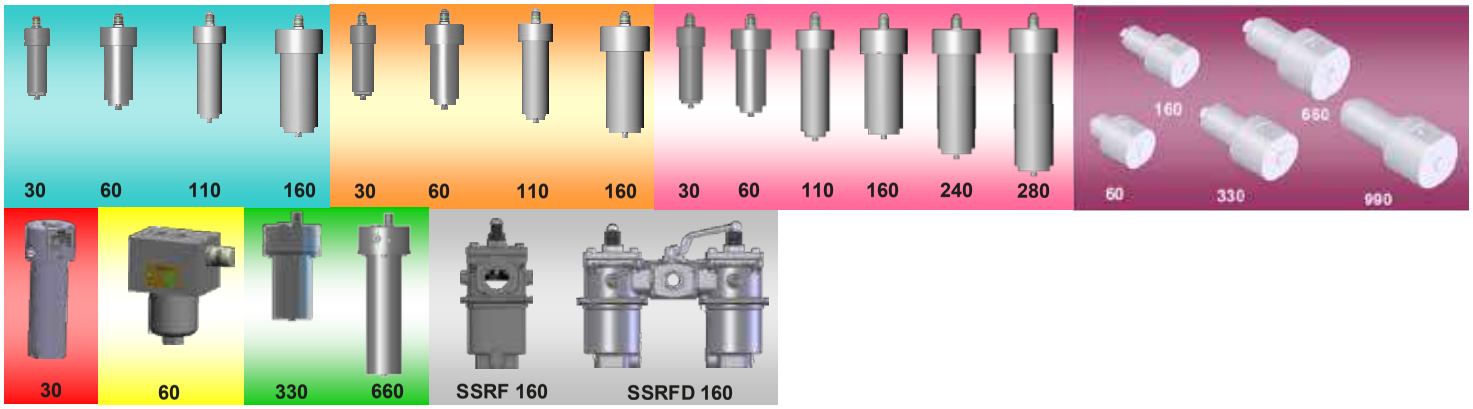
DF/DFF	420 bar
RFLD	64 bar

DF also in flange version and change-over

RFLD also in weld version up to size 1500 and pmax. 16 bar

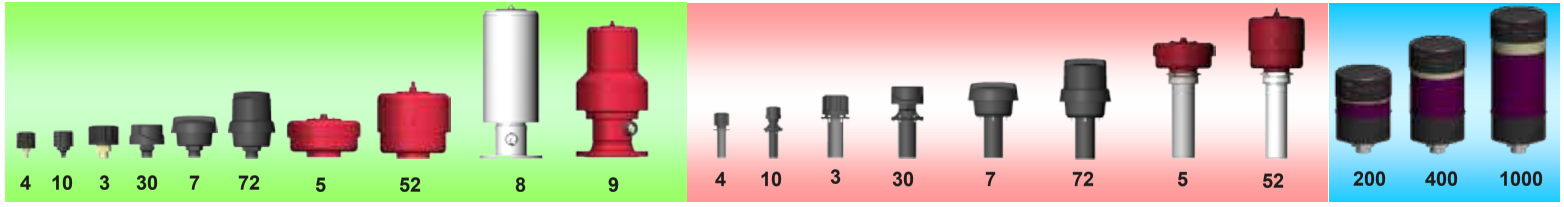
Stainless steel filters

ACSSF	1035 bar
HPSSF	700 bar
SSDF/ SSDFD	700 bar
MPSSF	450 bar
EDF R/A	400 bar
SSDFP	350 bar
EMLF	40 bar
SSRF	25 bar
SSRFD	25 bar



Breather filters

BF	---
ELF/ EFLF	---
BDE	---

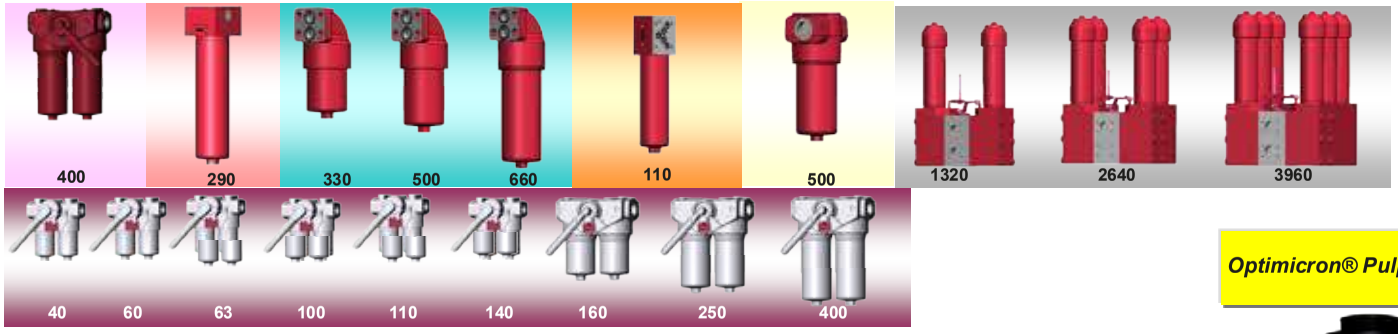


HYDAC INTERNATIONAL

Preferred Range: Paper Industry

Pressure line filters Hydraulics

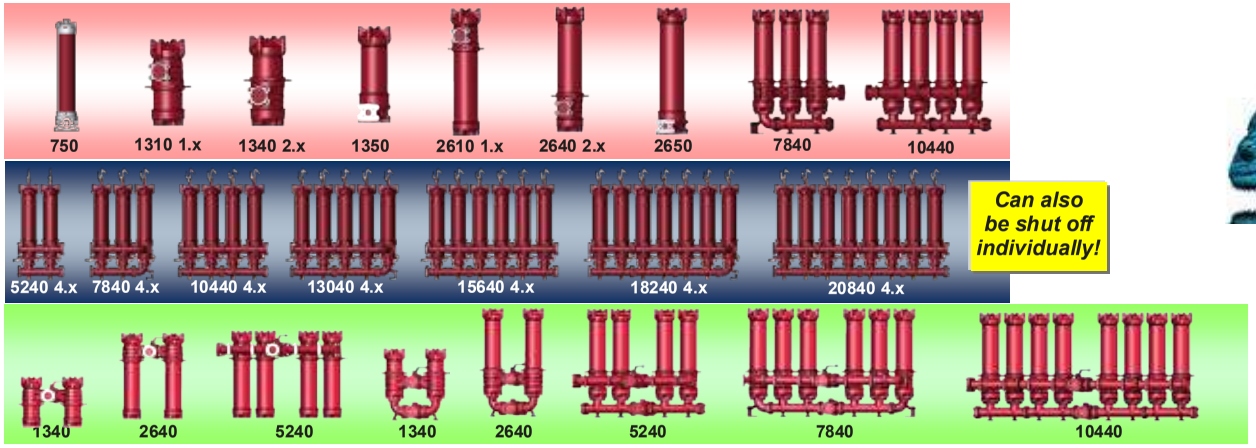
DF	420 bar
DFZ	315 bar
DF...QE	315 bar
DFP	315 bar
FMND	210 bar
DFDK	160 bar
FLND	25-63 bar



Optimicron® Pulp & Paper

Pressure line filters Lubrication circuit

NF 1.x/2.x	25 bar
NF 4.x	25 bar
NFD	25 bar



Can also be shut off individually!

Return line filters Hydraulic/Lubrication

RF	25 bar
MPSSF	25 bar
RFLD	25 bar

Breather filters

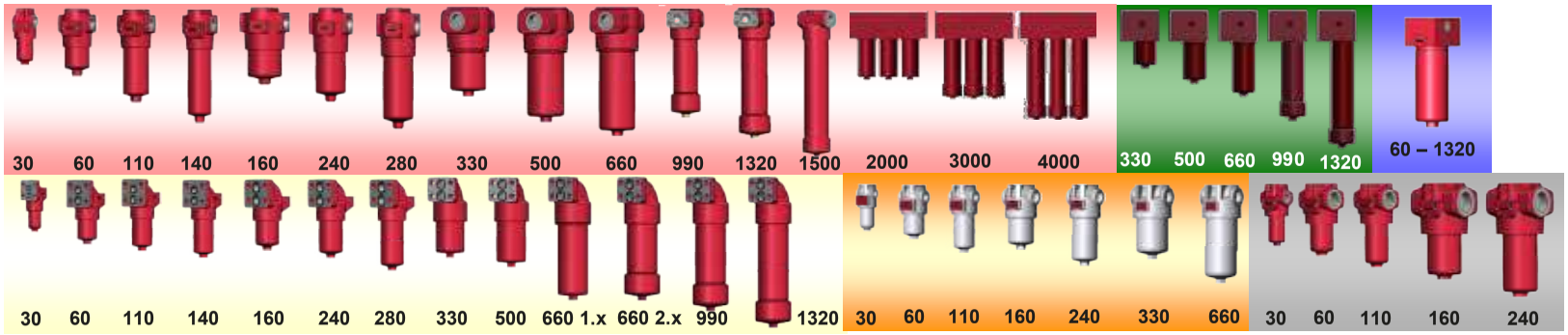
BF	---
ELF	---
BDE	---

HYDAC INTERNATIONAL

Preferred Range: Steel Works

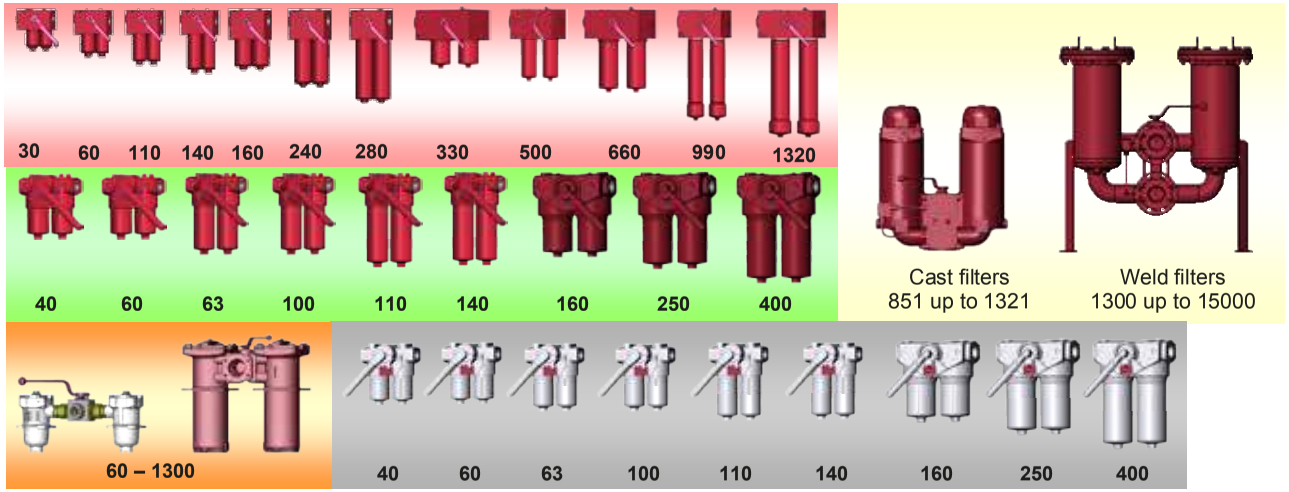
Pressure line filters – single

DF/DFF	420 bar
DFFX	420 bar
DF..Q E	315 bar
DFP	315 bar
MDF	280 bar
LF	100 bar



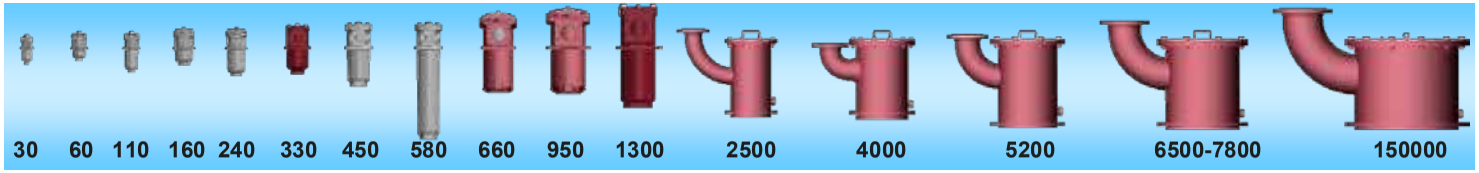
Pressure line filters – change-over

DFDK	315 bar
FMND	210-250 bar
RFLD	16-64 bar
FLND	25 bar
RFD	25 bar



Return line filters

RF	25 bar



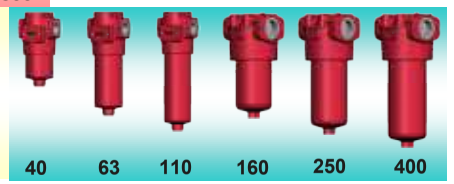
Fans

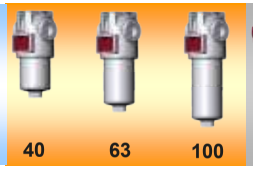
BF	
TC	
BDE	

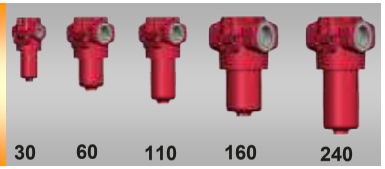
Preferred Range: Metal-Cutting Machine Tools

Pressure line filters single

DF/DFF	420 bar
DFN	400 bar
DF..QE	315 bar
MDF	280 bar
LFN/LFNF	50 bar
FLN	25 bar





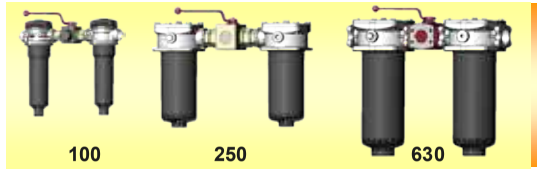


Pressure line filters change-over

FMND	210-250
FLND	25 bar

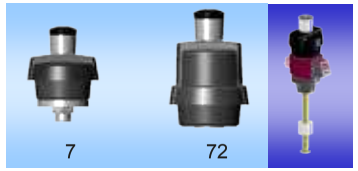
Return line filters

RFND	10-25
RFN	10 bar



Fans

BF	---
TC (TankConditioner)	

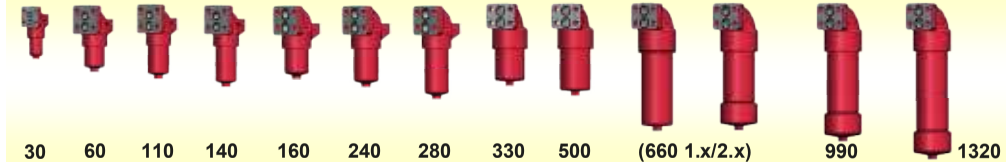


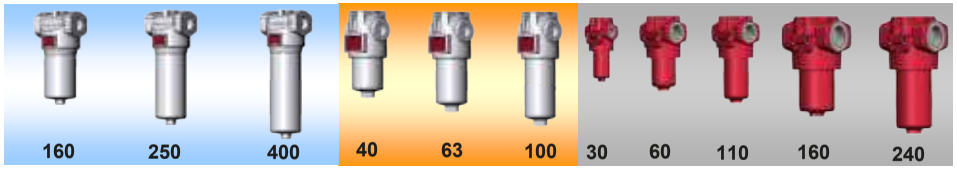
HYDAC INTERNATIONAL

Preferred Range: Chipless Metal-Forming Machine Tools (1/2) (e.g. presses)

Pressure line filters single

DF/DFF	420 bar
DFFX	420 bar
DFN	400 bar
DF..QE	315 bar
MDF	280 bar
LFN/LFNF	50 bar
FLN	25 bar

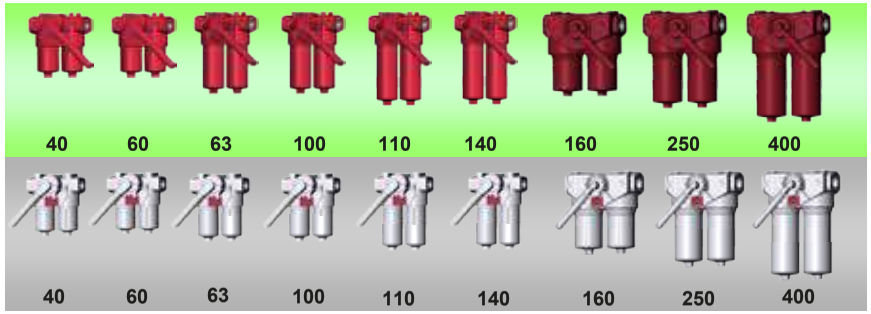




Optimicron® Pulse

Pressure line filters change-over

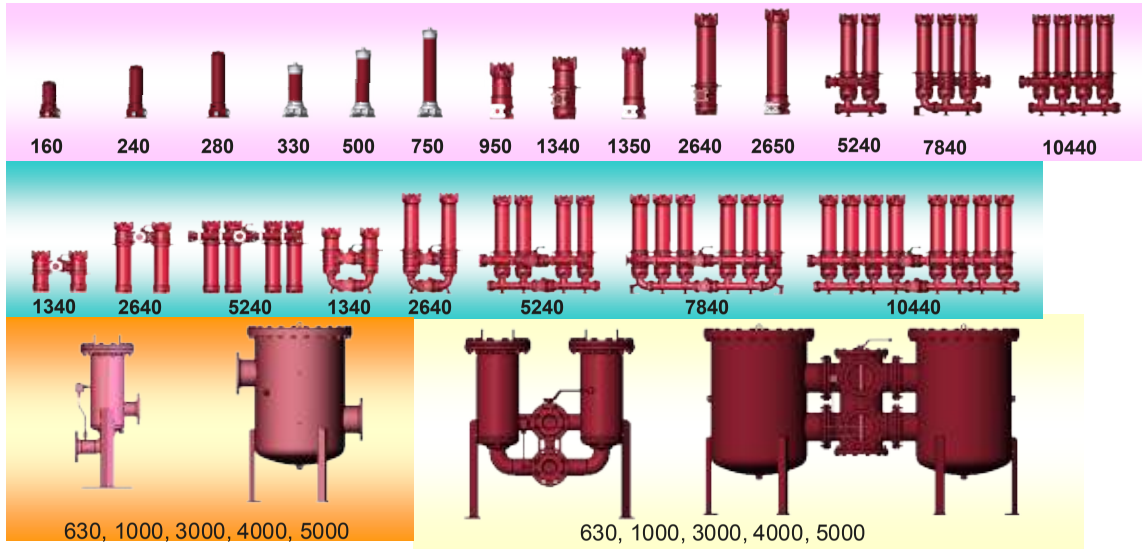
FMND	210-250
FLND	25 bar



Preferred Range: Chipless Metal-Forming Machine Tools (2/2) (e.g. presses)

Offline filters
single and change-over

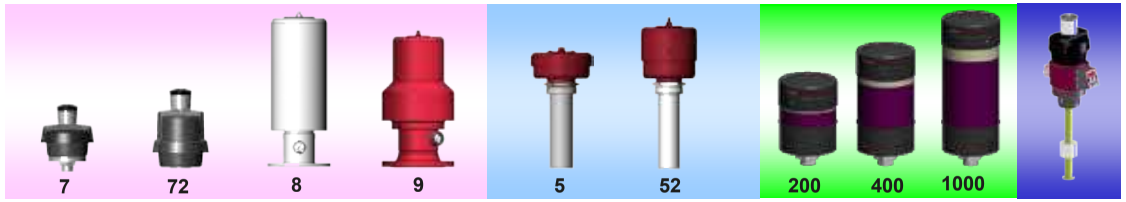
NF	25 bar
NFD	25 bar
RFLND	10-25
RFLN	10 bar



Optimicron® Power

Breather filters

BF	---
ELF	---
BDE	---
TC (TankConditioner)	

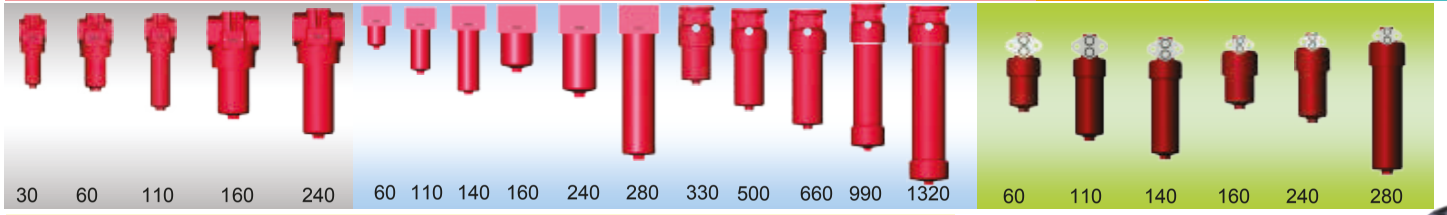


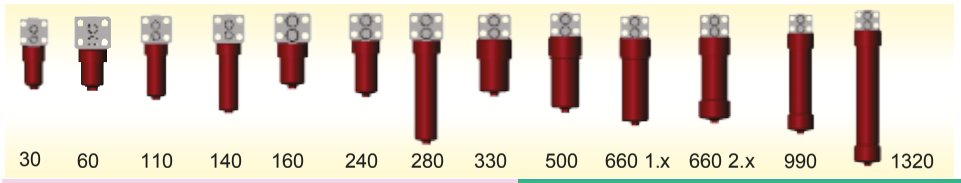
HYDAC INTERNATIONAL

Preferred Range: Power Plant Technology (1/2)

Pressure line filters – single

DF	420 bar
DFN	400 bar
DF...QE	315 bar
DFZ	315 bar
DFP	315 bar
MDF	280 bar
DF...MA	250 bar
LF	100 bar
NF	25 bar

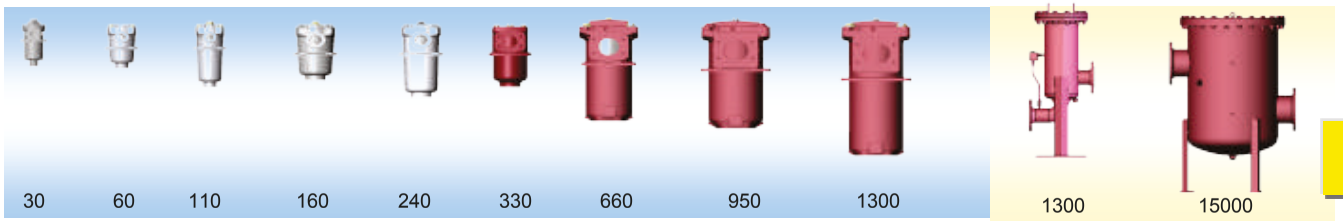




Optimicron® Pulse

Return line filters – single

RF	25 bar
RFL	16 bar



Optimicron® Power

Breather filters

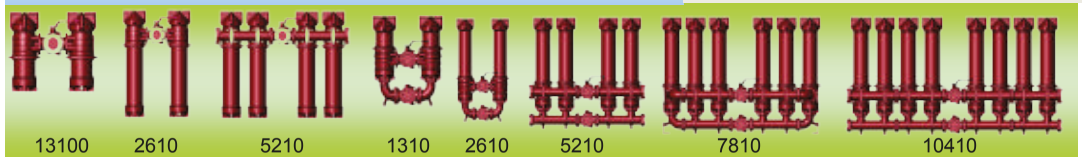
BF	
TC	
BDE	

Preferred Range: Power Plant Technology (2/2)

Pressure line filters – change-over

DFDKN	315 bar
FMND	250 bar
FLND	63 bar
NFD	25 bar

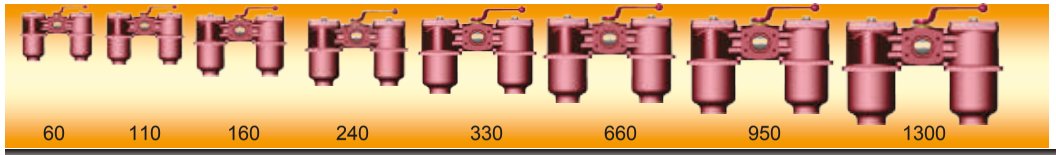
Manifold version up to 160 bar:



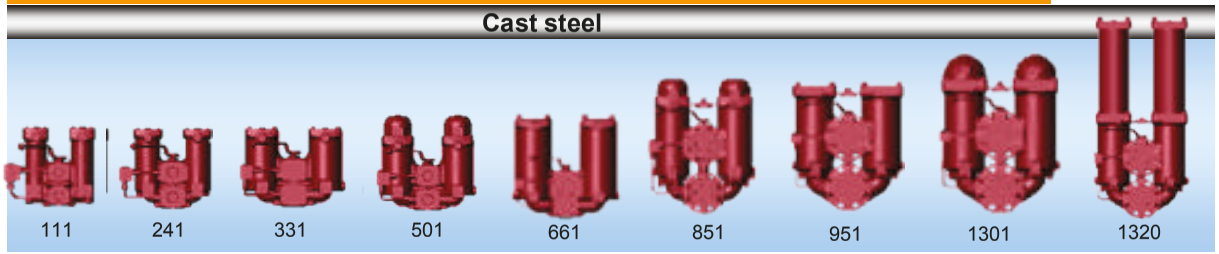
Optimicron® Power

Return line filters – change-over

RFD	25 bar
RFLD	16 bar
AFLD	64 bar

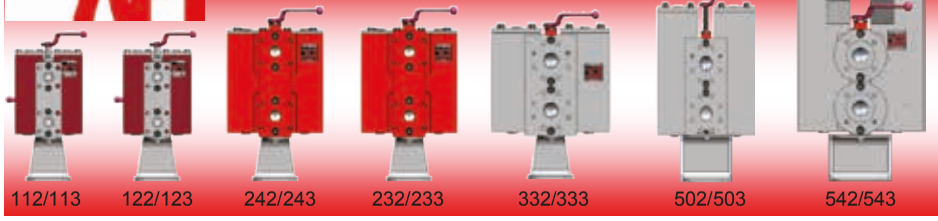


Cast steel

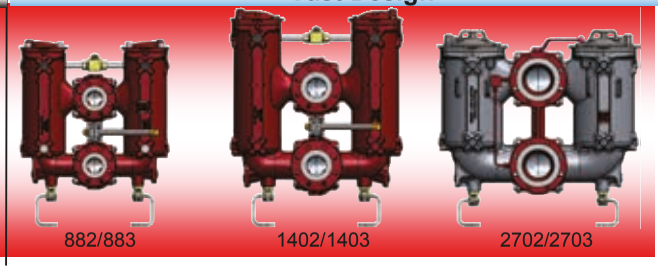


Forged

energy API



Cast Design



NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Industriegebiet
D-66280 Sulzbach/Saar
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Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

HYDAC INTERNATIONAL

Innovative Element Technology

for installation in HYDAC filters

- Quick Selection -

High Quality Element Technology for Hydraulic Oils and Lubricants

Design

As the core of the filter, it is the filter element which performs the actual filtration and/or dewatering function in the housing. Elements consist of several pleated filtration and support layers which are placed as a cylinder around or inside the stabilizing support tube. These mesh packs are sealed by the end-caps. Depending on the type of filter, flow direction through the filter elements is from the outside to the inside, or from the inside to the outside. Depending on the filter material, the filter mesh pack is encased in an additional outer plastic wrap.

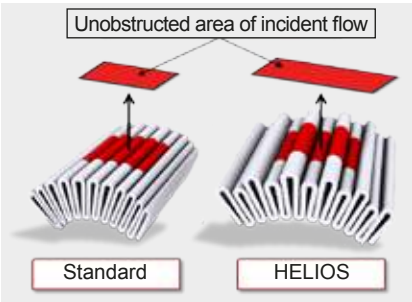
Innovation
Stat-Free® technology

With the new Stat-Free® filter elements, HYDAC has for the first time succeeded in combining excellent electrostatic characteristics with filtration performance. Unprecedented low charge generation in the filter element and in the fluid in the system is achieved with a new type of filter element mat and element design.

Innovation
HELIOS pleat geometry

Helios doubles the available area for incident flow and its small support pleats prevent collapsing of the filter mesh pack (compression of the pleats) even under high hydraulic loads.

In comparison to a standard pleat design, Helios achieves a significant reduction in flow velocity between the pleats and this is maintained even under the most adverse conditions.



Innovation
Outer wrap printed with customer logo

Since the outer wrap can be printed with the customer logo, it acts as an advertising medium for the OEM and guarantees security of the spares business. At the same time, the user can be certain of obtaining an original spare part. Particular benefit: the logo remains perfectly legible even in the contaminated condition.

The outer wrap with its multicoloured design and improved diffuser effect ensures optimised flow over the pleat tips.

The tried-and-tested outer wrap which is in highly tear-resistant plastic has elliptical perforations in the Optimicron® element. The shape of these pores (patent pending) improves the angle of incidence onto the filter pleats.

Installation and element versions

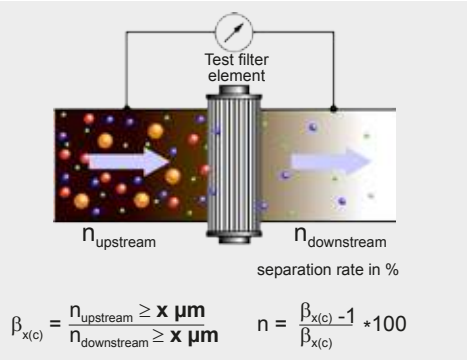
- In inline filters to API 614 (element version "**A**")
- In return line filters/inline filters (element version "**R**")
- In return line filters to DIN 24550 (element version "**RN**")
- In inline filters (element version "**D**")
- In inline filters to DIN 24550 (element version "**DN**")
- In inline filters, but return line filter element (element version "**RD**")
- In inline filters MFX (element version "**MX**")
- In return line suction filters RKM (element version "**RK**")
- In suction line filters (element version "**RS**")

Multipass-Filter Efficiency Data to ISO 16889

The contamination retention and particle filtration performance of an element (with the exception of: paper P, P/HC, wire mesh W, W/HC, V and Superabsorber AM) are established in the multipass test to ISO 16889. This procedure with its precisely defined test conditions and a standard test dust (ISO MTD) enables the performance data of different elements to be compared.

Explanation of the Multipass Test

The multipass test is an idealised hydraulic circuit, in which the filter element under test is subjected to a constant flow rate. The size and number of contamination particles are calculated before and after the element.
The ratio of the number of particles of a certain size (and larger) before the filter to the number of particles of a certain size after the filter indicates the filtration performance, what is known as the $\beta_{x(c)}$ value. The "x" stands for the particular particle size being considered. A $\beta_{x(c)}$ value of 200 or above is considered (according to DIN 24550) to be absolute filtration. It is important that $\beta_{x(c)}$ values remain at absolute level over a wide differential pressure range and do not fall as the element contamination and operating time increase. The degree of separation is determined from the $\beta_{x(c)}$ value (see illustration).



$$\beta_{x(c)} = \frac{n_{upstream} \geq x\ \mu m}{n_{downstream} \geq x\ \mu m} \qquad n = \frac{\beta_{x(c)} - 1}{\beta_{x(c)}} * 100$$

Performance features

Owing to their high performance standard, HYDAC absolute elements protect the functions of important and expensive hydraulic components and increase their service life.
The most important performance features are:

- High level of particle separation ($\beta_{x(c)}$ values)
- High level of particle separation over a wide differential pressure range (high $\beta_{x(c)}$ value stability)
- High contamination retention capacity
- High burst pressure values
- Low initial pressure difference
- Good flow fatigue strength
- Good water retention capacity (for water-absorbent filter materials)

Dynamic Multipass Test = Hydraulic Load Cycle Test (HLCT)

The new dynamic Multipass Test provides application-orientated characteristics of filtration performance data (field measurements) and relates directly to real work cycles. It is based on different flow profiles for selected HYDAC key applications derived from years of field experience. The Hydraulic Load Cycle Test establishes a direct association of the particular flow profiles to the filter designs and filter media used.

Performance features

- **Flow ripple parameters adjusted to suit the user**
  - Flow rate acceleration
  - Retention times at Q_{min} and Q_{max}
  - Pulsation frequency
- **Test fluid selected according to**
  - oil type for specific application
  - Operating temperature
  - Operating viscosity
- **Test dirt and type of dirt addition selected on basis of following aspects**
  - Both test dirt alternatives (ISO MTD and ISO FTD)
  - Other test dirt varieties with greater practical relevance
  - Both options for dirt addition (discontinuous/continuous)
    Type of dirt addition adjusted to suit application
    (e.g. in relation to machine's operating conditions, discontinuous dirt addition for maintenance or oil change)
  - Adjusted upstream dirt concentration
- **Simple presentation of results**
  - β values and β value stability spread out across entire duration of test
  - Cleaning cycles only with specific reference to application
    Example: filter element 0160 D… e. g. cleaning cycles for different operating conditions (cold start, commissioning system pump, for various load conditions of the filter element)
  - Direct reference to application-specific flow rate

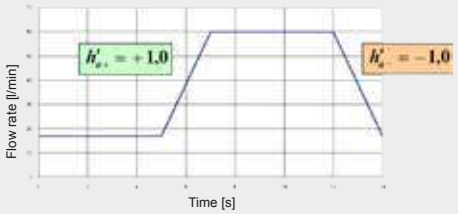
NEW and ESSENTIAL dynamic parameters:

Flow rate acceleration number (VB number) (for each cm² filter area)

$$h'_{a(+/-)} = \frac{\left(\frac{dQ}{dt}\right)}{A_{eff}} = \frac{\left(\frac{Q_2 - Q_1}{t_2 - t_1}\right)}{A_{eff}} = \frac{a_Q}{A_{eff}} \qquad \left[\frac{l}{min^2 \cdot cm^2}\right]$$

With:

dQ	Flow rate difference between Q_2 and Q_1	[l/min]
dt	Time difference between t_1 and t_2	[min]
A_{eff}	Effective filtration area	[cm²]



Example: Filter element 0160 D...

A large choice of filter elements.

Optimicron® Power

- **Designation:** ON/PO
- **Filter material:** plastic fibre, multi-layer support
- **Filtration rating:** 5, 10, 20 µm
- **Collapse stability:** 10 bar
- **Flow direction:** outside to inside.
- **Plastic shell:** yes
- **Element version:** A, R
- **Element type:** single-use element
- **Brochure no.:** 7.213../..

Optimicron® Pulse

- **Designation:** ON/PS, OH/PS
- **Filter material:** glass fibre, single-layer support
- **Filtration rating:** 3, 5, 10, 20 µm
- **Collapse stability:** 20 / 210 bar
- **Flow direction:** outside to inside.
- **Plastic shell:** yes
- **Element version:** D
- **Element type:** single-use element
- **Brochure no.:** 7.222../..

Optimicron® Pulp & Paper

- **Designation:** ON/PP
- **Filter material:** glass fibre, multi-layer support
- **Filtration rating:** 5 µm
- **Collapse stability:** 10 bar
- **Flow direction:** outside to inside.
- **Plastic shell:** yes
- **Element version:** R
- **Element type:** single-use element
- **Brochure no.:** 7.223../..

	AFLD	AFLS	DF	DF... M P	DF...M A DF... MHA	DF...Q E DF...MHE	DFDK	DFDKN	DFF	DFFX	DFM	DFN	DFNF
Optimicron® Power	A	A											
Optimicron® Pulse			D		D	D			D	D			
Optimicron® Pulp & Paper													
Optimicron®			D	D	D	D	D		D	D	D		
Betamicron®			D	D	D	D	D	DN	D	D	D	DN	DN
Mobilemicron®													
Ecomicron®													
Stainless steel wire mesh			D	D	D	D	D	DN	D	D		DN	DN
Paper													
Metal fibre			D	D	D	D	D		D	D			
Aquamicron®													
Aquamicron®/ Betamicron®													

The right filter element for every application.

Optimicron®

Caution: Ongoing conversion from Betamicron® (BN4HC) to Optimicron® (ON)!

- **Designation:** ON
- **Filter material:** glass fibre, multi-layer support
- **Filtration rating:** 1, 3, 5, 10, 15, 20 µm
- **Collapse stability:** 20 bar
- **Flow direction:** outside to inside.
- **Plastic shell:** yes
- **Element version:** D, R
- **Element type:** single-use element
- **Brochure no.:** 7.224../..

Betamicron®

- **Designation:** BN4HC, BH4HC
- **Filter material:** glass fibre, multi-layer support
- **Filtration rating:** 3, 5, 6, 10, 20, 25 µm
- **Collapse stability:** 20 / 210 bar
- **Flow direction:** outside to inside.
- **Plastic shell:** yes
- **Element version:** D, DN, MX, R, RD, RN
- **Element type:** single-use element
- **Brochure no.:** 7.210../..

Mobilemicron®

- **Designation:** MM
- **Filter material:** plastic fibre, multi-layer support
- **Filtration rating:** 8, 10, 15 µm
- **Collapse stability:** 10 bar
- **Flow direction:** outside to inside.
- **Plastic shell:** yes
- **Element version:** MX, R, RD, RK
- **Element type:** single-use element
- **Brochure no.:** 7.211../..

	DFP	DFPF	DFZ	FLN	FLND	FMMD	HDF	HDFF	HFM	LF	LFF	LFM	LFN
Optimicron® Power													
Optimicron® Pulse			D										
Optimicron® Pulp & Paper													
Optimicron®	D	D	D		D	D	D	D	D	D	D	D	
Betamicron®	D	D	D	DN	D / DN	D / DN	D	D	D	D	D	D	DN
Mobilemicron®													
Ecomicron®													
Stainless steel wire mesh				DN	D / DN	D / DN				D	D		DN
Paper													
Metal fibre	D	D	D							D	D		
Aquamicron®													
Aquamicron®/ Betamicron®													

Better Quality, Performance and Efficiency.

Ecomicron®

- **Designation:** ECON2
- **Filter material:** glass fibre, multi-layer support
- **Filtration rating:** 3, 5, 10, 20 µm
- **Collapse stability:** 10 bar
- **Flow direction:** outside to inside.
- **Plastic shell:** yes
- **Element version:** MX, R
- **Element type:** single-use element
- **Brochure no.:** 7.212../..

Stainless steel wire mesh

- **Designation:** W, W/HC
- **Filter material:** **stainless steel wire mesh**
- **Filtration rating:** 25, 50, 100, 200 µm
- **Collapse stability:** 20 bar
- **Flow direction**: outside to inside (D, DN, R, RN)
  inside to outside (RS)
- **Plastic shell:** no
- **Element version:** D, DN, R, RN, RS
- **Element type:** cleanable to some extent
- **Brochure no.:** 7.215../..

Stainless steel fibre

- **Designation:** V
- **Filter material:** metal fibre
- **Filtration rating:** 3, 5, 10, 20 µm
- **Collapse stability:** **210 bar**
- **Flow direction:** outside to inside.
- **Plastic shell:** no
- **Element version:** D, R
- **Element type:** cleanable to some extent
- **Brochure no.:** 7.216../..

	LFNF	LPF	LPF...GGA	LPF.../-TH	MDF	MFM	MFM...L	MFM.../ -OIU	MFX	NF	NFD	RF
Optimicron® Power												
Optimicron® Pulse												
Optimicron® Pulp & Paper										R	R	
Optimicron®		D			D	D	D	D		R	R	R
Betamicron®	DN	D	RD	RD	D	D	D	D	MX	R	R	R
Mobilemicron®			RD	RD					MX			
Ecomicron®									MX	R	R	
Stainless steel wire mesh	DN	D			D					R	R	R
Paper										R	R	R
Metal fibre					D					R	R	R
Aquamicron®										R	R	
Aquamicron®/ Betamicron®										R	R	R

Innovation in every pleat.

Paper

- **Designation:** P, P/HC
- **Filter material:** cellulose fibre
- **Filtration rating:** 10, 20 µm
- **Collapse stability:** 10 bar
- **Flow direction**: outside to inside (R)
  inside to outside (RS)
- **Plastic shell:** no
- **Element version:** R, RS
- **Element type:** single-use element
- **Brochure no.:** 7.214../..

Aquamicron®

- **Designation:** AM
- **Filter material:** superabsorber
- **Filtration rating:** 40 µm
- **Collapse stability:** 10 bar
- **Flow direction:** outside to inside.
- **Plastic shell:** no
- **Element version:** R
- **Element type:** single-use element
- **Brochure no.:** 7.217../..

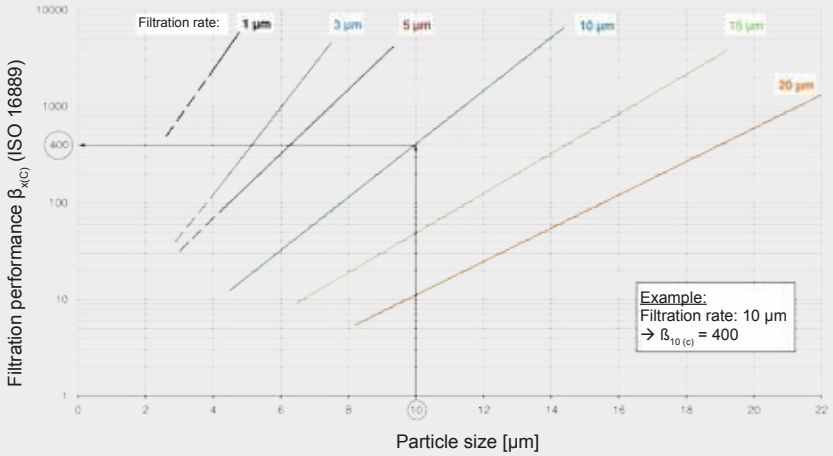
Betamicron® / Aquamicron®

- **Designation:** BN4AM
- **Filter material:** glass fibre with superabsorber
- **Filtration rating:** 3, 10 µm
- **Collapse stability:** 10 bar
- **Flow direction:** outside to inside.
- **Plastic shell:** no
- **Element version:** R
- **Element type:** single-use element
- **Brochure no.:** 7.218../..

	RFD	RFL Cast/weld	RFLD Cast/weld	RFLN	RFLND	RFM	RFN	RFND	RKM	SF	SFF	SFM
Optimicron® Power		R	R									
Optimicron® Pulse												
Optimicron® Pulp & Paper												
Optimicron®	R	R	R			R						
Betamicron®	R	R	R	RN	RN	R	RN	RN				
Mobilemicron®						R			RK			
Ecomicron®						R						
Stainless steel wire mesh	R	R	R			R				RS	RS	RS
Paper	R	R	R			R				RS	RS	RS
Metal fibre	R	R	R									
Aquamicron®	R	R	R			R						
Aquamicron®/ Betamicron®	R	R	R			R						

Filtration performance

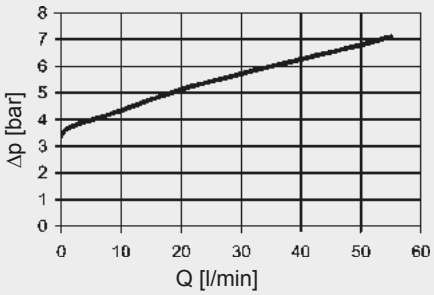
The illustration shows the filtration efficiencies for various filtration ratings, with Optimicron® used as an example:



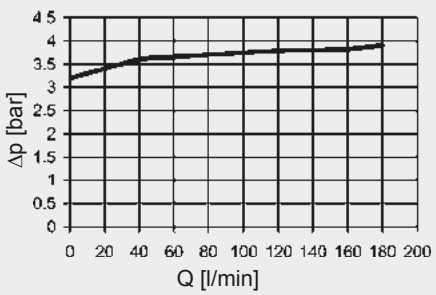
Bypass valve curves

The bypass valve curves apply to mineral oil with a density of 0.86 kg/dm³.
The valve differential pressure changes proportionally to the density (others on request). (others on request)

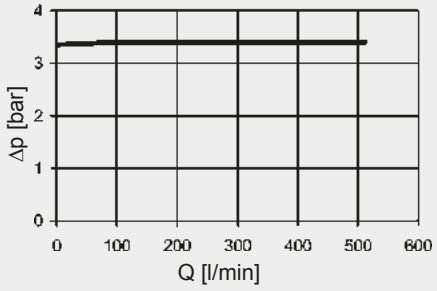
30



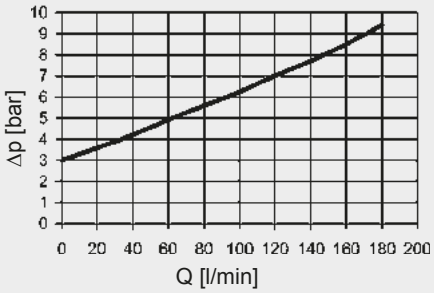
75, 160, 165, 185, 240, 280



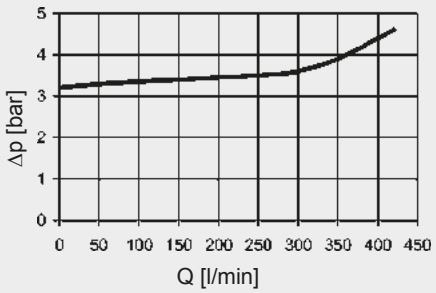
660, 850, 1700



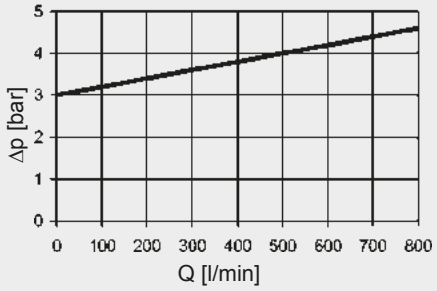
60, 90, 110, 140, 150



210, 270, 330, 500, 750



950, 1300, 2600



NOTICE
The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department. For applications or operating conditions not described please contact the relevant technical department.
All technical details are subject to change without notice.

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HYDAC FILTERTECHNIK

Innovative Element Technology

Stat-Free®

1. Introduction

The use of modern environmentally-friendly hydraulic and lubrication oils, together with the trend towards ever more compact systems and finer filtration, has in the past few years exacerbated the problem of electrostatic charge and discharge. As a result, the components integrated into the system become severely restricted in their function or are even damaged. Electrostatic discharges destroy filter elements, damage valves and sensors and can even cause explosions in the hydraulic tank. In addition, they accelerate oil ageing.

To ensure that the whole system operates economically and without risk, it is essential to use filter systems which are capable of absorbing oil ageing products and which can prevent dangerous electrostatic discharges from occurring. Unscheduled and costly oil changes can be avoided by using this system of filters.

We have recognized the long-term problem of electrostatic discharge and with our innovative **Stat-Free® series of elements** have developed an effective solution to the occurrence of charging and discharging in the hydraulic and lube circuit.

With findings drawn from the specifically designed **Electrostatic Test Rig** which has been verified by TÜV as well as numerous field tests, we have been able to create an element technology which inhibits the phenomenon of electrostatic discharge in the filter element as well as significantly reducing the charge in the oil.

In the following pages, the principles and consequences of electrostatic charge and discharge in the hydraulic circuit are examined more closely and the advantages of the new Stat-Free® element technology are demonstrated.

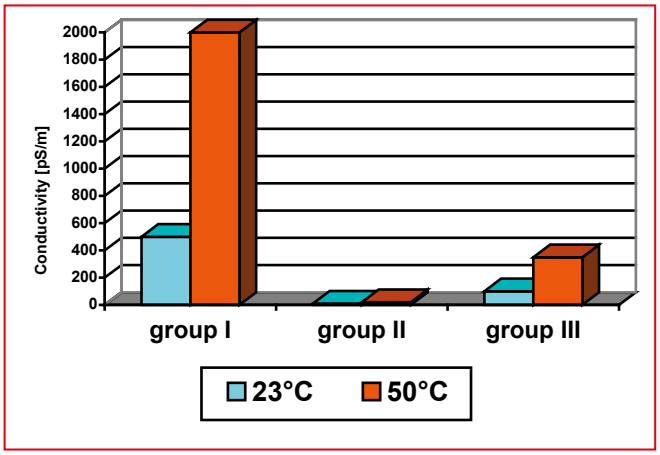
2. The Trend in Hydraulic Fluids

Globalisation of markets compels oil producers worldwide to supply consistently high quality hydraulic and lubrication oils to the manufacturers and operators of systems, such as compressor stations, large transmissions or machines. For category I base oils, where the molecular structure of the crude oil has not been changed, this is not guaranteed. Increasingly, therefore, base oils are used where the molecular structure has been broken down by hydrocracking and then selectively rearranged according to requirement.

Refinery capacities of oil producers all over the world are currently geared to this trend (in Asia and the USA, for example, predominantly category II base oils or higher are produced).

To achieve the oil characteristics guaranteed by the oil producers, additives (usually several, as an additive package) must be added to the base oil. Category I base oils contain aromatics most of which are toxic. In addition the additive packages contain zinc which is a heavy metal, and ash is produced on combustion. They therefore no longer comply with the current international environmental standards.

Hydraulic and lubrication oils in **category II and III** which are produced with appropriate additive packages, contain no toxins or carcinogens, are free of heavy metals and do not produce residues as a result of combustion. However, because they do not contain any metal, these oils have **low electrical conductivity**. When this oil flows through the filters in the hydraulic system, an electrostatic charge is generated. This can result in sparking in the system, which can cause considerable damage to hydraulic components.

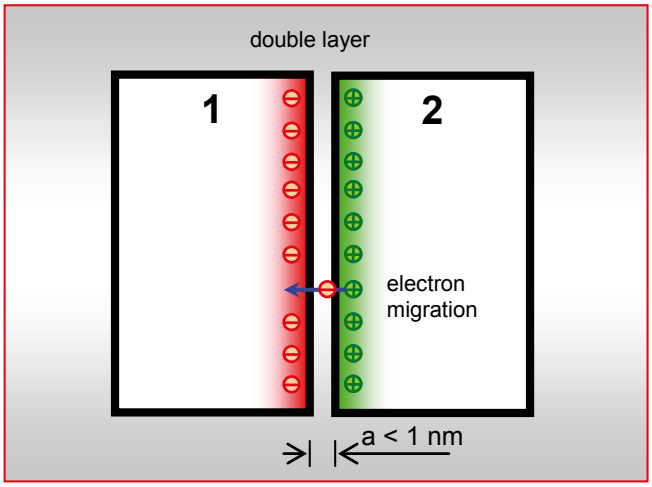


Examples of conductivity in oils of different categories

3. Theoretical Principles

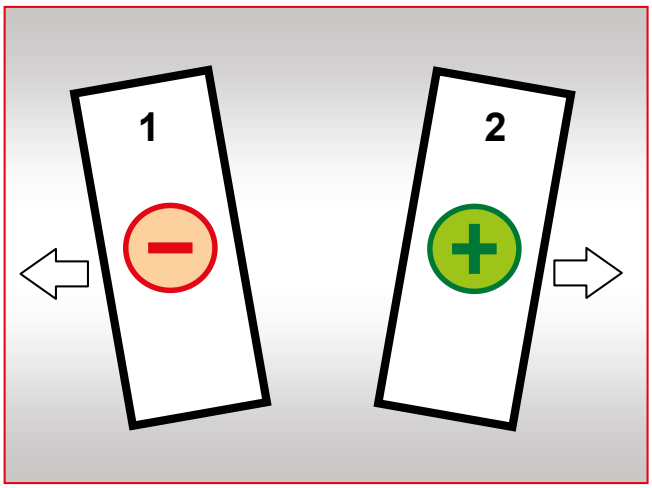
3.1 Electrostatic charging of solid particles

Every substance or material has a certain electron work function, i.e. the tendency to accept or release electrons. If two substances which have different electron work functions are then brought together (distance < 10^{-9}m) at the same temperature, then at the point of interface, electrons are transferred from the material with low work function to the material with higher work function. An electrical double layer is produced with a certain charge Q. There does not have to be any friction between the two materials. Friction merely reduces the distance between the substances involved.



Development of the double layer

If the two materials are separated and the distance between them is therefore increased, the capacitance is reduced and the potential difference (= voltage) is increased. Both materials are electrostatically charged.



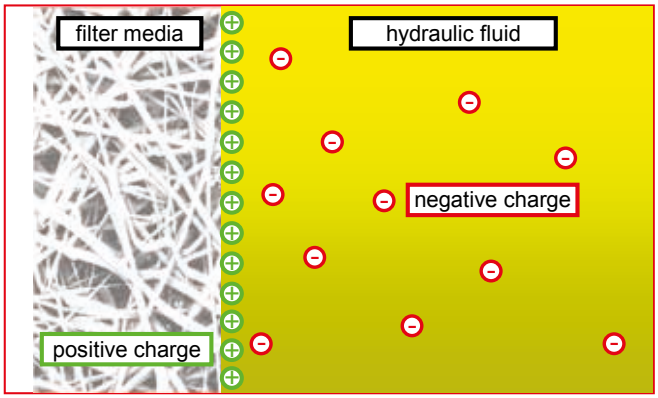
Separation of the two materials

The amount of charge is dependent on the speed of separation, amongst other things. If separated slowly, charge can be equalized over the last point of contact. The faster the separation occurs, the higher will be the charge.

If the voltage generated exceeds the specific limit of dielectric strength (in air approx. 3 kV/mm), there will be a sudden equalization of voltage which is usually in the form of discharge sparking.

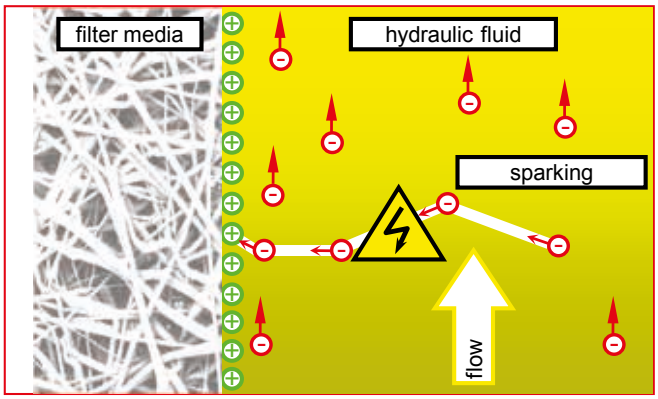
3.2 Charging of fluids

In fluid/solid systems as is the case in hydraulic systems (filter medium/oil) a double charging layer is also formed here at the phase boundary, as shown in the following diagram. Near the boundary, this double layer consists of a linked layer of charge carriers (in this case positively charged). In the oil there is a diffuse layer of opposing (negative) charge carriers.



Distribution of charge in fluid/solid systems

When the fluid then flows, the charge is carried downstream and creates a difference in potential. The faster the fluid is flowing, the higher the potential difference will be. If the voltage exceeds the dielectric strength of the oil, it will discharge in the form of sparking.



Sparking

The precondition for charge generation is that the fluid has a sufficiently low conductivity, otherwise the charges of the diffuse layer can flow back and can be equalized.

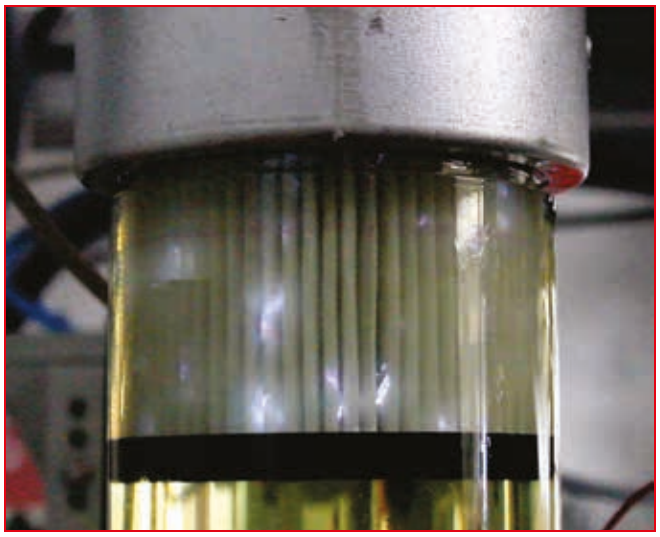
3.3 Main factors

The main factors influencing the electrostatic behaviour in hydraulic systems:

- **Electric conductivity**
  The lower the conductivity, the higher the charge
- **Filter medium**
  Different materials produce different charges depending on the electron work function
- **Temperature**
  In general the charge falls as the temperature rises
- **Flow velocity**
  The higher the flow velocity, the higher the charge
- **Contamination**
  Conductive particles or water increase the conductivity of the fluid which results in a lower charge

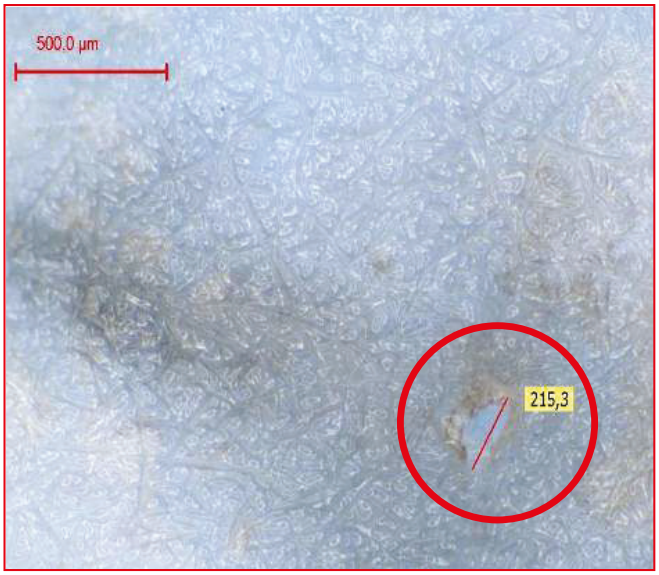
4. Consequences of Discharge

The consequences of electrostatic discharges can be serious.



Electrostatic discharging in the filter element

The discharge sparks can burn **holes**, for example, in the filter medium. The following picture shows a hole of about 200 µm in 3 µm filter media. The required oil cleanliness is therefore no longer achievable.



Burn hole in the filter material

Furthermore, when the charge is carried further downstream by the oil, uncontrolled discharges can occur in the hydraulic tank. Depending on the oil/air mixture in the tank, dangerous **explosions** are possible.

Breather filter burned as a result of explosion in the tank

The electrostatic discharges also cause **electromagnetic waves** which disrupt and damage sensitive sensors and electronic components in a hydraulic system.

It is not only hydraulic components but also the hydraulic oil itself which is damaged by discharges. The sparking cracks the molecules of the fluid and free radicals are formed. These radicals polymerize into long chains and this in turn leads to the **formation of varnish**. In addition, the free radicals accelerate oil ageing.

5. Measuring Equipment

5.1 Mobile measuring equipment

In order to examine more closely the electrostatic behaviour of a hydraulic system in the field, we have a range of test equipment.

With the aid of a **portable conductivity measurement instrument** we are able very quickly and simply to determine the electrical conductivity of the hydraulic fluid. It enables us to make an initial assessment as to whether the conductivity has fallen below a critical limit and can lead to electrostatic phenomena.

Furthermore, HYDAC has developed a special voltage sensor, the so-called **StatStick**. In conjunction with our widely-available portable device (HMG 3000) it is possible for our engineers in the field to measure the voltage in the oil directly in the system.

Innovative StatStick with HMG 3000

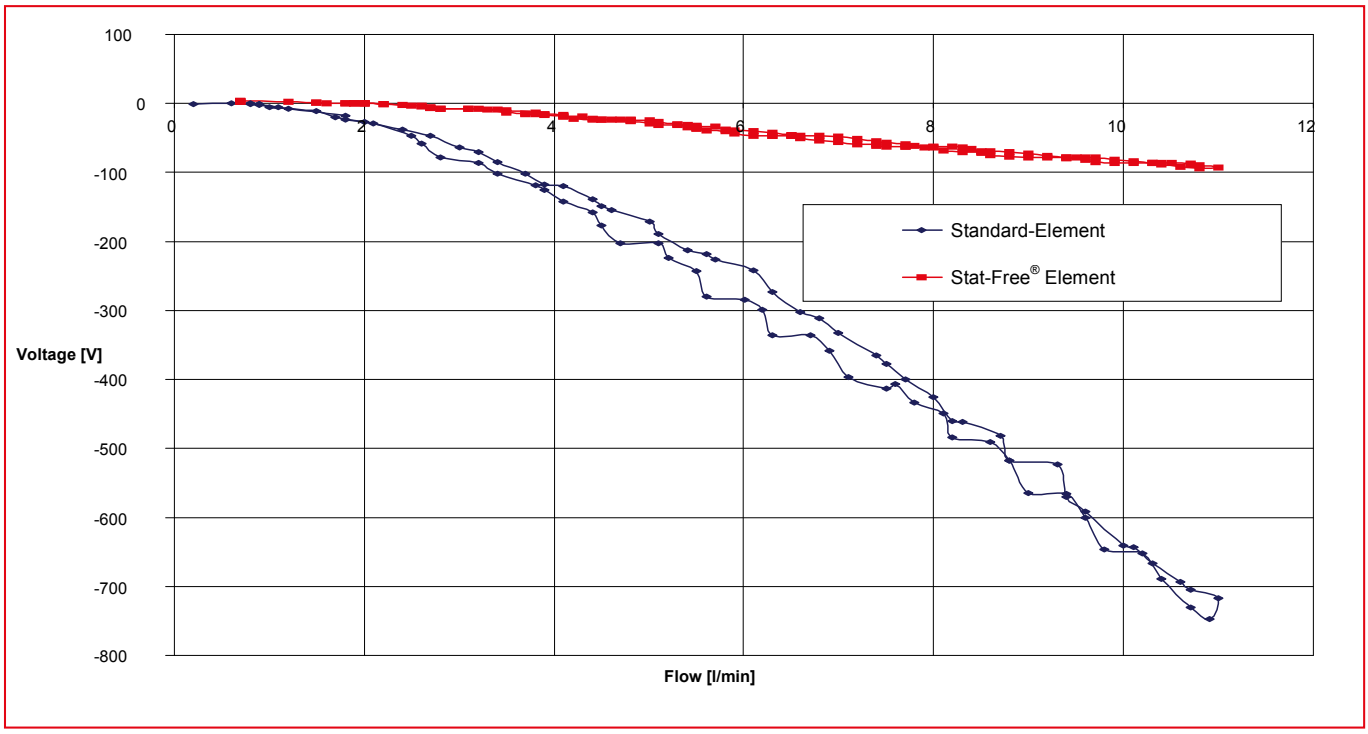
In the case of discharge sparking in the system, an oscilloscope can also be used as a measurement device. Owing to the high sampling rate of the oscilloscope, the transient discharges are shown as peaks on the display.

5.2 Stationary test rig

Our specially developed **test rig** which has been certified by TÜV is used to simulate real-world critical applications. With the help of the test rig, the electrostatic behaviour of the hydraulic filter in critical oils has been thoroughly analysed.

This has led to the development of the Stat-Free® filter element series which combats the problem of electrostatic discharge.

HYDAC Electrostatic Test Rig



Comparative measurement of a standard element versus a Stat-Free® element on the electrostatic test rig

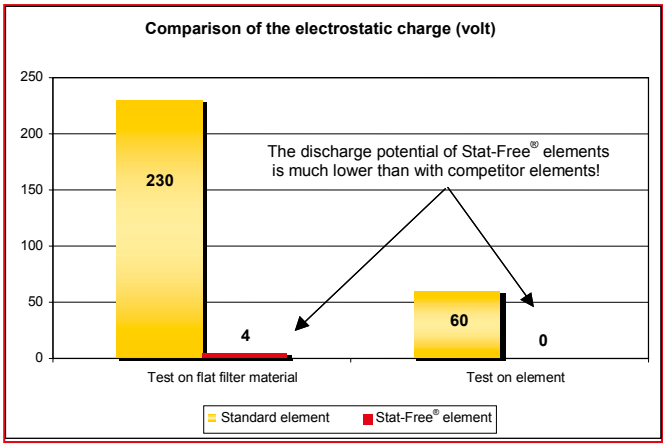
6. The Stat-Free® Technology

If a hydraulic system is using an oil with a **low conductivity** and a non-conductive filter element, the filter and the fluid can be **charged** electrostatically and can lead to electrostatic **discharges**.

A **purely discharge-capable** design without the addition of a special combination of media, indeed reduces sparking in the element but the oil continues to be charged. The charges at the interface of the filter can dissipate, but the fluid has an even **higher charge** because there is no sparking on the filter to neutralize the charge. The highly charged oil is transported further through the system and uncontrolled discharges are possible in other parts of the system which under certain circumstances can lead to serious damage (e.g. explosion in the tank).

Using a new type of filtration meshpack and element design, HYDAC has for the first time combined excellent electrostatic characteristics and filtratioin performance. Our Stat-Free® elements have achieved a previously **all-time low charge** of the filter element and the fluid during system operation. In addition the Stat-Free® elements are equipped with conductive O-ring caps and conductive core tubes.

The performance of Stat-Free® elements has been confirmed in thorough laboratory and field tests. By comparing the test diagram below, the Stat-Free® elements have a striking advantage over the conventionally designed standard elements, in terms of the oil charge generated.



Comparison of the electrostatic charge (volt)

The new Stat-Free® technology is available for the following HYDAC element materials:

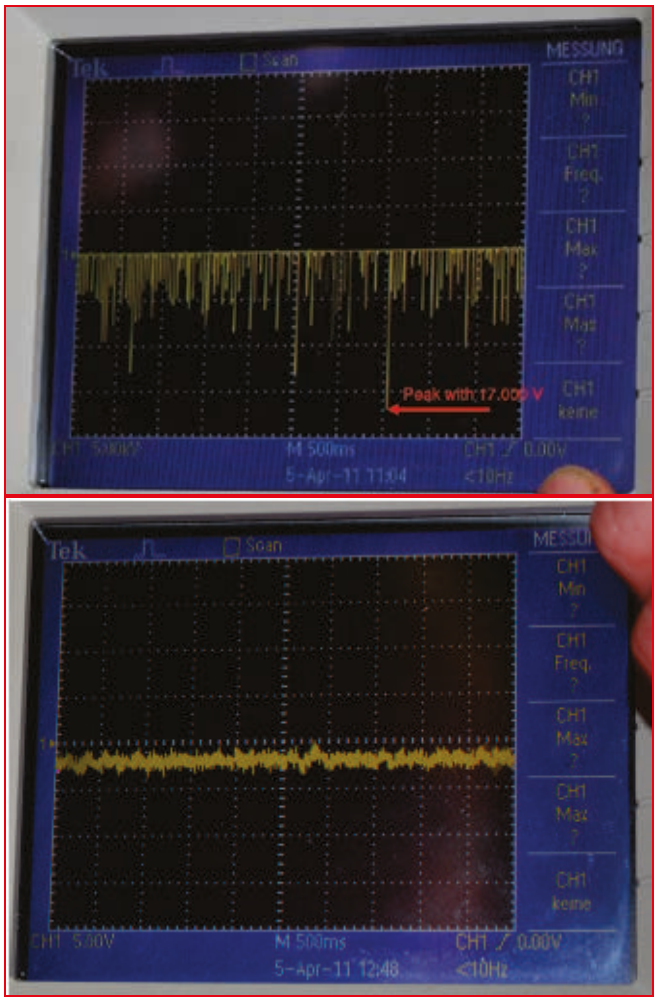
- **Mobilemicron (MM)**
  for filtration ratings 8, 10, 15 µm
- **Optimicron® (ON)**
  for filtration ratings 1, 3, 5, 10, 15, 20 µm,
  Optimicron® Pulp & Paper (ON/PP)
  for filtration rating 5 µm and
  Betamicron® (BN4HC, BH4HC)
  for filtration ratings 3, 5, 10, 20 µm
  In this case, please add **/-SFREE** to the element model code.
  Example: 2600 R 010 ON /-SFREE
- **Optimicron® Power (ON/PO)**
  for filtration ratings 5, 10, 20 µm and
  Optimicron® Pulse (ON/PS, OH/PS)
  for filtration ratings 3, 5, 10, 20 µm with SFREE inclusive

Stat-Free® elements are particularly suitable for applications in power plants, gas turbines, plastic injection moulding machines and calenders (paper industry) and in mobile hydraulics, as well as any other hydraulic and lubrication system which uses new low conductivity oils.

They guarantee a **high level of operating reliability**, since they prevent sparks, deflagration and sludge formation in the oil. **Longer oil change intervals** can be achieved through non-damaging filtration of the oil.

7. Real-World Example and Reference

HYDAC became aware of the possibility of explosions in the hydraulic tank of a large hydraulic system after breather filters were burned out. The filters concerned were competitor's filters which were not optimized for electrostatic charging. Measurements made on site using the StatStick revealed voltage peaks of **up to 17,000 Volt** and dangerous discharge sparks in the tank. Once retro-fitted with Stat-Free® elements, **no further discharges** could be detected and the voltage was just **2-3 Volt**.



Voltage measurement using StatStick (above: competitor's standard element voltage peaks up to 17kV [scaling: 5kV]; below: Hydac Stat-Free® element 2-3V [scaling: 5V])

A number of established companies in sectors such as turbine lubrication, presses, plastic injection moulding machines and mobile hydraulics have already named HYDAC as a reference with regard to finding a solution to the problem of electrostatic discharge, as indicated by the following quotation:

"Due to numerous, frequently recurring difficulties on actual systems, we urgently recommend using filter cartridges which inhibit electrostatic charging in oils with low electrical conductivity. ***These filters are available from HYDAC under the same model code, by adding "/-SFREE"."***

Moreover, the functionality of the Stat-Free® filter elements has been analysed by DEKRA EXAM GmbH, the German specialist unit for explosion protection at the mining test facility (BVS). The efficiency of the elements was confirmed in the expert report 13EXAM 10666 BVS-BI by DEKRA EXAM GmbH, Explosion Protection Department.

8. Summary

- The charge separation in **low conductivity oils** results in electrostatic charging and discharging.
- Electrostatic discharges can cause the following damage, amongst others:
  - Explosions in the hydraulic tank
  - Accelerated oil ageing
  - Damage to the filter element
  - Destruction of electronic components
  - Damage to cooler units
- A conductive design of filter element is **not** sufficient to reduce oil charging.
- HYDAC **Stat-Free® elements** ensure a very low charge in the filter element and the hydraulic fluid

Advantages:

- **High level of operating reliability**
  because discharge sparking, deflagration and sludge formation in the oil is eliminated
- **Longer oil change intervals**
  because filtration of the oil is non-damaging

Conclusion:

These developments prove that at HYDAC we will always find a solution to a customer problem. We not only provide an efficient result, but we will see you through the whole diagnostic process, especially in challenging cases.

We look forward to hearing about your new projects!

NOTES

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HYDAC INTERNATIONAL

Energy efficient filtration. Our contribution to sustainability.

Optimicron®
Innovative Filter Element Technology for Sustainable Filtration

HYDAC Optimicron® has a wealth of innovations and optimised features.

HYDAC Optimicron® at a glance:

- Unique HELIOS pleat geometry
- Innovative, integrated drainage layer*
- New, upstream drainage layer*
- Efficient filter materials
- Expansion of the range of filtration ratings
- Optimised filter element wrap

Optimicron® will save you up to 30 % in differential pressure. This not only protects your pocket, but also the environment.

*) Designed for specific applications

Optimicron®
Innovative Filter Element Technology for Sustainable Filtration

Resources are increasingly scarce, energy prices are rising and the environment is suffering. Energy efficiency is the key to counteracting this trend and to saving both costs and valuable resources.

HYDAC Optimicron® shows the way!

These innovative filter elements can make substantial savings on energy and costs for machine and system operators . The savings apply over the entire service life and the elements offer superior performance at the same time. The high energy efficiency of the new filter elements therefore reduces CO_2 emissions.

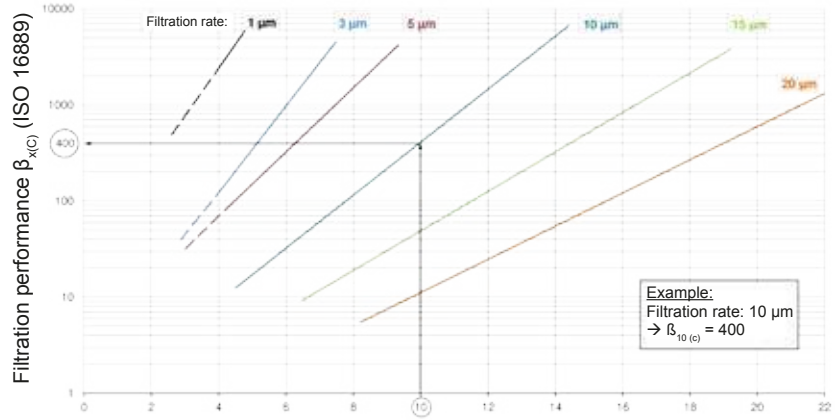
Our contribution to sustainability!

Optimicron® shows the way

Performance data

Energy and cost savings over the entire service life with superior performance at the same time.

β-values for Optimicron®



Δp/Q Gradient coefficients in mbar / l/min

Optimicron® D elements

Size	Filtration rating					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0030	77.8	63.9	43.3	22.8	14.0	11.3
0035	50.2	21.3	17.1	13.7	10.0	7.44
0055	26.0	12.3	9.90	7.90	5.17	3.84
0060	53.5	26.0	18.3	12.1	9.78	6.32
0075	16.7	8.40	6.75	5.40	3.33	2.48
0095	13.2	6.74	5.40	4.33	2.62	1.92
0110	25.8	13.4	9.61	6.06	4.63	2.99
0140	19.9	11.5	7.39	4.38	3.54	2.29
0160	18.5	11.0	7.70	4.10	3.71	3.18
0240	11.5	6.90	5.34	3.19	2.44	2.10
0260	8.18	4.96	3.87	2.31	1.83	1.44
0280	5.54	3.37	2.74	1.49	1.36	1.17
0300	14.6	8.90	7.13	4.88	2.80	2.61
0330	8.23	4.19	3.37	2.46	1.55	1.22
0450	7.30	4.45	3.52	2.39	1.40	1.26
0500	5.05	2.57	2.07	1.23	0.949	0.747
0650	4.46	2.69	2.20	1.47	0.855	0.810
0660	3.78	1.93	1.56	0.93	0.710	0.562
0900	3.37	2.10	1.67	1.10	0.647	0.630
0990	2.51	1.280	1.031	0.613	0.472	0.372
1320	1.85	0.966	0.759	0.451	0.348	0.274
1500	1.64	0.968	0.704	0.480	0.360	0.284

Optimicron® R elements

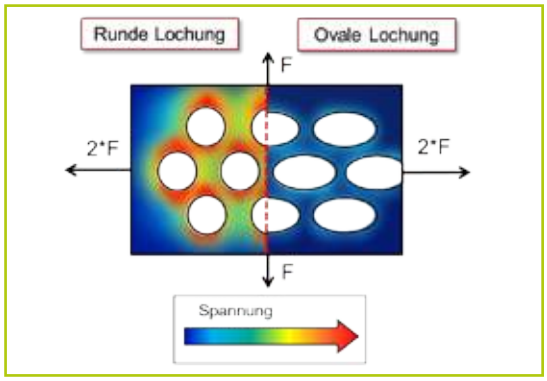
Size	Filtration rating					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0030	89.8	68.4	43.9	26.8	16.8	14.7
0060	47.2	23.6	17.2	9.82	9.01	6.85
0075	25.6	19.4	13.4	7.31	4.80	4.40
0090	22.5	13.1	9.49	6.07	4.30	3.21
0110	22.3	13.1	8.87	5.40	4.26	3.24
0150	13.4	7.80	5.65	3.61	2.55	1.91
0160	16.0	8.00	5.68	3.22	2.69	2.32
0165	14.1	9.44	7.37	4.02	2.25	2.42
0185	10.4	7.44	5.74	2.93	1.65	1.41
0195	7.66	5.48	4.22	2.16	1.22	1.04
0210	5.66	3.28	2.55	1.53	1.00	0.88
0240	10.4	5.18	3.66	2.27	1.84	1.41
0270	3.66	2.12	1.65	0.993	0.649	0.568
0280	5.10	2.57	2.08	1.43	1.06	0.804
0330	8.09	3.72	2.73	1.48	1.28	1.02
0450	6.33	3.17	2.30	1.40	1.00	0.850
0500	5.27	2.60	1.90	1.09	0.835	0.685
0580	2.49	1.23	0.900	0.525	0.395	0.340
0600	2.35	1.23	1.10	0.613	0.416	0.340
0660	3.57	1.69	1.21	0.671	0.566	0.447
0750	2.11	1.12	0.924	0.529	0.335	0.322
0850	2.77	1.31	1.001	0.576	0.439	0.360
0950	2.39	1.03	0.793	0.476	0.379	0.311
1300	1.72	0.723	0.585	0.350	0.320	0.223
1700	1.35	0.640	0.527	0.281	0.252	0.176
2600	0.841	0.362	0.292	0.176	0.157	0.111

Optimicron® Features

Optimised filter element wrap

Innovative wrap offers a high degree of tear-resistance and identifies the element as being original equipment.

The new perforations ensure optimised flow onto the filter pleats and thus minimise pressure losses effectively.

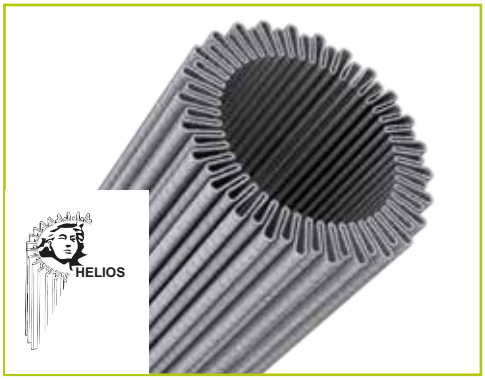


The optimised perforations have the effect of distributing the stress evenly in the axial and radial directions and thus increase tear-resistance.

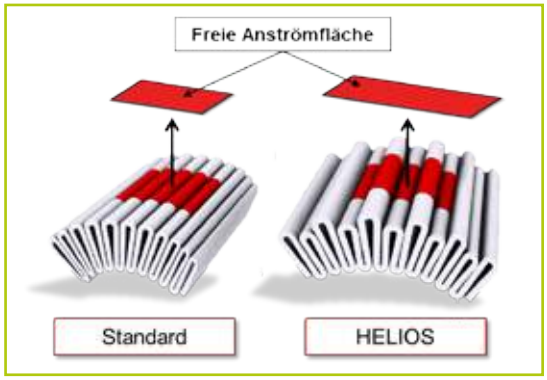
Customised multicoloured brand labelling provides protection from product piracy.

Innovative HELIOS pleat geometry

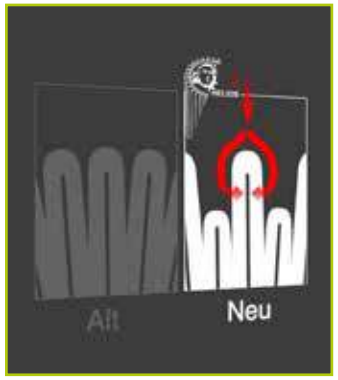
The special form of the pleats is like the crown of HELIOS, god of the sun.



The innovative HELIOS pleat geometry consists of alternating high and low pleats.



The special geometry significantly increases the area open to the flow and calms the flow in the area between the pleats, reducing the differential pressure.

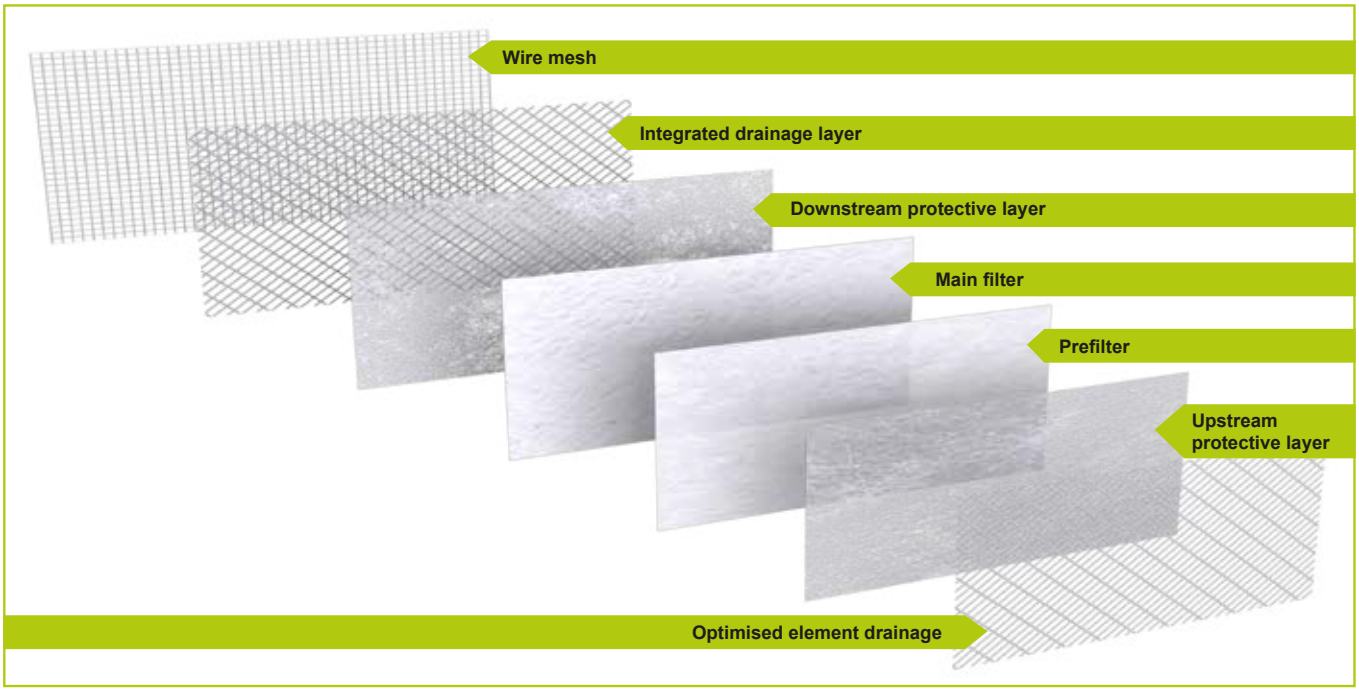


Particularly under high dynamic load conditions, the special geometry prevents the pleats becoming compressed and this reduces the differential pressure.

Optimicron® Features

Up to seven filtration layers

Free flow of fluid with very low differential pressure and high contamination retention.



Optimised element drainage
The unique asymmetrical structure provides large flow cross-sections, effectively preventing dead-spaces, turbulence and pressure losses

Upstream protective layer:
The homogenous and robust non-woven material protects the sensitive microglass media from mechanical damage.

Pre and main filter:
The graduated structure of the filter media ensures efficient particle retention together with a high level of contamination capacity and a long element service life.

Downstream protective layer:
The pressure-resistant protection and support layer offers optimum support for the pre- and main-filter media even under high differential pressure conditions.

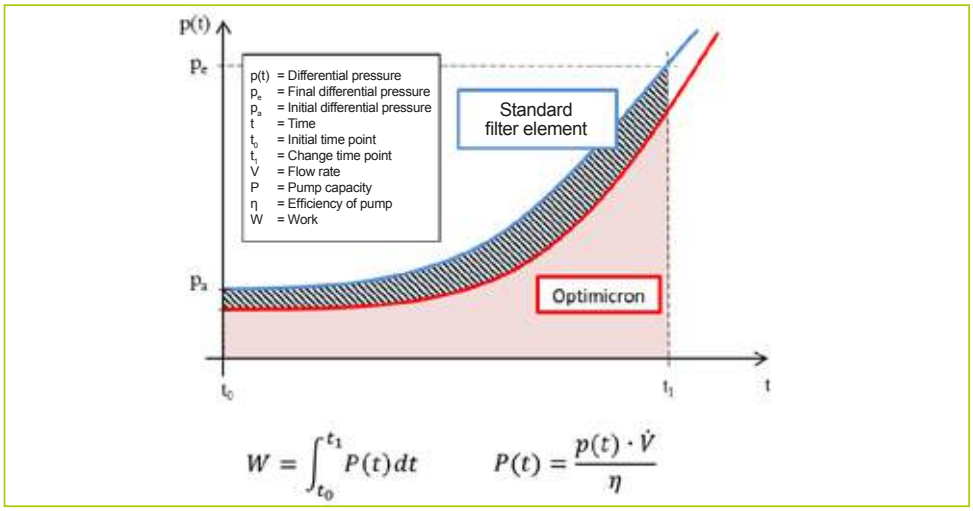
Integrated drainage layer
The integrated drainage layer directs the flow of fluid freely to the clean side and results in very low element differential pressures.

High quality wire mesh:
The stainless steel mesh ensures high stability of the filter pleats and has excellent fluid compatibility.

Optimicron® shows the way

Protects the environment and your pocket

HYDAC Optimicron® makes high energy savings possible over the whole service life of the filter element. This protects valuable resources and reduces the CO_2 emissions.



Our contribution to sustainability.

Energy efficient innovations are the main focus of our developments, so that systems operate more economically.

Optimicron® Power	Optimised filter elements for applications in power stations and rotary presses using Stat-Free® technology
Optimicron® Pulse	Optimised filter elements for applications with powerful pulsations using Stat-Free® technology
Optimicron® Pulp & Paper	Optimised filter elements for use in paper mills
For your application	Optimised filter elements for your application.

NOTES

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Optimicron® Power Filter Elements ON/PO

for power plant applications
up to 10 bar, filtration rating 5, 10 and 20 µm

Optimicron® Power

1. OPTIMICRON® POWER-ELEMENT

1.1 DESCRIPTION

The new filter elements in the Optimicron® Power series demonstrate impressive levels of robustness, safety and a particularly low pressure drop. They are compact in design and enable homogeneous flow of the fluid thanks to the innovative filter mesh pack structure.

Optimicron® Power elements have been designed to meet the requirements of the API 614 Standard.

The Stat-Free® technology incorporated into Optimicron® Power elements also ensures an increased level of operational safety by preventing electrostatic charging on the filter element. As a result, the service life of the oil is also considerably increased.

1.2 STAT-FREE® TECHNOLOGY INCLUDED

As standard, Optimicron® Power elements are equipped with the tried-and-tested Stat-Free® technology (to prevent electrostatic charging in the system).
As a result of increasing environmental awareness worldwide, operators are to a greater extent using zinc-free and ashless oils, such as bio oils which have very low conductivity. In these oils, electrostatic discharges are a common occurrence in the form of sparking, for example on the filter element or in the tank. Depending on the gas composition in and around the tank, sparking can cause deflagrations or explosions. Furthermore, the discharges can cause a chemical reaction in the oil, giving rise to oil ageing products.

1.3 GENERAL DATA

Collapse stability	10 bar for return line filter elements
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	5, 10, 20 µm
Bypass cracking pressure	Return line filter element (**"R"**): standard 3 bar Return line filter element for API applications (**"A"**): Without bypass valve as standard (others on request)
Category of filter element	Single use element

Oil ageing products can be deposited in the system and can clog up expensive system components. In addition, the filtration efficiency of the filter elements is impaired by sparking due to the holes burned in the filter mesh pack which in turn can lead to reduced retention of system contamination.
The Stat-Free® technology incorporated into Optimicron® Power elements slows down the oil ageing described above because the special filter mesh pack design prevents electrical charging in the system. This means that the service life of both the oil and the components can be extended. The Stat-Free® technology prevents the phenomenon of electrostatic charging and therefore the sparking in the system. It can be used in every conceivable application, irrespective of oil type.

1.4 INNOVATIVE OUTER WRAP WITH IMPROVED DIFFUSER EFFECT FOR PRINTING WITH CUSTOMER LOGO

Since the outer wrap can be printed with the customer logo, it also acts as an advertising medium for the OEM and guarantees security of the spares business. At the same time, the user can be certain of obtaining an original spare part. Particular benefit: the logo remains perfectly legible even in the contaminated condition.

1.5 COMPATIBILITY WITH HYDRAULIC FLUIDS TO ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD RETURN LINE FILTER ELEMENTS

(Can be used in the following filters: RFL, RFLD)

0660 R 010 ON/PO /-KB

Size
0110, 0240, 0330, 0500, 0660, 0850, 0950, 1300, 1700, 2600, 2700

Type
R Return line filter element

Filtration rating in µm
005, 010, 020

Filter material of element
ON/PO Optimicron® Power, collapse stability up to 10 bar

Supplementary details
V FPM (Viton) seal
KB without bypass valve

2.2 MODEL CODE FOR RETURN LINE FILTER ELEMENTS IN AFLD AND ALFS FILTERS

0880 A 010 ON/PO /-V

Size
0110, 0120, 0230, 0240, 0330, 0500, 0540, 0880, 1400, 2700

Type
A Filter elements to API standards

Filtration rating in µm
010

Filter material of element
ON/PO Optimicron® Power, collapse stability up to 10 bar

Supplementary details
V FPM (Viton) seal

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Return line filter element "R"...ON/PO			
Size	5 µm	10 µm	20 µm
0110	3.63	3.08	2.03
0240	1.32	1.12	0.72
0330	0.81	0.69	0.44
0500	0.53	0.45	0.29
0660	0.35	0.30	0.19
0850	0.28	0.24	0.16
0950	0.25	0.21	0.14
1300	0.18	0.15	0.10
1700	0.13	0.11	0.07
2600	0.08	0.07	0.05
2700	0.08	0.07	0.05

Return line filter element "A"...ON/PO	
Size	10 µm
0110	3.08
0120	1.37
0230	0.68
0240	1.12
0330	0.69
0500	0.45
0540	0.33
0880	0.14
1400	0.09
2700	0.07

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

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Optimicron® Pulse Filter Elements ON/PS / OH/PS

for applications with strong pulsations
up to 210 bar, filtration rating 3, 5, 10 and 20 µm

Optimicron® Pulse

1. OPTIMICRON® PULSE ELEMENT

1.1 DESCRIPTION

The new application-specific filter elements in the Optimicron® Pulse series are notable for their special fatigue strength in applications which are subject to extreme pulsations.

Pressure fluctuations in hydraulic systems can occur, for example, when cylinder pistons move or accumulators are charged. The frequency of pressure fluctuations varies considerably depending on the application. On injection moulding machines, the movement of the clamping unit causes large pressure fluctuations, often with an extremely high cycle rate. The new HYDAC Optimicron® Pulse filter element can withstand these dynamic stresses. Special flexible materials in the filter mesh pack provide the filter element with a high fatigue strength. Fatigue fractures in the filter mesh pack and penetration of contamination to the clean side are therefore prevented.

The innovative HELIOS pleat geometry ensures a free cross-sectional area even at high flow rates and as a result delivers a lower differential pressure.

Additionally, the Optimicron® Pulse filter element is fitted with the tried and tested Stat-Free® technology, which effectively prevents electrostatic discharges in the hydraulic system.

1.2 GENERAL DATA

Collapse stability	ON/PS: 20 bar OH/PS: 210 bar
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	3, 5, 10, 20 µm
Bypass cracking pressure	Pressure filter element ("**D**"): Without bypass valve as standard (bypass valve on request)
Category of filter element	Single use element

1.3 STAT-FREE TECHNOLOGY INCLUDED

As standard, Optimicron® Pulse elements are equipped with the tried-and-tested Stat-Free® technology (to prevent electrostatic charging in the system).
As a result of increasing environmental awareness worldwide, operators are to a greater extent using zinc-free and ashless oils, such as bio oils which have very low conductivity. In these oils, electrostatic discharges are a common occurrence in the form of sparking, for example on the filter element or in the tank. Depending on the gas composition in and around the tank, sparking can cause deflagrations or explosions. Oil ageing products can be deposited in the system and can clog up expensive system components.
In addition, the filtration efficiency of the filter elements is impaired by sparking due to the holes burned in the filter mesh pack which in turn can lead to reduced retention of system contamination.
The Stat-Free® technology incorporated into Optimicron® Pulse elements slows down the oil ageing described above because the special filter mesh pack design prevents electrical charging in the system. This means that the service life of both the oil and the components can be extended. The Stat-Free® technology prevents the phenomenon of electrostatic charging and therefore the sparking in the system. It can be used in every conceivable application, irrespective of oil type.

1.4 INNOVATIVE OUTER WRAP WITH INCREASED ROBUSTNESS AND IMPROVED DIFFUSER EFFECT FOR PRINTING WITH CUSTOMER LOGO

Since the outer wrap can be printed with the customer logo, it also acts as an advertising medium for the OEM and guarantees security of the spares business. At the same time, the user can be certain of obtaining an original spare part. Particular benefit: the logo remains perfectly legible even in the contaminated condition.

1.5 COMPATIBILITY WITH HYDRAULIC FLUIDS TO ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD PRESSURE FILTER ELEMENTS

(For use in filters: LF, LFF, LPF, DF, DFF, DF…MHA, DF…MHE, DFZ)

0660 D 010 ON/PS /-V

Size
0030, 0060, 0110, 0140, 0160, 0240, 0260, 0280, 0330, 0500, 0660, 0990, 1320, 1500

Type
D Pressure filter element

Filtration rating in µm
003, 005, 010, 020

Filter material of element
ON/PS Optimicron® Pulse, collapse stability up to 20 bar
OH/PS Optimicron® Pulse, collapse stability up to 210 bar

Supplementary details
V FPM (Viton) seal

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Pressure filter element "D"...ON/PS				
Size	3 µm	5 µm	10 µm	20 µm
0030	63.9	43.3	25.1	11.3
0035	23.6	19.0	16.3	9.3
0055	13.7	11.0	8.9	4.8
0060	28.9	20.4	14.5	7.9
0110	14.9	10.7	7.3	3.7
0140	12.8	8.2	5.3	2.9
0160	13.1	8.8	5.5	3.5
0240	8.2	6.1	4.3	2.3
0260	1.7	7.3	4.8	2.5
0280	4.0	3.1	2.0	1.3
0330	8.6	3.9	3.0	1.7
0500	3.0	2.4	1.5	1.1
0660	2.3	1.8	1.1	0.8
0990	2.0	1.2	0.7	0.5
1320	1.1	0.9	0.5	0.4
1500	1.1	0.9	0.5	0.4

Pressure filter element "D"...OH/PS				
Size	3 µm	5 µm	10 µm	20 µm
0030	87.5	59.3	34.4	15.5
0035	32.3	26.0	22.3	12.7
0055	18.8	15.1	12.2	6.6
0060	39.6	28.0	19.9	10.8
0110	20.4	14.7	10.0	5.1
0140	17.5	11.2	7.2	4.0
0160	18.0	12.1	7.6	4.8
0240	11.2	8.4	5.9	3.2
0260	2.3	10.0	6.6	3.4
0280	5.5	4.3	2.8	1.8
0330	6.7	5.3	4.1	2.3
0500	4.1	3.3	2.1	1.5
0660	3.1	2.5	1.5	1.1
0990	2.0	1.6	1.0	0.7
1320	1.5	1.2	0.7	0.6
1500	1.5	1.2	0.7	0.6

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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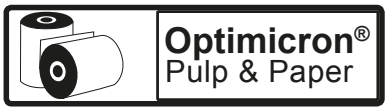
Optimicron® Pulp & Paper Filter Elements ON/PP

for use in paper mills
up to 10 bar, filtration rating 5 µm



1. OPTIMICRON® PULP & PAPER ELEMENT

1.1 DESCRIPTION

Drawing on HYDAC's many years of experience in the paper and pulp industry our new Optimicron® Pulp & Paper series elements have been specially developed for use in paper mills. Typically they are used in classic lubrication applications such as the dry and wet end, in the calender and in the cooling oil filtration circuit of the press section.

Thanks to innovative characteristics such as
the HELIOS pleat geometry and the optimised micro-glass media, the new industry-specific filter elements satisfy the typical requirements demanded of a filter element in such applications.

1.2 GENERAL DATA

Collapse stability	10 bar for return line filter elements
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	5 µm
Bypass cracking pressure	Return line filter element ("**R**"): standard 3 bar (others on request)
Category of filter element	Single use element

1.3 STAT-FREE® ELEMENT TECHNOLOGY OPTIONAL

By completely revising the materials used, e.g. through the use of conductive plastics, fully discharge-capable filter elements are the result. Electrical charging of the filter elements during operation has therefore been reduced to a negligible level. The risks of sudden sparking and the subsequent formation of soot or sludge in the oil are therefore reliably eliminated.

With the new Stat-Free® filter elements, HYDAC has for the first time succeeded in combining excellent electrostatic characteristics with filtration performance. Unprecedented low charge generation in the filter element and in the system fluid is achieved with a new type of filter mesh pack and element design.

1.4 INNOVATIVE OUTER WRAP WITH IMPROVED DIFFUSER EFFECT FOR PRINTING WITH CUSTOMER LOGO

Since the outer wrap can be printed with the customer logo, it also acts as an advertising medium for the OEM and guarantees security of the spares business. At the same time, the user can be certain of obtaining an original spare part. Particular benefit: the logo remains perfectly legible even in the contaminated condition.

1.5 COMPATIBILITY WITH HYDRAULIC FLUIDS TO ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD RETURN LINE FILTER ELEMENTS

(Can be used in filters: NF und NFD, starting at size 1340)

1300 R 005 ON/PP /-KB

Size
1300, 2600

Type
R Return line filter element

Filtration rating in µm
005

Filter material of element
ON/PP Optimicron® Pulp & Paper, collapse stability up to 10 bar

Supplementary details
V FPM (Viton) seal
KB without bypass valve
SFREE Stat-Free® element technology

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Return line filter element "R"...ON/PP	
Size	5 µm
1300	1.00
2600	0.45

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTE

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Optimicron® Filter Elements ON

up to 20 bar,
filtration rating 1, 3, 5, 10, 15 and 20 µm

Optimicron®

Please note:
Ongoing conversion from Betamicron® (BN4HC) to Optimicron® (ON)!

1. OPTIMICRON®

1.1 DESCRIPTION

The new Optimicron® filter elements have been optimised in respect of filtration performance and energy efficiency. They offer the best combination when it comes to separation efficiency, service life and differential pressure.

As a complete package the innovative characteristics of the new technology have a very positive impact on the differential pressure of the elements. For example, the new HELIOS filter mesh pack geometry has the effect of stabilising the pleats and increasing the available area of incident flow. The obvious advantage is improved flow conditions and as a result lower differential pressure.

HELIOS

The efficient micro-glass media forming the core of the filter element delivers first class filtration efficiency and a low differential pressure over the whole lifetime of the element and is now also available in 1 and 15 µm ratings.

The new design of the filter mesh pack and the combination of (up to seven) exclusive filtration layers has a particularly favourable effect on the differential pressure. So for example, a drainage layer with asymmetrical thread thickness as the first layer on the contaminated side channels the fluid and at the same time provides extensive and soft support of the other media. The penultimate filter layer, the so-called integrated drainage layer, ensures directed flow and prevents impact losses, dead spaces and turbulence which usually occur when wire mesh is used exclusively.

1.2 GENERAL DATA

Collapse stability	20 bar
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	1, 3, 5, 10, 15, 20 µm
Bypass cracking pressure	Pressure filter element (**"D"**): Without bypass valve as standard Return line filter element (**"R"**): Standard 3 bar (others on request) Return line filter element (**"RD"**): Standard 3.4 bar
Category of filter element	Single use element

1.3 STAT-FREE® TECHNOLOGY OPTIONAL

By completely revising the materials used, e.g. through the use of conductive plastics, fully discharge-capable filter elements are the result.

Electrical charging of the filter elements during operation has therefore been reduced to a negligible level. The risks of sudden sparking and the subsequent formation of soot or sludge in the oil are therefore reliably eliminated.

With the new Stat-Free® filter elements, HYDAC has for the first time succeeded in combining excellent electrostatic characteristics with filtration performance. Unprecedented low charge generation in the filter element and in the system fluid is achieved with a new type of filter mesh pack and element design.

1.4 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.5 INNOVATIVE OUTER WRAP WITH IMPROVED DIFFUSER EFFECT FOR PRINTING WITH CUSTOMER LOGO

Since the outer wrap can be printed with the customer logo, it also acts as an advertising medium for the OEM and guarantees security of the spares business. At the same time, the user can be certain of obtaining an original spare part. Particular benefit: the logo remains perfectly legible even in the contaminated condition.

1. APPLICATION

Optimicron® filter elements are intended to be used in all industries where particular importance is placed on first class filtration efficiency, high cleanliness classes as well as on significant savings in energy costs and on sustainable filtration.

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD PRESSURE FILTER ELEMENTS

(Can be used in the following filters: LFM, MFM, MFM…/-OIU, MFM..L.., DFM, HFM, LPF, LF, LFF, MDF, HDF, HDFF, DF, DFF, DFFX, FLND, FMND, DFDK, DF…MHA, DF…MHE, DF…M A, DF…M P, DFZ, DF…Q E, DFP, DFPF)

0660 D 010 ON /-V

Size
0030, 0035, 0055, 0060, 0075, 0095, 0110, 0140, 0160, 0240, 0260, 0280, 0300, 0330, 0450, 0500, 0650, 0660, 0900, 0990, 1320, 1500

Type
D Pressure filter element

Filtration rating in µm
001, 003, 005, 010, 015, 020

Filter material of element
ON Collapse stability up to 20 bar

Supplementary details
V FPM (Viton) seal
SFREE Stat-Free® element technology

2.2 MODEL CODE FOR STANDARD RETURN LINE FILTER ELEMENTS

(Can be used in the following filters: RFM, RF, RFD, RFL, RFLD, NF, NFD)

0660 R 010 ON /-V

Size
0030, 0060, 0075, 0090, 0110, 0150, 0160, 0165, 0185, 0195, 0210, 0240, 0260, 0270, 0280, 0330, 0450, 0500, 0580, 0600, 0660, 0750, 0850, 0950, 1300, 1700, 2600

Type
R Return line filter element

Filtration rating in µm
001, 003, 005, 010, 015, 020

Filter material of element
ON Collapse stability up to 20 bar

Supplementary details
V FPM (Viton) seal
KB without bypass valve
SFREE Stat-Free® element technology

2.3 MODEL CODE FOR RETURN LINE FILTER ELEMENTS IN PRESSURE FILTERS

(Can be used in the following filters: LPF…/-TH, LPF…GGA)

0241 RD 010 ON /-V

Size
0161, 0241, 0261, 0281

Type
RD Return line filter element for pressure filters

Filtration rating in µm
001, 003, 005, 010, 015, 020

Filter material of element
ON Collapse stability up to 20 bar

Supplementary details
V FPM (Viton) seal

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Pressure filter element "D"...ON						
Size	**1 µm**	**3 µm**	**5 µm**	**10 µm**	**15 µm**	**20 µm**
0030	77.8	63.9	43.3	22.8	14.0	11.3
0035	50.2	21.3	17.1	13.7	10.0	7.44
0055	26.0	12.3	9.90	7.90	5.17	3.84
0060	53.5	26.0	18.3	12.1	9.78	6.32
0075	16.7	8.40	6.75	5.40	3.33	2.48
0095	13.2	6.74	5.40	4.33	2.62	1.92
0110	25.8	13.4	9.61	6.06	4.63	2.99
0140	19.9	11.5	7.39	4.38	3.54	2.29
0160	18.5	11.0	7.70	4.10	3.71	3.18
0240	11.5	6.90	5.34	3.19	2.44	2.10
0260	8.18	4.96	3.87	2.31	1.83	1.44
0280	5.54	3.37	2.74	1.49	1.36	1.17
0300	14.6	8.90	7.13	4.88	2.80	2.61
0330	8.23	4.19	3.37	2.46	1.55	1.22
0450	7.30	4.45	3.52	2.39	1.40	1.26
0500	5.05	2.57	2.07	1.23	0.95	0.75
0650	4.46	2.69	2.20	1.47	0.86	0.81
0660	3.78	1.93	1.56	0.93	0.71	0.56
0900	3.37	2.10	1.67	1.10	0.65	0.63
0990	2.51	1.28	1.03	0.61	0.47	0.37
1320	1.85	0.97	0.76	0.45	0.35	0.27
1500	1.64	0.97	0.70	0.48	0.36	0.28

Return line element "R"...ON						
Size	**1 µm**	**3 µm**	**5 µm**	**10 µm**	**15 µm**	**20 µm**
0030	89.8	68.4	43.9	26.8	16.8	14.7
0060	47.2	23.6	17.2	9.82	9.01	6.85
0075	25.6	19.4	13.4	7.31	4.80	4.40
0090	22.5	13.1	9.49	6.07	4.30	3.21
0110	22.3	13.1	8.87	5.40	4.26	3.24
0150	13.4	7.80	5.65	3.61	2.55	1.91
0160	16.0	8.00	5.68	3.22	2.69	2.32
0165	14.1	9.44	7.37	4.02	2.25	2.42
0185	10.4	7.44	5.74	2.93	1.65	1.41
0195	7.66	5.48	4.22	2.16	1.22	1.04
0210	5.66	3.28	2.55	1.53	1.00	0.88
0240	10.4	5.18	3.66	2.27	1.84	1.41
0270	3.66	2.12	1.65	0.99	0.65	0.57
0280	5.10	2.57	2.08	1.43	1.06	0.80
0330	8.09	3.72	2.73	1.48	1.28	1.02
0450	6.33	3.17	2.30	1.40	1.00	0.85
0500	5.27	2.60	1.90	1.09	0.84	0.69
0580	2.49	1.23	0.90	0.53	0.40	0.34
0600	2.35	1.23	1.10	0.61	0.42	0.34
0660	3.57	1.69	1.21	0.67	0.57	0.45
0750	2.11	1.12	0.92	0.53	0.34	0.32
0850	2.77	1.31	1.00	0.58	0.44	0.36
0950	2.39	1.03	0.79	0.48	0.38	0.31
1300	1.72	0.72	0.59	0.35	0.32	0.22
1700	1.35	0.64	0.53	0.28	0.25	0.18
2600	0.84	0.36	0.29	0.18	0.16	0.11
2700	0.91	0.35	0.30	0.18	0.17	0.08

Return line element "RD"...ON						
Size	**1 µm**	**3 µm**	**5 µm**	**10 µm**	**15 µm**	**20 µm**
0161	17.71	10.67	8.76	4.97	3.41	3.04
0241	10.86	6.54	5.37	3.05	2.09	1.87
0261	7.19	4.33	3.56	2.02	1.38	1.24
0281	4.47	2.69	2.21	1.25	0.86	0.77

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
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Betamicron® Filter Elements BN4HC/BH4HC

up to 210 bar, filtration rating 3, 5, 6, 10, 20, 25 µm

1. BETAMICRON® ELEMENT

1.1 DESCRIPTION

The 3-stage structure of Betamicron® filter elements ensures the maximum contamination retention and filtration performance. An additional drainage layer directs the fluid flow with optimal efficiency, achieving particularly favourable Δp/Q characteristics.

An innovative bonding process used for the longitudinal seam guarantees that the cut ends of the mesh pack remain completely sealed even under high load variations. This eliminates the possibility of particles crossing from the contaminated to the clean side.

To prevent the formation of zinc soap, which occurs mainly in conjunction with water-based fluids (HFA / HFC) and bio oils, no components containing zinc are utilized.

The metal tube which forms a stable core inside the element is constructed as a spiral lock seam tube. This provides consistent stability and a significant reduction in element weight.

The pleated filter mesh pack is encased in a stable outer wrap. This wrap distributes the incoming fluid evenly over the mesh pack. In addition the mesh pack is not directly exposed to the flow, and this protects it from pulsating flows. In this way, the element achieves extremely high fatigue strength values. Moreover, the mesh pack is protected from mechanical damage.

1.2 GENERAL DATA

Collapse stability	BN4HC: 20 bar BH4HC: 210 bar
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	3, 5, 6, 10, 20, 25 µm
Bypass cracking pressure	Pressure filter element (**"D"**): Without bypass valve as standard Pressure filter element to DIN 24550 (**"DN"**): Without bypass valve as standard Pressure filter element for MFX filter (**"MX"**): standard 3.5 bar Return line filter element to DIN 24550 (**"RN"**): standard 3.5 bar (others on request)
Category of filter element	Single use element

1.3 STAT-FREE® TECHNOLOGY OPTIONAL

By completely revising the materials used, e.g. through the use of conductive plastics, fully discharge-capable filter elements are the result.

Electrical charging of the filter elements during operation has therefore been reduced to a negligible level. The risks of sudden sparking and the subsequent formation of soot or sludge in the oil are therefore reliably eliminated.

With the new Stat-Free® filter elements, HYDAC has for the first time succeeded in combining excellent electrostatic characteristics with filtration performance. Unprecedented low charge generation in the filter element and in the system fluid is achieved with a new type of filter mesh pack and element design.

1.4 OUTER WRAP PRINTED WITH CUSTOMER LOGO

Since the outer wrap can be printed with the customer logo, it also acts as an advertising medium for the OEM and guarantees security of the spares business. At the same time, the user can be certain of obtaining an original spare part. Particular benefit: the logo remains perfectly legible even in the contaminated condition.

1.5 COMPATIBILITY WITH HYDRAULIC FLUIDS TO ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD PRESSURE FILTER ELEMENTS

(Can be used in the following filters: DFM, LPF, LF, LFF, MDF, HDF, HDFF, DF, DFF, DFFX, FLND, FMND, DFDK, DF... MHA, DF...MHE, DF...M A, DF...M P, DFZ, DF...Q E, DFP, DFPF)

0660 D 010 BH4HC /-V

Size
0030, 0035, 0055, 0060, 0075, 0095, 0110, 0140, 0160, 0240, 0260, 0280, 0300, 0330, 0450, 0500, 0650, 0660,0900, 0990, 1320, 1500

Type
D Pressure filter element

Filtration rating in µm
003, 005, 010, 020

Filter material of element
BH4HC Collapse stability up to 210 bar

Supplementary details
V FPM (Viton) seal
SFREE Stat-Free® element technology

2.2 MODEL CODE FOR PRESSURE FILTER ELEMENTS TO DIN 24550

(Can be used in the following filters: FLN, LFN, LFNF, DFN, DFNF, FLND, FMND, DFDKN)

0100 DN 010 BN4HC /-V

Size
0040, 0063, 0100, 0160, 0250, 0400

Type
DN Pressure filter element to DIN 24550

Filtration rating in µm
003, 006, 010, 025

Filter material of element
BN4HC Collapse stability up to 20 bar
BH4HC Collapse stability up to 210 bar

Supplementary details
V FPM (Viton) seal
SFREE Stat-Free® element technology

2.3 MODEL CODE FOR PRESSURE FILTER ELEMENTS IN MFX FILTERS

0100 MX 010 BN4HC /-V

Size
0100, 0200

Type
MX Pressure filter element for MFX filter

Filtration rating in µm
003, 005, 010, 020

Filter material of element
BN4HC Collapse stability up to 20 bar

Supplementary details
V FKM (Viton) seal

2.4 MODEL CODE FOR RETURN LINE FILTER ELEMENTS TO DIN 24550

(Can be used in the following filters: RFN, RFND, RFLN, RFLND)

0100 RN 010 BN4HC /-V

Size
0040, 0063, 0100, 0160, 0250, 0400, 0630, 1000

Type
RN Return line filter element to DIN 24550

Filtration rating in µm
003, 006, 010, 025

Filter material of element
BN4HC Collapse stability up to 20 bar

Supplementary details
V FPM (Viton) seal
SFREE Stat-Free® element technology

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Pressure filter element "D"...BH4HC				
Size	3 µm	5 µm	10 µm	20 µm
0030	91.2	50.7	36.3	19.0
0035	47.8	28.1	16.8	10.5
0055	24.2	14.2	8.5	5.3
0060	58.6	32.6	18.1	12.2
0110	25.4	14.9	8.9	5.6
0140	19.9	11.3	8.1	4.3
0160	16.8	10.4	5.9	4.4
0240	10.6	6.8	3.9	2.9
0260	8.1	4.8	3.3	1.9
0280	5.7	3.4	1.8	1.6
0300	16.0	8.9	7.1	3.3
0330	7.7	4.5	2.8	2.0
0450	7.8	4.3	3.4	1.6
0500	4.2	2.6	1.5	1.2
0650	4.7	2.6	2.1	1.0
0660	3.3	1.9	1.0	0.9
0900	3.5	2.0	1.6	0.7
0990	2.2	1.3	0.8	0.6
1320	1.6	1.0	0.6	0.4
1500	1.4	0.8	0.6	0.5

Pressure filter element "DN"...BN4HC				
Size	3 µm	6 µm	10 µm	25 µm
0040	23.9	14.9	8.6	6.6
0063	16.3	9.9	6.0	4.6
0100	11.9	6.6	4.0	3.2
0160	7.9	5.1	3.4	2.6
0250	5.1	3.2	2.1	1.8
0400	3.2	2.0	1.3	1.0

Pressure filter element "DN"...BH4HC				
Size	3 µm	6 µm	10 µm	25 µm
0040	40.4	24.8	16.4	10.9
0063	29.0	18.2	11.7	7.6
0100	19.0	11.7	7.7	5.3
0160	8.0	5.1	3.8	2.5
0250	5.4	3.4	2.8	1.9
0400	3.4	2.1	1.7	1.1

Pressure filter element "MX"...BN4HC				
Size	3 µm	5 µm	10 µm	20 µm
0100	12.0	9.0	4.6	3.4
0200	7.0	5.3	2.7	2.0

Return line filter element "RN"...BN4HC				
Size	3 µm	6 µm	10 µm	25 µm
0040	14.2	7.8	4.8	2.6
0063	9.5	5.2	3.4	1.8
0100	6.8	3.3	2.3	1.2
0160	3.6	1.8	1.2	0.5
0250	2.8	1.4	0.9	0.4
0400	2.2	1.6	1.3	1.0
0630	2.1	1.2	0.9	0.7
1000	0.7	0.5	0.4	0.3

4.2 CONTAMINATION RETENTION CAPACITY IN G

The contamination retention and particle filtration performance of an element are established in the multipass test to ISO 16889. This procedure with its precisely defined test conditions and a standard test dust (ISO MTD) enables the performance data of different elements to be compared.

Pressure filter element "D"...BH4HC				
Size	3 µm	5 µm	10 µm	20 µm
0030	3.0	2.9	3.2	3.7
0035	5.3	5.2	5.8	6.6
0055	10.5	10.3	11.5	13.0
0060	4.6	4.5	5.0	5.7
0110	10.1	9.9	10.9	12.4
0140	13.3	13.0	14.3	16.3
0160	12.9	12.6	13.9	15.9
0240	21.6	21.1	23.2	26.5
0260	48.1	47.1	51.8	59.1
0280	48.1	47.1	51.8	59.1
0300	17.0	16.6	18.3	20.9
0330	34.6	33.9	37.2	42.5
0450	35.0	34.2	37.6	42.9
0500	57.5	56.3	61.8	70.5
0650	58.3	57.1	62.8	71.6
0660	76.8	75.2	82.6	94.3
0900	77.3	75.7	83.1	94.8
0990	111.8	109.4	120.2	137.2
1320	153.8	150.7	165.5	188.8
1500	164.5	161.1	177.0	202.0

Pressure filter element "DN"...BN4HC				
Size	3 µm	6 µm	10 µm	25 µm
0040	5.2	5.6	6.3	7.0
0063	7.3	7.9	9.2	11.2
0100	15.4	16.5	18.6	20.6
0160	27.5	29.3	33.1	36.7
0250	38.1	41.7	48.6	59.0
0400	76.2	81.3	91.4	101.5

Pressure filter element "DN"...BH4HC				
Size	3 µm	6 µm	10 µm	25 µm
0040	4.1	4.4	5.2	6.2
0063	7.3	7.9	9.2	11.2
0100	12.2	13.2	15.5	18.9
0160	21.8	23.9	27.8	33.8
0250	38.1	41.7	48.6	59.0
0400	63.6	69.5	81.0	98.3

Pressure filter element "MX"...BN4HC				
Size	3 µm	5 µm	10 µm	20 µm
0100	24.2	27.8	27.8	28.8
0200	41.3	47.4	47.4	49.4

Return line filter element "RN"...BN4HC				
Size	3 µm	6 µm	10 µm	25 µm
0040	7.1	8.0	8.9	10.6
0063	13.0	14.7	16.3	19.6
0100	22.0	24.7	27.5	33.0
0160	36.2	40.7	45.3	54.2
0250	61.4	69.1	76.8	92.1
0400	88.2	99.2	110.2	132.3
0630	148.6	167.3	185.8	222.9
1000	151.8	170.8	189.8	227.8

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTES

NOTE

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Mobilemicron® Filter Elements MM

up to 10 bar, filtration rating 8, 10, 15 µm

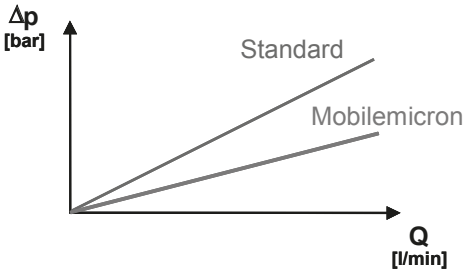
1. MOBILEMICRON® ELEMENT

1.1 DESCRIPTION

The use of Mobilemicron® element technology guarantees safe, reliable operation of your mobile machine.

The Mobilemicron® series of filter elements is characterized by an especially low pressure drop which makes them particularly suitable for use wherever high-viscosity oil is likely - especially at low temperatures during a cold start. When Mobilemicron® elements are used, compared to conventional hydraulic elements under the same ambient conditions, the Δp produced is lower and the flow rate is higher which results in a lower energy requirement.

Filtered flow during cold start



Thanks to its excellent cold start behaviour the Mobilemicron® element technology is used primarily in mobile applications but is also typically recommended for gear lubrication applications in systems with high temperature fluctuations and high-viscosity oils (>ISO VG 100).

1.2 GENERAL DATA

Collapse stability	10 bar for return line filter elements 20 bar for pressure filter elements
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	8, 10, 15 µm
Bypass cracking pressure	Return line filter element (**"R"**): standard 3 bar Pressure filter element for MFX filter (**"MX"**): standard 3.5 bar Return line filter element for RKM filter (**"RK"**): standard without bypass valve Return line filter element pressure filter (**"RD"**): standard without bypass valve (others on request)
Category of filter element	Single use element

1.3 STAT-FREE® ELEMENT TECHNOLOGY OPTIONAL

By completely revising the materials used, e.g. through the use of conductive plastics, fully discharge-capable filter elements are the result.

Electrical charging of the filter elements during operation has therefore been reduced to a negligible level. The risks of sudden sparking and the subsequent formation of soot or sludge in the oil are therefore reliably eliminated.

With the new Stat-Free® filter elements, HYDAC has for the first time succeeded in combining excellent electrostatic characteristics with filtration performance. Unprecedented low charge generation in the filter element and in the system fluid is achieved with a new type of filter mesh pack and element design.

1.4 OUTER WRAP PRINTED WITH CUSTOMER LOGO

Since the outer wrap can be printed with the customer logo, it also acts as an advertising medium for the OEM and guarantees security of the spares business. At the same time, the user can be certain of obtaining an original spare part. Particular benefit: the logo remains perfectly legible even in the contaminated condition.

1.5 COMPATIBILITY WITH HYDRAULIC FLUIDS TO ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD RETURN LINE FILTER ELEMENTS

(Can be used in the following filters: RF, RFD, RFM, RFL, RFLD)

0660 R 010 MM /-V

Size
0075, 0090, 0150, 0165, 0185, 0195, 0210, 0270, 0330, 0500, 0660, 0850

Type
R Return line filter element

Filtration rating in µm
008, 010, 015

Filter material of element
MM Mobilemicron®, collapse stability up to 10 bar

Supplementary details
V FPM (Viton) seal
KB without bypass valve
SFREE Stat-Free® element technology

2.2 MODEL CODE FOR RETURN LINE FILTER ELEMENTS IN RKM FILTERS

0300 RK 010 MM /-V

Size
0080, 0100, 0120, 0151, 0201, 0251, 0300, 0350, 0400, 0800

Type
RK Return line filter element for RKM filter

Filtration rating in µm
008, 010, 015

Filter material of element
MM Mobilemicron®, collapse stability up to 10 bar

Supplementary details
V FPM (Viton) seal
SFREE Stat-Free® element technology

2.3 MODEL CODE FOR RD PRESSURE FILTER ELEMENTS

(Can be used in the following filters: LPF…/-TH, LPF…GGA)

0251 RD 010 MM /-V

Size
0161, 0241, 0261, 0281

Type
RD Pressure filter element

Filtration rating in µm
008, 010, 015

Filter material of element
MM Mobilemicron®, collapse stability up to 20 bar

Supplementary details
V FPM (Viton) seal
SFREE Stat-Free® element technology

2.4 MODEL CODE FOR PRESSURE FILTER ELEMENTS IN MFX FILTERS

0100 MX 010 MM /-V

Size
0100, 0200

Type
MX Pressure filter element for MFX filter

Filtration rating in µm
008, 010, 015

Filter material of element
MM Mobilemicron®, collapse stability up to 20 bar

Supplementary details
V FPM (Viton) seal
KB without bypass valve
SFREE Stat-Free® element technology

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Return line filter element "R"...MM			
Size	8 µm	10 µm	15 µm
0075	4.83	4.83	3.02
0090	4.60	4.60	2.15
0150	2.08	2.08	1.30
0165	2.66	2.66	1.66
0185	1.97	1.97	1.23
0195	1.45	1.13	0.69
0210	0.95	0.95	0.59
0270	0.58	0.58	0.36
0330	1.43	1.43	0.89
0500	0.94	0.94	0.59
0660	0.55	0.55	0.34
0850	0.42	0.42	0.26

Return line filter element "RK"...MM			
Size	8 µm	10 µm	15 µm
0080	2.48	2.48	1.59
0100	1.74	1.74	1.11
0120	1.40	1.40	0.90
0151	1.00	1.00	0.65
0201	0.75	0.75	0.47
0251	0.58	0.58	0.36
0300	0.62	0.62	0.39
0350	0.30	0.30	0.20
0400	0.56	0.56	0.35
0800	0.44	0.44	0.27

Pressure filter element "RD"...MM			
Size	8 µm	10 µm	15 µm
0161	3.53	3.53	2.29
0241	2.03	2.03	1.32
0261	1.31	1.31	0.85
0281	0.82	0.82	0.53

Pressure filter element "MX"...MM			
Size	8 µm	10 µm	15 µm
0100	2.70	2.70	2.20
0200	1.60	1.60	1.30

4.2 CONTAMINATION RETENTION CAPACITY IN G

The contamination retention and particle filtration performance of an element are established in the multipass test to ISO 16889. This procedure with its precisely defined test conditions and a standard test dust (ISO MTD) enables the performance data of different elements to be compared.

Return line filter element "R"...MM			
Size	8 µm	10 µm	15 µm
0075	5.4	5.4	6.4
0090	7.4	7.4	8.8
0150	11.8	11.8	13.9
0165	9.9	9.9	11.6
0185	13.6	13.6	16.0
0195	18.5	18.5	21.7
0210	32.8	32.8	38.7
0270	50.8	50.8	59.9
0330	21.8	21.8	25.7
0500	33.4	33.4	39.4
0660	53.7	53.7	63.3
0850	69.1	69.1	81.4

Return line filter element "RK"...MM			
Size	8 µm	10 µm	15 µm
0080	11.0	11.0	13.3
0100	16.3	16.3	19.6
0120	20.7	20.7	25.0
0151	26.6	26.6	31.4
0201	50.9	50.9	61.4
0251	61.9	61.9	74.7
0300	55.6	55.6	67.1
0350	87.0	87.0	105.0
0400	67.4	67.4	81.3
0800	86.3	86.3	104.2

Pressure filter element "RD"...MM			
Size	8 µm	10 µm	15 µm
0161	11.3	11.3	13.7
0241	18.7	18.7	22.6
0261	29.0	29.0	35.0
0281	46.6	46.6	56.2

Pressure filter element "MX"...MM			
Size	8 µm	10 µm	15 µm
0100	13.3	13.3	15.7
0200	22.7	22.7	26.8

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTES

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Ecomicron®
Filter Elements ECON2
up to 10 bar, filtration rating 3, 5, 10, 20 µm

1. ECOMICRON® ELEMENT

1.1 DESCRIPTION

With the introduction of the new Betamicron® element technology HYDAC has broken new ground in the field of filter technology: with its markedly improved filtration performance the new glass fibre technology delivers a significant reduction in operating costs of both machine and system.

In the second step we were able to incorporate the outstanding values of the new Betamicron®4 technology into the environmentally friendly all-plastic variant Ecomicron®. The result was the new filter element generation Ecomicron®2 with tried-and-tested full-plastic structure and improved performance data.

The typical HYDAC element construction has been retained: the unique outer wrap ensures optimum flow control and protects the high-grade filter medium; the pleated filter mesh pack stabilises the filter element for flow from outside to inside and makes maximum use of the glass fibre capacity.

1.2 GENERAL DATA

Collapse stability	10 bar
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	3, 5, 10, 20 µm
Bypass cracking pressure	Return line filter element (**"R"**): standard 3 bar Pressure filter element for MFX filter (**"MX"**): standard 3.5 bar (others on request)
Category of filter element	Single use element

1.3 OUTER WRAP PRINTED WITH CUSTOMER LOGO

Since the outer wrap can be printed with the customer logo, it also acts as

an advertising medium for the OEM and guarantees security of the spares business. At the same time, the user can be certain of obtaining an original spare part. Particular benefit: the logo remains perfectly legible even in the contaminated condition.

1.4 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD RETURN LINE FILTER ELEMENTS

(Can be used in the following filters: RFM, NF, NFD)

0660 R 010 ECON2 /-V

Size
0075, 090, 150, 160, 165, 185, 195, 240, 280, 330, 500, 660, 750, 850, 950, 1300, 2600

Type
R Return line filter element

Filtration rating in µm
003, 005, 010, 020

Filter material of element
ECON2 Ecomicron®

Supplementary details
KB without bypass valve
V FKM (Viton) seal

2.2 MODEL CODE FOR PRESSURE FILTER ELEMENTS IN MFX FILTERS

0100 MX 010 ECON2 /-V

Size
0100, 0200

Type
MX Pressure filter element for MFX filter

Filtration rating in µm
003, 005, 010, 020

Filter material of element
ECON2 Ecomicron®

Supplementary details
KB without bypass valve
V FKM (Viton) seal

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Return line filter element "R"...ECON2				
Size	3 µm	5 µm	10 µm	20 µm
0075	22.0	14.2	8.1	4.4
0090	14.9	10.1	6.7	3.2
0150	8.9	6.0	4.0	1.9
0160	9.5	5.9	3.8	2.9
0165	11.2	7.8	4.5	2.4
0185	8.9	6.1	3.3	1.8
0195	6.6	4.5	2.4	1.3
0240	6.2	3.8	2.6	1.8
0280	3.1	2.2	1.6	1.0
0330	4.2	2.7	1.7	1.2
0500	3.0	1.9	1.3	0.8
0660	1.9	1.2	0.8	0.5
0750	1.3	0.9	0.6	0.4
0850	1.5	1.0	0.7	0.4
0950	1.2	0.8	0.5	0.4
1300	0.8	0.6	0.4	0.3
1700	0.7	0.5	0.3	0.2
2600	0.4	0.3	0.2	0.1

Pressure filter element "MX"...ECON2				
Size	3 µm	5 µm	10 µm	20 µm
0100	13.0	10.0	6.5	4.8
0200	8.0	5.9	3.8	2.8

4.2 CONTAMINATION RETENTION CAPACITY IN G

Return line filter element "R"...ECON2				
Size	3 µm	5 µm	10 µm	20 µm
0075	10.3	11.4	13.7	15.5
0090	12.2	13.5	16.2	18.3
0150	20.4	22.6	27.2	30.8
0160	18.6	20.7	24.9	28.1
0165	18.7	20.7	24.9	28.2
0185	25.6	28.4	34.1	38.6
0195	28.1	31.1	37.5	42.4
0240	29.3	32.5	39.1	44.2
0280	62.3	69.0	83.0	93.9
0330	38.4	42.6	51.2	57.9
0500	58.9	65.3	78.6	88.9
0660	87.1	96.5	116.1	131.3
0750	147.1	163.0	196.1	221.9
0850	112.1	124.2	149.5	169.1
0950	130.0	144.1	173.3	196.1
1300	181.0	200.7	241.4	273.1
1700	229.8	254.7	306.4	346.6
2600	369.4	409.4	492.5	557.2

Pressure filter element "MX"...ECON2				
Size	3 µm	5 µm	10 µm	20 µm
0100	25.6	29.9	29.9	33.0
0200	43.8	50.5	50.5	56.0

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTE

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Wire Mesh Filter Elements W, W/HC

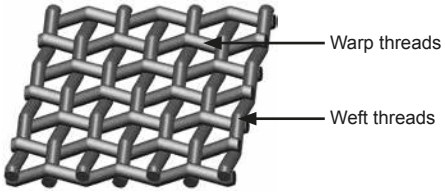
up to 20 bar, filtration rating 25, 50, 100, 200 µm

1. WIRE MESH ELEMENT

1.1 DESCRIPTION

Stainless steel wire mesh filter elements are used in lubrication systems for bearings (e.g. turbine bearings), water filtration, treatment plants for cooling emulsions and as guard filters.

On the W and W/HC filter elements both the warp and weft are equally strong which results in uniform openings in the filter mesh. The pressure drop is lower when filtering with stainless steel wire mesh filter elements. The pleated stainless steel square mesh is supported in single or multiple layers.



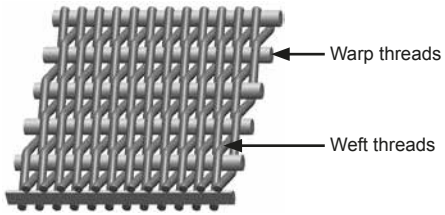
Compared to W/HC elements, W elements have a smaller pleat depth.

The W and W/HC stainless steel wire mesh elements are used in our return line and pressure filters.

Dutch weave

HYDAC offers another wire mesh filter element, the Dutch weave filter element "T". This element is primarily used as a protective filter in mining applications.

On Dutch weaves the warp thread is stronger than the weft thread. The weft wires are laid together as closely as possible and this results in a moderate pressure drop during filtration.



The so-called zero-mesh weaves are only used in pressure filters (Example for order code: 0330 D 050 T).

1.2 GENERAL DATA

Collapse stability	20 bar
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	25, 50, 100, 200 µm (others on request)
Bypass cracking pressure	Pressure filter element (**"D"**): Without bypass valve as standard Pressure filter element to DIN 24550 (**"DN"**): Without bypass valve as standard Return line filter element (**"R"**): standard 3 bar (others on request)
Category of filter element	Can be cleaned to extend service life

1.3 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG can only be used with Viton seals
- Fire-resistant fluids HFA, HFB, HFC and HFD as well as operating fluids with a high water content on request

1.4 CLEANING

Stainless steel wire mesh elements can be cleaned after use. However only a certain level (percentage) of cleaning is achievable.

In order to achieve the best possible result, the elements should be cleaned using specialist equipment.

The cleaning effect cannot however be predicted. It depends greatly on various conditions

- Filtration rating:
  The finer the filter material, the worse the cleaning level
- Operating pressure:
  The higher the operating pressure, the more firmly the contamination particles become embedded in the filter material
- Type of particle:
  For example, if the contamination consists mainly of fibres, the level of cleaning is worse than if it consists of cube-type particles.

  In addition it must be noted that with each cleaning process, it is only possible to restore approx. 80-90% of the initial filter area each time, i.e. after 4-5 cleaning cycles, the result might not make economic sense (cleaning costs versus service life).

  Further information on cleaning is provided in the operating manual which is available on request.

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD PRESSURE FILTER ELEMENTS

(Can be used in the following filters: LPF, LF, LFF, MDF, DF, DFF, DFFX, DFDK)

0660 D 025 W/HC /-V

Size
W: 0030, 0060, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320, 1500
W/HC: 0060, 0110, 0140, 0160, 0240, 0260, 0280, 0330, 0500, 0660, 0990, 1320

Type
D Pressure filter element

Filtration rating in µm
025, 050, 100, 200

Filter material of element
W, W/HC

Supplementary details
V FPM (Viton) seal
W suitable for oil-water emulsions (HFA, HFC)

2.2 MODEL CODE FOR PRESSURE FILTER ELEMENTS TO DIN 24550

(Can be used in the following filters: FLN, LFN, LFNF, DFN, DFNF, FLND, FMND)

0100 DN 025 W/HC /-V

Size
W: 0040, 0063, 0100 (only for FLND and FMND)
W/HC: 0040, 0063, 0100, 0160, 0250, 0400

Type
DN Pressure filter element to DIN 24550

Filtration rating in µm
025, 050, 100, 200

Filter material of element
W, W/HC

Supplementary details
V FPM (Viton) seal
W suitable for oil-water emulsions (HFA, HFC)

2.3 MODEL CODE FOR STANDARD RETURN LINE FILTER ELEMENTS

(Can be used in the following filters: RFM, RF, RFD, RFL, RFLD, NF, NFD)

0660 R 010 W/HC /-V

Size
0030, 0060, 0075, 0090, 0110, 0150, 0160, 0165, 0185, 0195, 0210, 0240, 0270, 0280, 0330, 0450, 0500, 0580, 0660, 0750, 0850, 0950, 1300, 1700, 2600, 2700

Type
R Return line filter element

Filtration rating in µm
025, 050, 100, 200

Filter material of element
W/HC Collapse stability up to 20 bar

Supplementary details
KB without bypass valve
V FKM (Viton) seal
W suitable for oil-water emulsions (HFA, HFC)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Details for 25, 50, 100, 200 µm

Pressure filter element "D"...		
Size	W	W/HC
0030	3.030	-
0060	0.757	0.757
0110	0.413	0.413
0140	0.324	0.324
0160	0.284	0.284
0240	0.189	0.189
0260	0.131	0.131
0280	0.089	0.089
0330	0.138	0.138
0500	0.091	0.091
0660	0.069	0.069
0990	0.046	0.046
1320	0.035	0.035
1500	0.020	-

Pressure filter element "DN"...		
Size	W	W/HC
0040	0.602	0.727
0063	0.374	0.416
0100	0.232	0.251
0160	-	0.127
0250	-	0.080
0400	-	0.046

Return line filter element "R"...	
Size	W/HC
0030	1.212
0060	0.612
0075	0.362
0090	0.312
0110	0.30
0150	0.185
0160	0.193
0165	0.199
0185	0.907
0195	0.668
0210	0.068
0240	0.123
0270	0.044
0280	0.060
0330	0.195
0450	0.165
0500	0.128
0580	0.065
0660	0.067
0750	0.055
0850	0.052
0950	0.048
1300	0.034
1700	0.025
2600	0.017
2700	0.020

4.2 FILTRATION AREA [CM²]

Pressure filter element "D"...		
Size	W	W/HC
0030	256	-
0060	330	418
0110	672	910
0140	884	1200
0160	857	1144
0240	1348	1911
0280	2862	4264
0330	1795	3133
0500	2891	5107
0660	3795	6958
0990	5431	10091
1320	7378	13916
1500	12966	-

Pressure filter element "DN"...		
Size	W	W/HC
0040	415	427
0063	743	745
0100	1234	1234
0160	-	2439
0250	-	3867
0400	-	6726

Return line filter element "R"...	
Size	W/HC
0030	256
0060	507
0075	857
0090	994
0110	1034
0150	1674
0160	1607
0165	1556
0185	2113
0195	2870
0210	4556
0240	2527
0270	7042
0280	5188
0330	3695
0450	4413
0500	5651
0580	11203
0660	8232
0750	13217
0850	10599
0950	11521
1300	16099
1700	21730
2600	32847
2700	28328

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTES

NOTE

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Subject to technical modifications.

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Metal Fibre Filter Elements V

up to 210 bar, filtration rating 3, 5, 10, 20 µm

1. METAL FIBRE ELEMENT

1.1 DESCRIPTION

Metal fibre filter elements are used primarily as protective filters in highly dynamic applications.

The filter element is constructed from randomly laid stainless steel wires. This stainless steel wire meshpack which is pleated, produces a low pressure drop and is suitable for all operating fluids.

The "V" metal fibre elements are used in our return line and pressure filters.

Additional metal fibre version "VB"
An additional metal fibre filter element offered by HYDAC is the "VB" element. This element is used primarily in test rig systems for test cycles where temperatures exceed 100°C and as working filters in highly dynamic applications. VB filter elements are used mainly in HYDAC pressure filters. (Order code example: 0110 D 005 VB).

1.3 GENERAL DATA

Collapse stability	210 bar
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	3, 5, 10, 20 µm (others on request)
Bypass cracking pressure	Pressure filter element (**"D"**): Without bypass valve as standard Return line filter element (**"R"**): standard 3 bar (others on request)
Category of filter element	Can be cleaned to extend service life

1.3 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.4 CLEANING

Stainless steel wire mesh elements can be cleaned after use. However only a certain level (percentage) of cleaning is achievable.

In order to achieve the best possible result, the elements should be cleaned using specialist equipment.

The cleaning effect cannot however be predicted. It depends greatly on various conditions

- Filtration rating:
  The finer the filter material, the worse the cleaning level
- Operating pressure:
  The higher the operating pressure, the more firmly the contamination particles become embedded in the filter material
- Type of particle:
  For example, if the contamination consists mainly of fibres, the level of cleaning is worse than if it consists of cube-type particles.

  In addition it must be noted that with each cleaning process, it is only possible to restore approx. 80-90% of the initial filter area each time, i.e. after 4-5 cleaning cycles, the result might not make economic sense (cleaning costs versus service life).

  Further information on cleaning is provided in the operating manual which is available on request.

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD PRESSURE FILTER ELEMENTS

(Can be used in the following filters: LF, LFF, MDF, DF, DFF, DFFX, DFDK, DF…M P, DF…M A, DF…Q E, DF…MHA, DF…MHE, DFZ, DFP, DFPF)

0660 D 010 V /-V

Size
0030, 0060, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320, 1500

Type
D Pressure filter element

Filtration rating in µm
003, 005, 010, 020

Filter material of element
V

Supplementary details
V FPM (Viton) seal

2.2 MODEL CODE FOR STANDARD RETURN LINE FILTER ELEMENTS

(Can be used in the following filters: RF, RFD, RFL, RFLD, NF, NFD)

0660 R 010 V /-V

Size
0030, 0060, 0110, 0160, 0240, 0280, 0330, 0450, 0500, 0580, 0660, 0750, 0850, 0950, 1300, 1700, 2600, 2700

Type
R Return line filter element

Filtration rating in µm
003, 005, 010, 020

Filter material of element
V

Supplementary details
KB without bypass valve
V FKM (Viton) seal

Others on request.

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Pressure filter element "D"...V				
Size	3 µm	5 µm	10 µm	20 µm
0030	18.4	13.5	7.5	3.6
0060	16.0	9.3	5.4	3.3
0110	8.2	5.6	3.3	2.2
0140	5.8	4.8	3.1	2.3
0160	4.6	3.2	2.3	1.4
0240	3.1	2.5	1.7	1.1
0280	2.3	1.7	1.2	0.8
0330	2.2	1.8	1.2	0.8
0500	1.5	1.2	0.8	0.5
0660	1.1	0.9	0.6	0.4
0990	0.8	0.6	0.4	0.3
1320	0.6	0.5	0.3	0.2
1500	0.3	0.2	0.2	0.1

Pressure filter element "R"...V				
Size	3 µm	5 µm	10 µm	20 µm
0030	19.4	14.2	7.9	3.8
0060	15.9	9.3	5.4	3.3
0110	7.6	5.1	3.0	2.0
0160	4.9	3.5	2.4	1.5
0240	3.2	2.6	1.7	1.2
0280	1.4	1.1	0.7	0.5
0330	2.1	1.7	1.1	0.8
0450	1.7	1.3	0.9	0.6
0500	1.5	1.2	0.8	0.5
0580	0.7	0.5	0.3	0.3
0660	1.0	0.8	0.6	0.4
0750	0.6	0.5	0.3	0.2
0850	0.8	0.6	0.4	0.3
0950	0.7	0.6	0.4	0.2
1300	0.5	0.4	0.3	0.2
1700	0.4	0.3	0.2	0.1
2600	0.3	0.2	0.1	0.1
2700	0.2	0.1	0.1	0.1

4.2 FILTRATION AREA [CM²]

Pressure filter element "D"...	
Size	V
0030	268
0060	318
0110	648
0140	852
0160	1082
0240	1702
0280	3615
0330	2260
0500	3640
0660	4770
0990	4735
1320	6454
1500	13294

Pressure filter element "R"	
Size	V
0030	221
0060	372
0110	758
0160	1071
0240	1685
0280	3578
0330	2081
0450	2652
0500	3182
0580	6732
0660	4659
0750	7956
0850	5999
0950	6813
1300	9520
1700	12297
2600	19424
2700	31175

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTE

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Paper Filter Elements P/HC

up to 10 bar, filtration rating 10, 20 µm

1. PAPER ELEMENT

1.1 DESCRIPTION

Paper filter elements are usually for applications requiring low levels of filtration. Typical applications are, for example, waste compactors for the filtration of lubrication oil or high-viscosity oils > ISO VG 100.

The filter element is constructed from randomly laid organic fibres that are stiffened with a binder.

Compared to P/HC elements, P elements have a smaller pleat depth.

"P/HC" paper elements are used in our return line filters.

Additional paper version
For low differential pressure stability (usually 2.5 to 3 bar) and for use as fuel and engine filters, randomly laid organic fibres are utilized, and stiffened using a phenolic resin as the binder.
HYDAC uses this material primarily in filler/breathers (e.g. BF, ELF: 0005 L 003 P), suction filters (e.g. SF, SFM: 0160 RS 010 P) as well as in spin-on cartridges (e.g. MF, MFD: 0160 MA 010 P). The pleated design provides a large filter surface at low cost.

For further information please see the relevant filter brochures.

1.2 GENERAL DATA

Collapse stability	10 bar
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	10, 20 µm (others on request)
Bypass cracking pressure	Return line filter element (**"R"**): standard 3 bar (others on request)
Category of filter element	Single use element

1.3 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD RETURN LINE FILTER ELEMENTS

(Can be used in the following filters: RFM, RF, RFD, RFL, RFLD, NF, NFD)

0660 R 010 P/HC /-V

Size
0030, 060, 075, 090, 0110, 0150, 0160, 0165, 0185, 0240, 0330, 0500, 0660, 0850, 0950, 1300, 1700, 2600

Type
R Return line filter element

Filtration rating in µm
010, 020

Filter material of element
P/HC

Supplementary details
V FKM (Viton) seal
KB without bypass valve

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Pressure filter element "R"...P/HC		
Size	10 µm	20 µm
0030	3.30	1.67
0060	1.67	0.83
0075	1.29	0.65
0090	1.05	0.53
0110	0.91	0.46
0150	0.73	0.31
0160	0.63	0.31
0165	0.61	0.30
0185	0.52	0.30
0195	0.33	0.16
0210	0.32	0.19
0240	0.42	0.21
0270	0.17	0.07
0280	0.20	0.10
0330	0.30	0.15
0450	0.25	0.13
0500	0.20	0.10
0580	0.10	0.05
0660	0.15	0.08
0750	0.08	0.04
0850	0.12	0.06
0950	0.11	0.05
1300	0.08	0.04
1700	0.06	0.03
2600	0.04	0.02
2700	0.05	0.02

4.2 FILTRATION AREA [CM²]

Pressure filter element "R"...P/HC	
Size	
0030	283
0060	572
0075	1055
0090	1121
0110	1166
0150	1897
0160	1978
0165	1915
0185	2398
0195	3533
0210	4226
0240	3110
0270	8063
0280	6385
0330	4230
0450	5053
0500	6470
0580	12826
0660	8722
0750	15133
0850	11230
0950	15221
1300	21269
1700	23020
2600	43394
2700	36157

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTE

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Aquamicron®- Filter Elements AM

up to 10 bar, filtration rating 40 µm

1. AQUAMICRON® ELEMENT

1.1 DESCRIPTION

The presence of water in hydraulic media is a frequent cause of failures, for example, blinding of very fine filters or jamming of valves, and these problems are often incorrectly attributed to excessive levels of solid contamination. In addition, the formation of rust and the reduction in lubricity on bearings and slideways can result in significant deterioration in system function. In other words, water is itself a serious "contaminant" of the hydraulic medium.

Since the conventional methods of dewatering are in most cases uneconomical in relation to the purchase price of the system, HYDAC Aquamicron® technology provides an economically acceptable, yet effective method of separating water from hydraulic media.

Aquamicron® filter elements are specifically designed to separate water from mineral oils, HFD-R oils and biodegradable oils. They are only available in the dimensions to suit HYDAC return line filter elements, size 330 and above. They can therefore be installed in all HYDAC filter housings, size 330 and above, which are equipped with return line filter elements.

The increasing pressure drop across the filter element which is becoming "saturated" with water indicates, with the aid of standard clogging indicators, that it is time to change the element.

As an added bonus when using the Aquamicron® technology, solid contamination is also filtered out of the hydraulic medium. This means the Aquamicron® element also doubles as a safety filter. The filtration rating is 40 µm absolute. To guarantee maximum efficiency it is recommended that they are installed offline.

1.2 GENERAL DATA

Max. permitted operating pressure	25 bar
Max. permitted Δp across element	10 bar
Temperature range	0 °C to +100 °C
Flow direction	From outside to inside
Filtration rating	40 µm
Bypass cracking pressure	Return line filter element ("**R**"): standard 3 bar (others on request)
Category of filter element	Single use element

1.3 PRINCIPLES OF AQUAMICRON® TECHNOLOGY

The separation of water from hydraulic fluids with the aid of the superabsorber embedded in the filter material is based on a physico-chemical reaction. The superabsorber reacts with the water present in the medium and expands to form a gel. This reaction is not reversible, even under increased pressure. The Aquamicron® technology is capable of absorbing circulating water, be it emulsified or free. These filter elements cannot remove dissolved water from the system, i.e. water below the saturation level of the hydraulic medium.

1.4 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant pressure fluid HFD

The following principles apply to Aquamicron® technology:

High water content	→	High absorption rate	
Low water content	→	Low absorption rate	
Unsaturated filter element	→	High absorption rate	
Saturated filter element	→	Low absorption rate	
Hydraulic filter area load (l/min/cm²)	↘	Absorption rate Water absorption capacity Residual water content	↗ ↗ ↘
Static pressure	↘	Absorption rate Water absorption capacity Residual water content	= = ↘
Pressure and flow rate fluctuations present		Absorption rate Water absorption capacity Residual water content	↘ ↘ ↗
Dispersant/detergent additives present		Absorption rate Water absorption capacity Residual water content	↘ = ↗

2. MODEL CODE

(also order example)

0660 R 040 AM /-V

Size
0330, 0500, 0660, 0750, 0850, 0950, 1300, 1700, 2600, 2700

Type
R Return line filter element

Filtration rating in µm
040

Filter material of element
AM Aquamicron®

Supplementary details
V FPM (Viton) seal

3. DETERMINATION OF THE WATER CONTENT G_W PRESENT IN THE SYSTEM

Two methods can be employed to determine the water content G_W present in the system:

- Hydrogen gas method
- Karl Fischer method to DIN 51777

The hydrogen gas method can be carried out using portable test equipment, e. g. the HYDAC Water Test Kit WTK, however, reading accuracy at water contents below 500 ppm is limited.

The Karl Fischer method on the other hand can only be conducted in the laboratory and is offered by HYDAC Filtertechnik as a laboratory service.

The water content GW is usually given in ppm (parts per million) or in percent (100 ppm corresponds to 0.01%).

3.1 DETERMINATION OF THE WATER RETENTION CAPACITY C_W (CM³)

$q = Q/A$
(recommendation: $q_{max} \leq 0.04$ l/min cm²)

q = specific filtration area load of a filter element in l/min cm²

Q = flow rate in l/min

A = filtration area in cm² (see Point 4.2)

$C_W = K_W \times A$ (cm³)

C_W = Water retention capacity of a filter element in cm³

K_W = specific water retention capacity dependent on the specific filtration area load in q (10^{-3} cm³ H_2O/cm²)

A = filtration area in cm² (see Pt. 4.2)

3.2 When sizing elements with the water absorbing filter material Aquamicron, we recommend using the table below:

Size	Recommended filter flow rate [l/min]	Water absorption capacity [cm³] at Δp = 2.5 bar and a viscosity of 30 mm²/s
330	13 ideal 100 maximum	260 180
500	19 ideal 155 maximum	400 280
660	28 ideal 255 maximum	570 400
750	48 ideal 390 maximum	982 691
850	35 ideal 286 maximum	730 520
950	39 ideal 314 maximum	800 570
1300	54 ideal 437 maximum	1120 790
1700	73 ideal 599 maximum	1505 1059
2600	109 ideal 870 maximum	2230 1570
2700	98 ideal 803 maximum	2020 1422

3.3 CALCULATION OF THE WATER QUANTITY M_W TO BE ABSORBED BY THE FILTER ELEMENT

$m_w = \Delta G_w \times 10^{-3} \times V_T$ (cm³)

m_w = water quantity to be absorbed by filter element in cm³

ΔG_w = Difference between the initial and required final water content in ppm

Please note:
It is impossible to achieve a final water content which is below the saturation level of the hydraulic medium!

V_T = Tank volume in l x 100

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Size	40 µm
330	2.10
500	1.38
660	0.93
750	0.55
850	0.72
950	0.66
1300	0.47
1700	0.36
2600	0.23
2700	0.26

4.2 FILTRATION AREA

Size	cm²
330	2785
500	4259
660	6174
750	9961
850	7949
950	8667
1300	12111
1700	15271
2600	20499
2700	20499

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTE

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Betamicron®/Aquamicron®-Filter Elements BN4AM

up to 10 bar, filtration rating 3, 10 µm

1. BETAMICRON®/ AQUAMICRON® ELEMENT

1.1 DESCRIPTION

The presence of water in hydraulic media is a frequent cause of failures, for example, blinding of very fine filters or jamming of valves and these problems are often incorrectly attributed to excessive levels of solid contamination. In addition, the formation of rust and the reduction in lubricity on bearings and slideways can result in significant deterioration in system function.
In other words, in addition to solid particles, water is an equally serious contaminant of the hydraulic medium. Since the conventional methods of dewatering are in most cases uneconomical in relation to the purchase price of the system, HYDAC BN4AM technology provides an economically acceptable, yet effective method of separating water from hydraulic media which at the same time achieves absolute filtration of solid particles.

General
BN4AM filter elements are specifically designed to separate water, and to achieve absolute filtration of solid particles, from mineral oils, HFD-R oils and biodegradable oils.
A superabsorber reacts with the water present in the medium and expands to form a gel. This reaction is not reversible, even under increased pressure. These filter elements cannot remove dissolved water from the system, i.e. water below the saturation level of the hydraulic medium. Solid particles are also removed by the Betamicron® filter element meshpack.

1.2 GENERAL DATA

Max. permitted operating pressure	10 bar
Max. permitted Δp across element	10 bar
Temperature range	0 °C to +100 °C
Flow direction	From outside to inside
Filtration rating	3, 10 µm
Bypass cracking pressure	Return line filter element ("**R**"): standard 3 bar (others on request)
Category of filter element	Single use element

1.3 PRINCIPLES OF THE BN4AM COMBINED FILTER ELEMENTS

- BN4AM filter element based on inorganic and water-absorbent fibres
- Exemplary absorption of water from mineral oils with the aid of a superabsorber embedded in the filter material
- Excellent absorption of finest particles over a wide differential pressure range (3, 10 µm absolute)
- Exemplary β-stability over wide differential pressure ranges
- Extremely high contamination retention capacity
- Good chemical resistence through the use of epoxy resins for impregnation and bonding
- Element protection due to high burst pressure stability (e. g. during cold starts and dynamic differential pressure surges)

1.4 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

The following principles apply to water separation:

High water content	→	High absorption rate	
Low water content	→	Low absorption rate	
Unsaturated filter element	→	High absorption rate	
Saturated filter element	→	Low absorption rate	
Hydraulic filter area load (l/min/cm²)	↘	Absorption rate Water absorption capacity Residual water content	↗ ↗ ↘
Static pressure	↘	Absorption rate Water absorption capacity Residual water content	= = ↘
Pressure and flow rate fluctuations present		Absorption rate Water absorption capacity Residual water content	↘ ↘ ↗
Dispersant/detergent additives present		Absorption rate Water absorption capacity Residual water content	↘ = ↗

2. MODEL CODE

(also order example)

0660 R 010 BN4AM /-V

Size
0330, 0500, 0660, 0750, 0850, 0950, 1300, 1700, 2600, 2700

Type
R Return line filter element

Filtration rating in µm
003, 010

Filter material of element
BN4AM Betamicron®/Aquamicron®

Supplementary details
V FPM (Viton) seal

3. DETERMINATION OF THE WATER CONTENT G_W PRESENT IN THE SYSTEM

Two methods can be employed to determine the water content G_W present in the system:

- Hydrogen gas method
- Karl Fischer method to DIN 51777

The hydrogen gas method can be carried out using portable test equipment, e. g. the HYDAC Water Test Kit WTK, however, reading accuracy at water contents below 500 ppm is limited.

The Karl Fischer method on the other hand can only be conducted in the laboratory and is offered by HYDAC Filtertechnik as a laboratory service.

The water content G_W is usually given in ppm (parts per million) or in percent (100 ppm corresponds to 0.01%).

3.1 WATER ABSORPTION - QUICK SIZING TABLE

Size	Recommended filter flow rate [l/min]	Water absorption capacity [cm³] at Δp = 2.5 bar and a viscosity of 30 mm²/s
330	13	180
500	19	280
660	28	400
750	48	691
850	35	520
950	39	570
1300	54	790
1700	73	1059
2600	109	1570
2700	98	1422

4. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 5.1)

5. ELEMENT CHARACTERISTICS

5.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Size	3 µm	10 µm
330	8.7	3.0
500	5.7	2.0
660	3.5	1.2
750	2.3	0.8
850	2.8	0.9
950	2.4	0.8
1300	1.6	0.6
1700	1.3	0.5
2600	0.8	0.3
2700	1.0	0.3

5.2 CONTAMINATION RETENTION CAPACITY IN G

The contamination retention and particle filtration performance of an element are established in the multipass test to ISO 16889. This procedure with its precisely defined test conditions and a standard test dust (ISO MTD) enables the performance data of different elements to be compared.

Size	3 µm	10 µm
330	55.0	60.0
500	83.9	93.9
660	120.0	140.0
750	209.3	234.5
850	156.5	175.3
950	170.0	190.0
1300	240.0	270.0
1700	320.8	359.4
2600	490.0	540.0
2700	430.7	482.5

For information on bypass valve curves, please see Filter Element (Quick Selection) brochure no.: E 7.221../..

NOTE

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For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Glass fibre filter elements ULP/UHC

with or without pre-filter
flow direction from in to out
up to 6 bar, filtration rating 5, 10, 20, 25 µm

1. GLASS FIBRE ELEMENT

1.1 DESCRIPTION

The 4-layered media structure of the ULP elements were developed on the basis of RT-Filtertechnik's many years of experience in mobile applications. The structure has a very low Δp/Q performance curve.

The 5-layered media structure of the UMC elements were developed on the basis of RT-Filtertechnik's many years of experience in mobile applications. The structure has a very high retention rate across the elements' entire service life. It is also highly stable in the event of flow rate fluctuations, which are very common in mobile applications.

1.2 GENERAL DATA

Collapse stability	6 bar
Filter element	ULP = Glass fibre UHC = Glass fibre with pre-filter
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From inside to outside
Filtration rating	5, 10, 20, 25 µm
Bypass cracking pressure	The bypass valve function is realised in the filter or in the element spigot. The cracking pressure is 3 bar as standard (others on request)
Category of filter element	Single use element

1.3 HELIOS PLEAT GEOMETRY: ΔP OPTIMISED FILTRATION/OPTIONAL

Using high-quality folding machines and pleat geometries, high-quality filter elements can always be significantly optimised technologically. In addition, the use of these folding technologies enables the improvement of low-weight, flow-optimised filtration materials in terms of their service life and pulsation stability. The other way round, pulsation resistant filter media of higher weight can be produced with significantly reduced differential pressure difference compared to filter elements folded in the conventional manner.

1.4 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids FHA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

2. MODEL CODE

2.1 MODEL CODE FOR STANDARD PRESSURE FILTER ELEMENTS

(Can be used in the following filters: LFR, LPFR, MDFR)

0080 D 010 ULP /-V

Size
0020, 0045, 0080, 0150, 0250

Type
D Pressure filter element

Filtration rating in µm
005, 010, 025

Filter material of element
ULP Collapse stability up to 6 bar

Supplementary details
V FPM (Viton) seal

2.2 MODEL CODE FOR RETURN LINE FILTER ELEMENTS

(Can be used in the following filters: RMER, RPER, RKMR)

0400 R 010 ULP /-V

Size
0170, 0230, 0300, 0310, 0400, 0500, 0600, 0800, 1200

Type
R Return line filter element

Filtration rating in µm
005, 010, 025

Filter material of element
ULP Collapse stability up to 6 bar

Supplementary details
V FPM (Viton) seal

2.3 MODEL CODE FOR RETURN LINE FILTER ELEMENTS RMTR

(Can be used in the following filters: RMTR)

0600 RMT 010 ULP /-V

Size
0600, 0800, 1200

Type
R Return line filter element

Filtration rating in µm
005, 010, 025

Filter material of element
ULP Collapse stability up to 6 bar

Supplementary details
V FPM (Viton) seal

2.4 MODEL CODE FOR STANDARD PRESSURE FILTER ELEMENTS WITH PRE-FILTER

(Can be used in the following filters: LFR, LPFR, MDFR)

0080 D 010 UHC /-V

Size
0020, 0045, 0080, 0150, 0250

Type
D Pressure filter element

Filtration rating in µm
005, 010, 020

Filter material of element
UHC Collapse stability up to 6 bar

Supplementary details
V FPM (Viton) seal

2.5 MODEL CODE FOR RETURN LINE FILTER ELEMENTS WITH PRE-FILTER

(Can be used in the following filters: RMER, RPER, RKMR, RFLR)

0400 R 010 UHC /-V

Size
0170, 0230, 0300, 0310, 0400, 0500, 0600, 0800, 1000, 1200

Type
R Return line filter element

Filtration rating in µm
005, 010, 020

Filter material of element
UHC Collapse stability up to 6 bar

Supplementary details
V FPM (Viton) seal

2.6 MODEL CODE FOR RETURN LINE FILTER ELEMENTS RMTR

(Can be used in the following filters: RMTR)

0600 RMT 010 UHC /-V

Size
0600, 0800, 1200

Type
R Return line filter element

Filtration rating in µm
005, 010, 020

Filter material of element
UHC Collapse stability up to 6 bar

Supplementary details
V FPM (Viton) seal

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{\text{viscosity}}{30}$$

(* gradient coefficient see Point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Pressure filter element "D"...ULP			
Filter size	5 µm	10 µm	25 µm
0020	32.4	17.6	8.0
0045	14.2	7.2	2.9
0080	11.3	5.5	2.2
0150	6.8	3.3	1.3
0250	4.2	2.0	0.8

Return line filter element "R"...ULP			
Filter size	5 µm	10 µm	25 µm
0170	3.23	1.70	0.79
0230	2.39	1.26	0.59
0300	1.79	0.94	0.44
0310	1.79	0.94	0.44
0400	1.37	0.72	0.33
0500	1.25	0.66	0.31
0600	0.50	0.25	0.08
0800	0.40	0.18	0.06
1200	0.24	0.10	0.03

Pressure filter element "D"...UHC			
Filter size	5 µm	10 µm	20 µm
0020	40.8	22.2	10.6
0045	18.0	9.0	4.5
0080	14.2	7.1	3.5
0150	8.6	4.3	2.0
0250	5.3	2.6	1.3

Return line filter element "R"...UHC			
Filter size	5 µm	10 µm	20 µm
0170	3.1	1.86	1.02
0230	2.9	1.38	0.76
0300	2.0	1.02	0.56
0310	2.0	1.02	0.56
0400	1.64	0.78	0.43
0500	1.51	0.72	0.40
0600	0.70	0.35	0.15
0800	0.54	0.26	0.09
1000	0.35	0.15	0.08
1200	0.28	0.13	0.06

Others on request!

4.2 CONTAMINATION RETENTION CAPACITY IN G

The contamination retention and particle filtration performance of an element are established in the multipass test to ISO 16889. This procedure with its precisely defined test conditions and a standard test dust (ISO MTD) enables the performance data of different elements to be compared.

Pressure filter element "D"...ULP			
Filter size	5 µm	10 µm	25 µm
0020	1.5	2.61	2.9
0045	3.4	6.03	6.7
0080	4.2	7.51	8.4
0150	5.3	9.45	10.5
0250	8.5	15.3	17.0

Return line filter element "R"...ULP			
Filter size	5 µm	10 µm	25 µm
0170	12.4	22.3	27.2
0230	17.4	31.3	38.1
0300	31.9	57.4	70.0
0310	27.1	48.8	59.5
0400	36.9	65.2	79.5
0500	43.8	78.9	96.2
0600	85.0	153.0	170.0
0800	115.0	207.0	230.0
1200	170.0	306.0	340.0

Pressure filter element "D"...UHC			
Filter size	5 µm	10 µm	20 µm
0020	4.6	6.9	7.8
0045	10.7	16.1	18.1
0080	13.4	20.0	22.6
0150	16.8	25.2	28.4
0250	27.2	40.8	45.9

Return line filter element "R"...UHC			
Filter size	5 µm	10 µm	20 µm
0170	24.3	36.4	44.4
0230	31.7	47.6	58.1
0300	51.8	77.7	94.8
0310	51.8	77.7	83.3
0400	60.8	91.2	111.3
0500	78.0	117.0	142.7
0600	272.0	408.0	459.0
0800	368.0	552.0	621.0
1000	438.0	658.0	739.0
1200	544.0	816.0	918.0

NOTE

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Wire Mesh Filter Elements WR

Flow direction from in to out
up to 6 bar, filtration rating 25, 40, 60, 100 µm

1. WIRE MESH ELEMENT

1.1 DESCRIPTION

WR filter elements have a wire mesh with a star-shaped pleat and support cylinder with square perforations. They are used for medium to large flow rates in inline filters, return line filters and suction line filters. Filter elements with a metal wire mesh are often used as an inexpensive and reusable solution. Depending on the requirements (filtration rating, pressure, dynamics) vaiours types of mesh are used, such as twill, linen and Dutch weave. Wire mesh filter elements are always surface filters, which means that they become contaminated faster than single use elements. For the regeneration, it must be borne in mind that elements finer than 40 µm can only be cleaned in the ultrasonic bath.

1.2 GENERAL DATA

Collapse stability	6 bar
Temperature range	-30 °C to +100 °C For sealing material FPM to -10 °C
Flow direction	From outside to inside
Filtration rating	25, 40, 60, 100 µm (others on request)
Bypass cracking pressure	The bypass valve function is realised in the filter or in the element spigot. For a pressure filter element ("**D**") or a return line filter element ("**R**") the cracking pressure is 3 bar as standard (others on request) Return line filter element, suction line ("**RS**"): without bypass valve as standard
Category of filter element	Can be cleaned to extend service life

1.3 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids FHA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.4 CLEANING

Stainless steel wire mesh elements can be cleaned after use. However only a certain level (percentage) of cleaning is achievable.

In order to achieve the best possible result, the elements should be cleaned using specialist equipment.

The cleaning effect cannot however be predicted. It depends greatly on various conditions

- Filtration rating:
  The finer the filter material, the worse the cleaning level
- Operating pressure:
  The higher the operating pressure, the more firmly the contamination particles become embedded in the filter material
- Type of particle:
  For example, if the contamination consists mainly of fibres, the level of cleaning is worse than if it consists of cube-type particles.

In addition it must be noted that with each cleaning process, it is only possible to restore approx. 80-90% of the initial filter area each time, i.e. after 4-5 cleaning cycles, the result might not make economic sense (cleaning costs versus service life).

Further information on cleaning is provided in the operating manual which is available on request.

2. MODEL CODE

2.1 MODEL CODE FOR PRESSURE FILTER ELEMENTS

(Can be used in the following filters: LFR, LPFR, MDFR)

0080 D 040 WR /-V

Size
0020, 0045, 0080, 0150, 0250

Type
D Pressure filter element

Filtration rating in µm
025, 040, 060

Filter material of element
WR Collapse stability up to 6 bar

Supplementary details
V FKM (Viton) seal

2.2 MODEL CODE FOR RETURN LINE FILTER ELEMENTS

(Can be used in the following filters: RMER; RMTR, RPER, RFLR)

0800 R 040 WR /-V

Size
0170, 0230, 0300, 0310, 0400, 0500, 0600, 0800, 1000, 1200

Type
R Return line filter element

Filtration rating in µm
025, 040, 060

Filter material of element
WR Collapse stability up to 6 bar

Supplementary details
V FKM (Viton) seal

2.3 MODEL CODE FOR RETURN LINE FILTER ELEMENTS, SUCTION LINE FILTER

(Can be used in the following filters: SFAR)

0180 RS 100 WR /-V

Size
0100, 0150, 0180, 200, 250

Type
RS Return line filter element, suction line filter

Filtration rating in µm
100

Filter material of element
WR Collapse stability up to 3 bar

Supplementary details
V FKM (Viton) seal

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{\text{viscosity}}{30}$$

(* gradient coefficient see Point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Details for 60 and 100 µm

Pressure filter element "D"...	
Size	WR
0020	2.0414
0045	0.9020
0080	0.7183
0150	0.4617
0250	0.2810

Return line filter element "R"...	
Size	WR
0170	0.0558
0230	0.0388
0300	0.0287
0310	0.0279
0400	0.0218
0500	0.0113
0600	0.0067
0800	0.0057
1200	0.0036

Return line filter element "RS"...	
Size	WR
0100	0.4299
0150	0.2991
0180	0.2293
0200	0.1994
0250	0.1376

4.2 FILTRATION AREA [CM²]

Pressure filter element "D"...	
Size	WR
0020	190
0045	430
0080	540
0150	840
0250	1380

Return line filter element "R"...	
Size	WR
0170	1720
0230	2320
0300	3110
0310	3200
0400	4100
0500	7900
0600	13600
0800	16000
1200	24700

Return line filter element "RS"...	
Size	WR
0100	1600
0150	2300
0180	3000
0200	3450
0250	5000

NOTES

NOTE

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RT-PLEAT filter elements

Element flow direction from in to out
up to 10 bar, filtration rating 3, 5, 7, 12 and 20 µm

1. RT PLEAT ELEMENT

1.1 DESCRIPTION

Within the HYDAC Group, a new generation of elements has been developed that enables efficient refitting of Pall housing of the types UR319, UR619, UR209 and UR219: RT-PLEAT.

They are used in pressure filter housing, where they provide fine filtration of hydraulic and lubricating oils.

Further information on Betterfit elements is available from the Betterfit database on our website (www.hydac.com) under Service > Online Tools > Betterfit

1.2 FUNCTION

The pleated structure of the new RT-PLEAT filter elements remains highly stable even under operating conditions such as cold starts or high differential pressures. This guarantees a high level of contamination retention and ensures that the contamination remains in the element, even during pressure pulsations. Furthermore, the entire filter surface is used during the service life of the filter element. This means that pressure losses are minimised.

- Long system life time and reliable component protection due to the high separation capacity
- Long element life times due to the high contamination retention capacity and low pressure loss at the element
- Low operating costs due to the long element changing intervals and the economic element price

1.3 GENERAL DATA

Collapse stability	10 bar
Temperature range	-20 °C to +120 °C
Flow direction	From inside to outside
Filtration rating	3, 5, 7, 12, 20 µm
Seal material	FKM
Bypass cracking pressure	Pressure filter element ("**D**"): Without bypass valve as standard
Category of filter element	Single use element

1.4 STAT-FREE® TECHNOLOGY OPTIONAL

By completely revising the materials used, e.g. through the use of conductive plastics, fully discharge-capable filter elements are the result. Electrical charging of the filter elements during operation has therefore been reduced to a negligible level. The risks of sudden sparking and the subsequent formation of soot or sludge in the oil are therefore reliably eliminated.

With the new Stat-Free® filter elements, HYDAC has for the first time succeeded in combining excellent electrostatic characteristics with filtration performance. Unprecedented low charge generation in the filter element and in the system fluid is achieved with a new type of filter mesh pack and element design.

1.5 INNOVATIVE OUTER WRAP WITH IMPROVED DIFFUSER EFFECT FOR PRINTING WITH CUSTOMER LOGO

Since the outer wrap can be printed with the customer logo, it also acts as an advertising medium for the OEM and guarantees security of the spares business. At the same time, the user can be certain of obtaining an original spare part. Particular benefit: the logo remains perfectly legible even in the contaminated condition.

1.6 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

E 7.225.0/11.16

2. MODEL CODE

2.1 MODEL CODE FOR RT-PLEAT PRESSURE FILTER ELEMENTS

1.28.04 D 03 RT-PLEAT /-V

Size

Type
D Pressure filter element

Filtration rating in µm
03, 05, 07, 12, 20

Filter material of element
RT-PLEAT Collapse stability up to 10 bar

Supplementary details
V FKM seal (standard = **must be specified**)
SFREE Stat-Free® element technology

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see housing curve in the relevant filter brochure

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see Point 4.1)

4. ELEMENT CHARACTERISTICS

4.1 GRADIENT COEFFICIENTS FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

Pressure filter element 1.21. ..."D"...RT-PLEAT /-V

Size	3 µm	5 µm	7 µm	12 µm	20 µm
1.21.08	8.90	3.50	3.16	2.61	2.25
1.21.13	5.50	2.17	1.97	1.63	1.40
1.21.20	3.60	1.41	1.27	1.05	0.91
1.21.40	1.80	0.70	0.63	0.53	0.46

Pressure filter element 1.22. ..."D"...RT-PLEAT /-V

Size	3 µm	5 µm	7 µm	12 µm	20 µm
1.22.20	1.00	0.82	0.74	0.67	0.61
1.22.40	0.40	0.41	0.37	0.34	0.30

Pressure filter element 1.27. ..."D"...RT-PLEAT /-V

Size	3 µm	5 µm	7 µm	12 µm	20 µm
1.27.03	65.90	20.40	18.80	16.50	15.18
1.27.07	29.30	9.00	9.86	7.30	8.10

Pressure filter element 1.28. ..."D"...RT-PLEAT /-V

Size	3 µm	5 µm	7 µm	12 µm	20 µm
1.28.04	33.70	11.00	9.90	9.00	8.20
1.28.08	17.20	5.60	5.00	4.60	4.20
1.28.13	10.80	3.50	3.10	2.80	2.50
1.28.20	7.00	2.30	2.10	1.80	1.60

4.2 CONTAMINATION RETENTION CAPACITY IN G

The contamination retention and particle filtration performance of an element are established in the multipass test to ISO 16889. This procedure with its precisely defined test conditions and a standard test dust (ISO MTD) enables the performance data of different elements to be compared.

Pressure filter element 1.21. ..."D"...RT-PLEAT /-V

Size	3 µm	5 µm	7 µm	12 µm	20 µm
1.21.08	41.08	22.63	25.57	47.97	52.77
1.21.13	67.71	37.30	41.00	78.61	86.47
1.21.20	104.52	57.58	63.34	121.35	133.48
1.21.40	208.70	115.04	126.54	242.44	266.68

Pressure filter element 1.22. ..."D"...RT-PLEAT /-V

Size	3 µm	5 µm	7 µm	12 µm	20 µm
1.22.20	455.00	340.29	374.31	504.47	554.92
1.22.40	910.00	680.59	748.65	1008.95	1109.84

Pressure filter element 1.27. ..."D"...RT-PLEAT /-V

Size	3 µm	5 µm	7 µm	12 µm	20 µm
1.27.03	4.90	6.25	6.88	6.06	6.80
1.27.07	11.07	14.13	15.40	13.70	15.10

Pressure filter element 1.28. ..."D"...RT-PLEAT /-V

Size	3 µm	5 µm	7 µm	12 µm	20 µm
1.28.04	9.80	11.70	12.90	12.12	13.33
1.28.08	19.60	23.40	25.74	19.88	21.87
1.28.13	30.63	36.57	40.59	37.88	41.67
1.28.20	40.55	77.13	84.84	59.10	65.05

NOTE

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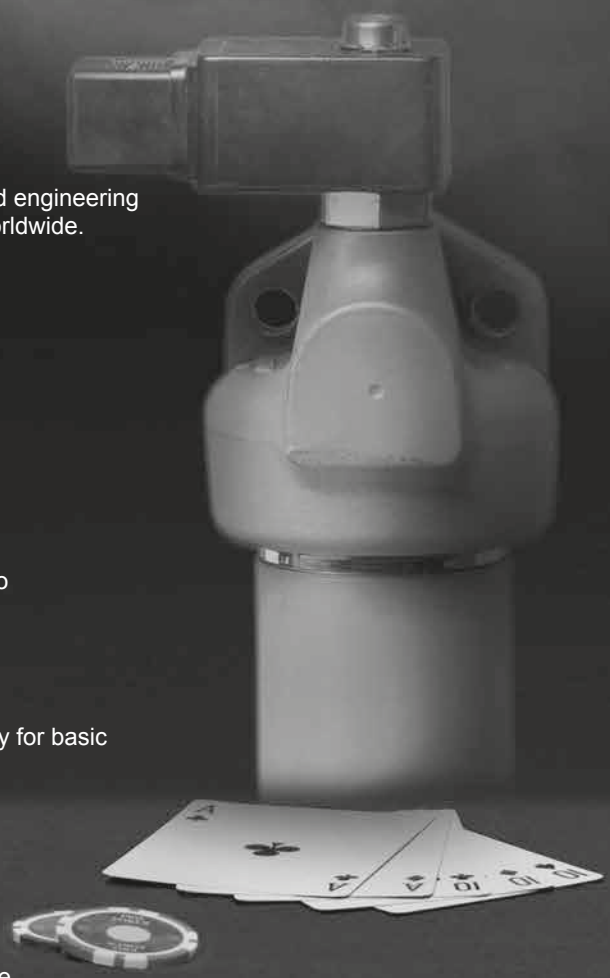
The HYDAC Betterfit Range With our Investment, You Can't Lose.

The HYDAC Betterfit Range: The Royal Flush in Filter Elements.

The Best Combination. Every Time. On Paper and in Practice.

With HYDAC and the HYDAC Betterfit Range you hold all the aces when it comes to conditioning your fluids:



Global Presence.
HYDAC forges close links with its customers by providing engineering advice and fluid engineering in over 45 international subsidiaries and over 500 distributors and service partners worldwide.

Specialist expertise.
HYDAC has developed expertise in the research, development and production of filter housings, filter systems and filter elements over many decades.

Industry competence.
HYDAC industry competence forged through close cooperation with the most exacting international clients in almost all industries in the world.

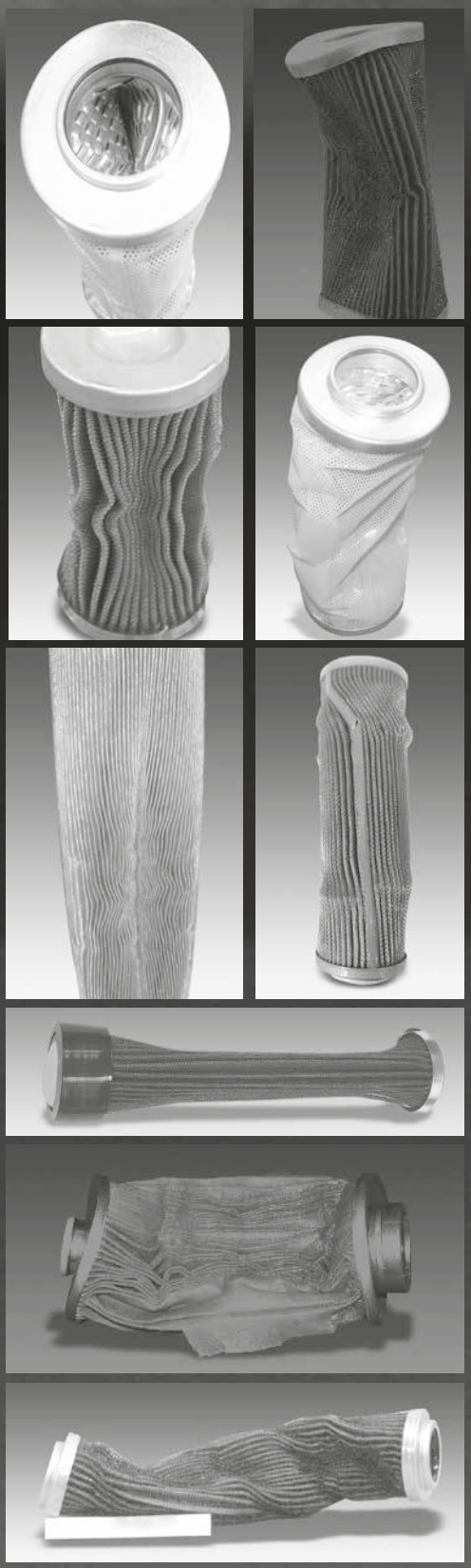
Complete range.
HYDAC filter elements provide a comprehensive range to suit all applications and also almost all competitor filters. Our customer-focused service package is included, ranging from specialist advice to availability at short notice.

Quality from the ground up.
In the HYDAC Fluid Care Center, which is our own state-of-the-art industrial laboratory for basic research, functionality and quality testing as well as application-specific development, we explore the most efficient fluid technology solutions.
This results in high-end quality filters and elements with maximum efficiency.

Strongest link in the chain.
As a system partner with wide-ranging industrial experience, HYDAC does its utmost to ensure each filter element is one of the most efficient links in the functionality chain of fluid technology systems. HYDAC therefore guarantees the greatest possible component protection for the longest possible service life.

Better is better than good enough.
The HYDAC Betterfit range combines the best ideas and the best in fluid engineering – filter elements which stand up to every comparison and every challenge.

Don't fall for a cheap bluff.



Using elements of inferior quality can have drastic consequences:

- **Poorer cleanliness classes in the customer's system**
- **Inadequate component protection**
- **Shorter filter lifetimes**
- **Threat to operating reliability and even risk of system failures**
- **Restricted system availability**
- **Increased Life Cycle Cost for the customer**

Never trust a poker face.
Don't let yourself be taken in!

Trust HYDAC,
Your system will thank you for it!

The shocking evidence of these no-name elements which have collapsed shows exactly what happens to cheap filter elements after just a few hours operation. The often unseen damage caused to control components and systems can sometimes have the effect of paralysing whole production systems.

By contrast, with HYDAC filter elements and their rigorous and systematic quality, you will have the winning hand for every application.

B-E-T-T-E-R-F-I-T
Better for quality and efficiency.

Here you are guaranteed to find the right element.

The HYDAC Betterfit range covers a wide variety of replacement elements in the dimensions used by competitors, particularly all well-known filter element manufacturers.
Our Betterfit elements are made predominantly from the tried-and-tested Betamicron4 element technology (other materials, such as synthetic fibre or wire mesh are also available).

Put your money on genuine quality equipment and opt for Hydac replacement elements – your system will thank you for it!

By using our Betterfit elements you will benefit from the whole Hydac service package – from oil sampling to oil analysis.
This also includes identifying the source of faults and designing filtration concepts.
Hydac supports you at every stage and in all aspects of fluid service.

Just as our motto says "With our investment, you can't lose" we will take care of your system, leaving you to concentrate fully on your core competence.

Steady expansion of the Betterfit range.

Since launching the Betterfit range the number of replacement filter elements has increased daily.
We respond to your request.
If the required element is not yet available, we will endeavour to add it to the Betterfit product range as quickly as possible once we have examined the design.
Today there are approximately 23,000 replacement elements in the Betterfit line of elements and the number is growing day by day.

Betamicron®4

Decades of experience and ongoing further development in the field of hydraulic and lubrication oil filtration have given HYDAC the technological edge in top quality filter element technology.

The high performance Betamicron®4 is the predominant material used in the **Betterfit element product range.**
This innovative glass fibre media will convince you with its exceptionally high contamination retention capacities, excellent filtration efficiency and optimized Δp/Q characteristics.

Particular customer benefits of HYDAC filter elements:

- **Energy cost savings**
  thanks to particularly low pressure drops
- **High quality component protection and long system life**
  due to excellent filtration efficiency
- Long service life
  and low operating costs
  due to particularly high contamination retention capacities
- High degree of operating reliability
  because of compact and robust construction

Efficiency

Global and yet local.

45 overseas companies and over 500 sales and service partners provide a worldwide presence on the ground.
We provide efficient support on demand.

Total cleanliness

And your system will thank you for it.

Technical support

Skilled advisors in the regional offices and overseas subsidiaries.

One for all

All from one supplier.

HYDAC can supply you with the whole spectrum of products including outstanding Fluid Service.
Specifically in the area of filtration, we can supply you with every filter element used in your production processes from our Betterfit range - just tell us your filter cartridge requirement and you will receive the complete package from one supplier.
In short: we take care of your filtration needs whilst you concentrate fully on your core competence.

Cleanliness

System cleanliness assured by professionalism and quality.

Fluid management

With HYDAC, your fluid is in safe hands

We know your fluid and welcome the opportunity to help you reduce the burden of fluid service. You will see for yourself the clear benefit of having a hydraulic or lubrication system that works perfectly, leaving you to concentrate fully on your specialism. Entrust us with your fluid and benefit from our Fluid Engineering package since this ensures:

- **A long system life**
  thanks to better component protection.
- **A definite cost saving**
  due to reduced operating and downtime costs.

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And fits all housings, fluids and cleanliness classes.

Intelligent fluid service

By making use of HYDAC fluid service specialists.

In fluid service, too, you can benefit from decades of experience and development.

How HYDAC's excellent fluid service benefits you:

- **On-site diagnostics with our laboratory vehicles**
- **Specialist staff available on demand**
- **Lower costs thanks to professional oil sample analysis, monitoring and support** (condition-based maintenance)
- **Lower maintenance and spare part costs**
- **Increased operating reliability due to fewer breakdowns**

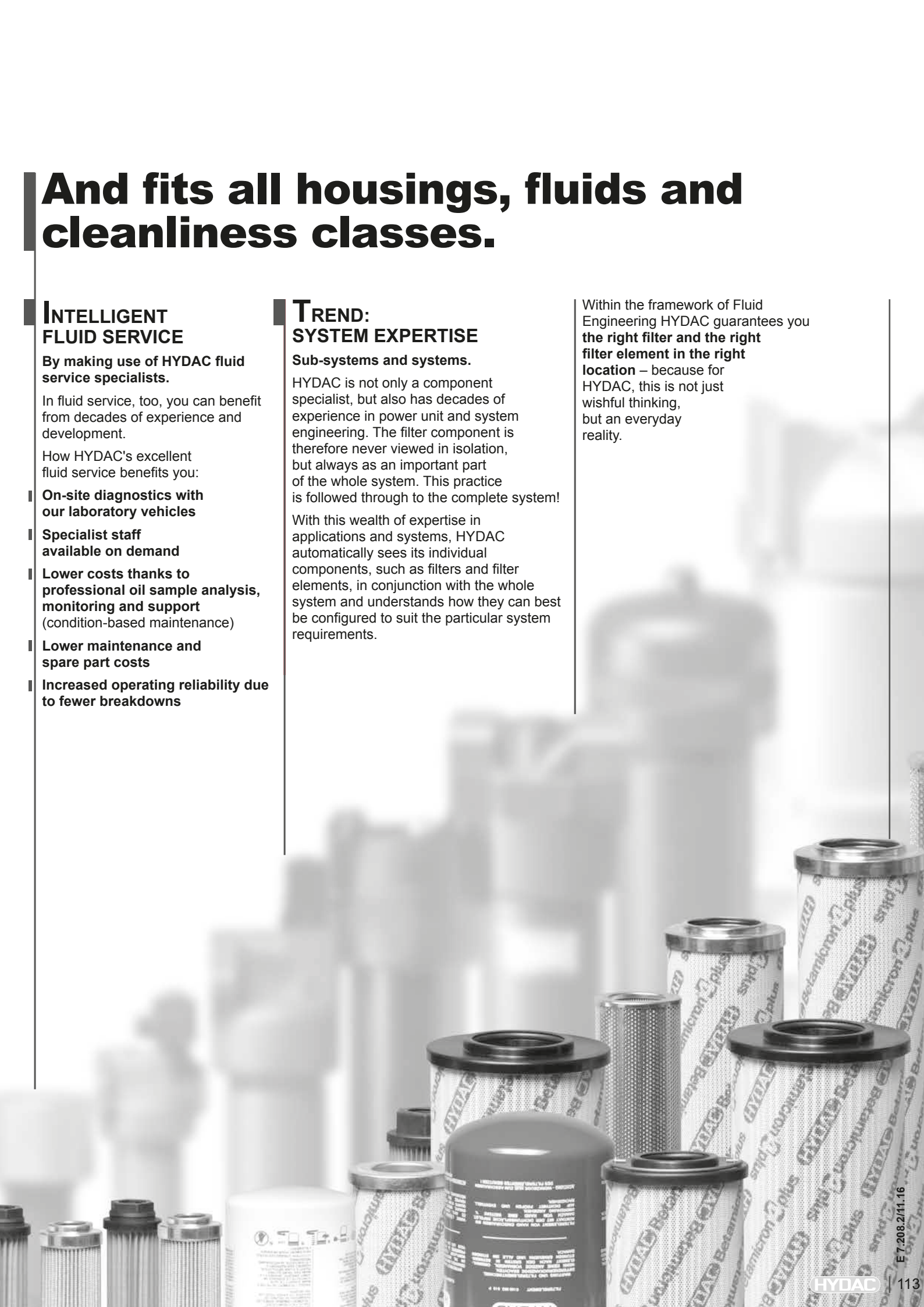
Trend: system expertise

Sub-systems and systems.

HYDAC is not only a component specialist, but also has decades of experience in power unit and system engineering. The filter component is therefore never viewed in isolation, but always as an important part of the whole system. This practice is followed through to the complete system!

With this wealth of expertise in applications and systems, HYDAC automatically sees its individual components, such as filters and filter elements, in conjunction with the whole system and understands how they can best be configured to suit the particular system requirements.

Within the framework of Fluid Engineering HYDAC guarantees you **the right filter and the right filter element in the right location** – because for HYDAC, this is not just wishful thinking, but an everyday reality.



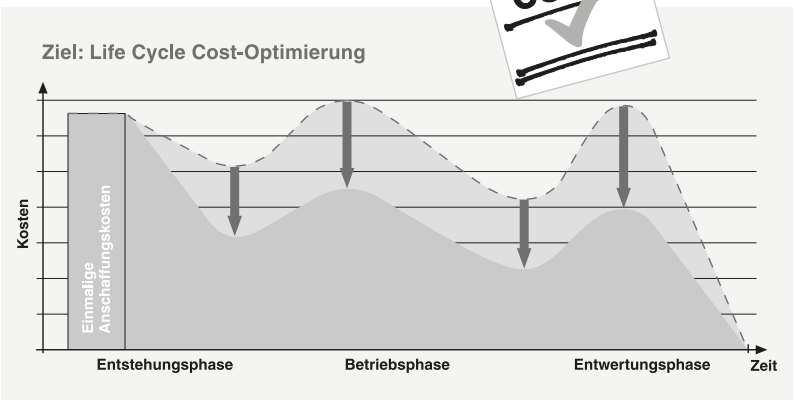
Don't gamble with your components.

Our advice: Invest in genuine quality!

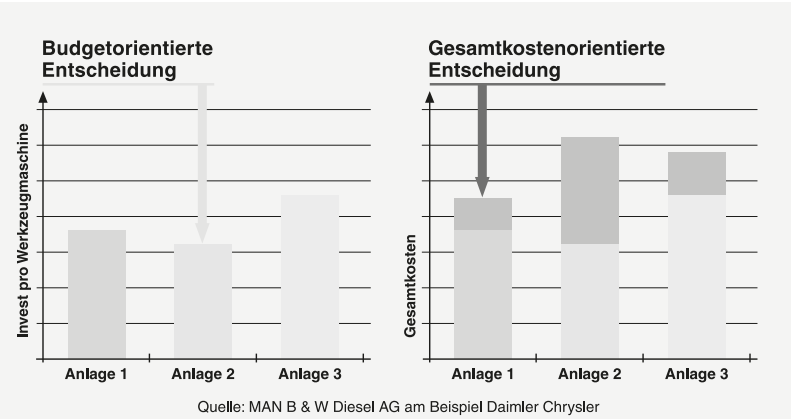
The many years' development in the area of element technology is your guarantee of first class quality in Hydac filter elements and this applies equally to the **Betterfit range**.

By using Betterfit elements, the **Life Cycle Cost** of your system will be optimized, thereby reducing the total costs of the machine or a component, from procurement right through to disposal. Reducing these costs is one of the **megatrends** pursued by large-scale end users in machine building.

Leading automotive manufacturers demand, for example, authoritative data on the **Life Cycle Cost** and the values derived from it – e.g. for machine tools for 10 years life, for presses even up to 30 years life. New investments by machinery manufacturers are decided on the basis of the machine prices and the Life Cycle Cost calculation provided.



Cost progression during the whole life cycle of the machine / system

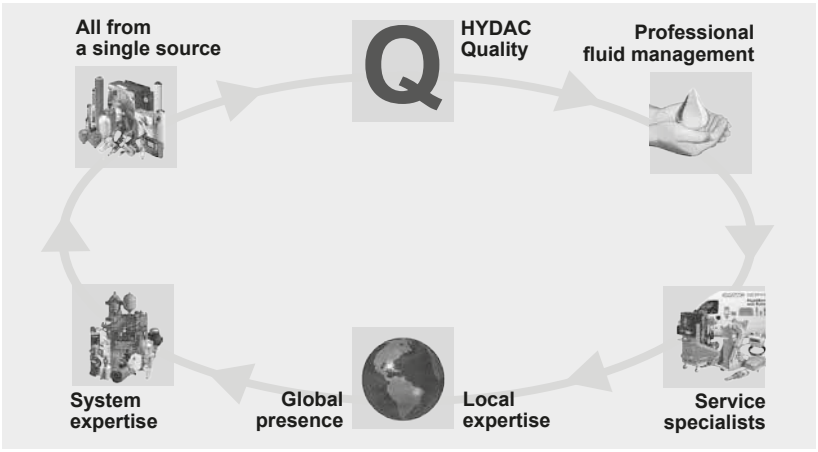


The winners in terms of system properties

With Us, Your Fluid is in Safe Hands.

The specialists at HYDAC have a good knowledge of your fluid and welcome the opportunity to help you reduce the burden of fluid service. You will see for yourself the clear benefit of having a hydraulic or lubrication system that works perfectly, leaving you to concentrate fully on your area of expertise.

When you decide on a HYDAC Betterfit element, you are not "just" buying a filter element, but you are also benefitting at the same time from the HYDAC network of expertise and service available worldwide:



Highest level of operating reliability for your applications
In HYDAC you have a professional partner for all aspects of fluid cleanliness and operating reliability for your system.

The complete HYDAC Betterfit range currently comprises approx. 23,000 elements and is growing daily.

The HYDAC filter range is also impressive with over 50 types of filter in every conceivable size and type. In addition, new individual solutions are constantly being developed, partly in active development partnership with the manufacturers.

HYDAC filters offer you the following advantages.

Low costs
the filter elements and housings are optimized for the particular industry

Easy maintenance
simple element change and easy-to-install filter housing

High level of operating reliability
filter media have high filtration efficiency for exceptional cleanliness classes and benefit from a high level of production quality

Low operating costs
particularly low pressure drops across filter and filter element for low energy consumption

All components and systems from one company
providing comprehensive system know-how and integrated system approach

Worldwide availability and advice
provided by our worldwide network of regional offices, agents and service partners

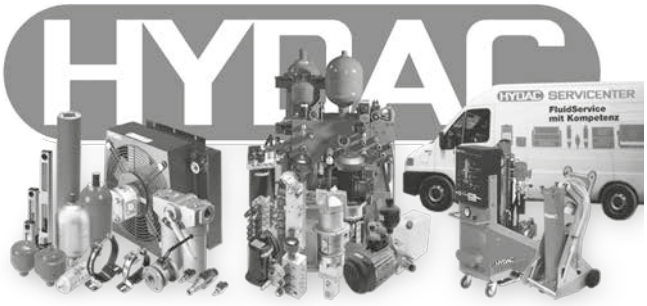
HYDAC, your Partner for Hydraulics and Lubrication Applications.

With 8,000 employees worldwide, HYDAC is one of the leading suppliers of fluid technology, hydraulic and electronic equipment.
Our wide range of products, combined with our established expertise in all aspects of hydraulics and lubrication applications qualify HYDAC to be your professional partner for every aspect of hydraulics. Particularly in the area of filtration you will profit from the decades of HYDAC experience and development successes.
Our quality and environment certification ISO 9001/2000 and ISO 18001 denote first class quality and responsible management of our resources.
That's why you can count on HYDAC - we provide, you profit.

All from one supplier.

HYDAC will help find the solution for you!

From first class components right up to turnkey system solutions, from support during commissioning to maintenance and optimization, from professional filtration, to oil condition monitoring and expert cooling.



First class laboratory and testing expertise in the HYDAC Fluid Care Center

The new Fluid Care Center, specifically designed for filters and filter monitoring, is an important component in HYDAC fluid management and the HYDAC service concept. Equipped with the most up-to-date instruments and test rigs, it offers a huge range of options for fluid analysis and application-specific filtration efficiency testing.
In our new laboratories, highly qualified staff are dedicated to continuously improving products and developing applications as well as carrying out analyses to customer specification – always tailored to the particular operating conditions. In addition to the central facility at our headquarters there are further laboratories and mobile fluid laboratories in several HYDAC centres in Germany and overseas.

Just one example of the numerous filter testing procedures: **Multipass test rig.**

Oil analysis in the HYDAC laboratory at company headquarters.

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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E-Mail: filter@hydac.com

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Filter Clogging Indicators

1. TECHNICAL SPECIFICATIONS

1.1 GENERAL

HYDAC clogging indicators are designed to indicate visually and/or electrically when the filter elements must be cleaned or changed. The operational safety of a system and efficient utilisation of a filter element can only be guaranteed if clogging indicators are used.

Depending on the type of filter, vacuum, return line or differential pressure clogging indicators are used.

1.2 SEALS

NBR (= Perbunan) or V (= Viton)

1.3 INSTALLATION

Some users install filters without clogging indicators and prefer instead to replace or clean the elements according to a specified time schedule or according to a set number of operating hours. However, this involves some risk.

Fitting a clogging indicator has two main advantages:

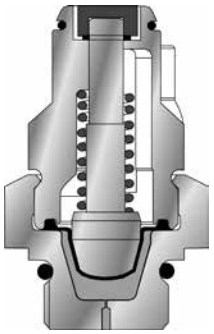
- The operator no longer has to estimate when the element is clogged.
- The unnecessary costs of changing the element too early are avoided.

All standard filters can be fitted with a clogging indicator at any time, by simply screwing it in.

1.4 DESIGN

Return line indicators

These are used for return line and suction filters. In return line filters they react to the increasing static pressure before the filter element, and in suction filters to the decreasing pressure after the filter element, which is caused by increasing contamination.

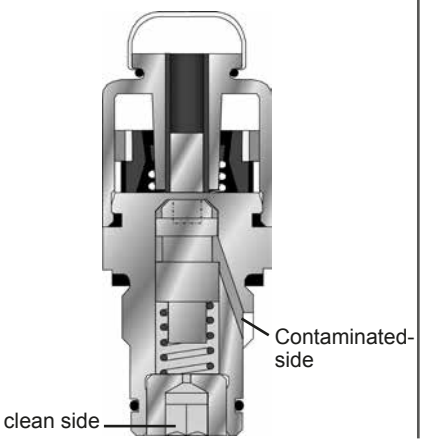


Differential pressure indicators

These are used for all inline filters and react to the increasing pressure differential caused by increasing contamination of the filter element.

The simplest installation of the differential clogging indicator is via G ½" cavity (according to HYDAC works standard HN 28-22)

The differential pressure indicator type V02 is piped up separately.



1.5 SPECIAL INDICATORS

Mobile indicators

These indicators have been developed for special applications and are fitted with AMP Junior Power Timer, AMP Superseal or Deutsch plugs.

ATEX indicators

These indicators are used in potentially explosive locations and are subject to the ATEX Equipment Directive 2014/34/EU and the ATEX Operator Directive 1999/92/EG.

UL and CSA indicators

Indicators which are exported to the USA and Canada often require classification according to current UL and CSA standards. The UL and CSA symbols are found on many products, particularly in the field of electrical engineering.

1.6 TABLE OF CONTENTS

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2. QUICK SELECTION TABLES FOR CLOGGING INDICATORS

2.1 BY INDICATOR TYPE

Please select the type of indicator you require from the table.

Type		Vacuum indicator	Permitt. operating pressure [bar]	Return line indicator	Permitt. operating pressure [bar]	Differential pressure indicator	Permitt. operating pressure [bar]
Visual	B			●	7	●	210/420
	BF					●	40
	BM			●	7	●	210/420
	E			●	7 (11)		
	ES			●	7		
	K	●	*	●	*		
	R			●	7		
	UBM	●	0				
	UE	●	0				
	UED	●	0				
	V					●	100
Electrical	C			●	40	●	210/420
	D			●	40	●	210/420
	F			●	40		
	LE			●	7	●	420
	LZ			●	7	●	420
	UF	●	0				
	VE					●	100
	VZ					●	100
Electronic	GC			●	7	●	420
	GW					●	25
Mobile	CD					●	210
	CJ					●	210/420
	CM			●	40	●	210
	CS					●	210/420
	FD			●	40		
	FJ			●	40		
	FS			●	40		
	LEM			●	7	●	420
	M					●	210
ATEX	B			●	7	●	210/420
	C			●	40	●	210/420
UL Approval (=CRUUS)	C					●	210/420
CSA Approval	C			●	40		

* Dependent on application.

2.2 BY FILTER TYPE

Please select the clogging indicator required for your filter from the table.

Type	BF	BL	BLT	DF DFF	DFDK DFDKN	DF MA/QE MP	DFM	DFN DFNF	DFP DFPF DFFX	DFZ	ELF	FLN	FLND FMND	HDF HDFF	HDP	HFM	LF LFF	LFM	LFN LFNF
B				●	●	●	●	●				●	●			●	●	●	●
BF																			
BM				●	●	●	●	●	●	●		●	●	●		●	●	●	●
E																			
ES																			
K	●	●	●								●								
R/RS																			
UBM	●	●	●								●								
UE												●[1]					●[1]		
UED															●				
V																			
C				●	●	●	●	●	●	●		●	●	●		●	●	●	●
D				●	●	●	●	●	●	●		●	●	●		●	●	●	●
F																			
LE				●	●	●	●	●	●	●		●	●	●		●	●	●	●
LZ				●	●	●	●	●	●	●		●	●	●		●	●	●	●
UF												●[1]					●[1]		
VE																			
VZ																			
GC				●	●	●	●	●	●	●		●	●	●		●	●	●	●
GW																			
CD				●	●	●	●	●	●	●		●	●	●		●	●	●	●
CJ/CS				●	●	●	●	●	●	●		●	●	●		●	●	●	●
CM				●	●	●	●	●	●	●		●	●	●			●	●	●
FJ/FD/ FS																			
M												●	●				●	●	●
LEM				●	●	●	●	●	●	●		●	●	●		●	●	●	●

Type	LPF	MDF	MF	MFD	MFM	MFX	NF	NFD	RF	RFD	RFL	RFLD	RFN	RFND	RFM	RKM	SF	SFF	SFM
B	●	●			●				●	●	●	●	●	●	●	●			
BF	●					●													
BM	●	●			●	●	●	●	●	●	●	●	●	●	●	●			
E			●[2]	●[2]					●	●			●	●	●				
ES									●	●			●	●	●				
K																			
R/RS																●			
UBM																			
UE	●[1]		●[1]	●[1]							●[1]					●	●	●	●
V											●	●							
C	●	●			●	●	●	●	●	●	●	●	●	●	●	●			
D	●	●			●	●	●	●	●	●	●	●	●	●	●	●			
F			●	●					●	●			●	●	●	●			
LE	●	●			●	●	●	●	●	●	●	●	●	●	●	●			
LZ	●	●			●	●	●	●	●	●	●	●	●	●	●	●			
UF	●[1]		●[1]	●[1]							●[1]					●	●	●	●
VE											●	●							
VZ											●	●							
GC	●	●			●		●	●	●	●	●	●	●	●	●	●			
GW	●						●	●			●	●							
CD	●	●			●		●	●	●	●	●	●	●	●	●	●			
CJ/CS	●	●			●		●	●	●	●	●	●	●	●	●	●			
CM	●	●				●	●	●	●	●	●	●	●	●	●	●			
FJ/FD/ FS			●	●					●	●			●	●	●	●			
M	●					●													
LEM	●	●			●	●	●	●	●	●	●	●	●	●	●	●			

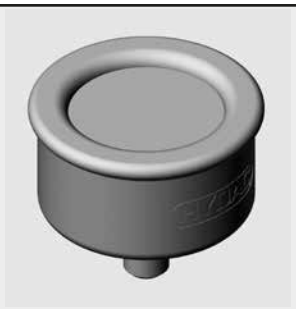
[1] Can only be used for suction operation

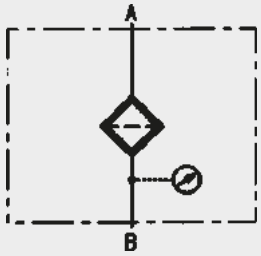
[2] Use VMF 16 E.0 only

3. SPECIFICATIONS

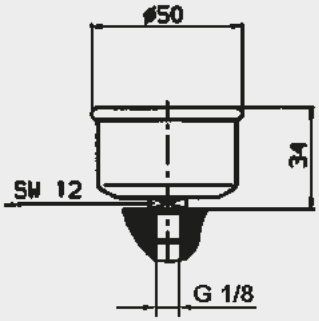
3.1 VACUUM INDICATORS

VMF x UE.x

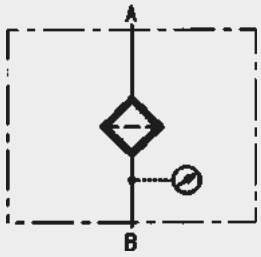




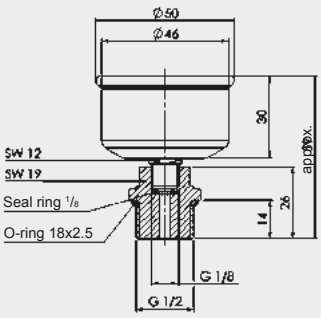
Type of indication	visual-analogue, scale indication
Weight	53 g
Pressure setting or indication range	-1 bar to 0 bar
Permitt. operating pressure	-0.7 to 0 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G 1/8
Max. torque	10 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VMF 1 UE.0



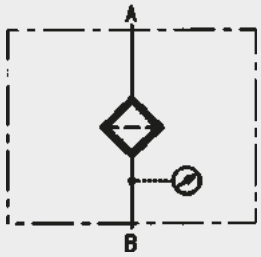
VR x UE.x



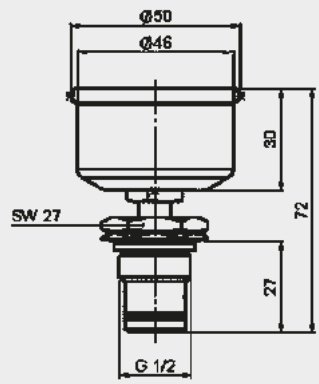
Type of indication	visual-analogue, scale indication
Weight	125 g
Pressure setting or indication range	-1 bar to 0 bar
Permitt. operating pressure	-0.7 to 0 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G 1/2
Max. torque	30 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VR 1 UE.0



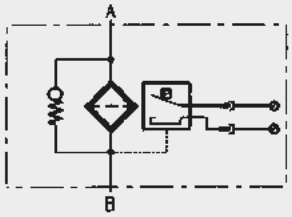
VRD x UE.x



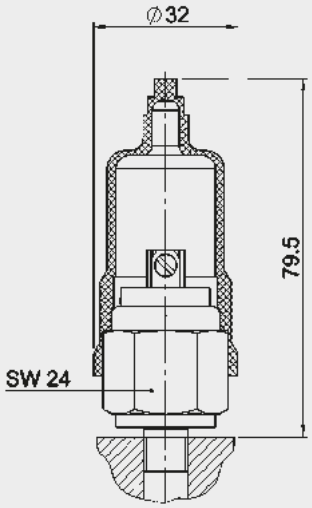
Type of indication	visual-analogue, scale indication
Weight	133 g
Pressure setting or indication range	-1 bar to 0 bar
Permitt. operating pressure	-0.7 to 0 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VRD 1 UE.0



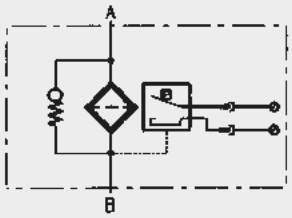
VMF x UF.x



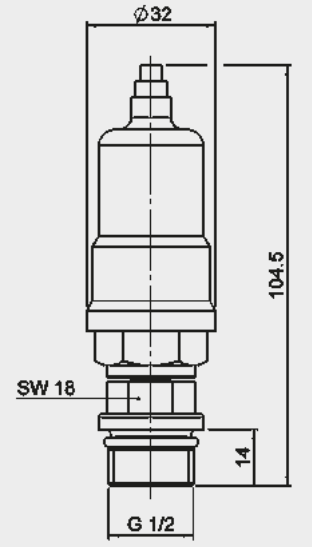
Type of indication	electrical switch
Weight	75 g
Pressure setting or indication range	-0.2 bar ±0.1 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/8
Max. torque	10 Nm
Switching type	N/O contact (N/C as an option)
Max. switching voltage	48 V
Electrical connection	threaded connection
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	ohmic 2.5 A at 24 V = ohmic 2.5 A at 42 V ~
Protection class to DIN 40050	IP 65, terminals IP 00
Order example	VMF 0.2 UF.1



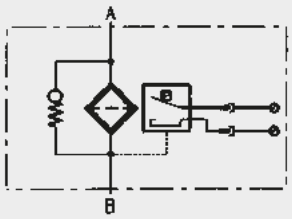
VR x UF.x



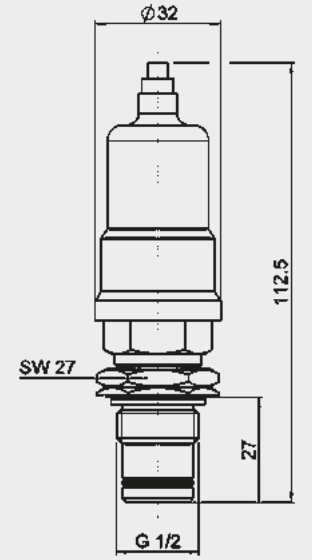
Type of indication	electrical switch
Weight	146 g
Pressure setting or indication range	-0.2 bar ±0.1 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	30 Nm
Switching type	N/O contact (N/C as an option)
Max. switching voltage	48 V
Electrical connection	threaded connection
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	ohmic 2.5 A at 24 V = ohmic 2.5 A at 42 V ~
Protection class to DIN 40050	IP 65, terminals IP 00
Order example	VR 0.2 UF.1



VRD x UF.x

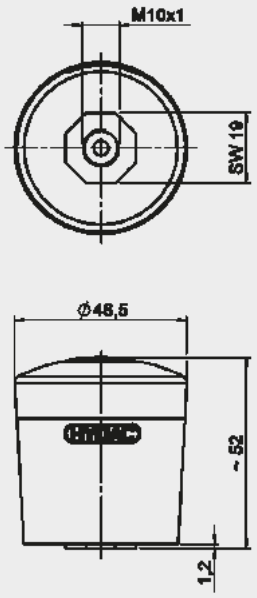


Type of indication	electrical switch
Weight	154 g
Pressure setting or indication range	-0.2 bar ±0.1 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/O contact (N/C as an option)
Max. switching voltage	48 V
Electrical connection	threaded connection
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	ohmic 2.5 A at 24 V = ohmic 2.5 A at 42 V ~
Protection class to DIN 40050	IP 65, terminals IP 00
Order example	VRD 0.2 UF.1

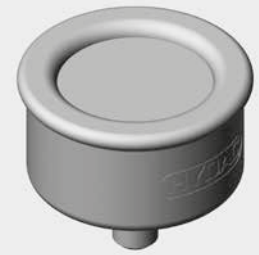


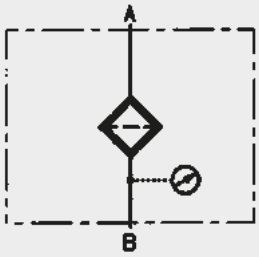
VMF x UBM.x

Type of indication	visual, yellow pin
Weight	54 g
Pressure setting or indication range	-0.035 bar
Permitt. operating pressure	1 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	M10 x 1
Max. torque	2 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VMF 0.035 UBM.0

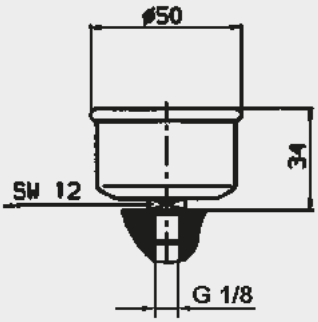


VMF x UED.x



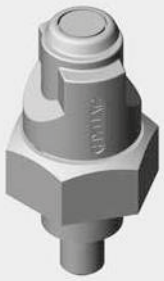


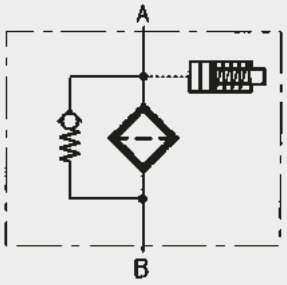
Type of indication	visual-analogue, scale indication (filled with silicone oil)
Weight	85 g
Pressure setting or indication range	-1 bar to 0 bar
Permitt. operating pressure	-0.7 to 0 bar continuous
Permitt. temperature range	-20 °C to +90 °C
Thread	G $^{1}/_{8}$
Max. torque	10 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VMF 1 UED.0



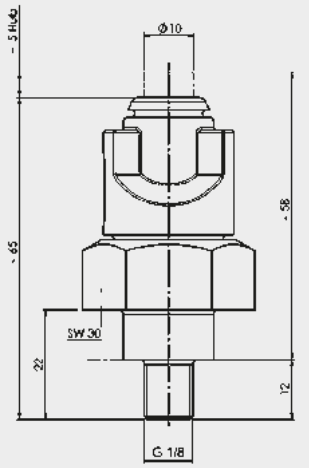
3.2 RETURN LINE INDICATORS

VMF x B.x

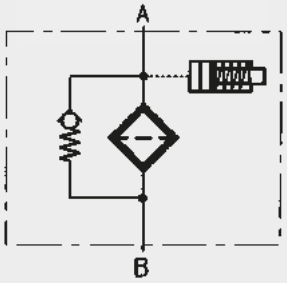




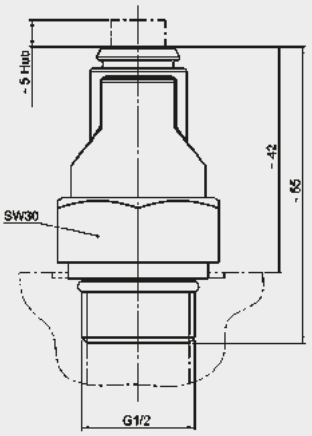
Type of indication	visual, red pin
Weight	81 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VMF 2 B.1



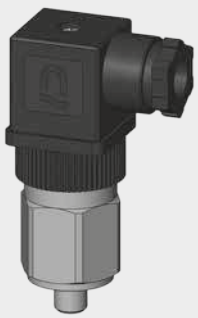
VR x B.x

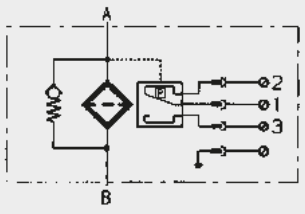


Type of indication	visual, red pin
Weight	42 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	15 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VR 2 B.1

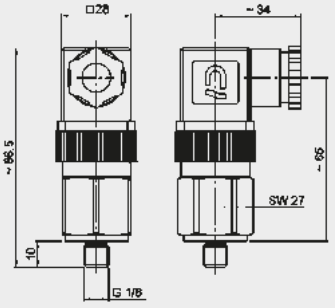


VMF x C.x

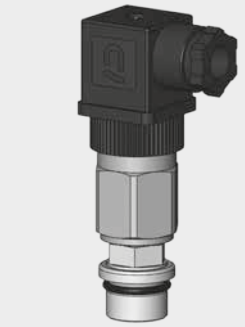


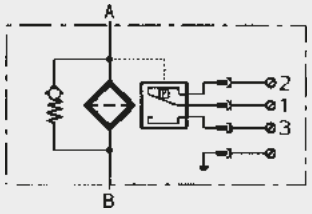


Type of indication	electrical switch
Weight	121 g
Pressure setting or indication range	2 bar -0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	230 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	250 W = 300 VA ~
switching capacity	Ohmic 6 A at 24 V = Ohmic 0.03 to 6 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VMF 2 C.1

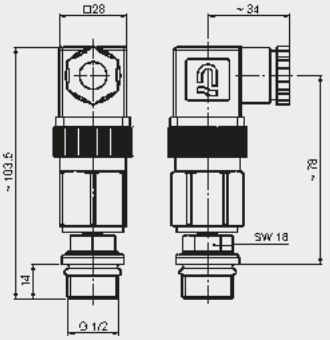


VR x C.x

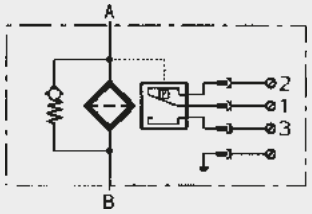




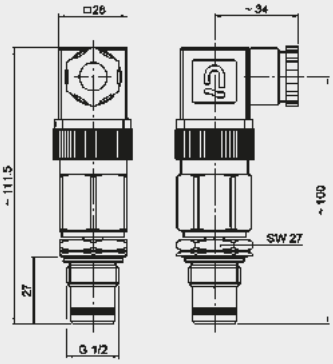
Type of indication	electrical switch
Weight	192 g
Pressure setting or indication range	2 bar -0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	230 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	250 W = 300 VA ~
switching capacity	Ohmic 6 A at 24 V Ohmic 0.03 to 6 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VR 2 C.1



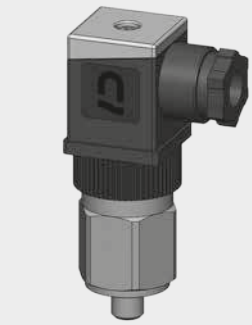
VRD x C.x

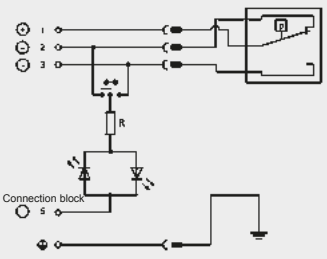


Type of indication	electrical switch
Weight	208 g
Pressure setting or indication range	2 bar -0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	230 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	250 W = 300 VA ~
switching capacity	Ohmic 6 A at 24 V Ohmic 0.03 to 6 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VRD 2 C.1

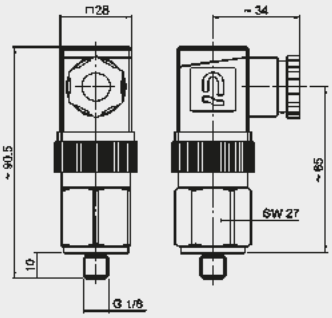


VMF x D.x /-L...

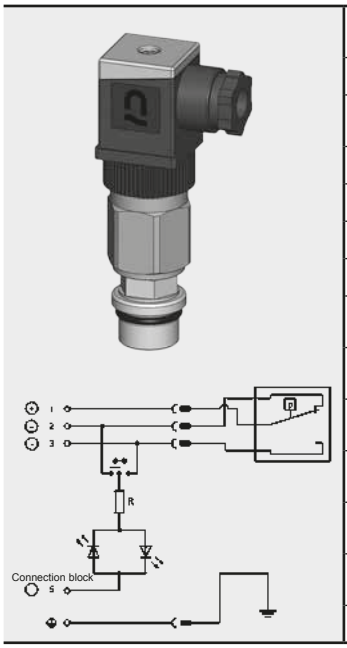




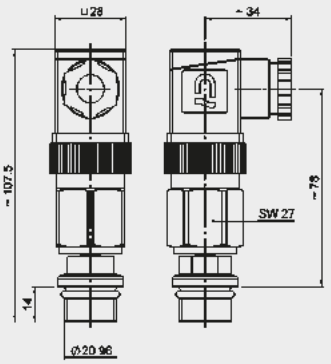
Type of indication	visual indicator and electrical switch
Weight	127 g
Pressure setting or indication range	2 bar -0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/8
Max. torque	10 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	24, 48, 115, 230 V (depending on the type of light insert)
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	250 W = 300 VA ~
switching capacity	Ohmic 6 A at 230 V = Ohmic 0.03 to 6 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VMF 2 D.1 /-L24



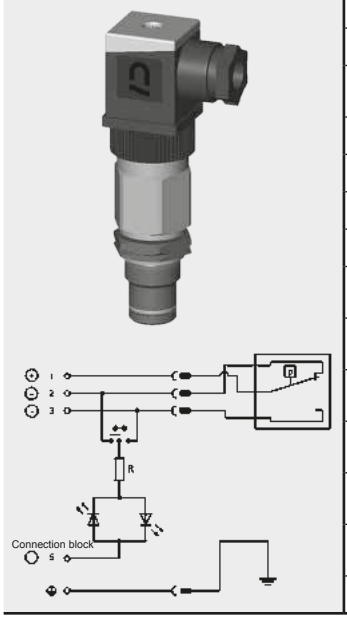
VR x D.x /-L...



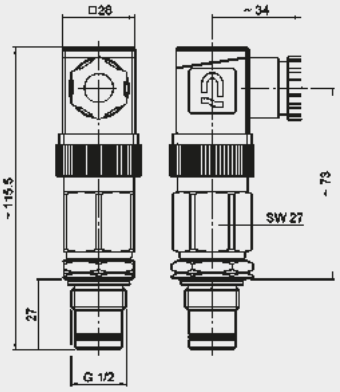
Type of indication	visual indicator and electrical switch
Weight	200 g
Pressure setting or indication range	2 bar -0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	24, 48, 115, 230 V (depending on the type of light insert)
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	250 W = 300 VA ~
switching capacity	Ohmic 6 A at 24 V = Ohmic 0.03 to 6 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VR 2 D.1 /-L110



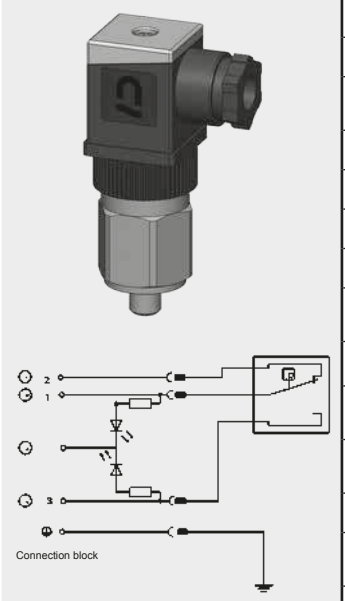
VRD x D.x /-L...



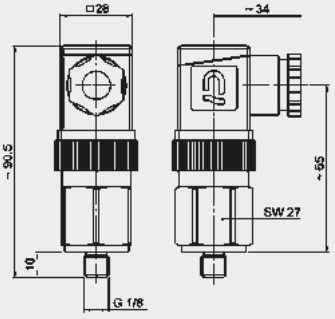
Type of indication	visual indicator and electrical switch
Weight	215 g
Pressure setting or indication range	2 bar -0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	24, 48, 115, 230 V (depending on the type of light insert)
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	250 W = 300 VA ~
switching capacity	Ohmic 6 A at 24 V = Ohmic 0.03 to 6 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VRD 2 D.1 /-L110



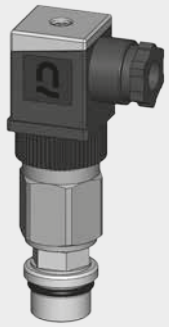
VMF x D.x /-LED

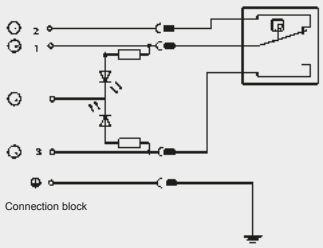


Type of indication	visual indicator and electrical switch
Weight	120 g
Pressure setting or indication range	2 bar -0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/8
Max. torque	10 Nm
Switching type	N/O contact
Max. switching voltage	24 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	250 W = 300 VA ~
switching capacity	Ohmic 6 A at 24 V =
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VMF 2 D.1 /-LED

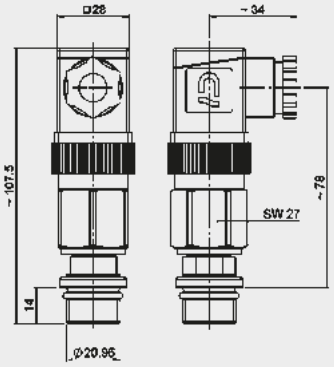


VR x D.x /-LED

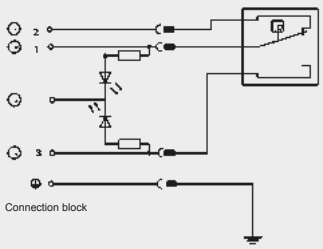




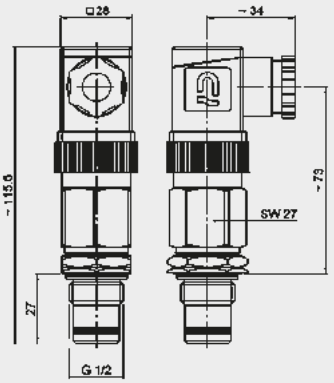
Type of indication	visual indicator and electrical switch
Weight	191 g
Pressure setting or indication range	2 bar -0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/O contact
Max. switching voltage	24 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	250 W = 300 VA ~
switching capacity	Ohmic 6 A at 24 V =
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VR 2 D.1 /-LED



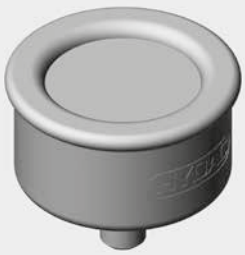
VRD x D.x /-LED

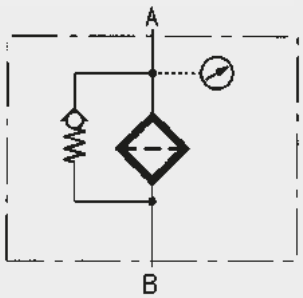


Type of indication	visual indicator and electrical switch
Weight	207 g
Pressure setting or indication range	2 bar -0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/O contact
Max. switching voltage	24 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	250 W = 300 VA ~
switching capacity	Ohmic 6 A at 24 V =
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VRD 2 D.1 /-LED

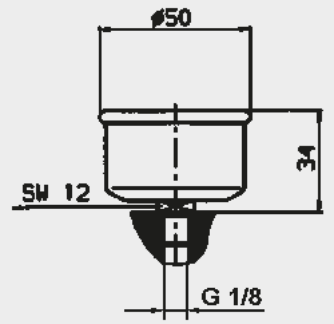


VMF x E.x

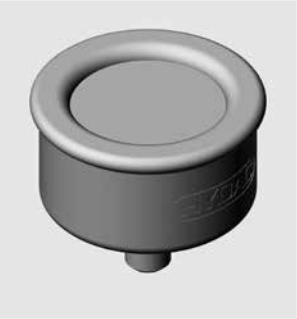


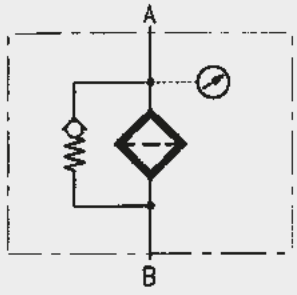


Type of indication	visual-analogue, scale indication
Weight	54 g
Pressure setting or indication range	0 bar to +10 bar
Permitt. operating pressure	7 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VMF 2 E.0

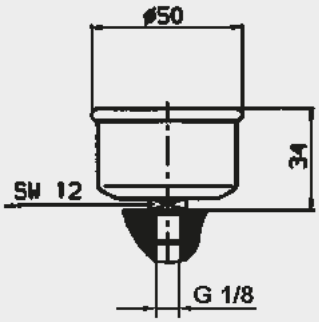


VMF 16 E.x

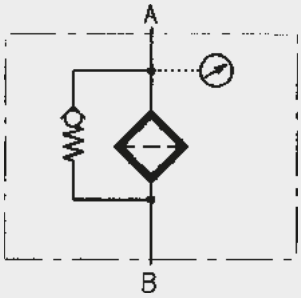




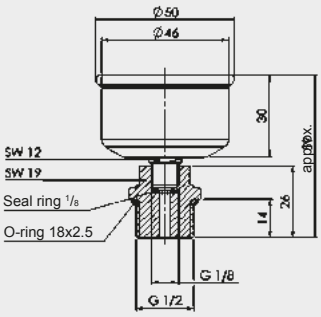
Type of indication	visual-analogue, scale indication
Weight	55 g
Pressure setting or indication range	0 bar to +16 bar
Permitt. operating pressure	11 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G 1/8
Max. torque	10 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VMF 16 E.0



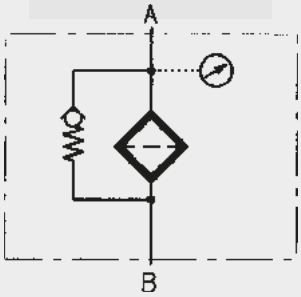
VR x E.x



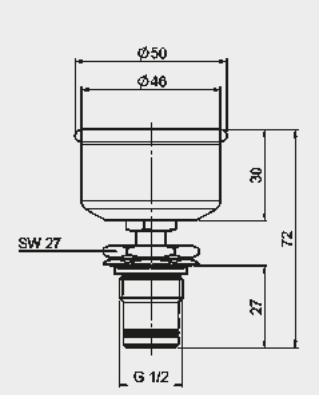
Type of indication	visual-analogue, scale indication
Weight	125 g
Pressure setting or indication range	0 bar to +10 bar
Permitt. operating pressure	7 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VR 2 E.0



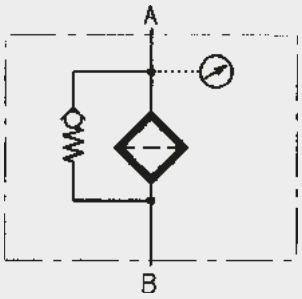
VRD x E.x



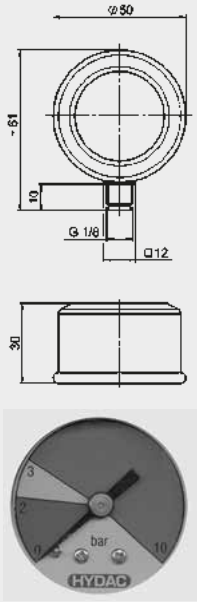
Type of indication	visual-analogue, scale indication
Weight	141 g
Pressure setting or indication range	0 bar to +10 bar
Permitt. operating pressure	7 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VRD 2 E.0



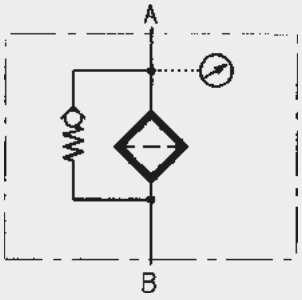
VMF x ES.x



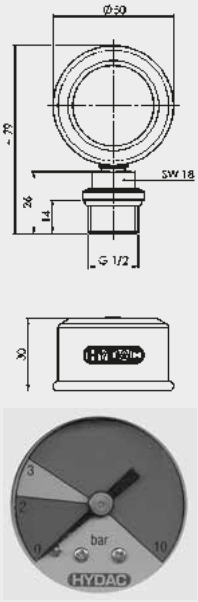
Type of indication	visual-analogue, scale indication
Weight	59 g
Pressure setting or indication range	0 bar to +10 bar
Permitt. operating pressure	7 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VMF 2 ES.0



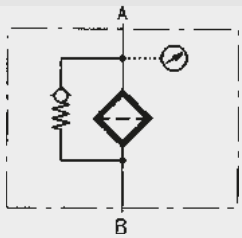
VR x ES.x



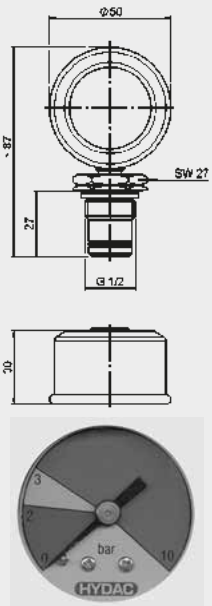
Type of indication	visual-analogue, scale indication
Weight	130 g
Pressure setting or indication range	0 bar to +10 bar
Permitt. operating pressure	7 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G $^1/_2$
Max. torque	33 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VR 2 ES.0



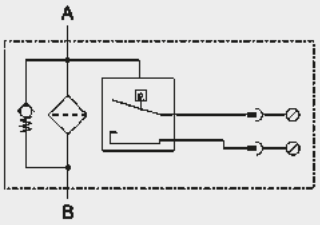
VRD x ES.x



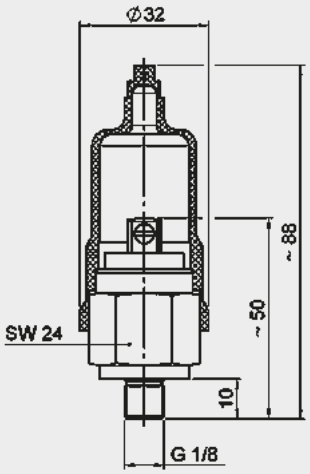
Type of indication	visual-analogue, scale indication
Weight	146 g
Pressure setting or indication range	0 bar to +10 bar
Permitt. operating pressure	7 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G $^1/_2$
Max. torque	33 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VRD 2 ES.0



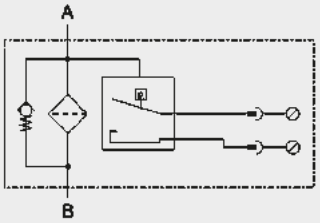
VMF x F.x



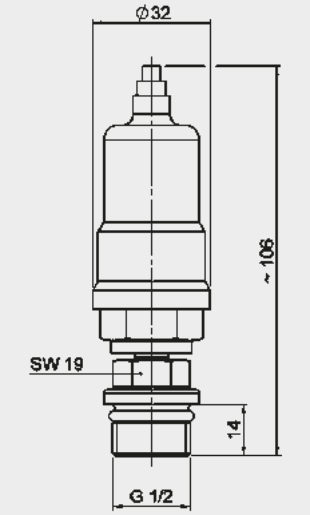
Type of indication	electrical switch
Weight	71 g
Pressure setting or indication range	2 bar ±0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/8
Max. torque	10 Nm
Switching type	N/O contact (N/C as an option)
Max. switching voltage	42 V
Electrical connection	threaded connection
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	Ohmic 2.5 A at 24 V = Ohmic 2.5 A at 42 V ~
Protection class to DIN 40050	IP 65, terminals IP 00
Order example	VMF 2 F.0



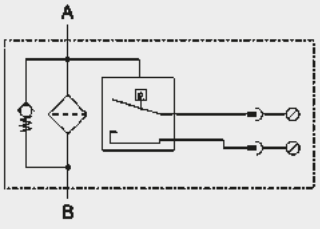
VR x F.x



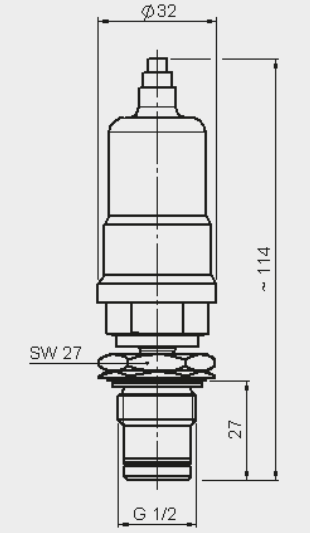
Type of indication	electrical switch
Weight	142 g
Pressure setting or indication range	2 bar ±0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/O contact (N/C as an option)
Max. switching voltage	42 V
Electrical connection	threaded connection
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	Ohmic 2.5 A at 24 V = Ohmic 2.5 A at 42 V ~
Protection class to DIN 40050	IP 65, terminals IP 00
Order example	VR 2 F.0



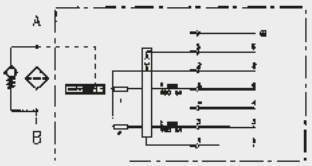
VRD x F.x



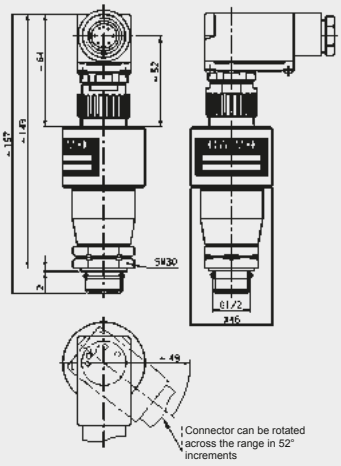
Type of indication	electrical switch
Weight	158 g
Pressure setting or indication range	2 bar ±0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/O contact (N/C as an option)
Max. switching voltage	42 V
Electrical connection	threaded connection
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	Ohmic 2.5 A at 24 V = Ohmic 2.5 A at 42 V ~
Protection class to DIN 40050	IP 65, terminals IP 00
Order example	VRD 2 F.1



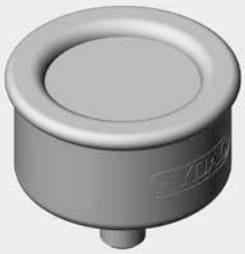
VR x GC.x

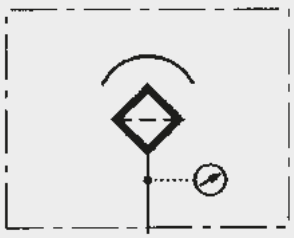


Type of indication	Electronic/analogue (4-20 mA or 1-10 V) 1 electrical switching contact at 75% and at 100% of the pressure setting Analogue signal up to 20% of the pressure setting constant 4mA or 1 V
Weight	340 g
Pressure setting or indication range	2 bar -10%
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +80 °C
Thread	G $^1/_2$
Max. torque	15 Nm
Switching type	N/C or N/O, electronic PNP positive switching (factory setting)
Max. switching voltage	Operating voltage 20-30 V DC
Electrical connection	7 pole plug to DIN 43651; PG 11
Max. switching voltage at resistive load	12 W
switching capacity	Ohmic 0.4 A at 30 V =
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VR 2 GC.0 /-LED-SQ-123

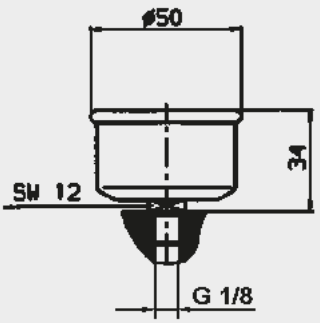


VMF x K.x

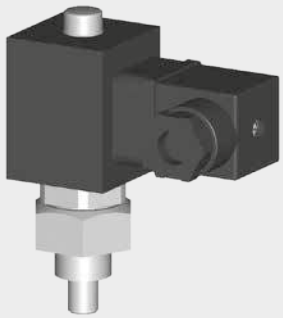


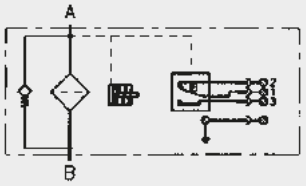


Type of indication	visual-analogue, scale indication
Weight	54 g
Pressure setting or indication range	-1 bar to + 0.6 bar
Permitt. operating pressure	-0.7 to +0.4 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VMF 0.6 K.0

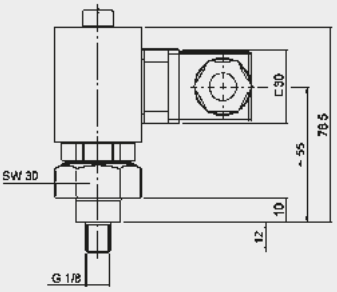


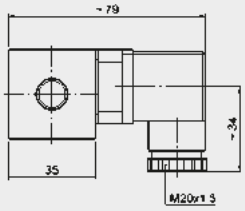
VMF x LE.x



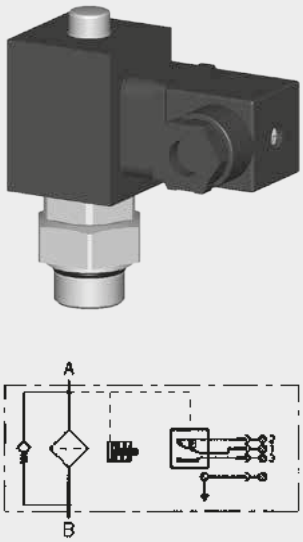


Type of indication	visual, red pin and electrical switch 1 switching contact at 100% of the pressure setting
Weight	176 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	115 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VMF 2 LE.1

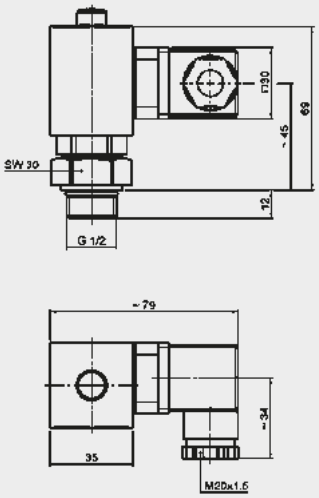




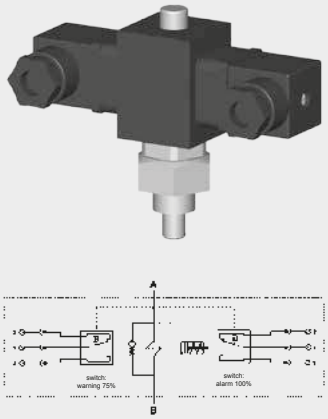
VR x LE.x



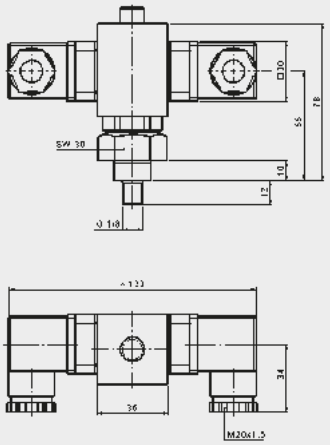
Type of indication	visual, red pin and electrical switch 1 switching contact at 100% of the pressure setting
Weight	137 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	15 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	115 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VR 2 LE.1



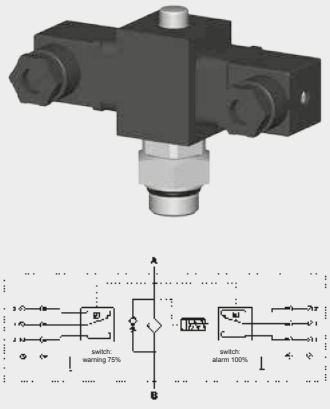
VMF x LZ.x



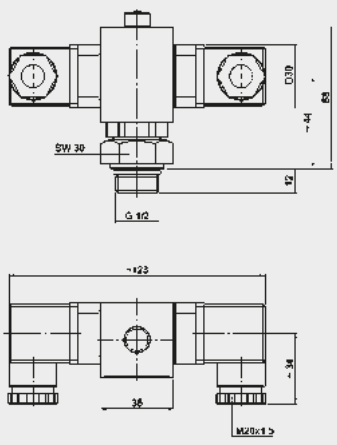
Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting
Weight	230 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	115 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VMF 2 LZ.1



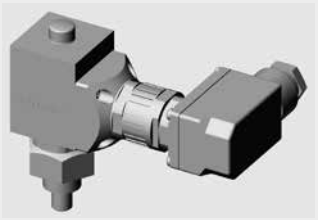
VR x LZ.x

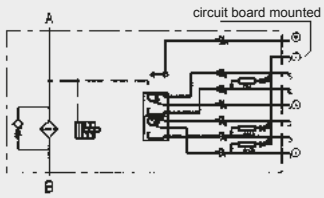


Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting
Weight	190 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	15 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	115 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VR 2 LZ.1

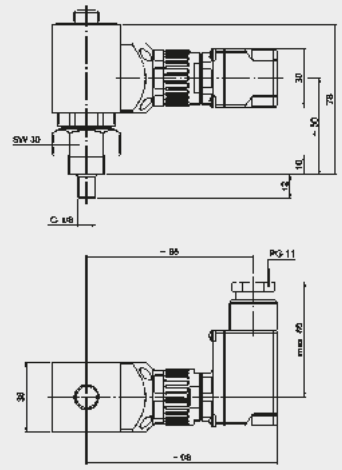


VMF x LZ.x /-DB

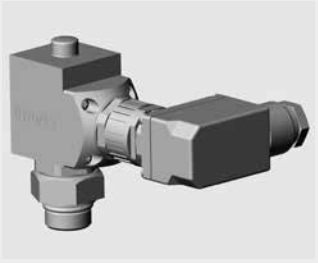


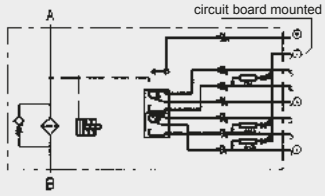


Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting 1 green LED constantly lit 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	170 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	24 V
Electrical connection	Male connection PG 11 Female connector to DIN 43651
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VMF 2 LZ.1 /-DB

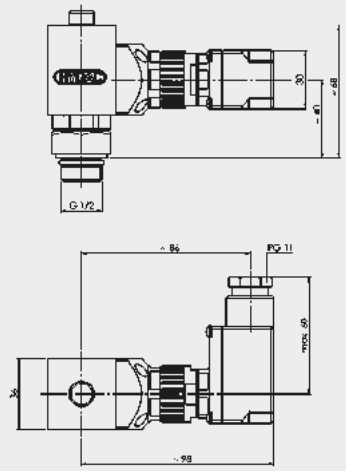


VR x LZ.x /-DB

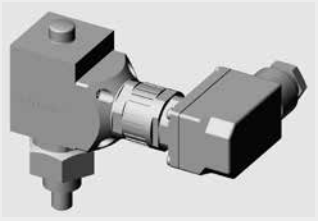


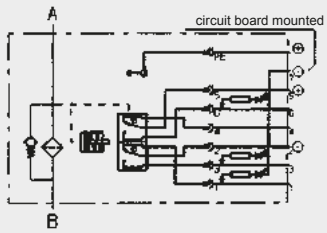


Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting 1 green LED constantly lit 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	190 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	15 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	24 V
Electrical connection	Male connection PG 11 Female connector to DIN 43651
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VR 2 LZ.1 /-DB

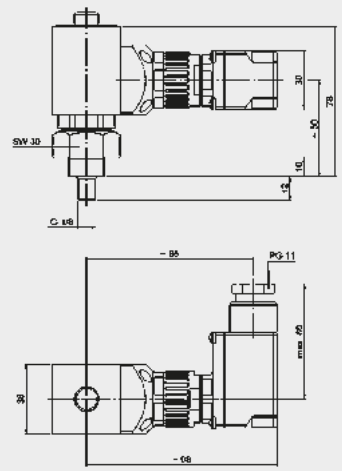


VMF x LZ.x /-CN

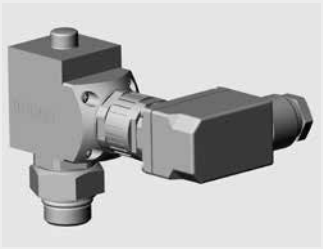


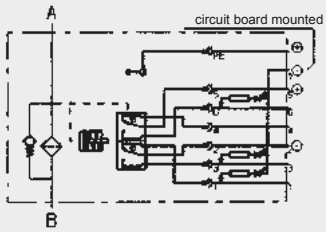


Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting 1 green LED goes out at 75% 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	170 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	24 V
Electrical connection	Male connection PG 11 Female connector to DIN 43651
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VMF 2 LZ.1 /-CN

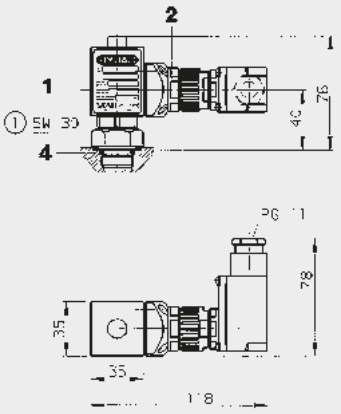


VR x LZ.x /-CN

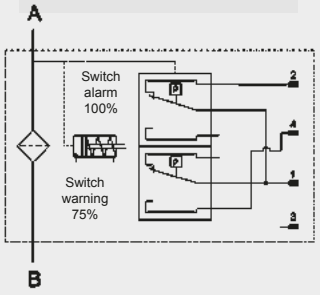




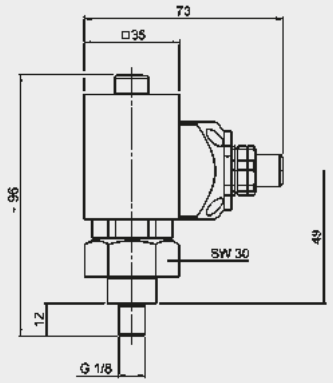
Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting 1 green LED goes out at 75% 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	190 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/2
Max. torque	15 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	24 V
Electrical connection	Male connection PG 11 Female connector to DIN 43651
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VR 2 LZ.1 /-CN



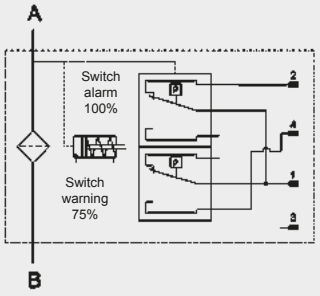
VMF x LZ.x /-BO



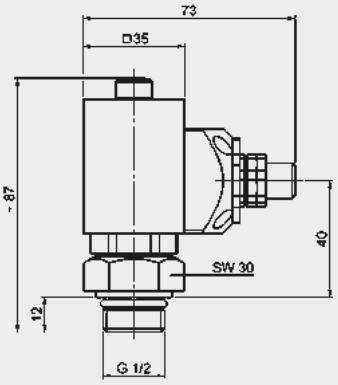
Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting
Weight	120 g
Pressure setting or indication range	2 bar (or 2.5 bar) -10%
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/8
Max. torque	10 Nm
Switching type	N/O (75%) N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VMF 2 LZ.1 /-BO



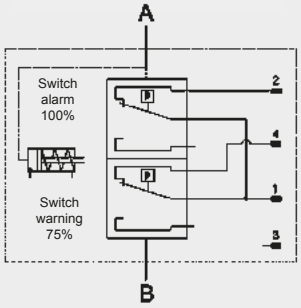
VR x LZ.x /-BO



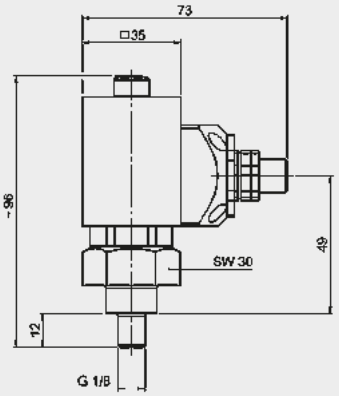
Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting
Weight	145 g
Pressure setting or indication range	2 bar (or 2.5 bar) -10%
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/2
Max. torque	15 Nm
Switching type	N/O (75%) N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VR 2 LZ.1 /-BO



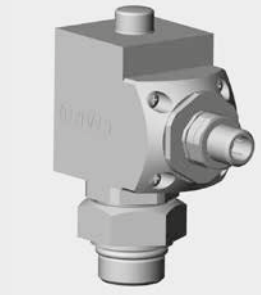
VMF x LZ.x /-AV

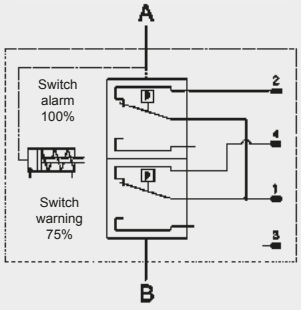


Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting
Weight	120 g
Pressure setting or indication range	2 bar (or 2.5 bar) -10%
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	N/C (75% and 100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VMF 2 LZ.1 /-AV

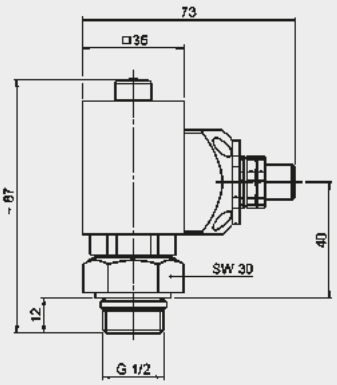


VR x LZ.x /-AV

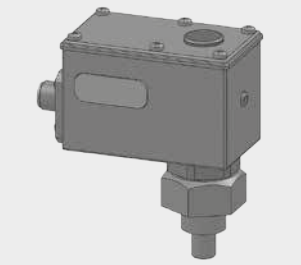


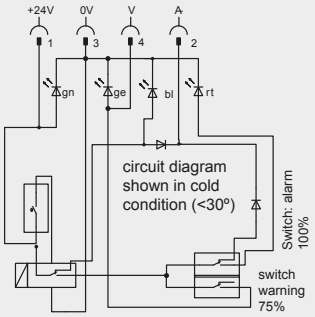


Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting
Weight	145 g
Pressure setting or indication range	2 bar (or 2.5 bar) -10%
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	15 Nm
Switching type	N/C (75% and 100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VR 2 LZ.1 /-AV

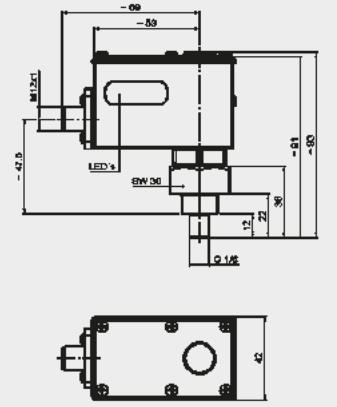


VMF x LZ.x /-D4C

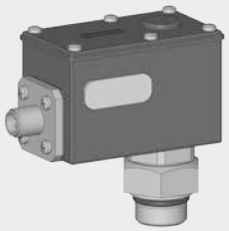


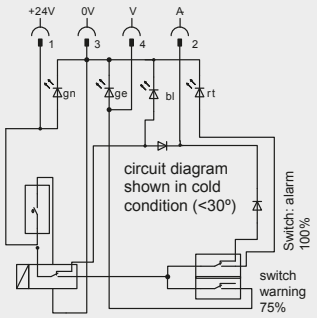


Type of indication	1 electrical switching contact at 75% and 100% of the pressure setting and suppression of the switching signal up to approx. 30 °C 2 green LED's light when below 30 °C 1 green LED lights from 30 °C 1 yellow LED lights from 75% 1 redLED lights from 100% Δp
Weight	245 g
Pressure setting or indication range	2.5 bar -10%
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	N/O (75%) N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VMF 2 LZ.2 /-D4C

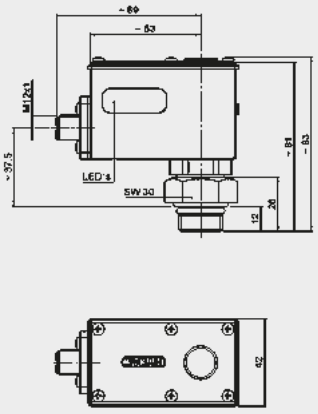


VR x LZ.x /-D4C

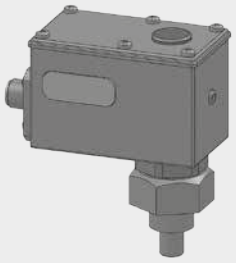


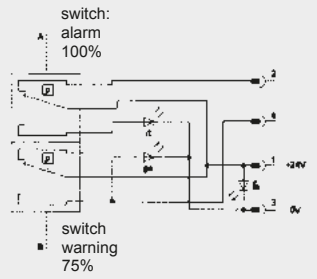


Type of indication	1 electrical switching contact at 75% and at 100% of the pressure setting and suppression of the switching signal up to approx. 30 ºC. 2 green LED's light when below 30 °C 1 green LED lights from 30 °C 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	205 g
Pressure setting or indication range	2.5 bar -10%
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	15 Nm
Switching type	N/O (75%) N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VR 2 LZ.2 /-D4C

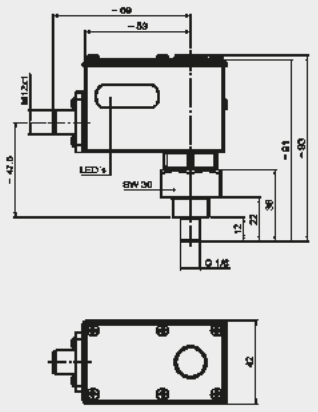


VMF x LZ.x /-BO-LED

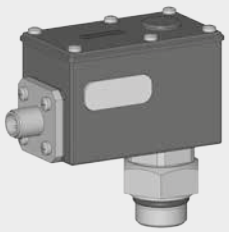


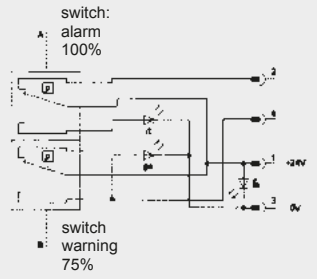


Type of indication	1 electrical switching contact at 75% and at 100% of the pressure setting 1 green LED constantly lit 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	245 g
Pressure setting or indication range	2.5 bar -10%
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	N/O (75%), N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VMF 2 LZ.2 /-BO-LED

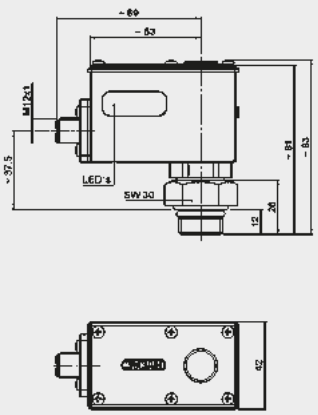


VR x LZ.x /-BO-LED

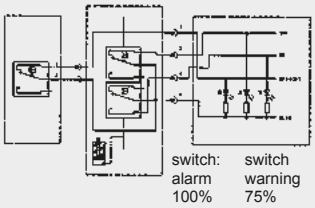




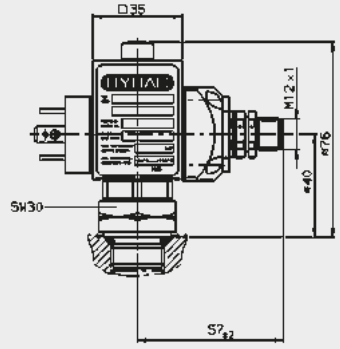
Type of indication	1 electrical switching contact at 75% and at 100% of the pressure setting 1 green LED constantly lit 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	205 g
Pressure setting or indication range	2.5 bar -10%
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	15 Nm
Switching type	N/O (75%), N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VR 2 LZ.2 /-BO-LED



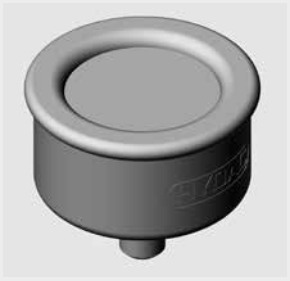
VR x LZ.x /-GM

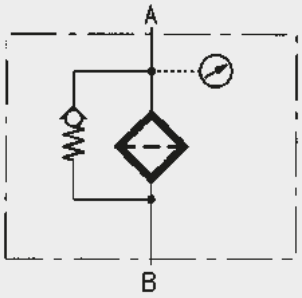


Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting Indicator function possible in conjunction with the "No element" indicator
Weight	290 g
Pressure setting or indication range	2.5 bar -10%
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	15 Nm
Switching type	-
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VR 2 LZ.1 /-GM

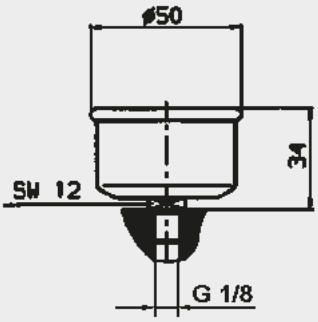


VMF x R.x

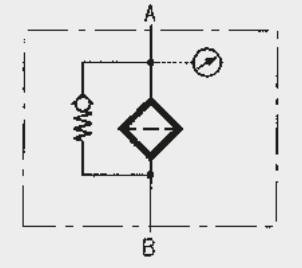




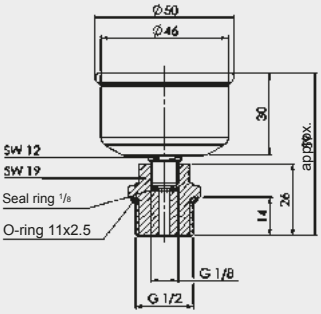
Type of indication	visual-analogue, scale indication
Weight	54 g
Pressure setting or indication range	0 to 10 bar
Permitt. operating pressure	7 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G $^1/_8$
Max. torque	10 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VMF 2 R.0



VR x R.x

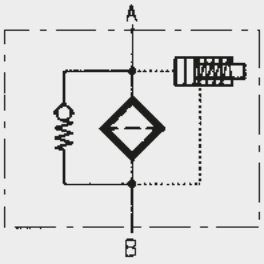


Type of indication	visual-analogue, scale indication
Weight	125 g
Pressure setting or indication range	0 to 10 bar
Permitt. operating pressure	7 bar continuous
Permitt. temperature range	-20 °C to +60 °C
Thread	G $^1/_2$
Max. torque	33 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VR 2 R.0

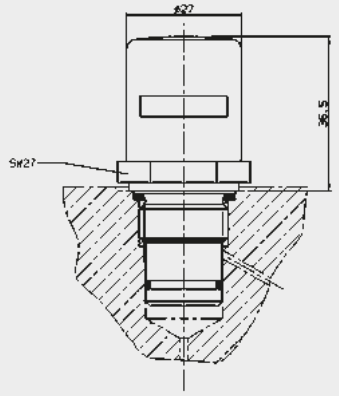


3.3 DIFFERENTIAL PRESSURE INDICATORS

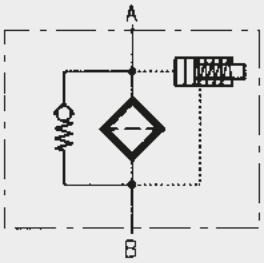
VM x B.x



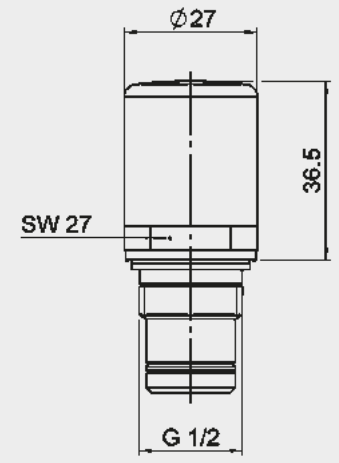
Type of indication	visual, red/green band Automatic reset
Weight	55 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VM 5 B.1



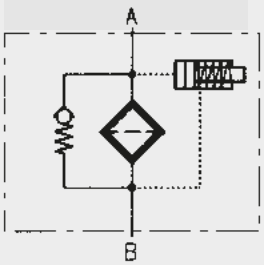
VD x B.x



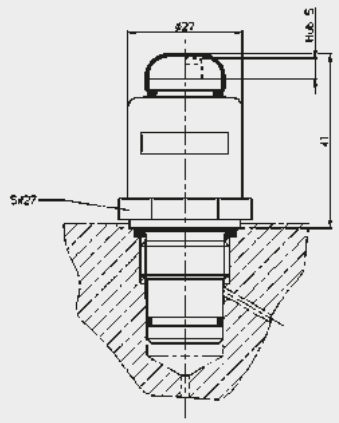
Type of indication	visual, red/green band Automatic reset
Weight	110 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	100 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VD 5 B.1



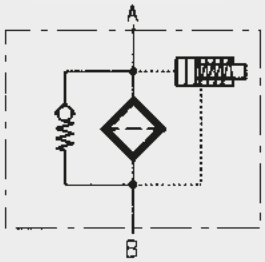
VM x BM.x



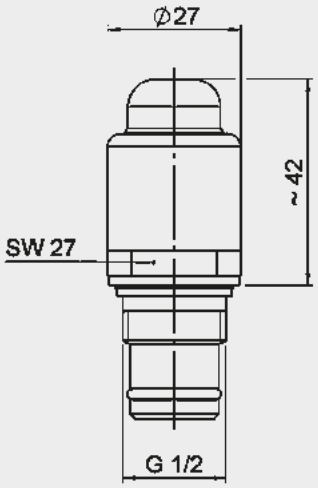
Type of indication	visual, red/green band Manual reset
Weight	55 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VM 5 BM.1



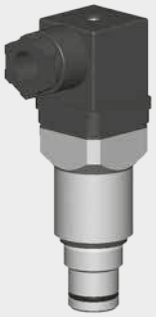
VD x BM.x

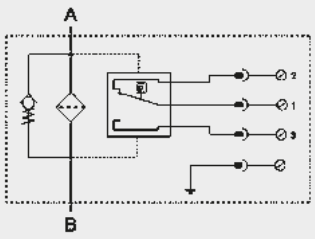


Type of indication	visual, red/green band Manual reset
Weight	110 g
Pressure setting or indication range	2 bar -10 % 5 bar -10% 8 bar ±10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	100 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VD 5 BM.1

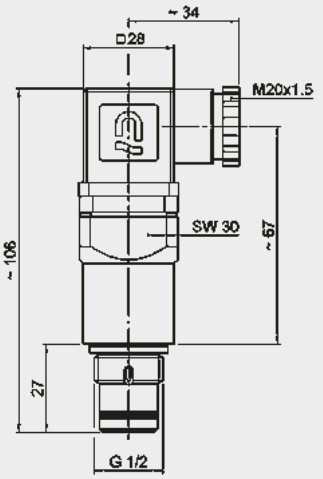


VM x C.x

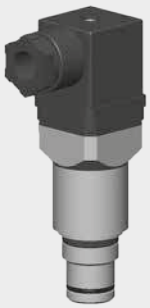


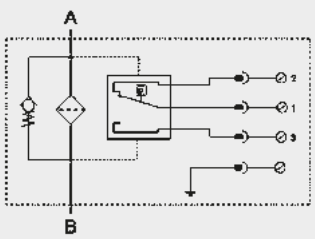


Type of indication	electrical switch
Weight	120 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	230 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity [1]	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VM 5 C.0

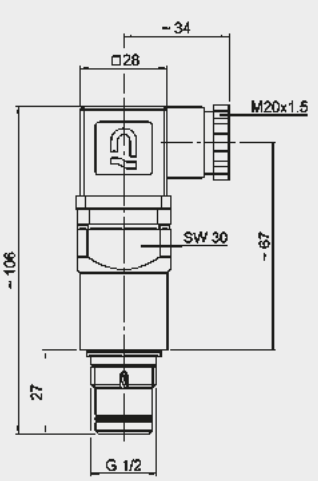


VD x C.x



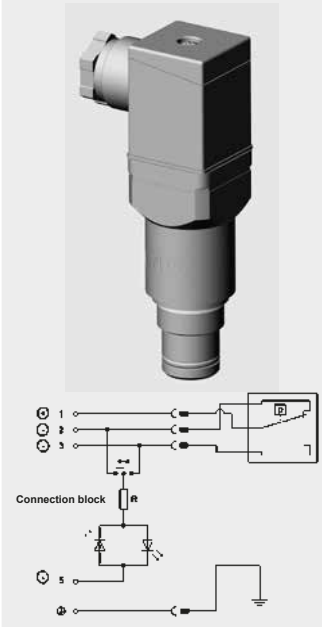


Type of indication	electrical switch
Weight	220 g
Pressure setting or indication range	5 bar -10% 8 bar ±10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	100 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	230 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity [1]	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VD 5 C.0

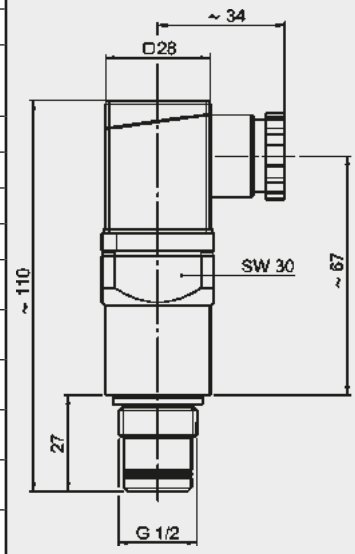


[1] Required amperage > 20 mA; for lower amperages, order "-SO135" indicators (see Supplementary details).

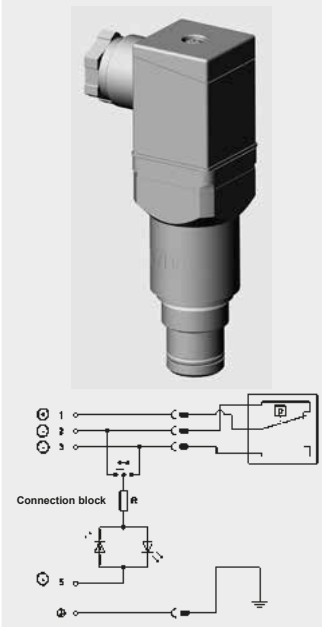
VM x D.x /-L...



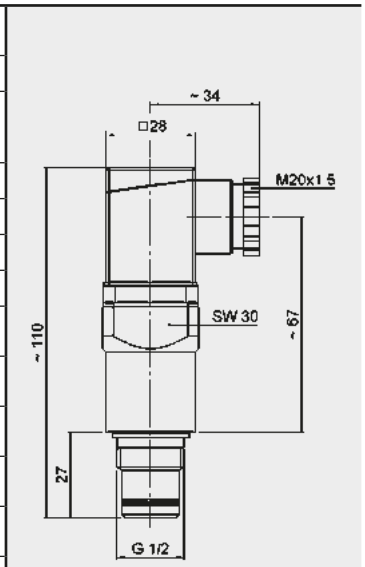
Type of indication	visual indicator and electrical switch
Weight	150 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	24, 48, 115, 230 V (depending on the type of light insert)
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity [1]	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VM 5 D.0 /-L24



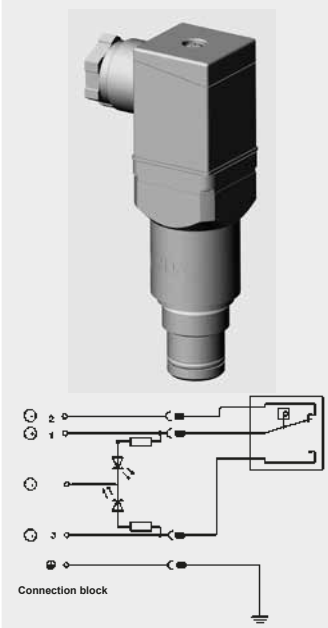
VD x D.x /-L...



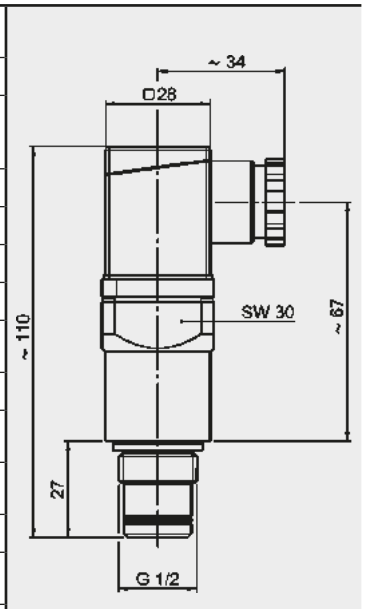
Type of indication	visual indicator and electrical switch
Weight	250 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	100 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	24, 48, 115, 230 V (depending on the type of light insert)
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity [1]	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VD 5 D.0 /-L24



VM x D.x /-LED

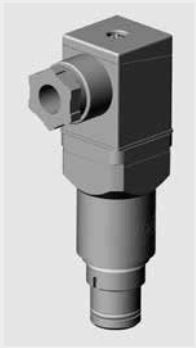


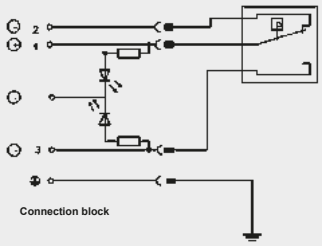
Type of indication	visual indicator and electrical switch
Weight	150 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	24 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity [1]	ohmic 3 A at 24 V =
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VM 5 D.0 /-LED



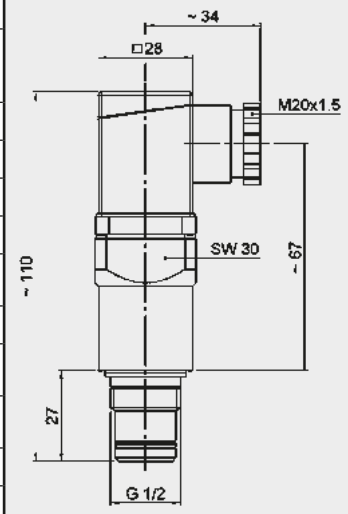
[1] Required amperage > 20 mA; for lower amperages, order "-SO135" indicators (see Supplementary details).

VD x D.x /-LED

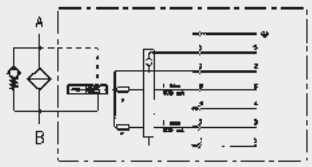




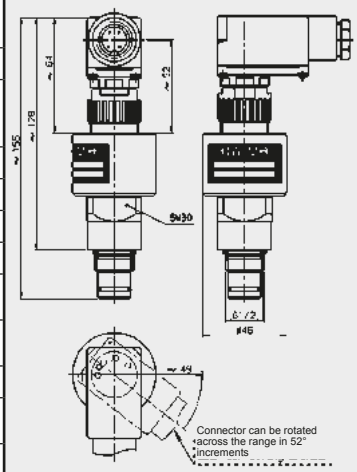
Type of indication	visual indicator and electrical switch
Weight	250 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	100 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	24 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity [1]	ohmic 3 A at 24 V =
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VD 5 D.0 /-LED



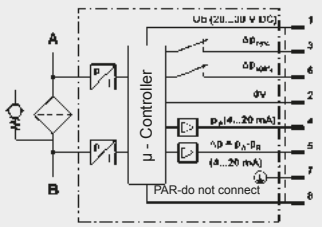
VD x GC.x



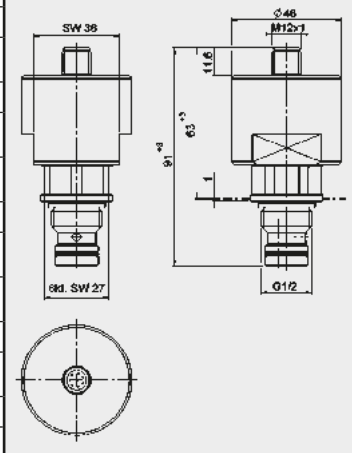
Type of indicator	Electronic/analogue (4-20 mA or 1-10 V) 1 electrical switching contact at 75% and at 100% of the pressure setting Analogue signal up to 20% of the pressure setting constant 4mA or 1 V
Weight	400 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar -10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-30 °C to +80 °C
Thread	G 1/2
Max. torque	100 Nm
Switching type	N/C or N/O, electronic PNP positive switching (factory setting)
Max. switching voltage	Operating voltage 20 to 30 V DC
Electrical connection	7 pole plug to DIN 43651; PG 11
Max. switching voltage at resistive load	12 W
switching capacity	ohmic 0.4 A at 30 V =
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VD 5 GC.0 /-LED-SQ-123



VL x GW.x

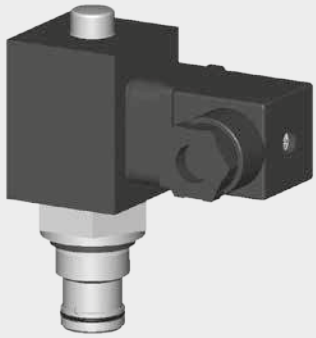


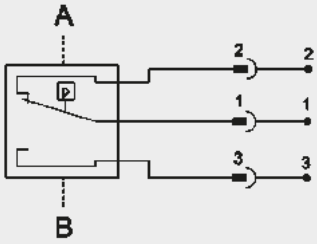
Type of indication	Electronic/analogue (4-20 mA) for condition monitoring filters incl. bypass monitoring. 1 switching contact at 75% and at 100% of the pressure setting		
Weight	157 g		
Pressure setting p (switching contact 100%)	2 bar ±5%	3 bar ±5%	5 bar ±5%
Indication range Δp	0 to 5 bar	0 to 5 bar	0 to 8 bar
Indication range "pressure before filter"	25 bar		
Type of switching switching outputs Δp	electronic switch, PNP positive switching N/O or N/C contacts (factory setting)		
Output Load	400 mA		
Max. switching voltage / operating voltage	20 to 30 V DC		
Analogue outputs "press. before filter" & Δp	4 to 20 mA (max. resistance 600Ω)		
Electrical connection	M12 x 1 / 8 pole		
Protection class to DIN 40050	IP 65		
Permitt. operating pressure	25 bar		
Permitt. temperature range	-40 °C to +85 °C		
Thread	G 1/2		
Max. torque	33 Nm		
Order example	VL 5 GW.0 /-V-123		



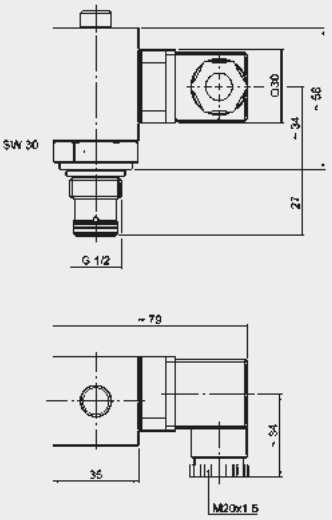
[1] Required amperage > 20 mA; for lower amperages, order "-SO135" indicators (see Supplementary details).

VD x LE.x

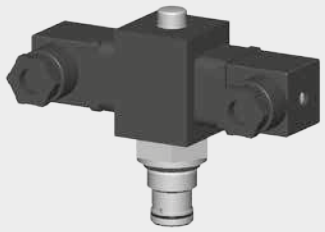


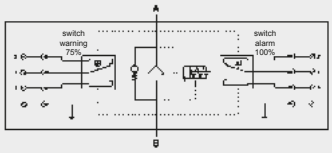


Type of indication	visual, red pin and electrical switch 1 switching contact at 100% of the pressure setting
Weight	198 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar -10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	50 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	115 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VD 5 LE.1

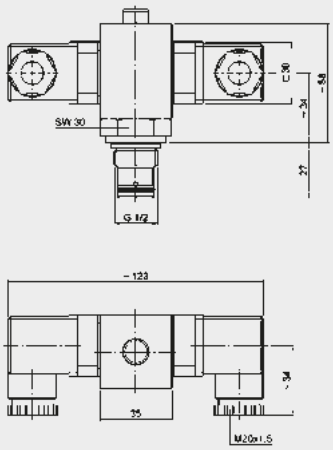


VD x LZ.x

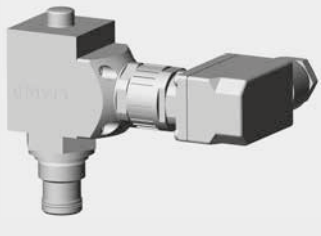


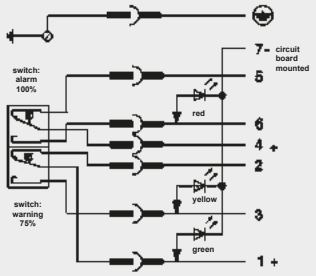


Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting
Weight	240 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar -10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	50 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	115 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VD 5 LZ.1

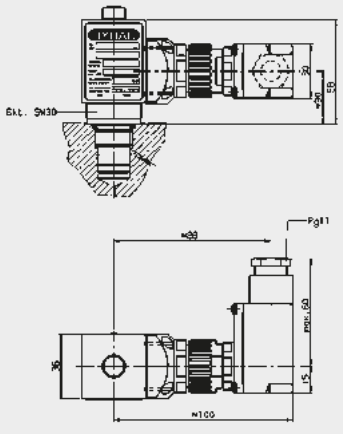


VD x LZ.x /-DB

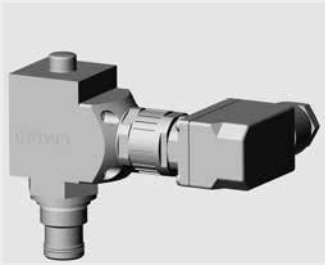


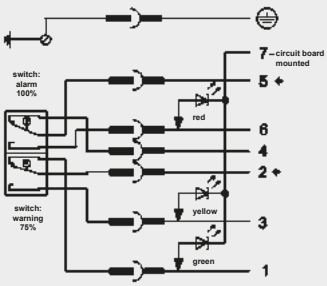


Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting 1 green LED constantly lit 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	245 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar -10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	50 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	24 V
Electrical connection	Male connection PG 11 Female connector to DIN 43651
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VD 5 LZ.1 /-DB

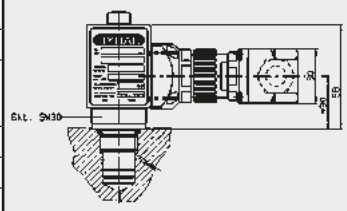


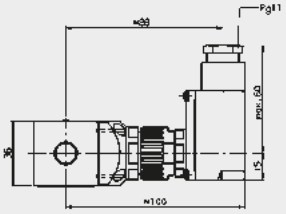
VD x LZ.x /-CN



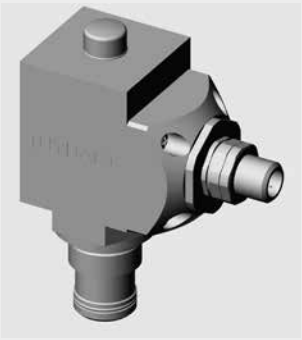


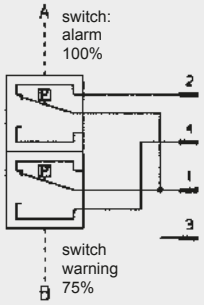
Type of indication	visual, red pin and 1 electrical switching contact at 75% and at 100% of the pressure setting 1 green LED goes out at 75% 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	245 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar -10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/2
Max. torque	50 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	24 V
Electrical connection	Male connection PG 11 Female connector to DIN 43651
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VD 5 LZ.1 /-CN



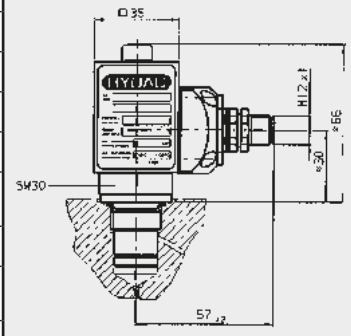


VD x LZ.x /-BO

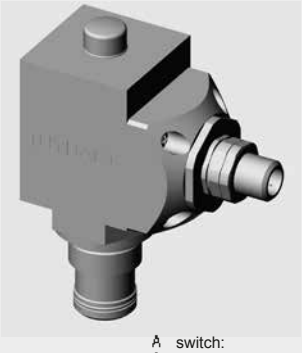


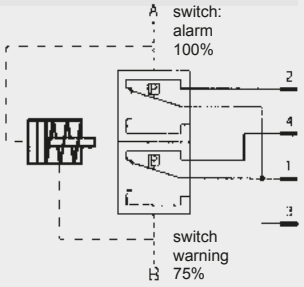


Type of indication	visual, red pin and one electrical switching contact at 75% and at 100% of the pressure setting
Weight	197 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar -10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/2
Max. torque	50 Nm
Switching type	N/O (75%) N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VD 5 LZ.1 /-BO

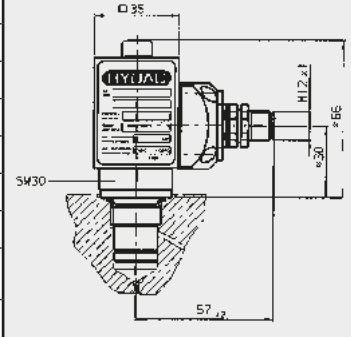


VD x LZ.x /-AV

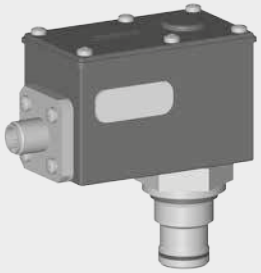


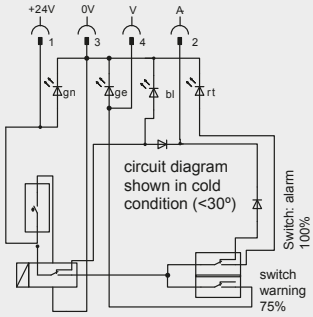


Type of indication	visual, red pin and one electrical switching contact at 75% and at 100% of the pressure setting
Weight	197 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar -10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/2
Max. torque	50 Nm
Switching type	N/C (75% and 100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VD 5 LZ.1 /-AV

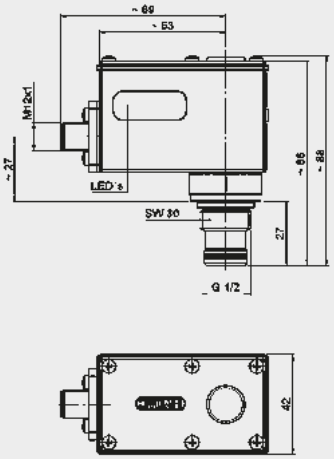


VD x LZ.x /-D4C

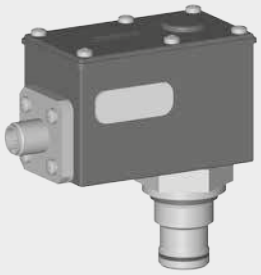


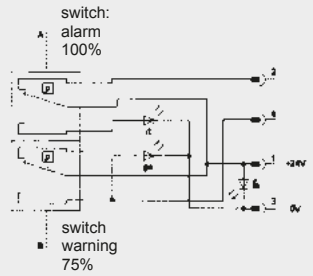


Type of indicator	1 electrical switching contact at 75% and at 100% of the pressure setting and suppression of the switching signal when operating temperature is below 30 °C 2 green LEDs light when below 30 °C 1 green LED lights from 30 °C 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	256 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar -10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/2
Max. torque	50 Nm
Switching type	N/O (75%) N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VD 5 LZ.2 /-D4C

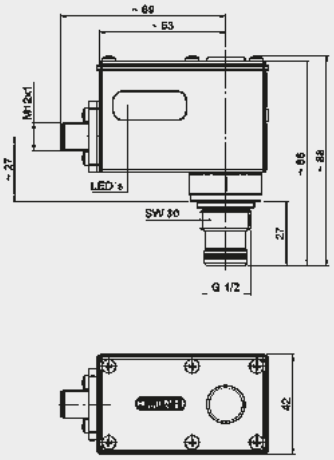


VD x LZ.x /-BO-LED

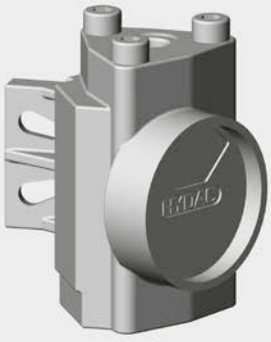


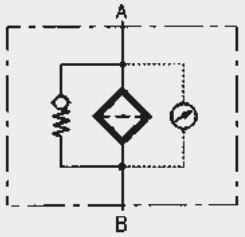


Type of indication	1 electrical switching contact at 75% and at 100% of the pressure setting 1 green LED constantly lit 1 yellow LED lights from 75% 1 red LED lights from 100% Δp
Weight	250 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar -10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/2
Max. torque	50 Nm
Switching type	N/O (75%) N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VD 5 LZ.2 /-BO-LED

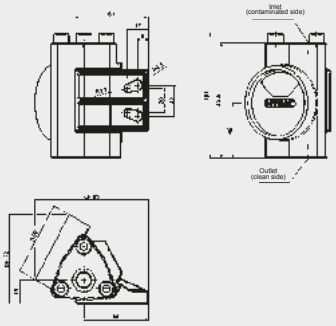


V02 x V.x

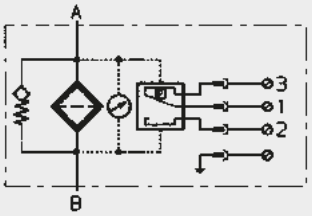




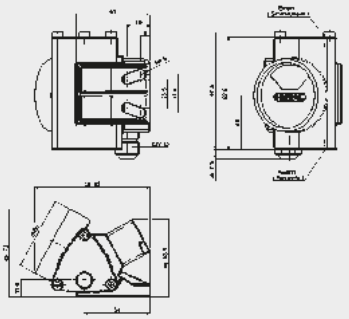
Type of indication	visual-analogue
Weight	580 g
Pressure setting or indication range	0.8 bar ±10% 2.0 bar ±10% 4.3 bar ±10%
Permitt. operating pressure	100 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/4
Max. torque	-
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	V02 2 V.0



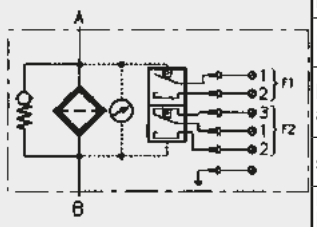
V02 x VE.x



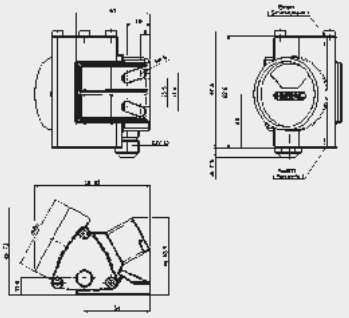
Type of indication	Visual/analogue indicator and electrical switching contact 100% of the pressure setting
Weight	640 g
Pressure setting or indication range	0.8 bar ±10% 2.0 bar ±10% 4.3 bar ±10%
Permitt. operating pressure	100 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/4
Max. torque	-
Switching type	100% change-over contact
Max. switching voltage	250 V
Electrical connection	threaded connection M16 x 1.5
Max. switching voltage at resistive load	100% contact 30 W = 60 VA ~
switching capacity	Ohmic 2.5 A at 24 V = Ohmic 1 A at 220 V ~
Protection class to DIN 40050	IP 65
Order example	V02 2 VE.0



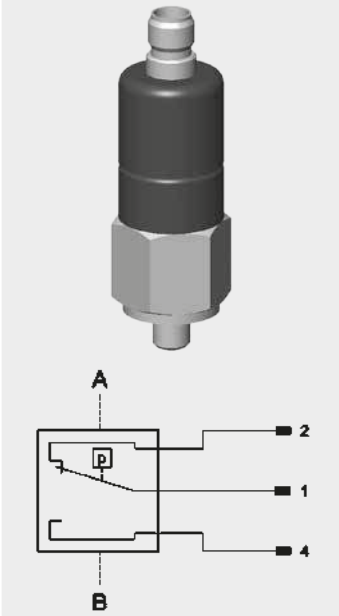
V02 x VZ.x



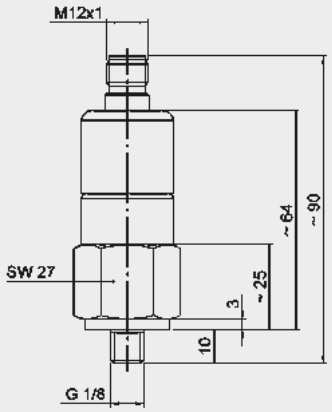
Type of indication	Visual/analogue indicator and 1 electrical switching contact at 75% and 100% of the pressure setting	
Weight	650 g	
Pressure setting or indication range	0.8 bar ±10% 2.0 bar ±10% 4.3 bar ±10%	
Permitt. operating pressure	100 bar	
Permitt. temperature range	-30 °C to +100 °C	
Thread	G 1/4	
Max. torque	-	
Switching type	75% - N/O contact 100% - change-over contact	
Max. switching voltage	250 V	
Electrical connection	threaded connection M16 x 1.5	
Max. switching voltage at resistive load	75% contact 120 W = 120 VA ~	100% contact 30 W = 60 VA ~
switching capacity	Ohmic 2.5 A at 24 V = Ohmic 1 A at 220 V ~	
Protection class to DIN 40050	IP 65	
Order example	V02 2 VZ.0	



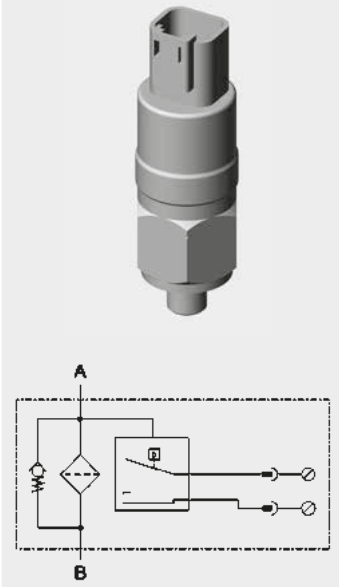
3.4 MOBILE INDICATORS
3.4.1 RETURN LINE
VMF x CM.x



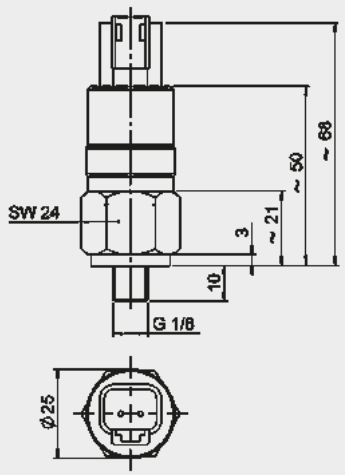
Type of indication	electrical switch
Weight	90 g
Pressure setting or indication range	2 bar ±0.3 bar
Permitt. operating pressure	10 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/8
Max. torque	10 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	24V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	250 W= 300 VA~
switching capacity	Ohmic 6 A at 24 V = Ohmic 0.03 to 6 A at max. 230 V ~
Protection class to DIN 40050	IP 67 (only if the connector is wired and fitted correctly)
Order example	VMF 2 CM.1/-4M0



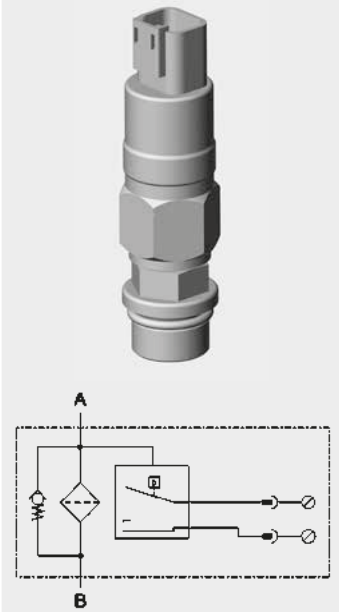
VMF x FD.x (plug connection: Deutsch DT 04-2P)



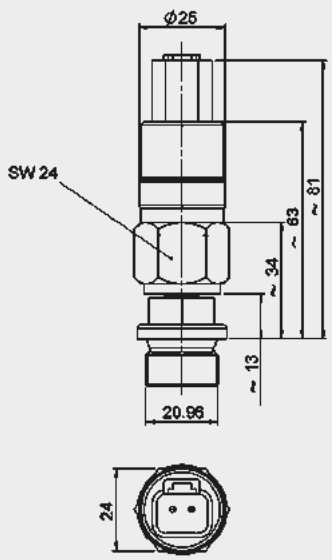
Type of indication	electrical switch
Weight	70 g
Pressure setting or indication range	2 bar ±0.3 bar
Permitt. operating pressure	11 bar continuous
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/8
Max. torque	10 Nm
Switching type	N/O or N/C
Max. switching voltage	42 V
Electrical connection	Deutsch DT 04-2P
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	Ohmic 2.5 A at 24 V = Ohmic 1 A at 220 V ~
Protection class to DIN 40050	IP 67 (only if the connector is wired and fitted correctly)
Order example	VMF 2 FD.0 /-2M0

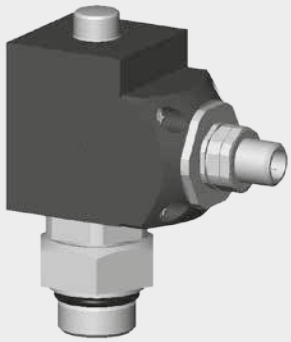


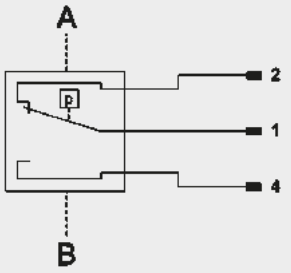
VR x FD.x (plug connection: Deutsch DT 04-2P)



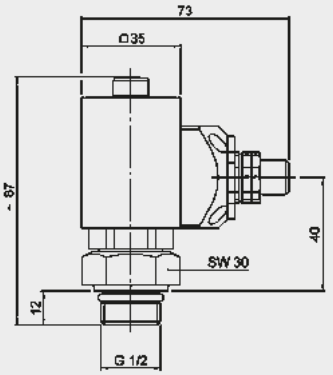
Type of indication	electrical switch
Weight	90 g
Pressure setting or indication range	2 bar ±0.3 bar
Permitt. operating pressure	11 bar continuous
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/O or N/C
Max. switching voltage	42 V
Electrical connection	Deutsch DT 04-2P
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	Ohmic 2.5 A at 24 V = Ohmic 1 A at 220 V ~
Protection class to DIN 40050	IP 67 (only if the connector is wired and fitted correctly)
Order example	VR 2 FD.0 /-2M0







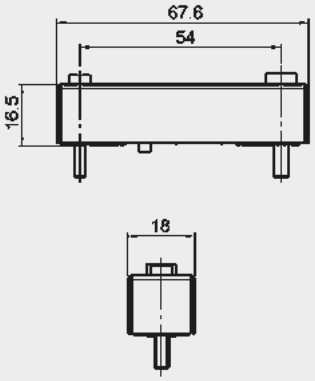
Type of indication	visual, red pin and electrical switch 1 switching contact at 100% of the pressure setting
Weight	140 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	15 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	24V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VR 2 LEM.1/-4M0



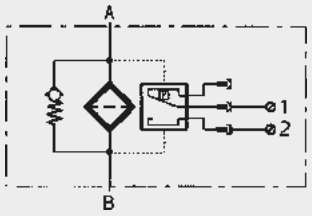
3.4.2 DIFFERENTIAL PRESSURE

VL x BF.x

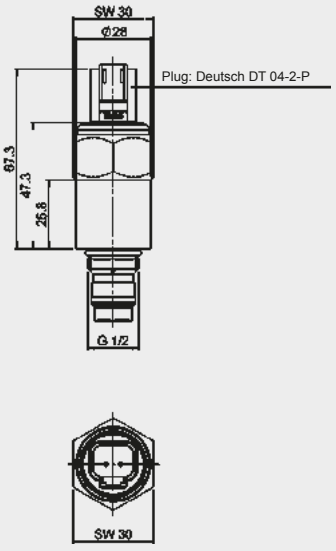
Type of indication	visual
Weight	25 g
Pressure setting or indication range	1 bar -10% 2.5 bar -10%
Permitt. operating pressure	40 bar
Permitt. temperature range	-10 °C to +80 °C
Thread	M3; M4
Max. torque	0.6 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VL 2.5 BF.0



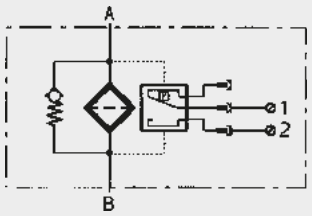
VM x CD.x (plug type: Deutsch DT 04-2P)



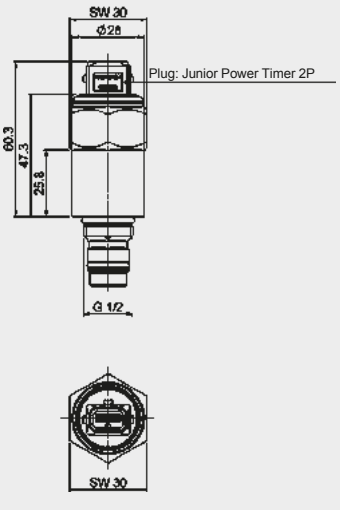
Type of indication	electrical switch
Weight	100 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G $^1/_2$
Max. torque	33 Nm
Switching type	N/O or N/C
Max. switching voltage	48 V
Electrical connection	-
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~
Protection class to DIN 40050	IP 67 (only if the connector is wired and fitted correctly)
Order example	VM 5 CD.0 /-2M0



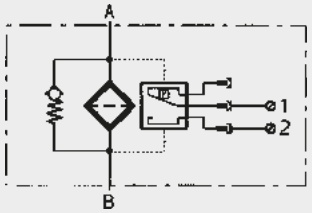
VM x CJ.x (plug type: Junior Power Timer)



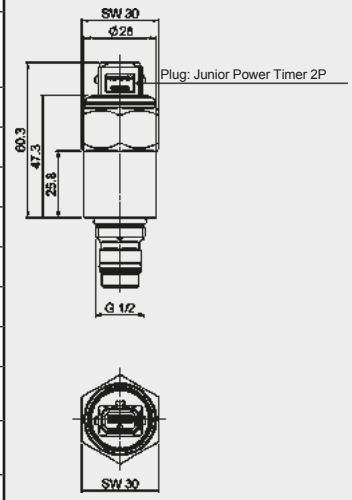
Type of indication	electrical switch
Weight	100 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G $^1/_2$
Max. torque	33 Nm
Switching type	N/O or N/C
Max. switching voltage	48 V
Electrical connection	Junior Power Timer
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~
Protection class to DIN 40050	IP 54 (only if the connector is wired and fitted correctly)
Order example	VM 5 CJ.0 /-2M0



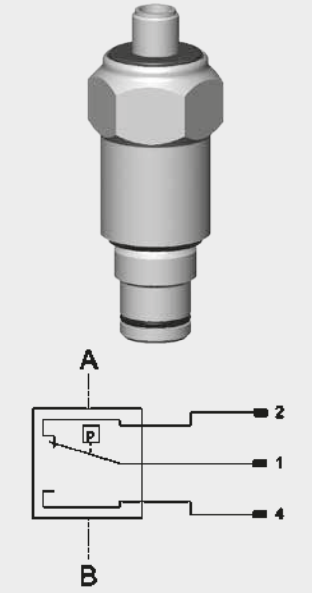
VM x CJ.x (plug type: Junior Power Timer)



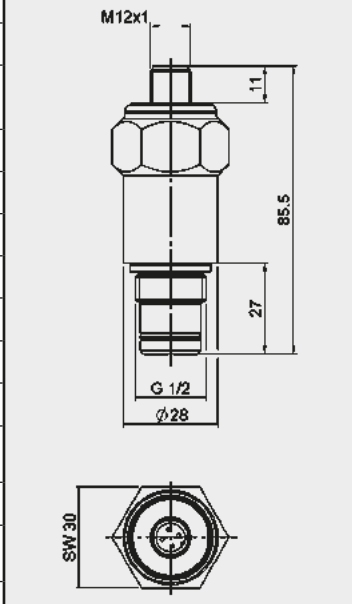
Type of indication	electrical switch
Weight	200 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	100 Nm
Switching type	N/O or N/C
Max. switching voltage	48 V
Electrical connection	Junior Power Timer
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~
Protection class to DIN 40050	IP 54 (only if the connector is wired and fitted correctly)
Order example	VD 5 CJ.0 /-2M0



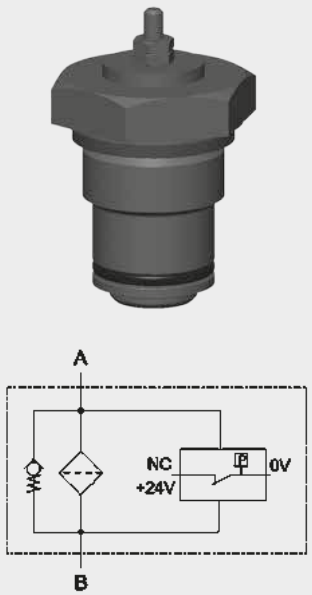
VM x CM.x



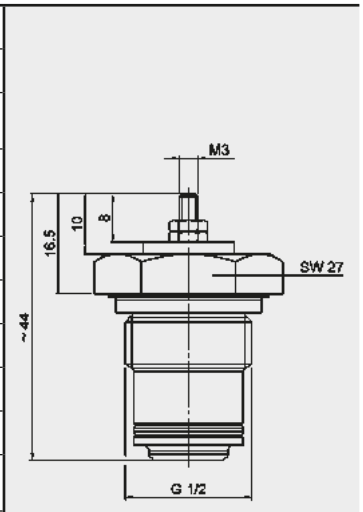
Type of indication	electrical switch
Weight	70 g
Pressure setting or indication range	2 bar –10% 5 bar –10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	48 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	ohmic 2.5 A at 24 V = ohmic 2.5 A at 42 V ~
Protection class to DIN 40050	IP 67 (only if the connector is wired and fitted correctly)
Order example	VM 2 CM.0/-4M0



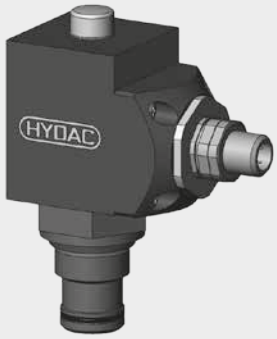
VM x M.x

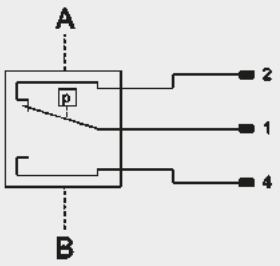


Type of indication	single pole (ground switching)
Weight	31 g
Pressure setting or indication range	2 bar ±15%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/O or N/C
Max. switching voltage	24V
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	terminals IP00
Order example	VM 2 M.0

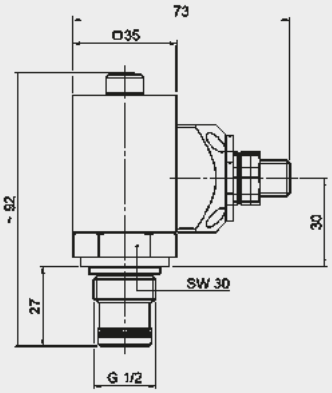


VD x LEM.x





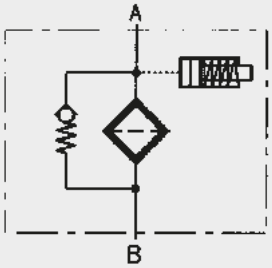
Type of indication	visual, red pin and electrical switch 1 switching contact at 100% of the pressure setting
Weight	350 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar -10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G $^1/_2$
Max. torque	50 Nm
Switching type	N/C or N/O contacts Reed contacts (change-over contacts)
Max. switching voltage	24V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VD 5 LEM.1/-4M0



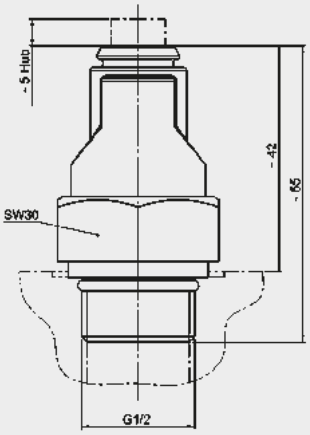
3.5 INDICATORS IN ACCORDANCE WITH ATEX DIRECTIVE

3.5.1 RETURN LINE

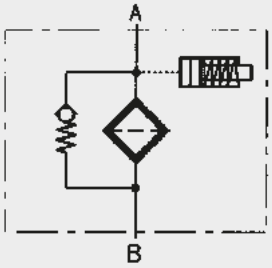
VR x B.x (ATEX) Can be used on aluminium filters up to Zone 1



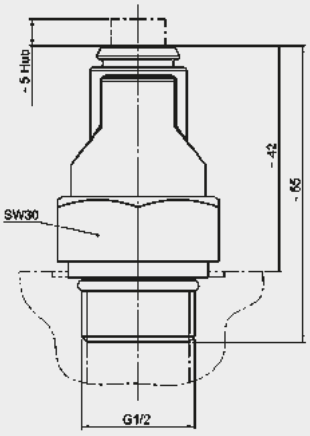
Type of indication	visual, red pin
Weight	44 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/2
Max. torque	15 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VR 2 B.0 /-2GC



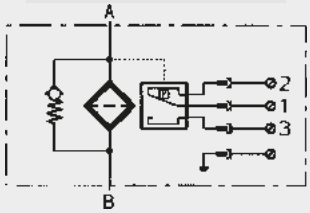
VR x B.x (ATEX) Can be used on steel/cast iron filters up to Zone 1



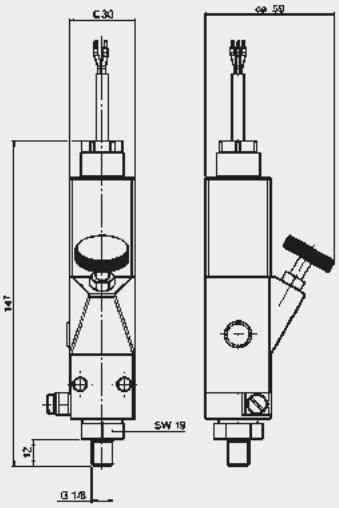
Type of indication	visual, red pin
Weight	44 g
Pressure setting or indication range	2 bar -0.2 bar
Permitt. operating pressure	7 bar
Permitt. temperature range	-10 °C to +100 °C
Thread	G 1/2
Max. torque	15 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VR 2 B.0 /-2GC-SO174



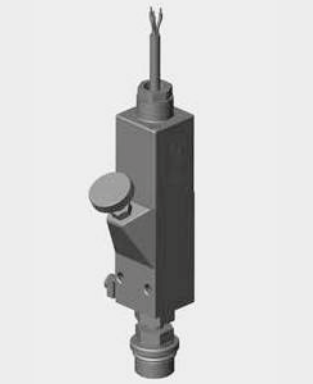
VMF x C.x /-Ex2G

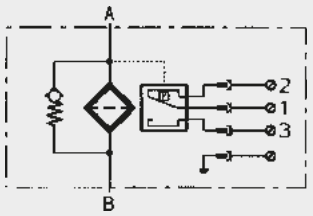


Type of indication	electrical switch
Weight	415 g
Pressure setting or indication range	2 bar ±0.5 bar
Permitt. operating pressure	200 bar
Permitt. temperature range	-20 °C to +70 °C (T6)/-20 °C to +80 °C (T5)
Thread	G 1/8
Max. torque	10 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	250 V
Electrical connection	Cable connection PG 9 Cable length 2 m
Max. switching voltage at resistive load	62.5 W = 250 VA ~
switching capacity	Ohmic 0.25 A at 250 V = Ohmic 1 A at 250 V ~
Protection class to DIN 40050	IP 65
ATEX designation	Ⓔx II 2G EEx d IIC T6 / T5
Order example	VMF 2 C.0 /-Ex2G

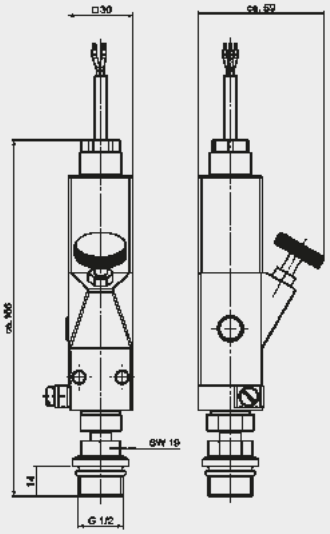


VR x C.x /-Ex2G

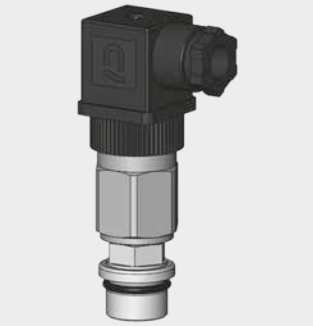


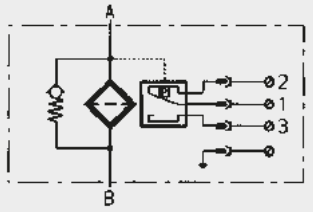


Type of indication	electrical switch
Weight	470 g
Pressure setting or indication range	2 bar ±0.5 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-20 °C to +70 °C (T6)/-20 °C to +80 °C (T5)
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	250 V
Electrical connection	Cable connection PG 9 Cable length 2 m
Max. switching voltage at resistive load	62.5 W = 250 VA ~
switching capacity	Ohmic 0.25 A at 250 V = Ohmic 1 A at 250 V ~
Protection class to DIN 40050	IP 65
ATEX designation	Ex II 2G Ex d IIC T6 / T5
Order example	VR 2 C.0 /-Ex2G

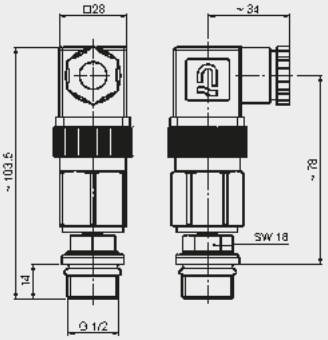


VR x C.x (ATEX) Can be used on filters up to Zone 1 *





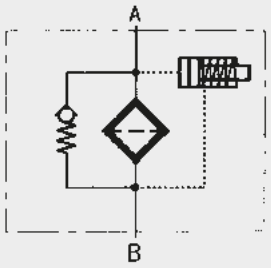
Type of indication	electrical switch
Weight	340 g
Pressure setting or indication range	2 bar ±0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G 1/2
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	*
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	*
switching capacity	*
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VR 2 C.1 /-2GBC



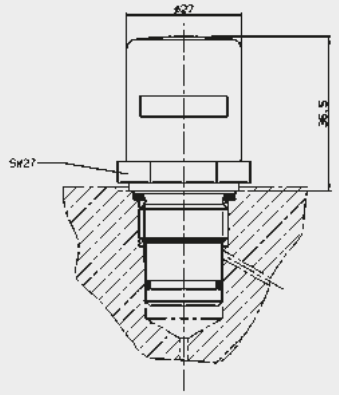
* The clogging indicator is simple electrical operating equipment according to DIN EN 60079-14 and may only be used in intrinsically safe circuits (supplied with manufacturer's declaration and operating instructions).

3.5.2 DIFFERENTIAL PRESSURE

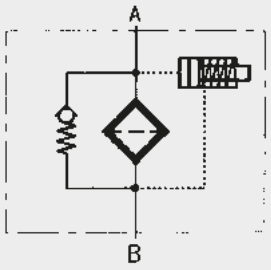
VM x B.x (ATEX) Can be used on aluminium filters up to Zone 1



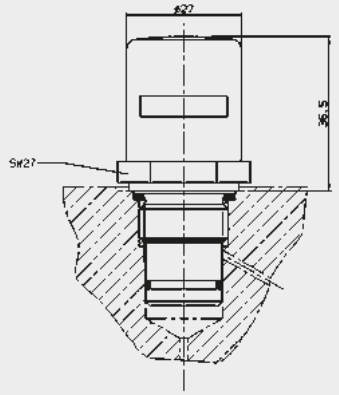
Type of indication	visual, red/green band Automatic reset
Weight	110 g
Pressure setting or indication range	5 bar -10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G $^1/_2$
Max. torque	33 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VM 5 B.1 /-2GC



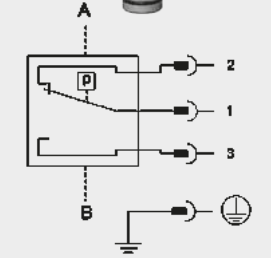
VD x B.x (ATEX) Can be used on filters up to Zone 1



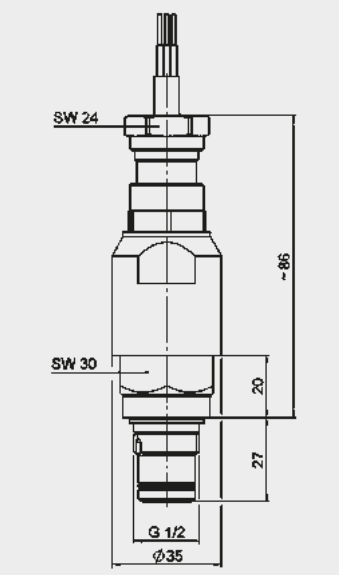
Type of indication	visual, red/green band Automatic reset
Weight	110 g
Pressure setting or indication range	5 bar -10% 8 bar ±10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G $^1/_2$
Max. torque	100 Nm
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
switching capacity	-
Protection class to DIN 40050	-
Order example	VD 5 B.1 /-2GC



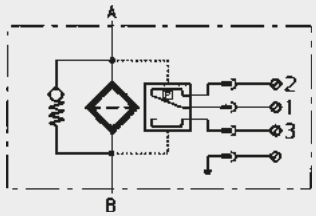
VD x C.x /-2GEXDIIC



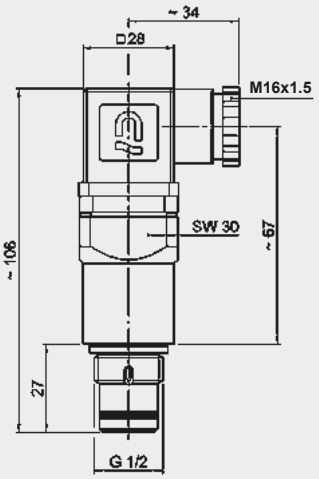
Type of indication	electrical switch
Weight	from 600 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-20 °C to +60 °C (setting) (media temperature max. 75 °C)
Thread	G $^1/_2$
Max. torque	100 Nm
Switching type	Change-over
Max. switching voltage	250 V
Electrical connection	Cable connection
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	ohmic 3 A at 24 V = ohmic 0.03 A to 5 A at 250 V ~
Protection class to DIN 40050	IP 66
ATEX designation	Ⓔx II 2G Ex d IIC T6
Order example	VD 2 C.1 /-2GEXDIIC



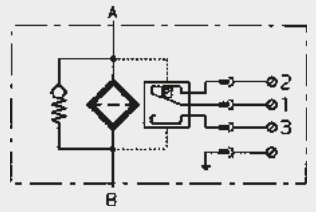
VM x C.x (ATEX) Can be used on aluminium filters up to Zone 1 *



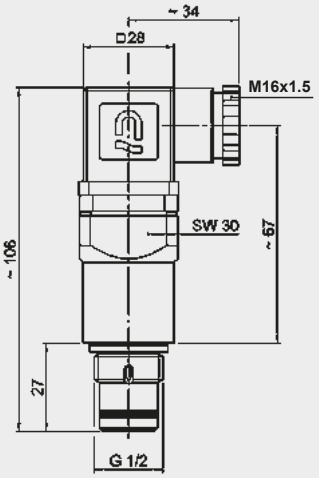
Type of indication	electrical switch
Weight	120 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G $^1/_2$
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	*
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	*
switching capacity	*
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VM 5 C.0 /-2GBC-SO135



VD x C.x (ATEX) Can be used on filters up to Zone 1 *



Type of indication	electrical switch
Weight	120 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G $^1/_2$
Max. torque	100 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	*
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	*
switching capacity	*
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VD 5 C.0 /-2GBC-SO135

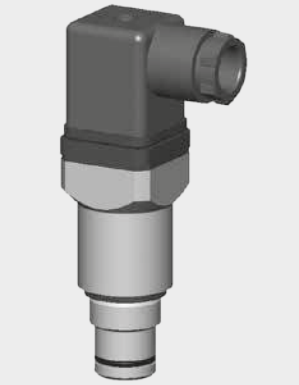


* The clogging indicator is simple electrical operating equipment according to DIN EN 60079-14 and may only be used in intrinsically safe circuits (supplied with manufacturer's declaration and operating instructions).

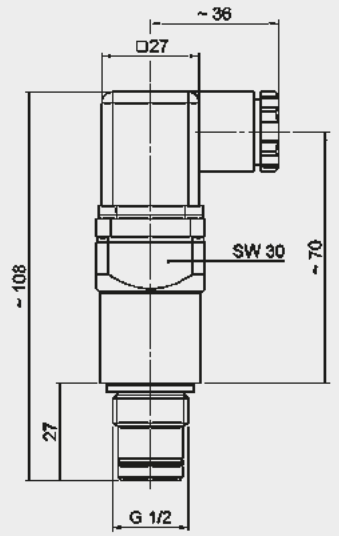
3.6 INDICATORS WITH UL OR CSA APPROVAL

3.6.1 DIFFERENTIAL PRESSURE

VM x C.x (UL, Standard 508)

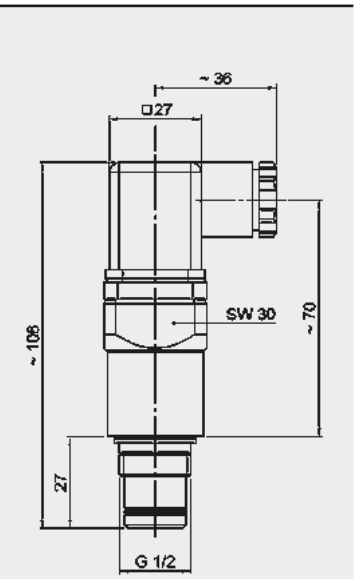


Type of indication	electrical switch
Weight	120 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	210 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G $^1/_2$
Max. torque	33 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	115 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	ohmic 3 A at 24 V =
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VM 5 C.0 /-CRUUS

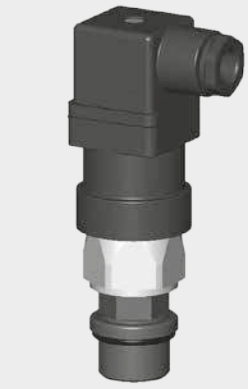


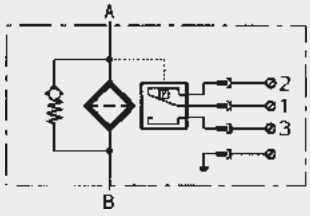
VD x C.x (UL, Standard 508)

Type of indication	electrical switch
Weight	120 g
Pressure setting or indication range	2 bar -10% 5 bar -10% 8 bar ±10%
Permitt. operating pressure	420 bar
Permitt. temperature range	-30 °C to +100 °C
Thread	G $^1/_2$
Max. torque	100 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	115 V
Electrical connection	Male connection M20 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	60 W = 100 VA ~
switching capacity	ohmic 3 A at 24 V =
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VD 5 C.0 /-CRUUS

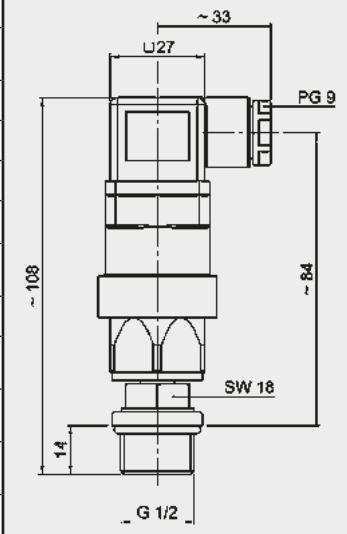


3.6.2 RETURN LINE
VR x C.x (CSA)





Type of indication	electrical switch
Weight	340 g
Pressure setting or indication range	2 bar -0.3 bar
Permitt. operating pressure	40 bar
Permitt. temperature range	-5 °C to +120 °C
Thread	G $^1/_2$
Max. torque	30 Nm
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	230 V
Electrical connection	Male connection PG 9 Female connector to DIN EN 175301-803
Max. switching voltage at resistive load	250 W = 300 VA ~
switching capacity	ohmic 4 A at 24 V ohmic 0.3 to 4 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)
Order example	VR 2 C.0 /-CSA



4. MODEL CODE

VR 2 D . X /-V-L24

4.1 STANDARD CLOGGING INDICATORS

Type

VMF return line indicator; connection G $^1/_8$
VR return line indicator; connection G $^1/_2$
VRD return line indicator; for differential pressure cavity
VM differential pressure indicator; up to 210 bar operating pressure
VD differential pressure indicator; up to 420 bar operating pressure
VL differential pressure indicator; up to 25 bar operating pressure
V02 differential pressure indicator; piped separately; up to 100 bar operating pressure

Pressure setting

see particular clogging indicator

Version

B visual with automatic reset (for vertical installation only!)
BF visual, mobile
BM visual with manual reset
C electrical
CA electrical with AMP connector (Mark II)
CD electrical with Deutsch connector (DT 04-2P)
CJ electrical with AMP Junior Power Timer connector
CM electrical with M12x1 connector
CS electrical with AMP Superseal connector
D visual/electrical
E pressure gauge, horizontal
ES pressure gauge, vertical
F pressure switch
FD pressure switch with Deutsch connector (DT 04-2P)
FJ pressure switch with AMP Junior Power Timer connector
FS pressure switch with AMP Superseal connector
GC electronic
GW electronic
K pressure gauge, horizontal
LE visual/mechanical with 100% switching contact
LEM visual/mechanical with 100% switching contact and M12x1 connector
LZ visual/mechanical with 75% and 100% switching contact
M electrical, earth-switching
R pressure gauge, horizontal
RS pressure gauge, vertical
UBM visual, negative pressure
UE negative pressure gauge, horizontal
UF negative pressure switch
V visual/analogue
VE visual/analogue with 100% switching contact
VZ visual/analogue with 75% and 100% switching contact

Modification number

X the latest version is always supplied

Supplementary details

30C cold start suppression of switch outputs up to 30 °C ±5 °C
(only for C-, D-, LZ indicators; power supply only with direct current – max. 24 volts;
C and D indicators only for VD and VM; D and LZ indicators only as N/O contact)
L... lamp with appropriate voltage (24, 48, 110, 230 volts)] only for
LED 2 light-emitting diodes up to 24 volts] version "D"
OE N/C function
SO135 indicator suitable for PLC control via gold crosspoint contacts
W suitable for oil/water emulsions (HFA, HFC)
V seal made from Viton (FKM), suitable for phosphate ester fluid (HFD-R) and biodegradable oils
(must be specified for version "GW")
Addition: For VMF indicators B, LE, LZ and C/-EX2G a "/-V" must be added for a Viton version.
For all other VMF versions, the standard is V and is not specified.

Supplementary details for "GC" type

113 N/O function — pressure peak suppression up to 10 sec.; cold start suppression of switching outputs (PNP technique, positive switching) up to 25 °C
123 N/C function — pressure peak suppression up to 10 sec.; cold start suppression of switching outputs (PNP technique positive switching) up to 25 °C

Must be specified! Others on request

30C cold start suppression of switching outputs up to 30 °C (other temperatures on request)
LED 3 LEDs (green, yellow, red) in terminal box
PF floating switching outputs (due to relay in the plug)
SP analogue signal: voltage output 1-10 V] if SP or SQ are not specified
SQ analogue signal: voltage output 4 to 20 mA (current source)] "current sink" model supplied

Supplementary details to "GW" type

113 N/O function — pressure peak suppression up to 10 sec.; cold start suppression of switching outputs (PNP technique positive switching) up to 25 °C
123 N/C function — pressure peak suppression up to 10 sec.; cold start suppression of switching outputs (PNP technique positive switching) up to 25 °C

Must be specified! Others on request

Supplementary details for "LZ" type

AV	plug and connector to AUDI, VW specification
BO	plug and connector to BMW, Opel, Ford specification
BO-LED	as for BO, but with progressive LED strip
CN	electrical connection, 1 connector DIN 43651 with 3 LEDs (to CNOMO specification NF E 48-700)
DB	electrical connection, 1 connector to DIN 43651 with 3 LEDs (to Daimler-Benz and BMW specification)
D4C	plug and connector to Daimler-Chrysler specification with cold start suppression 30 °C

Supplementary details to "ATEX" type

2GC	for visual indicator type "B" with ATEX certificate
2GBC	for electrical indicator type "C" with ATEX certificate (the switch used in the indicator is a passive component according to EN 50020 and can therefore be used in intrinsically safe circuits as simple apparatus in accordance with EN 60079-14)
2GEXDIIC	for electrical indicator suitable for use in Zone 1 (Category 2), gas atmosphere, Category d (Flameproof Enclosure), Explosive subdivision IIC to ATEX directive
EX2G	Ex-protection type for the return line indicator type "C"

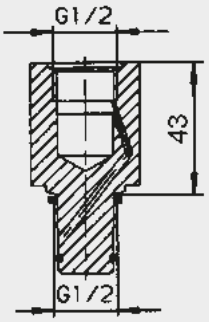
Supplementary details for "UL" and "CSA" approval

CRUUS	for electrical differential indicator type "C" with UL approval
CSA	for electrical return line indicator type "C" with CSA approval

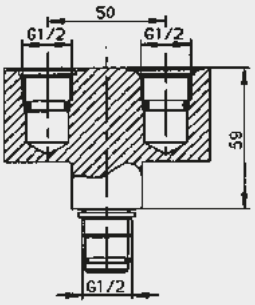
5. ADAPTERS

5.1 TYPES

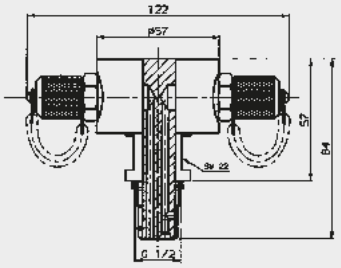
Designation	ADAPTER VD-D-S.0
Part no.	00318736
Description	Extending adapter for differential pressure cavity to HYDAC works standard HN 28-22

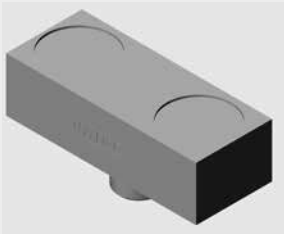


Designation	ADAPTER VD-D+D-S+S.0
Part no.	00318732
Description	Y-adapter to convert 1 differential pressure cavity into 2 differential pressure cavities according to HYDAC works standard HN 28-22. Swivel-type on request!

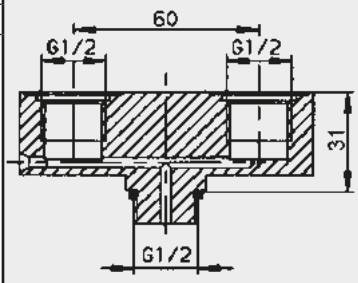


Designation	ADAPTER VD-1/4+1/4-W+W.0 /-00404337
Part no.	00404337
Description	Test adapter for different pressure cavity according to HYDAC works standard HN 28-22. To test the pressure before and after the filter element. Also available without minimess couplings (on request)!

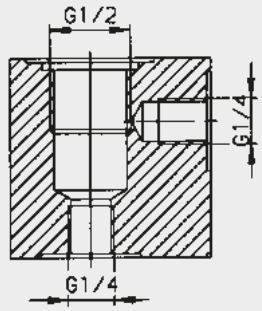




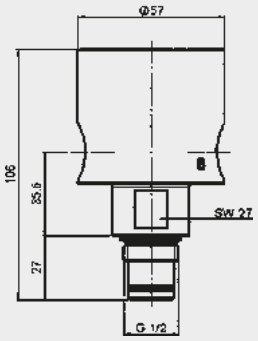
Designation	ADAPTER VR-R+R-S+S.0
Part no.	00318741
Description	Y-adapter to convert 1 return line cavity into 2 return line cavities (G ½) Swivel-type on request!

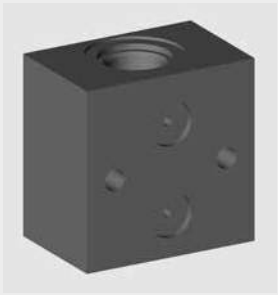


Designation	ADAPTER V ¼ I-D-S.0
Part no.	00318730
Description	Connection adapter for piping clogging indicators separately with differential pressure cavity according to HYDAC works standard HN 28-22. Two connections G ¼ (one before and one after the filter element)

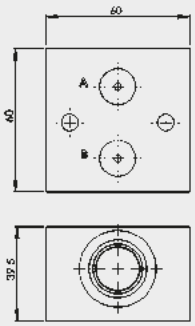


Designation	ADAPTER VD-D+1/4+1/4-S+W+W.0
Part no.	00318744
Description	Extending adapter for differential pressure cavity according to HYDAC works standard HN 28-22. Also two connections, one before and one after the filter element.





Designation	ADAPTER VF-D-S.0 /-RT
Part no.	On request
Description	only for the following filters: LFR, LPFR, MDFR, RFLR, RKMR, RMER, RMTR, RPER



5.2 MODEL CODE (= EXAMPLE)

ADAPTER VD-D+1/4+1/4-S+W+W.X /-ESB

Connection
- VD differential pressure indicator; connection G ½
- VR return line indicator; connection G ½
- V¼I differential pressure indicator; connection G ¼ internal
- VF differential pressure indicator; flange type

port 1 / port 2 / port 3

Ports (several ports are possible!)
- D differential pressure cavity G ½
- R return line cavity G ½
- MF cavity for pressure gauge and pressure switch
- 1/4 cavity G ¼ for Minimess test points (M16 x 1.5)
- 1/8 cavity G $^1/_8$ for Minimess test points (plug-in connection)

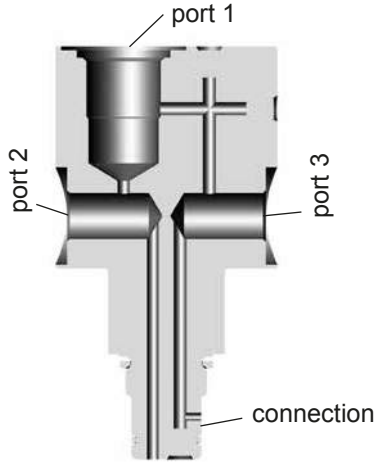
port 1 / port 2 / port 3

Orientation of the ports
- S vertical
- W horizontal

Type code
- X the latest version is always supplied

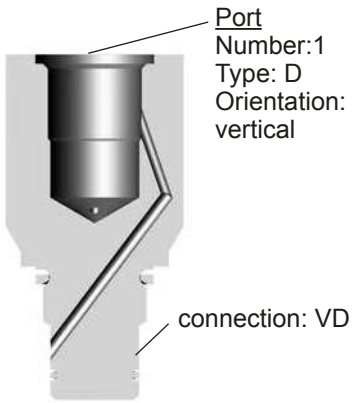
Supplementary details
- ESB swivel type
- V seal in Viton (FPM), suitable for phosphate ester (HFD-R) and biodegradable oils

VD-D+1/4+1/4-S+W+W.0

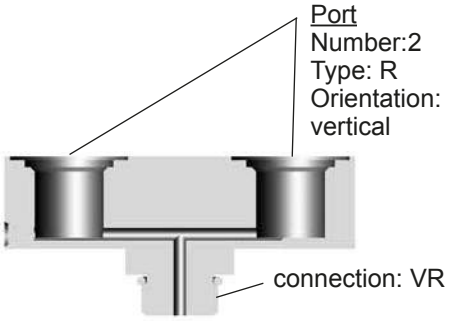


5.3 OTHER EXAMPLES

VD-D-S.0



VR-R+R-S+S.0

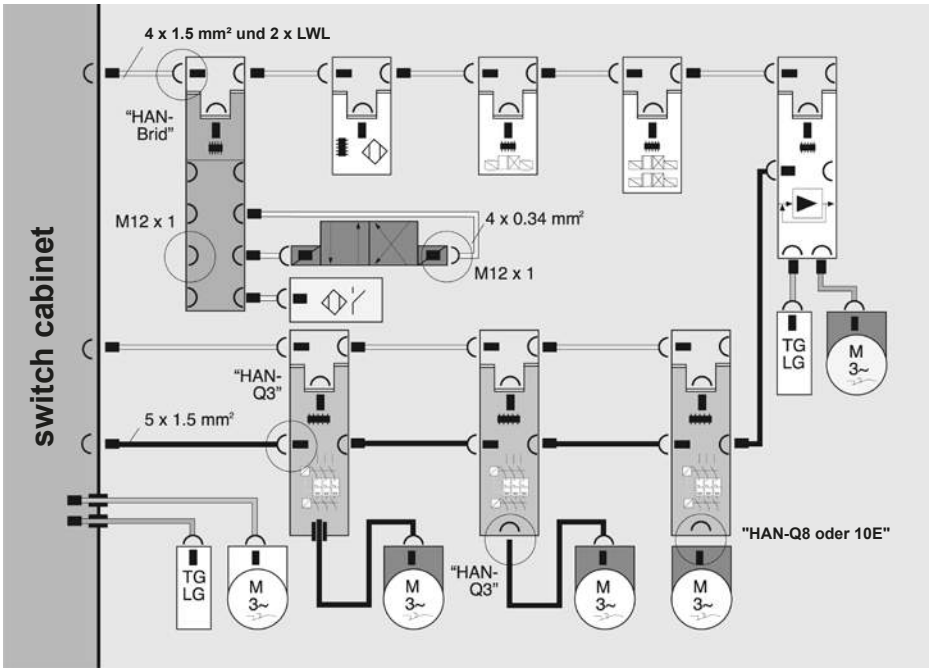


6. DESINA SPECIFICATION

DESINA is a fully comprehensive system intended to bring standardization and decentralization to the field of fluid technology and to electrical installation of machinery and systems. The system engineering, automotive and supply industries have worked together to draw up specifications of the necessary components. DESINA makes use of tried-and-tested solutions, such as open bus systems, standard industrial plugs etc.

By standardizing components, interfaces and connection systems, such as a hybrid field bus cable (Cu/LWL), a wide range of different field bus systems can be made compatible on a single physical base.

6.1. TOTAL CONCEPT FOR MACHINE TOOL INSTALLATION



6.2. CLOGGING INDICATORS

The following clogging indicators are approved to DESINA specification:

VD 5 LZ.x /-D4C
VR 2.5 LZ.x /-D4C
VD 5 LZ.x /-BO
VR 2.5 LZ.x /-BO
VD 5 LZ.x /-AV
VR 2.5 LZ.x /-AV
VR 2.5 LZ.x /-GM

all with M 12 x 1 connector!

DESINA

The DESINA logo is shown on the type code label of approved clogging indicators.

NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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E 7.050.15/11.16

Plastic Tank Systems
Standard models

Basic version
45 litres

70 litres

Premium version
45 litres

70 litres

1. TECHNICAL SPECIFICATIONS

1.1 PLASTIC TANK SYSTEMS

When ordering tank systems, the customer receives the complete system from one company, factory-tested and ready-to-install. It includes the tank, hydraulic filter, breather, fluid level gauge, with standard or special threaded connections, depending on the version. What is more, the client will also save considerably on installation, logistics and transportation costs.

Our tank systems are available in two versions: Basic and Premium.

1.2 FILTER ELEMENTS

The HYDAC filter elements used in the plastic tank systems are validated and their quality is constantly monitored according to the following standards:

ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

1.3 TANK SPECIFICATIONS

Tank volume	45 or 70 litres
Materials	PA model: Polyamide (PA6) PE model: Crosslinked polyethylene (XLPE)
Maximum operating temperatures	-25 °C to +105 °C for PA6 -30 °C to +65 °C for XLPE
Colour	Basic version: natural/transparent Premium version: black
Filtration ratings and materials	On return line filter: 10 µm abs. (Mobilmicron) On the air breather: 3 µm paper On the filler-breather filter: 3 µm paper On the suction filter: 125 µm wire mesh

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Plastic tanks are generally used where a light, space-saving design is required, typically in mobile hydraulics.

1.6 SPECIAL MODELS AND ACCESSORIES

- Clamping bands, vertical or horizontal, depending on the application (please contact the HYDAC Accessories division)
- Customized tank versions and steel tanks (please contact Filter Division Technical Sales or one of our regional offices)
- Extension for oil outlet

1.7 SPARE PARTS

See original spare parts list for the relevant filter.

1.8 COMPATIBILITY WITH OPERATING FLUIDS DIN ISO 2943:

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids to VDMA 24568 HETG, HEES, HEPG on request
- Operating fluids with high water content (>50% water content) on request

2. MODEL CODE (also order example)

Tank PE 45 SK 1 . X /- ...

Type
Tank

Material
PA polyamide
PE polyethylene

Tank size
45 45 litres
70 70 litres

Tank versions (see also point 3)

SB **Standard tank - Basic:**

- includes return line filter RFM 165 (for 45 l) or RFM 185 (for 70 l) incl. 10 µm Mobilemicron filter material
- includes air breather BF 30
- includes suction connection M48 x 2
- includes drain G 1/2 with threaded plug DIN 908

SK **Standard tank - Premium:**

- includes return line filter RFM 165 (for 45 l) or RFM 185 (for 70 l) incl. 10 µm Mobilemicron filter material
- includes filler/breather ELF 30/-KT
- includes suction filter 0070 SHB 125 W /-M48 (DN32)
- includes fluid level gauge FSA
- includes additional connection G 1/2
- includes additional connection G 1
- includes drain G 1/2 with threaded plug DIN 908

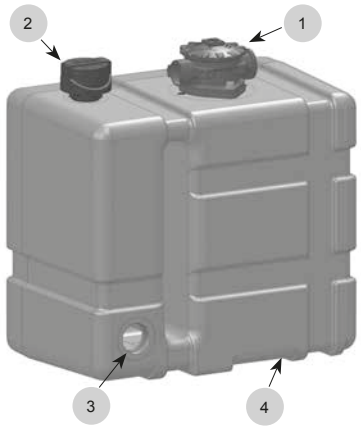
Type code
1

Modification number
X the latest version is always supplied

Supplementary details
If required

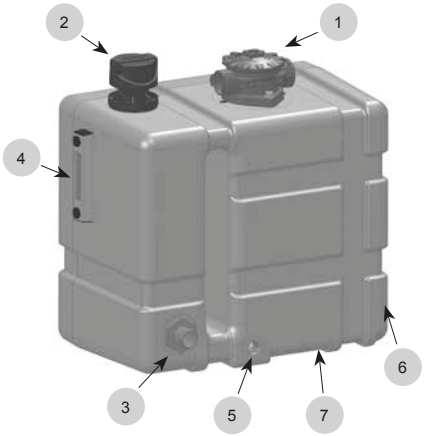
3. TANK VERSIONS

3.1 STANDARD TANK - BASIC



1. Return line filter
2. Breather filter
3. Suction port
4. Drain

3.2 STANDARD TANK - PREMIUM



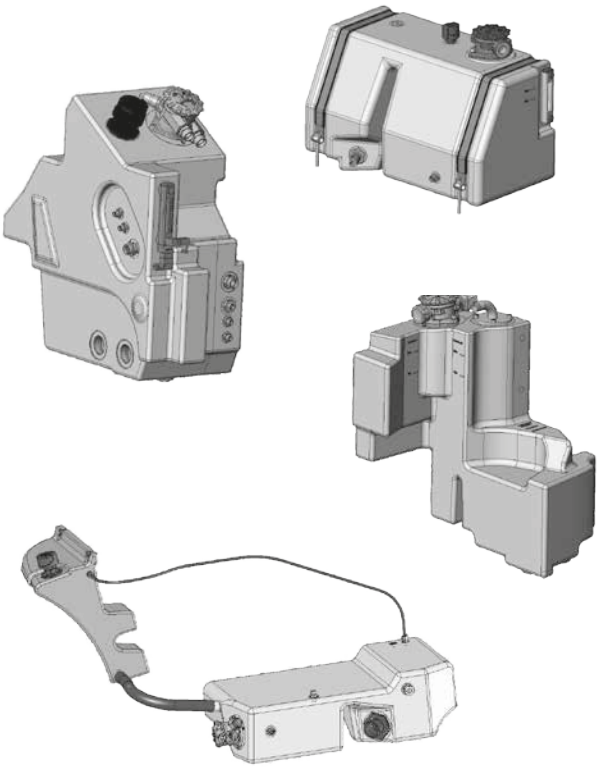
1. Return line filter
2. Filler / breather filter
3. Suction filter
4. Fluid level gauge
5. Additional return line connection
6. Additional return line connection
7. Drain

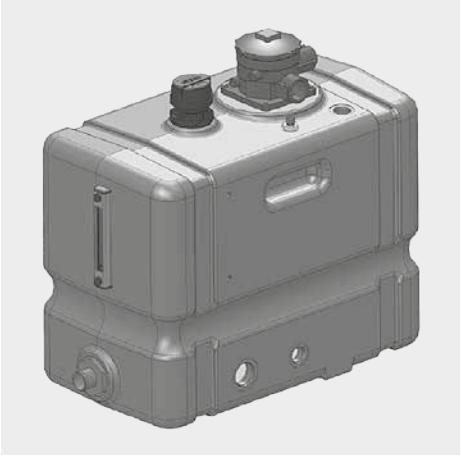
3.3 CUSTOMIZED PLASTIC TANKS

We will be pleased to discuss your particular installation requirements and answer your questions on the range of accessories.

Please contact us for further information.

Here are some examples:





TECHNICAL DESCRIPTION

Since the demand for tanks with larger filling volumes is constantly increasing, a 100 litre tank was added to the range of plastic tanks.

Material:	PA6
Max. operating temperatures:	-20…+100 °C
Version:	Standard tank - Premium

MODEL CODE

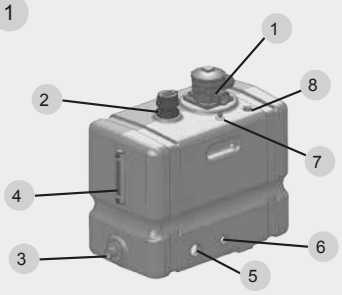
Tank PA 100 SK 1 . X /- ...

Type
Tank

Material
PA polyamide

Tank size
100 100 litres

Tank versions
SK
- with return line filter RFM 210 incl. 10µm Betamicron®-filter material (BN4HC) 1
- with filler / breather filter ELF 30 2
- with suction filter 0110 SHB 125 W 3
- with fluid level gauge FSA 4
- with additional connection M48 x 2 5
- with additional connection G 1 6
- with additional connection M22 x 1.5 7
- with additional connection G 1 8

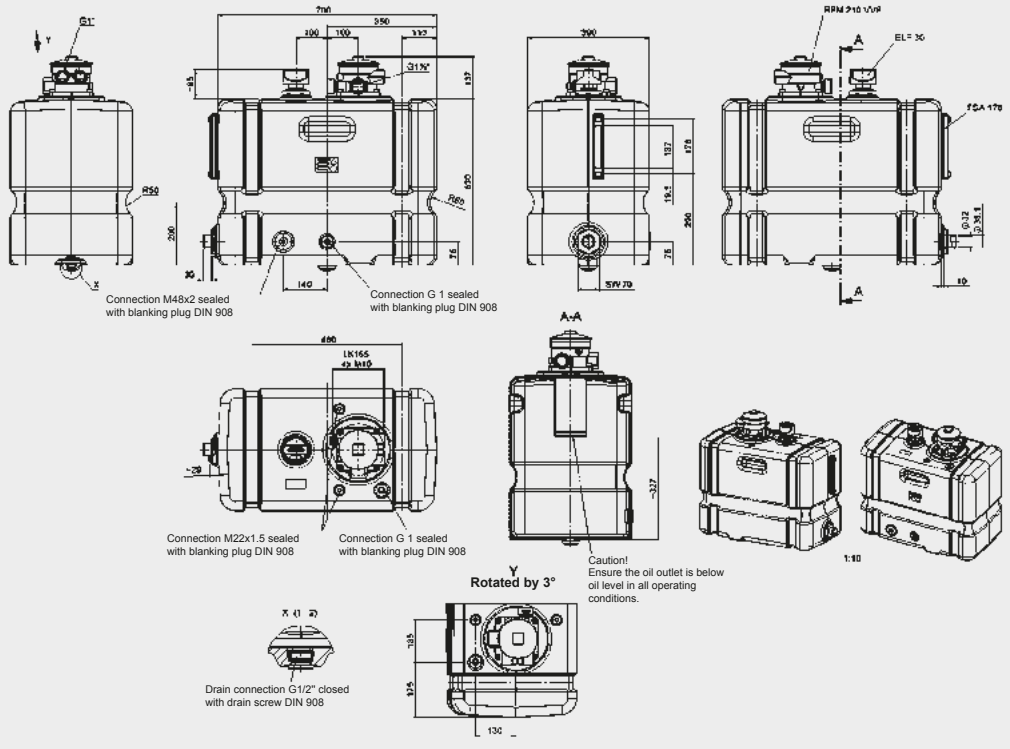


Type code
1

Modification number
X the latest version is always supplied

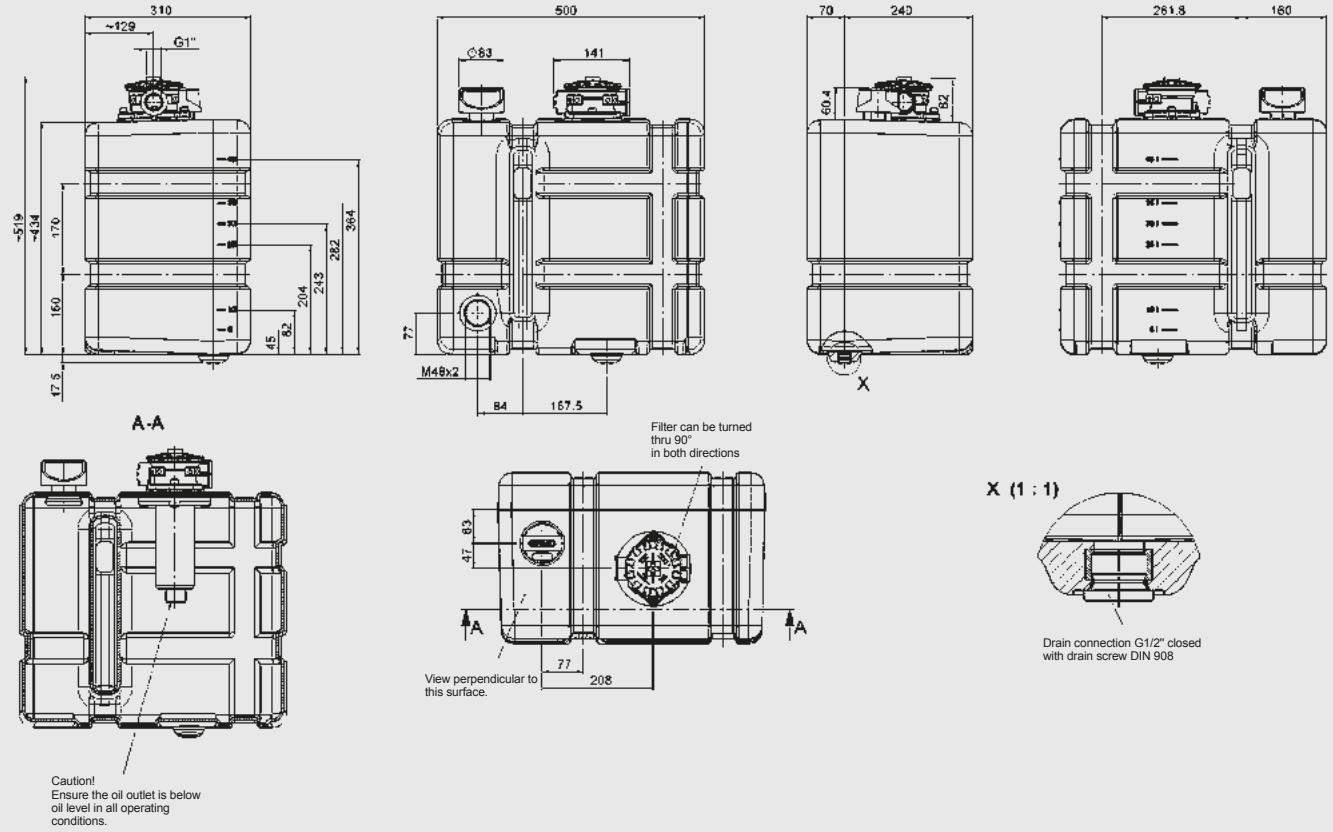
Supplementary details
If required

DIMENSIONS

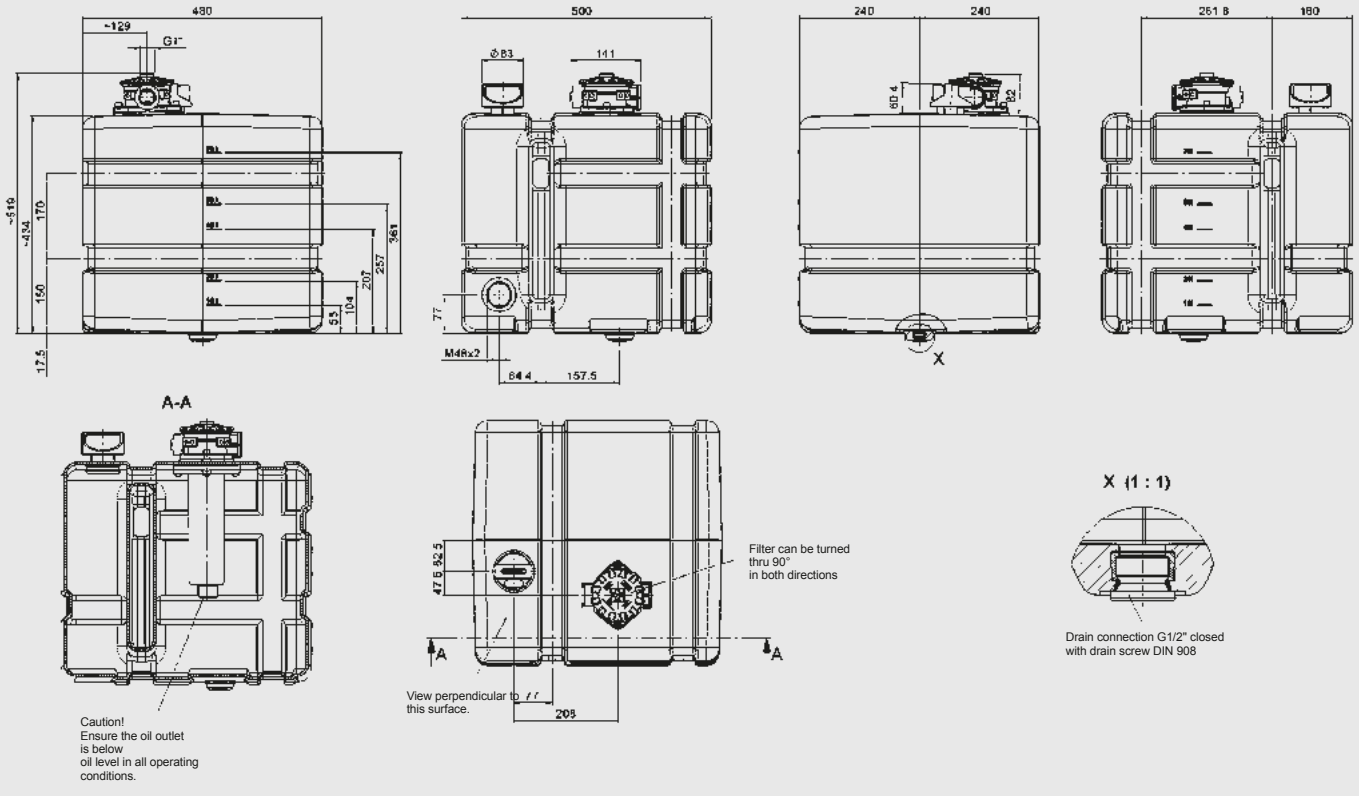


5. DIMENSIONS

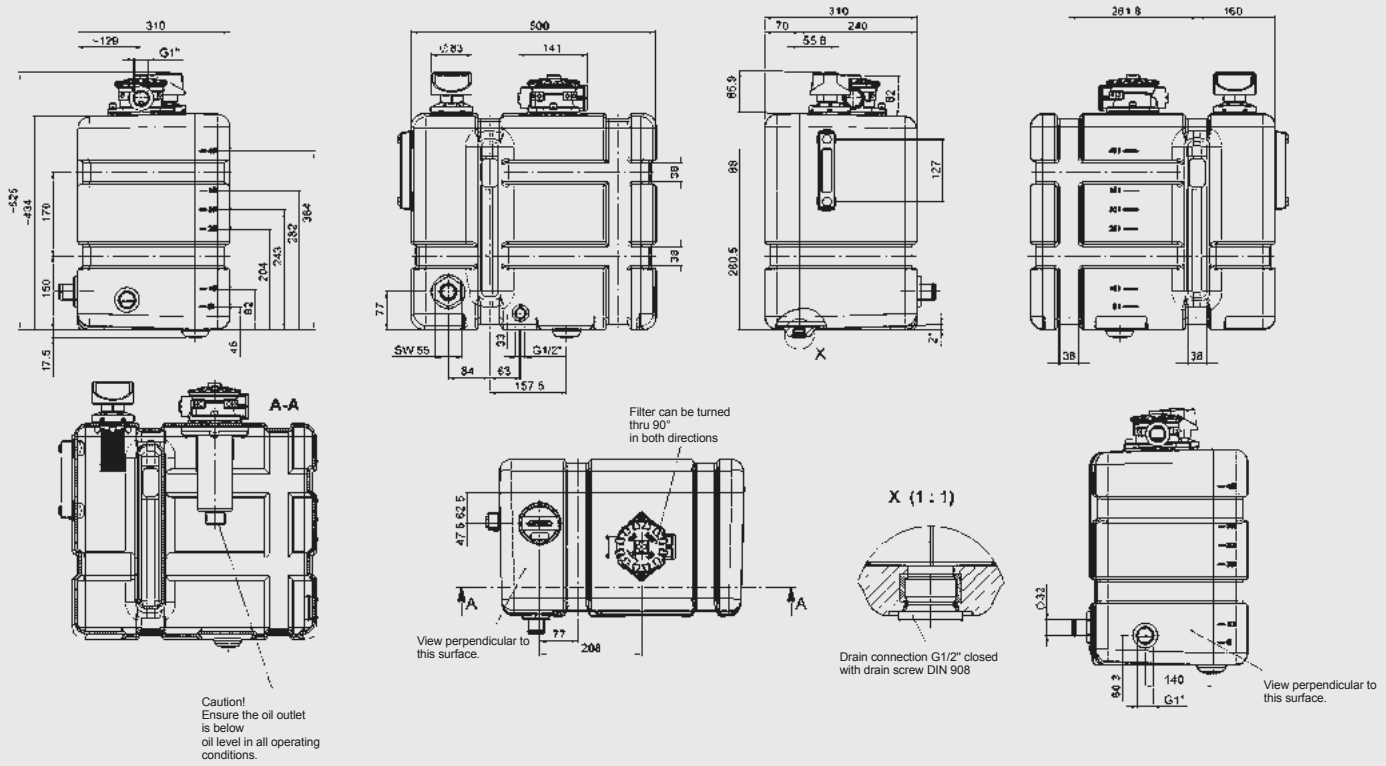
5.1 BASIC VERSION 45 LITRES



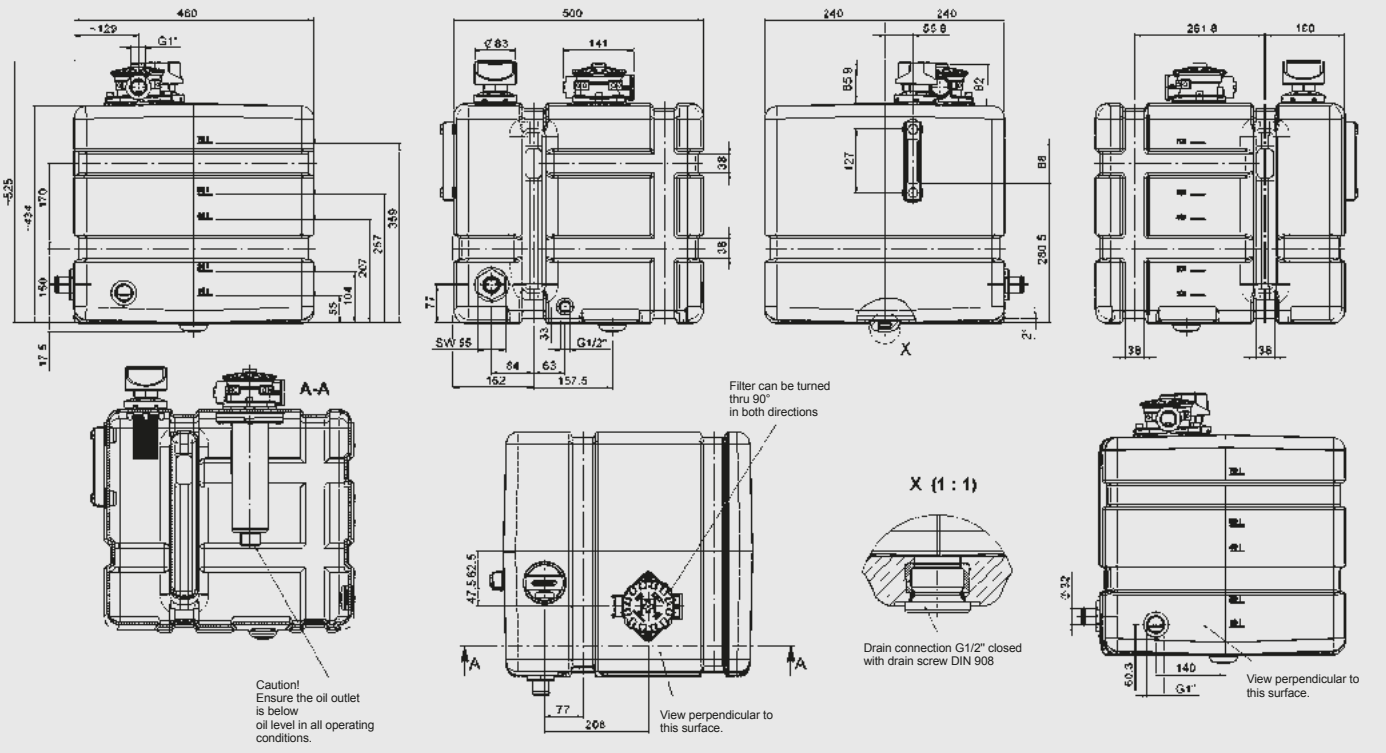
5.2 BASIC VERSION 70 LITRES



5.3 PREMIUM VERSION 45 LITRES



5.4 PREMIUM VERSION 70 LITRES



NOTES

NOTE

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Subject to technical modifications.

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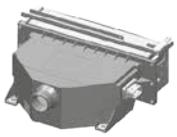
CabinAirCare CACR
Housing external/internal to the vehicle

Steel housing mounted on cab

Plastic housing mounted on cab

Plastic housing installed in cab



1. TECHNICAL SPECIFICATIONS

1.1 CABINAIRCARE

Due to increasingly large loads and the tightening of requirements for air purity in vehicle cabs in sectors such as the construction and agricultural industries, existing systems for vehicle air conditioning and air filtration are no longer sufficient. The number of ultrafine particles is sometimes alarmingly high, be it due to the frequent use of combustion engines or technical improvements in pre-filtration. These ultrafine particles and nanoparticles not only collect in the lungs, but due to their size they also enter the bloodstream and spread throughout the human body. This may cause vulnerabilities to diseases such as asthma and cardiovascular illnesses. This has now been recognised by the authorities, and legal regulations will be passed to account for these changes in the environmental conditions. To meet these demands and, of course, to provide a healthy cab climate conducive to effective working, HYDAC already offers highly efficient air filter systems that can be fitted or retrofitted into vehicle cabs.

1.2 FUNCTION

For the filtration of airborne pollutants, including nano-particles and gases.

1.3 APPLICATION BENEFITS

HYDAC provides designs for specific target groups and, as required, adjustment of the entire filter system, for example to suit agricultural applications (=CACRA; certified to DIN EN 15695), construction (=CACRB) or special applications with increased air purity requirements (rescue vehicles, sanitary cabins).

A patented closing and sealing concept offers reliable protection for employees and operators inside closed cabs and passenger compartments.

1.4 TECHNICAL SPECIFICATIONS

Air flow rate	30 – 120 m³/h (max. depending on choice of fan)
Possible overpressure in vehicle cab	25 Pa – 300 Pa (max. depending on choice of fan)
Power supply	24 V DC or 12 V DC
Pressure differential across filter	between 0.4 mbar and approx. 10 mbar
Material	Plastic version: PA66-GF30 Steel version: DC01
Service life of filter stages	max. 1 year, depending on application

1.5 STANDARD DESIGN

- plastic or steel housing
- with single-stage fan control
- without internal cab pressure monitoring
- without clogging indicator
- with PU seal (= polyurethane seal)
- without cable kit

1.6 SPECIAL DESIGNS AND ACCESSORIES

- without fan control
- three-stage or automatic fan control
- with monitoring of internal cab pressure
- with internal cab display and control
- with cable kit
- with door contact switch

Others on request!

1.7 SPARE PARTS

See original spare parts lists and operating instructions for the particular CabinAirCare unit. On request.

1.8 TEST OPTIONS

- On-site measurement of airborne pollutants at customer's premises
- In-house cab air test bench to DIN EN 15695-1
  This specially developed cab test bench can be used to test mobile cabs for system suitability (e.g. leaktightness) and to certify them to DIN EN 15695-1 with a suitable filter system.

E 7.016.1.5/11.16

2. MODEL CODE (also order example)

2.1 CabinAirCare – agricultural (to DIN EN 15695)

2.1.1 Mounted on cab

CACRA AK 52 V 12 W 2.0 /-000 - HMI1 - KIDU1 - KK

Type
CACRA CabinAirCare – agricultural

Version
AK plastic housing, mounted on cab
AS steel housing, mounted on cab

Fan specification
40 Pressure Plus – basic (without controller – only for "AK" version)
41 Pressure Plus – 3stage (in 3 stages)
42 Pressure Plus – dynamic (automatic fan control)
50 Premium – basic (without controller)
51 Premium – 3stage (in 3 stages)
52 Premium – dynamic (automatic fan control)

Coarse filter stage
V pre-filter

Electrical connection
0 12/24 V DC
12 12 V DC
24 24 V DC

Type of clogging indicator
W no clogging indicator

Type code
2 standard

Modification number
X the latest version is always supplied

Supplementary details:

Details of filter element(s) – must be specified!
000 without filter element(s) = empty housing
121 Cat 2 – single-stage setup (= CACRE F7 B3 /-400-132)
131 Cat 3 – multiple-stage setup (=CACRE F7 A2 /-400-132 + CACRE H13 B3 /-400-132)
142 Cat 4 – three-stage setup
(=CACRE G4F7 B1 /-400-132 + CACRE H13 A2 /-400-132 + CACRE AK1 B3 /-400-132)

In-cab display and control unit
HMI1 display unit with 3-stage controller and cab inner pressure warning lamp

Cab inner pressure monitoring
KIDU1 differential pressure switch without display, with switching output

Other optional information
KK cable kit
TK door contact switch

Further versions and additions available on request

2.1.2 Installed in cab

CACRA EK 30 V 12 W 2.0 /-000 - HMI1 - KIDU1 - KK

Type
CACRA CabinAirCare – agricultural

Version
EK plastic housing installed in cab

Fan specification
30 Standard – basic (single-stage fan)
31 Standard – 3stage (in 3 stages)
40 Pressure Plus – basic (without control)
50 Premium – basic (without control)

Coarse filter stage
V pre-filter
W without

Electrical connection
0 12/24 V DC
12 12 V DC
24 24 V DC

Type of clogging indicator
W no clogging indicator

Type code
2 standard

Modification number
X the latest version is always supplied

Supplementary details:

Details of filter element(s) – must be specified!
000 without filter element(s) = empty housing
141 Cat 4 – a compact element (=CACRE F7H13AK1 B3 /-400-132)

In-cab display and control unit
HMI1 display unit with 3-stage controller and cab inner pressure warning lamp

Cab inner pressure monitoring
KIDU1 differential pressure switch without display, with switching output

Other optional information
KK cable kit
TK door contact switch

Further versions and additions available on request

2.2 CabinAirCare – construction

2.2.1 **Mounted on cab**

CACRB AK 42 V 0 W 2.0 /-000 - HMI1 - KIDU1 - KK

Type
CACRB CabinAirCare – construction

Version
AK plastic housing, mounted on cab
AS steel housing, mounted on cab

Fan specification
41 Pressure Plus – 3stage (in 3 stages)
42 Pressure Plus – dynamic (automatic fan control)
61 Standard – 3stage (in 3 stages)
62 Standard – dynamic (automatic fan control)

Coarse filter stage
V pre-filter

Electrical connection
0 12 and 24 V DC

Clogging indicator
W without clogging indicator
(visual or electric clogging indicator on request!)

Type code
2 standard

Modification number
X the latest version is always supplied

Supplementary details:

Details of filter element(s) – must be specified!
000 without filter element(s) = empty housing
201 dust ventilation – two-stage setup (=CACRE G4 A2 /-400-132 + CACRE F7 B3 /-400-132)
202 asbestos – three-stage setup
(CACRE G4 B1 /-400-132 + CACRE M6 A2 /-400-132 + CACRE H13 B3 /-400-132)

In-cab display and control unit
HMI1 display unit with 3-stage controller and cab inner pressure warning lamp

Cab inner pressure monitoring
KIDU1 differential pressure switch without display, with switching output

Other optional information
KK cable kit
TK door contact switch

Further versions and additions available on request

3. FILTER ELEMENTS

3.1 Filter groups

Filter groups	Characteristics using the example of particles and gases removed by the filter	Letter code = filter classes EN 779/EN 1822	Recommended application
Coarse dust filter for particles > 10 µm	● Insects ● Textile fibres and hair ● Sand ● Fly ash ● Pollen ● Spores, pollen ● Cement dust	G3 G4*	Pre-filters and circulation air filters for civil defence facilities, exhaust from spray booths and kitchen extraction, etc. Pollution protection for air conditioning and compact units (e.g. window-type air conditioning units, fans)
Fine dust filter for particles 0.1 – 10 µm	● Pollen ● Spores, pollen ● Cement dust ● Particles that cause staining or dust deposits ● Bacteria and germs on host particles	M5 M6 F7*	Pre-filters and circulation air filters in central ventilation systems, final filters in air conditioning systems for offices and production facilities, control centres, hospitals, IT centres, pre-filters for active carbon filters
Combination of coarse and fine dust filters	Example: G4F7 = G4+F7		
HEPA filter for particles 0.1 – 1 µm	● Oil vapour and soot in original state ● Germs, bacteria, viruses ● Airborne radioactive particles	H12 H13*	Final filters for clean rooms to Class 100,000 or 10,000 Final filters for civil defence facilities, exhaust filters for nuclear installations
Nano-filtration	● Absolute filtration of particles < 0.3 µm of > 99%	NF	Absolute filters for the strictest demands for air in the cab
Gas filtration (active carbon element)	● Gas filter in accordance with EN 15695-2 ● Other gases on request	AK1* AK2	Category 4 cabs in accordance with EN 15695-1
Combination of HEPA filter and/or nano-filter and gas filter	Example: H13AK1 = H13+AK1		

* Preferred range

3.2 Type code – filter element CACRE – agricultural (DIN EN 15695)

CACRE F7 B1 /-400-132

Type
CACRE

Filter stage(s)
F7 filter stage F7 (EN 779)
H13 filter stage H13 (EN 1822)
AK1 filter stage AK1 for Cat. 4 application (EN 15695-2)
G4F7 compact stage (comprising G4 and F7 – EN 779)
F7H13AK1 compact stage (comprising F7, H13 and AK1 – Cat. 4 – EN 15695-2)

Element depth
A 50 mm (only for on-cab mounting)
B 100 mm

Coding
1-3 position in the on-cab mount version (see item 3.4)
3 general for in-cab version (in conjunction with cassette depth "B" = 100 mm)

Element length and height
-400-132

3.3 Type code – filter element CACRE – construction

CACRE G4 A1 /-400-132

Type
CACRE

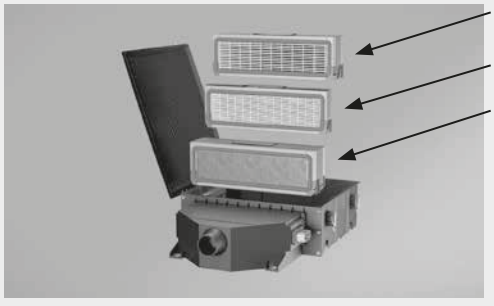
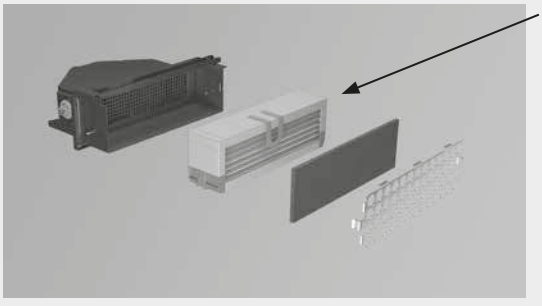
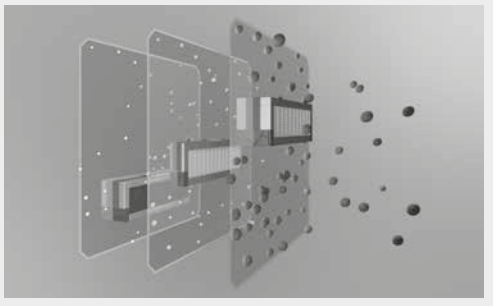
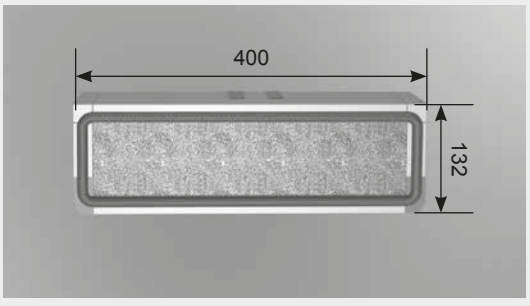
Filter stage(s)
G4 filter stage G4 (EN 779)
M6 filter stage M6 (EN 779)
F7 filter stage F7 (EN 779)
H13 filter stage H13 (EN 1822)
G4F7 compact stage (comprising G4 and F7 – EN 779)

Element depth
A 50 mm (only for on-cab mounting)
B 100 mm

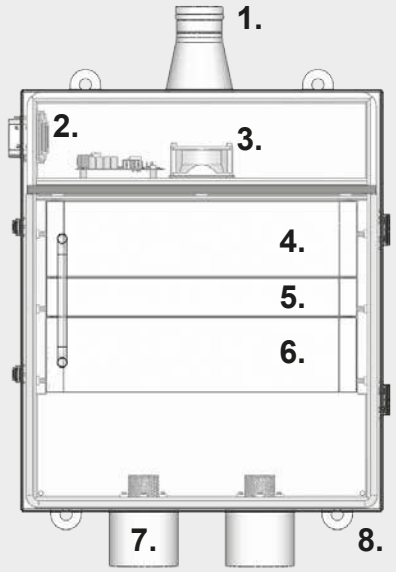
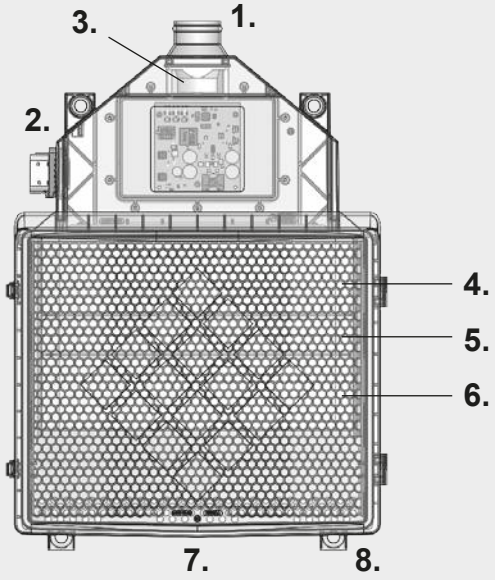
Coding
1-3 position in the on-cab mount version (see item 3.4)
3 general for in-cab version (in conjunction with element depth "B" = 100 mm)

Element length and height
-400-132

3.4 Positioning and dimensions of the filter elements

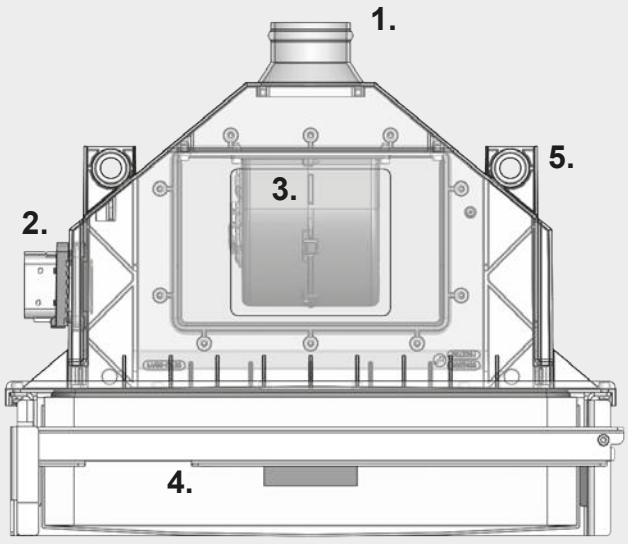
On-cab mount version	In-cab version
	
	

4. DESIGN

On-cab mount version, steel	On-cab mount version, plastic
	

1. Air vent
2. Control and plug-in connection
3. Suction fan
4.-6. Filter elements
7. Air inlet
8. Mounting point

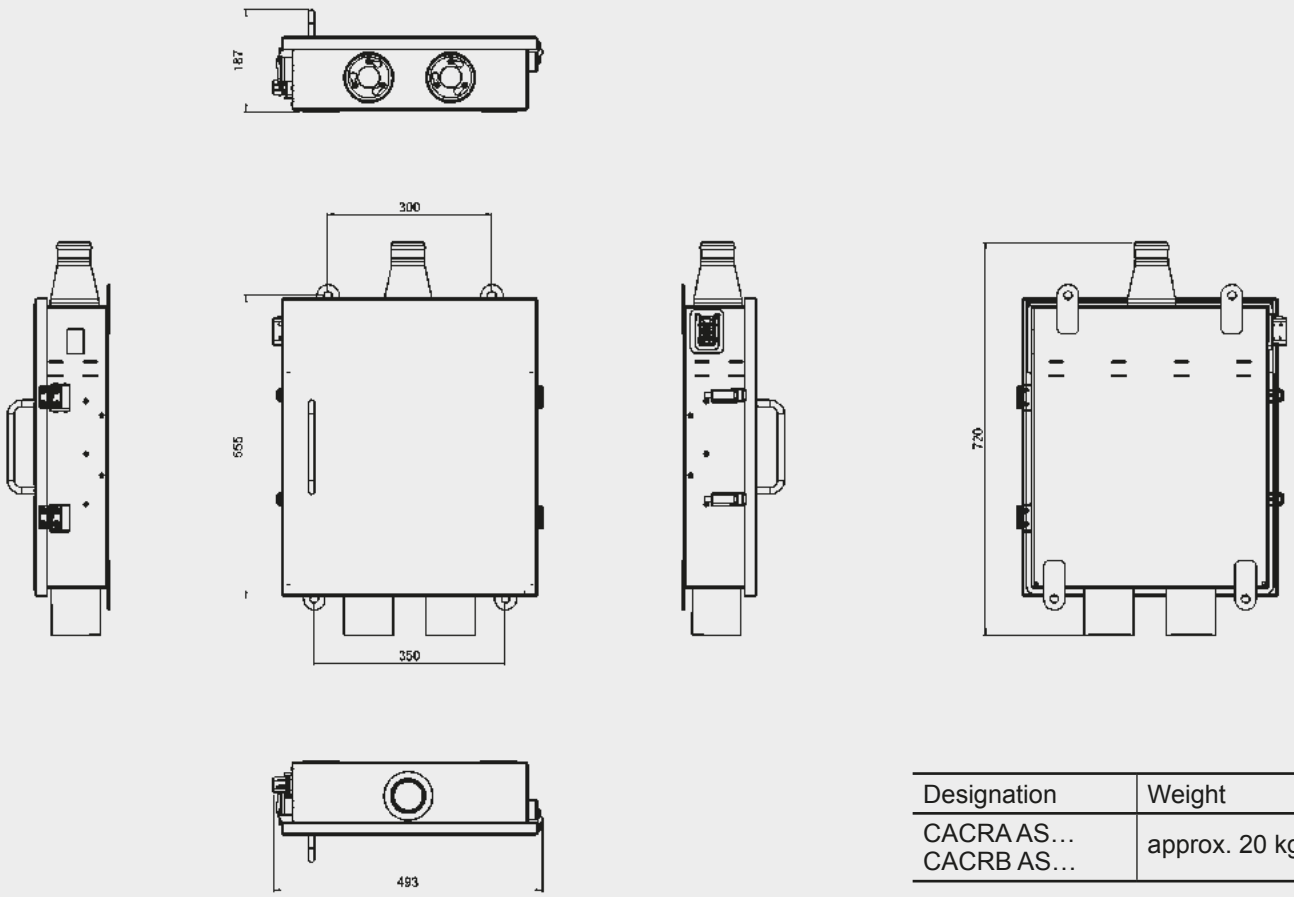
In-cab version, plastic



1. Air vent
2. Plug-in connection
3. Suction fan
4. Compact element
5. Mounting point
6. Air inlet (via element – not shown)

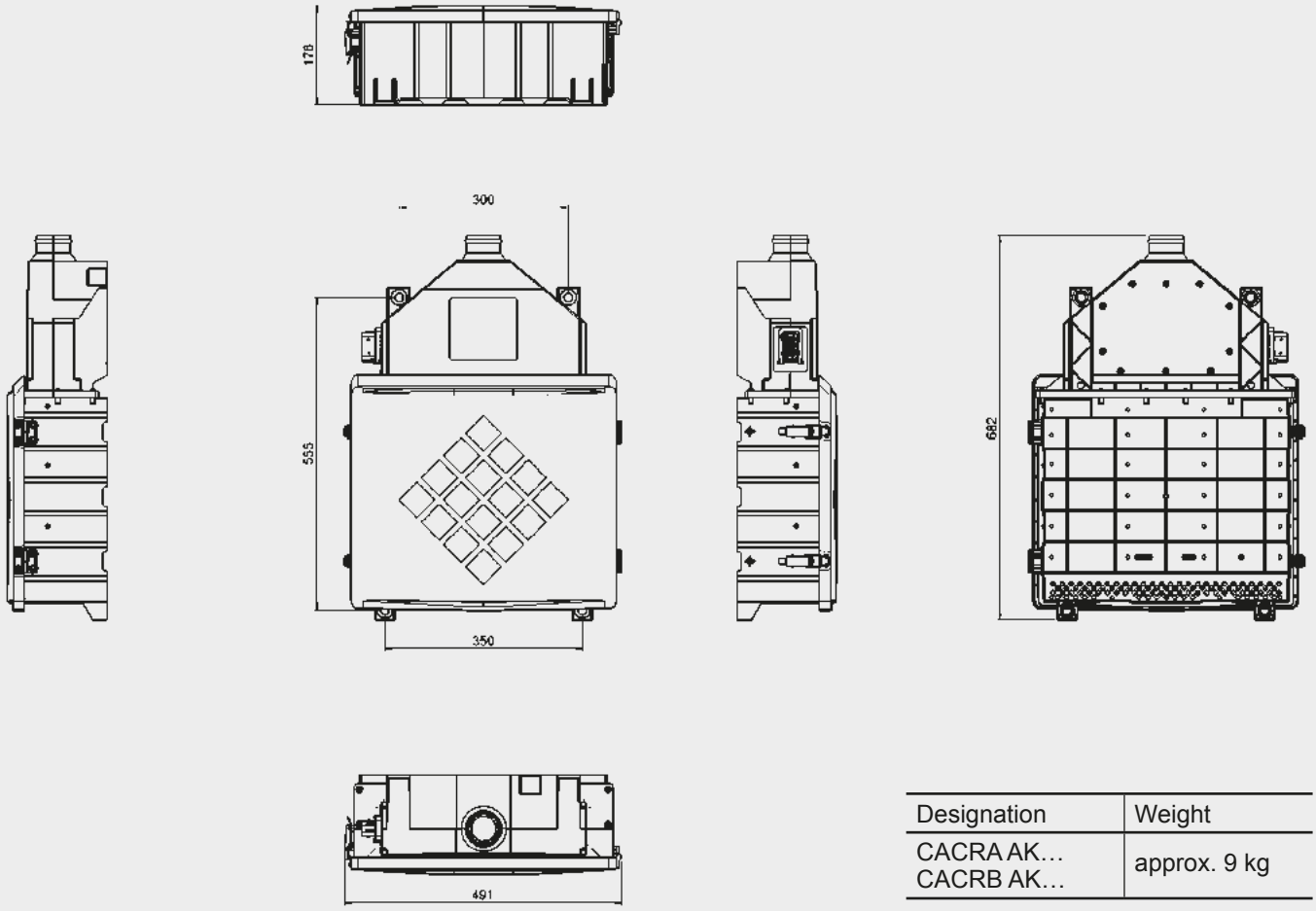
5. DIMENSIONS

5.1 ON-CAB MOUNT VERSION, STEEL HOUSING



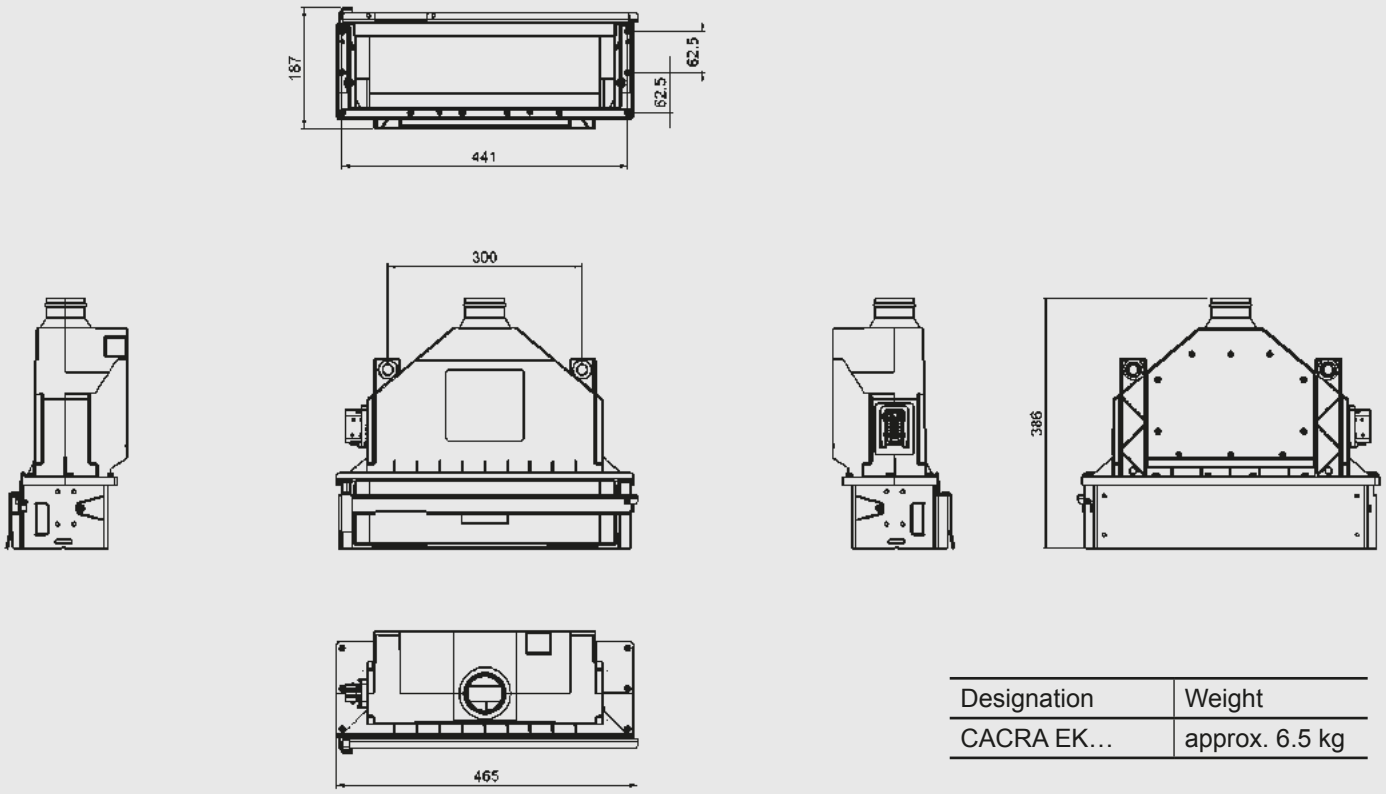
Designation	Weight
CACRA AS… CACRB AS…	approx. 20 kg

5.2 ON-CAB MOUNT VERSION, PLASTIC VERSION



Designation	Weight
CACRA AK… CACRB AK…	approx. 9 kg

5.3 IN-CAB VERSION, PLASTIC VERSION



Designation	Weight
CACRA EK…	approx. 6.5 kg

NOTE

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Subject to technical modifications.

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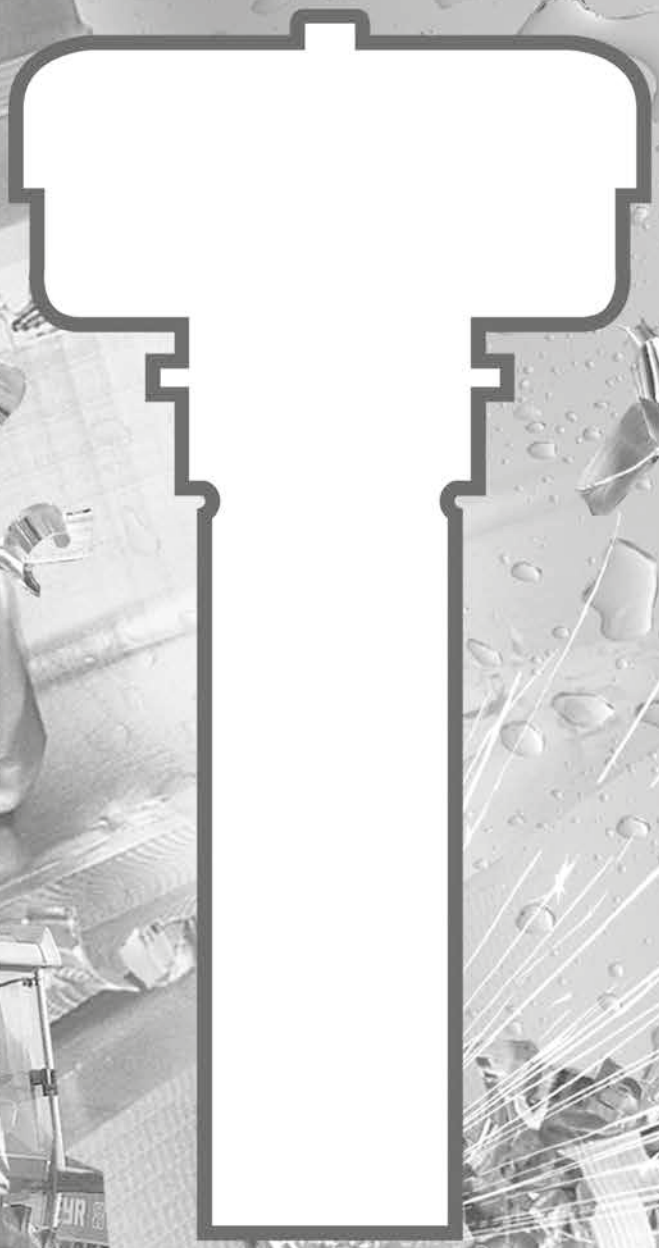
E 7.016.1.5/11.16

HYDAC INTERNATIONAL

Breathers and Filler Breathers



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Your Professional Partner for Breathers and Filler Breathers.

HYDAC Quality.

HYDAC's filtration technology is the culmination of rigorous laboratory testing as well as practical field-testing. It offers a complete range of filters for liquid and gaseous media. The HYDAC Filter Division manufactures products tailored to market requirements and to the highest quality standards, backed by modern machinery and a large production capacity. HYDAC Filtration Technology is based on intensive basic research, technical problem solving, specific customer requirements, and international standardization.

HYDAC Products.

Our wide range of products, combined with our expertise in development, manufacturing, sales and service enables the widest range of requirements to be met worldwide.

Our quality and environment certification to ISO 9001/2000 and ISO 14001 denote first class quality and responsible management of our resources.

System solutions. One supplier. One contact.

Wherever you need us, we are there to help you find the most effective solution – for every application, from components to a complete system.

HYDAC is represented in all industries.

For more than 50 years and with over 8,000 employees, 45 overseas subsidiaries and over 500 sales and service partners worldwide, we are in close contact with our customers, providing engineering advice, production, installation and service.
Core industries include:

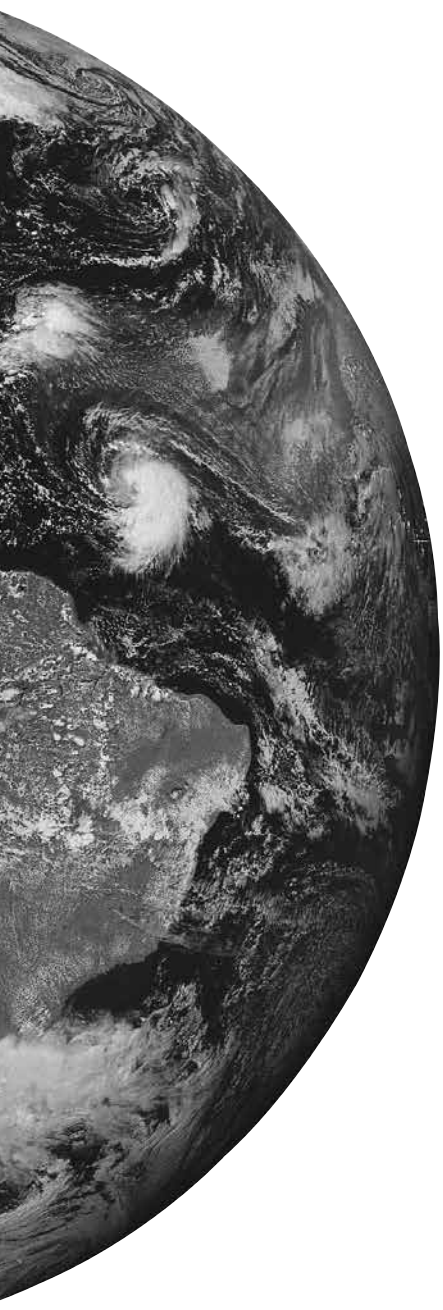
Mobile Hydraulics:

- Construction Machinery
- Agricultural Machinery
- Municipal Machines
- Fork Lifts
- Mining Machinery

Industrial Hydraulics:

- Machine Tools
- Injection Moulding Machines
- Paper Industry
- Power Plant Technology
- Mining
- Automotive Industry
- Iron/Steel/Metal Production
- Oil and Gas Industry
- Wind Energy

E 7.411.3/11.16



The importance of top quality air filters.

Air filters are an essential component of every hydraulic system. They guarantee that the air drawn into the tank as a result of fluctuations in the oil level is filtered reliably.

Very often too little attention is paid to air filters, with disastrous consequences.
They are seen as mass-produced items and are selected purely on price. This misapprehension can lead to inefficiency in the system and even to failure of components.

By using first class, cost-effective HYDAC breather filters, contamination is prevented from entering the system from the air – which means:
Longer life expectancy and availability for the whole system.

Top quality filter elements.

HYDAC air filter elements consist of high quality phenolic resin impregnated paper and provide a low-cost, yet very efficient protection against airborne contamination.

In contrast to the foam material elements, phenolic resin impregnated paper is resistant to water and therefore also ensures optimum component protection when water is drawn in.

HYDAC paper elements for air filters have a filtration rating of 3 µm at a separation value of ß = 500. This corresponds to a retention rate of 99.5% for particles of 2 µm and 100% for particles of 3 µm.

Recommendations.

Higher specifications for cleanliness of the operating fluid result in increased demands on the filtration concept used. Accordingly, HYDAC recommends selecting an air filter that has at least the same filtration rating as the finest system filter in the hydraulic circuit.

The following changing intervals are recommended:

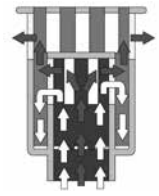
For air breathers without clogging indicator:
- Please change your air filter every 6 months or at every service interval.

For air breathers with clogging indicators:
- Please change your air filter at 0.2 pressure drop since a higher pressure drop could lead to cavitation at the pump.

Special features of the filter housing.

The durable HYDAC air filter housings are made from strong metal or glass fibre reinforced polyamide (PA6). They are particularly appropriate for the punishing demands of mobile applications.

Options:
- HYDAC's unique anti-splash feature prevents oil from splashing out of the tank via the breather filter (e.g. when the mobile machine is in driving mode)
(not available for BF 8 and 9 or BF/ELF 3 and 4).
- Visual clogging indicator (available for BF 7, 8 and 9)
- Dipstick (only on BF 10, 30)
- Integrated check/bypass valve for pressurized tanks (not for BF/ELF 10, 30 and 5)
- Custom thread (available on BF 7, 10 and 30) and cap with company logo
(available for BF/ELF 7, 10 and 30)


Anti-splash protection


Visual clogging indicator


BF 10
with dipstick

Cap with company name /
company logo


Custom thread

Breather filters and dryers.

Drymicron breather filters and dryers prevent contamination particles and water vapour from entering the tank (see "Breather Dryer BDL/BDM" and "BDE" sections of the Filter Catalogue).

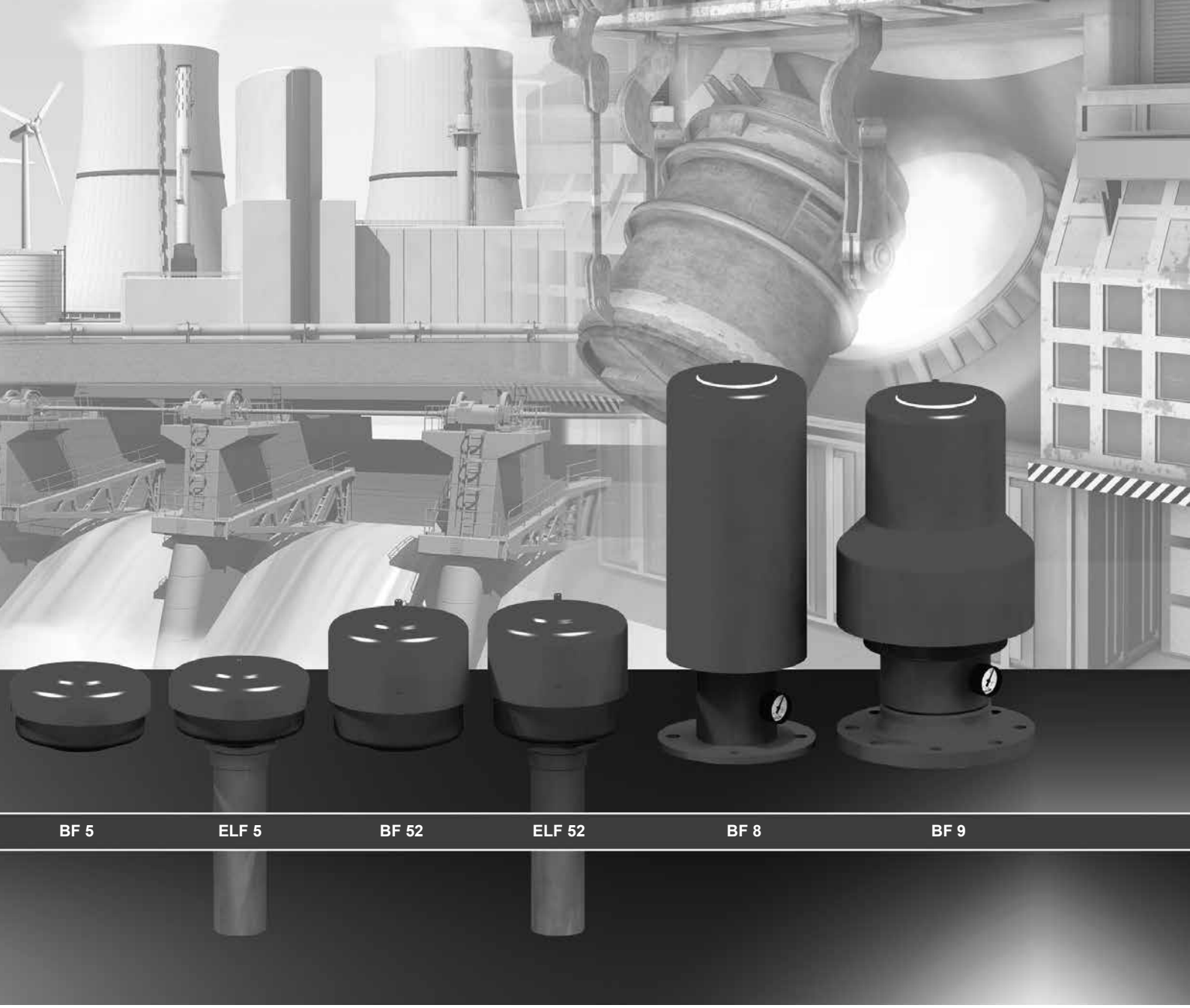

BDL / BDM


BDE

Technical data	BF 10	ELF 10	BF 4	ELF 4	BF 30	ELF 30	BF 3	ELF 3	BF 7	ELF 7	BF 72	ELF 72
Litres/min (at Δp = 0.01 bar)	200	200	125	125	400	400	400	400	1000	1000	1200	1200
Litres/min (at Δp = 0.04 bar)	380	380	340	340	880	880	880	880	1800	1800	2100	2100
Connection type	Thread	Flange	Thread	Flange	Thread	Flange	Thread	Flange	Thread	Flange	Thread	Flange
Connection size	1/2 NPT, G1/4, M22x1.5	3 hole flange	G 1/4 male	3 hole flange	G3/4, 3/4 NPT, M30x1.5, M42x2	6 hole flange	G3/4, G1/2 G3/8 male	6 hole flange	3/4 NPT, G1 male +	6 hole flange	3/4 NPT, G1 male +	6 hole flange
Element media	3 µm papier	3 µm paper	3 µm paper	3 µm paper	3 µm papier	3 µm paper	3 µm paper	3 µm paper	3 µm papier	3 µm paper	3 µm papier	3 µm paper
Replaceable element	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Material of cap	Polyamide	Polyamide	Steel	Steel	Polyamide	Polyamide	Steel	Steel	Polyamide	Polyamide	Polyamide	Polyamide
Material of strainer	–	Polyamide	–	Polyamide	–	Polyamide	–	Polyamide	–	Polyamide	–	Polyamide
Clogging indicator	–	–	–	–	–	–	–	–	Optional	Optional	Optional	Optional

Options	BF 10	ELF 10	BF 4	ELF 4	BF 30	ELF 30	BF 3	ELF 3	BF 7	ELF 7	BF 72	ELF 72
Check valve	Optional	Optional	–	–	Optional	Optional	Optional	Optional	–	–	–	–
Anti-splash	Optional	Optional	–	–	Optional	Optional	–	–	Optional	Optional	Optional	Optional
Dipstick	Optional	Optional	–	–	Optional	Optional	Optional	Optional	–	–	–	–

For sizes BF/ELF 10 to BF/ELF 72, we recommend sizing the filters according to differential pressure (Δp = 0.01bar)



Technical data	BF 5	ELF 5	BF 52	ELF 52	BF 8	BF 9
Litres/min (at v = 20 m/s)	2600	2600	3600	3600	5500	9700
Litres/min (at Δp = 0.01 bar)	3000	3000	5000	5000	10000	15000
Connection type	Thread	Thread	Thread	Thread	Flange	Flange
Connection size	G2 1/2 female +	G2 1/2, G3 male	G2 1/2 female +	G2 1/2, G3 male	DN93, 4 hole flange	DN125 8 hole flange
Element media	3 µm paper	3 µm paper	3 µm paper	3 µm paper	Betamicron	2 µm Betamicron
Replaceable element	Yes	Yes	Yes	Yes	Yes	Yes
Material of cap	Steel	Steel	Steel	Steel	Steel	–
Material of strainer	–	Steel	–	Steel	–	–
Clogging indicator	–	–	–	–	Optional	Optional

Options	BF 5	ELF 5	BF 52	ELF 52	BF 8	BF 9
Check valve	Optional	Optional	Optional	Optional	–	–
Anti-splash	–	–	–	–	–	–
Dipstick	–	–	–	–	–	–

For sizes BF 5 to BF 9, we recommend sizing the filters according to flow velocity (v = 20 m/s)

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
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Subject to technical modifications.

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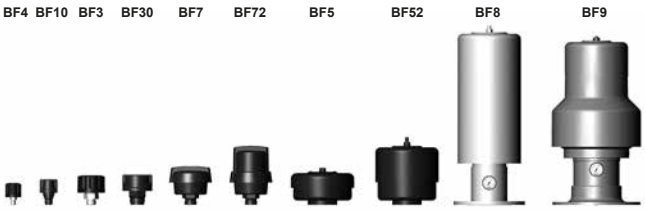
Tank Breather Filter BF

up to 11000 l/min



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

Breather filter sizes 4, 10, 3 and 30 consist of a housing which is screwed onto the oil tank, and a built-in filter element.

Sizes 5, 52, 7 and 72 have housings which are screwed onto the oil tank and have one or two exchangeable filter element(s).
BF 5 and 52 are fitted with a built-in oil mist trap as standard.

Sizes 8 and 9 consist of a flange for mounting to the tank, an exchangeable element and a cap. The BF 9 also has an oil mist trap which allows the oil to be drained via an oil drain plug.

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Contamination retention capacities in g

	Paper
BF	3 µm
4	2.9
10	2.9
3	6.2
30	6.2
7	26.1
72	52.2
5	85.1
52	170.2

The filter elements are made from phenolic resin-impregnated paper and cannot therefore be cleaned.

1.3 FILTER SPECIFICATIONS

Temperature range	-30 °C to +100 °C
Material of housing	Steel, zinc-plated/plastic coated (BF 4, 3), Steel (BF 5, 52) Steel, galvanized (BF 8) Aluminium (BF 9) Glass fibre reinforced plastic (BF 10, 30, 7, 72)
Type of clogging indicator	VMF (pressure gauge)
Pressure setting of clogging indicator	0.6 bar K pressure gauge 0.035 bar UBM indicator (others on request)

1.4 SEALS

NBR (= Perbunan) on filter
Polyurethane on element
Cardboard on mounting flange

1.5 SPECIAL MODELS AND ACCESSORIES

- with check/bypass valve to support the suction characteristics of the pump
  Not 100% air-tight or leakage-free!
  (only BF 10 (except for G¼), 3, 30, 5 and 52)
- with anti-splash device
  (only BF 10, 3, 30, 7, 72)
- with connection for a clogging indicator
  (only BF 7, 72, 8, 9)
- with manual pressure release
  (= BFPR; only BF 10)

1.6 SPARE PARTS

See Original Spare Parts List

1.7 CERTIFICATES, APPROVALS, STANDARDS

BF 7, 72 to Renault standard;
others on request

1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

The standard models are suitable for use with mineral and lubrication oils.
For fire-resistant and biodegradable oils, see tables:
Fire-resistant fluids

BF	HFA	HFC	HFD-R
4, 3, 5, 52	–	–	–
10, 30, 7, 72	●	●	–
8, 9	●	●	●

- HFA oil in water emulsion
  (H2O content ≥ 80%)
- HFC water polyglycol solution
  (H2O content 35–55%)
- HFD-R synthetic, water-free phosphate ester

Biodegradable fluids

BF	HTG	HE	HPG	
			PAG	PRG
4, 10, 3, 30	+	+	●	●
7, 72, 5, 52	+	+	●	●
8, 9	+	+	●	●

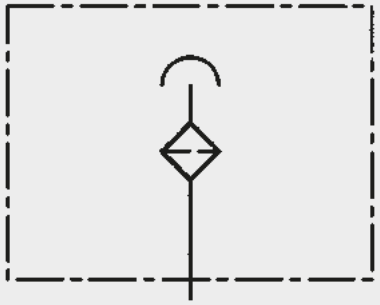
+ suitable for all
● contact our Technical Sales Department
– not suitable

- HTG vegetable oil based operating fluids
- HE ester-based synthetic hydraulic fluids
- HPG polyglycol-based synthetic hydraulic fluids
- PAG sub-group of HPG: polyalkylene glycol
- PEG sub-group of HPG: polyethylene glycol

1.9 CHANGING INTERVALS

The filter elements or filters must be replaced as frequently as the fluid filters, but at least every 12 months.

Symbol



2. MODEL CODE (also order example)

2.1 COMPLETE FILTER

2.1.1 BF 4 and 3

BF P 3 G 3 W 4 . X /-RV

Filter type
BF

Filter material
P Paper

Size of filter
BF 4, 3

Type and size of connection

Des.	Type	Connection	Filter size BF4	Filter size BF3
G	Thread ISO 228	G ¼	•	
		G ½		•
		G ¾		•
		G 3/8		•

Filtration rating in µm
P 3 (absolute)

Type of clogging indicator
W without port, no clogging indicator

Type code

Size	Code	Connection	Δp [bar]
BF 3	1.X	G ¾	-
BF 3	2.X	G 3/8	-
BF 3	3.X	G ½	-
BF 3../-RV	4.X	G ¾	0.4
BF 3../-RV	5.X	G ¾	0.7
BF 3../-RV	6.X	G ¾	0.2
BF 3../-RV	7.X	G ¾	1.0
BF 4	1.X	G ¼	-

Modification number
X the latest version is always supplied

Supplementary details
RV check/bypass valve (not for BF 4)

2.1.2 BF 10 and 30

BF P 30 G 3 W 1 . X /-RV0.2

Filter type
BF

Filter material
P Paper

Size of filter
BF 10, 30

Type and size of connection

Des.	Type	Connection	Filter size BF10	Filter size BF30
G	thread	G ¼	•	
		G 3/8	•	
	ISO 228	G ¾		•
M	metr. connection	M 42x2		•
		M 30x1.5		•
		M 22x1.5	•	
N	NPT thread	½	•	
		¾		•
U	UNF thread	1 1/16-12UN-2A	•	•

Filtration rating in µm
P 3 (absolute)

Type of clogging indicator
W without port, no clogging indicator

Type code

Size	Code	Connection
BF 30 G…	1.X	G ¾
BF 30 M…	1.X	M 42x2
BF 30 M...	2.X	M 30x1.5
BF 30 N...	1.X	NPT ¾
BF 30 U...	1.X	1 1/16-12UN-2A
BF 10 G...	1.X	G ¼
BF 10 G...	2.X	G 3/8
BF 10 M...	1.X	M 22x1.5
BF 10 N...	1.X	NPT ½
BF 10 U...	3.X	1 1/16-12UN-2A

Modification number
X the latest version is always supplied

Supplementary details
AS anti-splash without check/bypass valve
RV0.2, RV0.4, RV0.7 valve with relevant pressure setting (not for BF 10 with G 1/4)

2.1.3 BF 7 and 72

BF P 72 G 3 W 1 . X /-AS

Filter type
BF

Filter material
P Paper

Size
BF 7, 72

Type and size of connection

Des.	Type	Connection	Filter size 7	Filter size 72
G	Thread ISO 228	G 1	•	•
N	NPT-Thread	3/4	•	•
U	UNF-Thread	G 1 5/16-12UN	•	•
M	metric connection	M30 x 1.5	•	•

Filtration rating in µm
P 3 (absolute)

Type of clogging indicator
W without port, no clogging indicator
K pressure gauge (measuring range -1 to +0.6 bar) (not for BF 72)
UBM visual/analogue vacuum gauge with manual reset (pressure setting: -0.035 bar)

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
AS anti-splash device (not for model with K pressure gauge)

2.1.4 BF 5 and 52

BF P 52 G 3 W 1 . X /-RV0.4

Filter type
BF

Filter material
P Paper
BN Betamicron®

Size of filter
BF 5, 52

Type and size of connection

Des.	Type	Conn.	Filter size 5	Filter size 52
G	Thread ISO 228	G 2½	•	•
N	NPT-Thread	2½	•	•

Filtration rating in µm
BN 3, 10 (absolute)
P 3 (absolute)

Type of clogging indicator
W without port, no clogging indicator

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
RV0.4 check/bypass valve with 0.4 bar pressure setting
SO479 filter suitable for HFC fluids

2.1.5 **BF 8 and 9**

BF BN 8 F 1 A 1 . X

Filter type
BF

Filter material
BN Betamicron®
BN/AM Betamicron®/Aquamicron®

Size of filter
BF 8, 9

Type and size of connection

Des.	Type	Filter size 8	9
F	Flange	•	•

Filtration rating in µm
BN 1, 2 for BF 8
BN 2 for BF 9
BN/AM 1 for BF 8

Type of clogging indicator
A blanking plug in indicator port
K pressure gauge (measuring range -1 to +0.6 bar)

Type code
1

Modification number
X the latest version is always supplied

2.2 REPLACEMENT ELEMENT

0005 L 003 P

Size
0005 for BF 5, 52 (on BF 52: 2 x 0005 L...)
0007 for BF 7
0072 for BF 72
0008 for BF 8
0009 for BF 9

Type
L

Filtration rating in µm
P: 003 (BF 5, 52, 7, 72)
BN: 001, 002 (BF 8)
BN: 002 (BF 9)
BN: 003, 010 (BF 5, 52)
BN4AM: 001 (BF 8)

Filter material
P Paper (BF 5, 52, 7, 72)
BN Betamicron® (BF 5, 52, 8, 9)
BN4AM Betamicron®/Aquamicron® (BF 8)

Replacement elements cannot be ordered for BF 4, 10, 3, 30.

These filters are only available complete!

2.3 REPLACEMENT CLOGGING INDICATOR

VMF 0.6 K . X

Type
VMF Return line indicator

Pressure setting
0.6 -1 to +0.6 bar
0.035 -0.035 bar

Type
A blanking plug in indicator port
K pressure gauge (pressure setting -1 to +0.6 bar)
UBM visual-analogue vacuum gauge with manual reset (pressure setting: -0.035 bar)

Modification number
X the latest version is always supplied

2.4 MODEL CODE FOR BF 7 AND 72 TO RENAULT SPECIFICATION

BF P 7 F 3 UBM 0 . X

Size
7 Tank volume from 20 to 400 litres
72 Tank volume over 400 litres

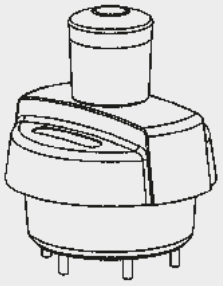
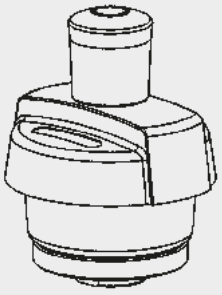
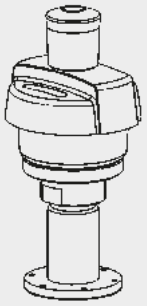
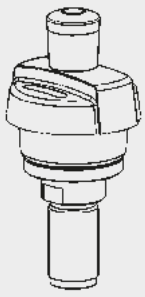
Type and size of connection

Des.	Type	Filter size 7	72
G	with threaded adapter	•	•
F	with flange adapter	•	•
S	with weld adapter	•	•

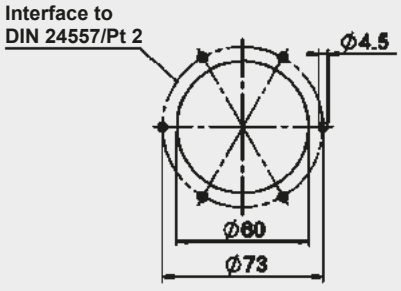
Type of clogging indicator
UBM visual analogue vacuum pressure gauge with manual reset, measuring range 0 to +0.035 bar

Type code (TKZ)
0 without adapter (basic model)
2 incl. adapter with male thread G ¾
3 incl. adapter with female thread 1½-16 UNC
4 incl. adapter with female thread G ¾
5 incl. flange adapter (1½-16 UNC)
6 incl. flange adapter (G ¾)
7 incl. weld adapter (1½-16 UNC)
8 incl. weld adapter (G ¾)
9 incl. adapter with male thread G 1¼

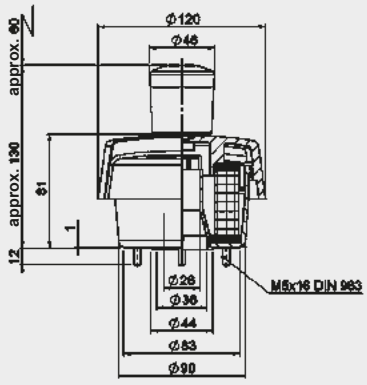
Modification number
X the latest version is always supplied
EFS Filling protection

Basic model	With threaded adapter	With flange adapter	With weld adapter
			

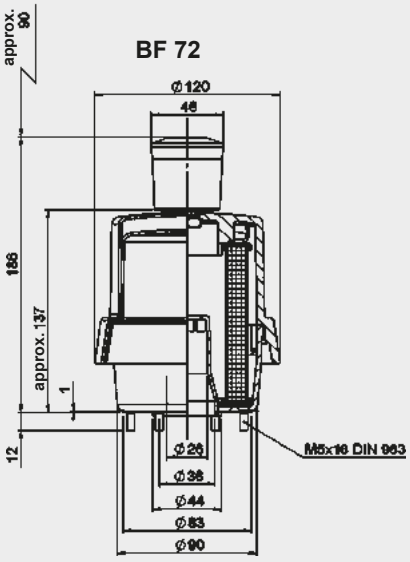
Dimensions BF 7/72 to RENAULT specification



BF 7



BF 72



For further information on the BF7/72 to Renault specification please contact HYDAC.

2.5 BREATHER FILTER WITH MANUAL PRESSURE RELIEF BFPR

MODEL CODE

Type	Filter material	Size	Type of connection	Filtration rating [µm]	Type of clogging indicator	Type code	Modification number	Supplementary details
BFPR	**P =** phenolic resin impregnated paper	**10**	**U =** 1 1/16-12UN-2A others on request	**3**	**W =** without port (no clogging indicator)	**1**	**.x =** The latest version is always supplied	**RV0.35 =** pre-charge pressure 0.35 bar **RV0.7 =** pre-charge pressure 0.7 bar **RV1.15 =** pre-charge pressure 1.15 bar Required information!

TECHNICAL DESCRIPTION

Breather filters with manual pressure release "BFPR" consist of a housing which is screwed onto the oil tank and which has an integrated air filter element.

An integrated valve allows the oil tank to be pressurized to different pressures, for example to support the pump during start-up, thereby avoiding cavitation of the pump.

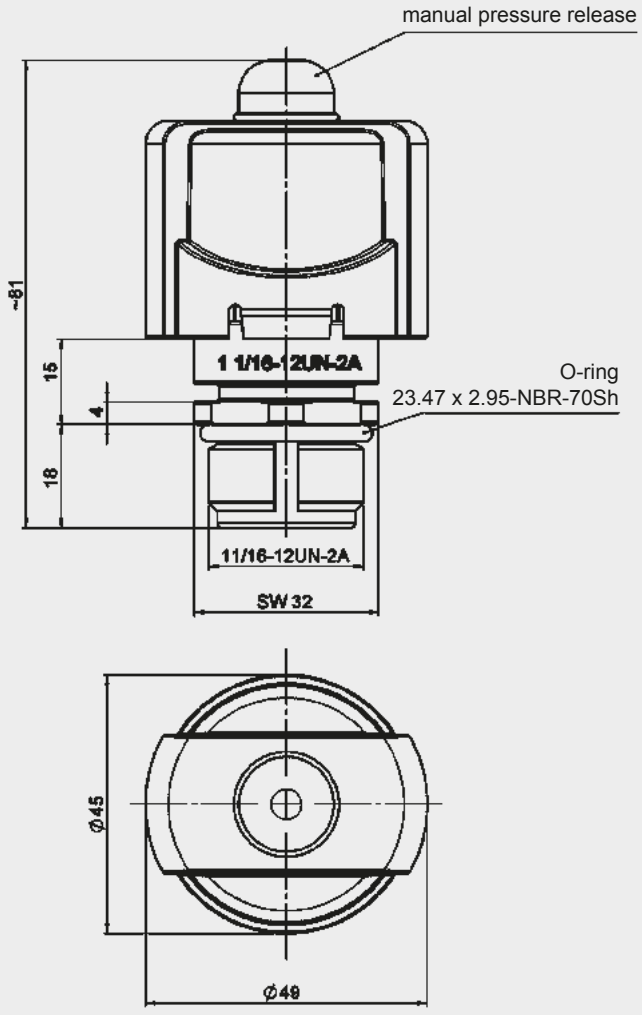
The manual pressure release function enables complete pressure release which is initiated when the pressure release button is pressed. This pressure release is required for example before carrying out maintenance on the tank and connecting pipes or hoses, to prevent potential accidents or injury by opening a pressurised system.

CAUTION:
This filter must not be used as a safety valve!

Max. flow rate:	200 l/min
Weight:	0.22 kg

Curves and further information on request.

DIMENSIONS



2.5 BREATHER FILTER BF 6 – INTEGRATED CHECK VALVE OPTION AVAILABLE

MODEL CODE

Type	Filter material	Size	Type of connection	Filtration rating [µm]	Type of clogging indicator	Type code	Modification number	Supplementary details
BF	**DRY =** Hydrophobic material **P =** Material impregnated with phenol resin	**6**	**G =** Thread G 3/4 More available on request	**5**	**W =** No clogging indicator option **K =** Pressure gauge (pressure setting -1 to +0.6 bar)	**1**	**.x =** The latest version is always supplied	**RV0.3 =** Pre-charge pressure 0.3 bar

TECHNICAL DESCRIPTION

The latest breather filter development from HYDAC is the BF 6.

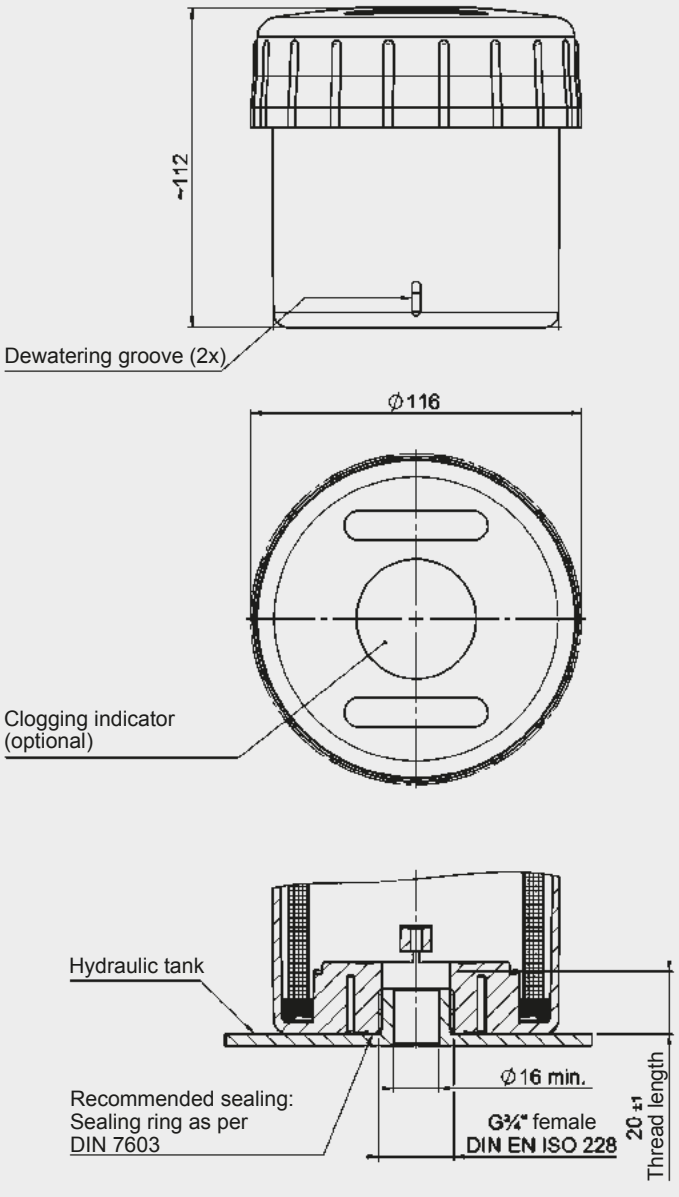
The BF 6 can be fitted with a hydrophobic filter element ("DRY") with an ~ 1,500 cm² filter surface, thus removing any water spray.

Option available with four integrated check valves to enable tank pre-charging – even at different pressure settings.

- Max. flow rate: 500 l/min
- Material: plastic (PA 6)
- Sealing material: NBR; HNBR
- Filter material: hydrophobic material (DRY) or material impregnated with phenol resin (P)
- Connections: G ¾ (inner)
- Weight: 0.3 kg

Please contact us for further information and characteristics!

DIMENSIONS



3. FILTER CALCULATION / SIZING

3.1 SINGLE PASS FILTRATION PERFORMANCE DATA FOR AIR FILTER ELEMENTS

The following separation values were established under real-life simulated conditions.

This means that the selected velocity of the flow against the filter mesh-pack was 20 cm/s and the contamination added was 40 mg/m³ of ISO MTD test dust.

Filtration rating	Retention value d...	For particle size	Filter material
3 µm	d 80	0.74 µm	Paper
	d 100	2.64 µm	
10 µm	d 80	0.25 µm	BN
	d 100	0.84 µm	

The d 80 value refers to the particle size which is filtered out at a rate of 80% during the retention test. The particle size determined by this method is called the nominal filtration rating of the air filter. The d 100 value therefore refers to the particle size which is filtered out at a rate of 100% during the single pass test. The particle size determined by this method is called the absolute filtration rating of the air filter.

Table of average dust concentrations in real life:

Urban regions with a low level of industry	3–7 mg/m³ air
General mechanical engineering	9–23 mg/m³ air
Construction industry (wheeled vehicles)	8-35 mg/m³ air
Construction industry (tracked vehicles)	35-100 mg/m³ air
Heavy industry	50-70 mg/m³ air

3.2 DIFFERENTIAL PRESSURE ACROSS BREATHER FILTER

The differential pressure (with clean element) for the various filter sizes is shown in the graphs under Point 3.4.

3.3 SIZING GUIDELINES

The rate at which contamination enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

Caution:

Incorrectly sized tank breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

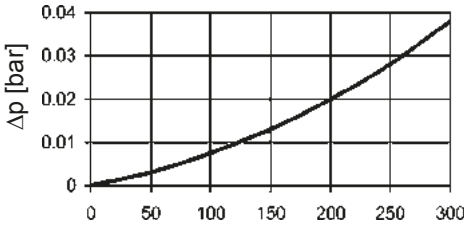
For optimum sizing the following should therefore be observed:

- Filtration rating of breather filter ≤ filtration rating of hydraulic filter
- Only use breather filters with an absolute retention rate (d100 ≤ x µm; x = given filtration rating)
- Max. permitted initial pressure loss: 0.05 bar, optionally 0.01 bar (with a clean filter element and calculated air flow rate)
- Determining the calculated air flow:
  $Q_A = f5 \times Q_p$
  Q_A = calculated air flow in l_N/min
  f5 = factor for operating conditions
  Qp = max. flow rate of the hydraulic pump in l/min

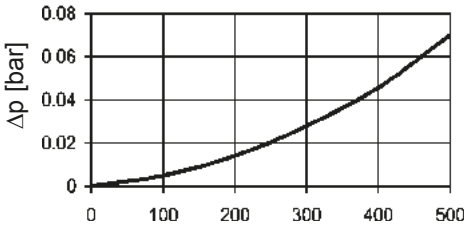
Ambient conditions	Factor f5
Low dust concentration; filter fitted with clogging indicator; continuous monitoring of the filter	1–2
Average dust concentration; filter without clogging indicator; intermittent monitoring of the filter	3–6
High dust concentration; filter without clogging indicator; infrequent or no monitoring of the filter	7–10

3.4 AIR FLOW RATE

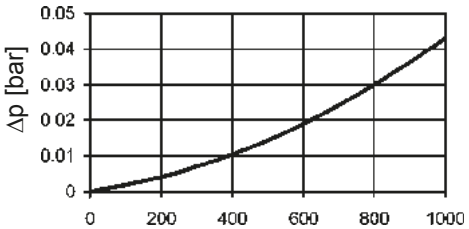
BF 4



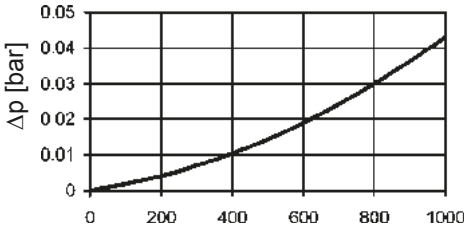
BF 10



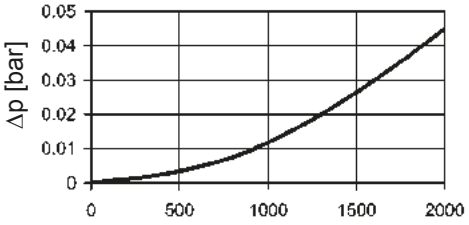
BF 3



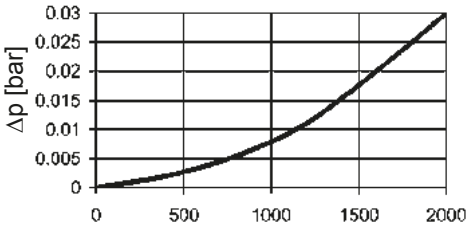
BF 30



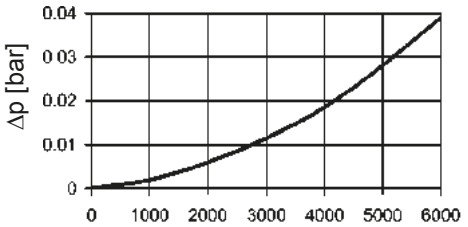
BF 7



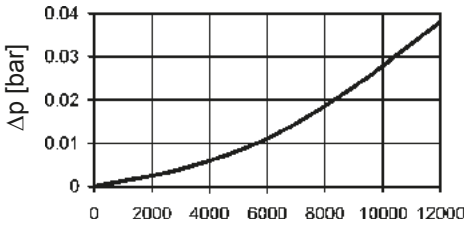
BF 72



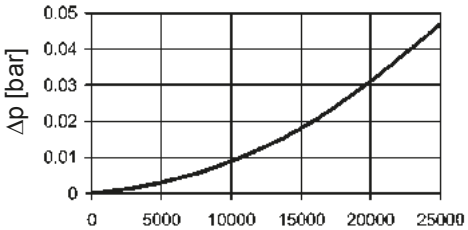
BF 5



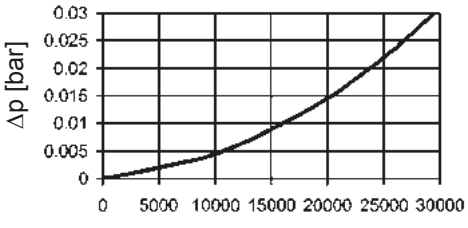
BF 52



BF 8



BF 9



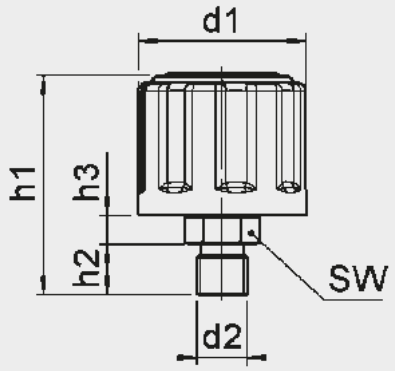
Pressure drop curves for BF filters with check/bypass valve (version /-RV...) on request.

4. DIMENSIONS

Tank requirements

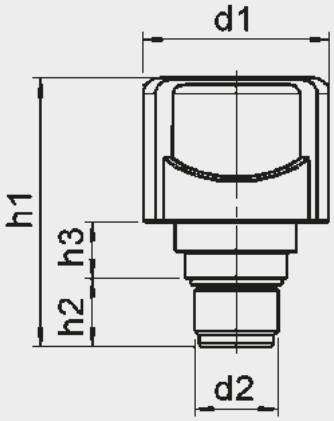
1. In the filter contact area, the tank flange should have a maximum flatness of 0.2 mm and Ra 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.

BF 4



Type	BF 4...
d1	44
d2	G ¼
h1	58
h2	14
h3	8
SW	17
Weight	~ 0.08 kg

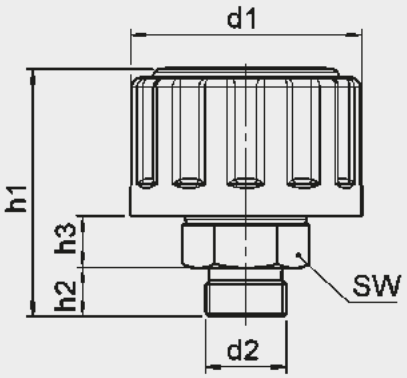
BF 10



Type	BF 10 "G"...	BF 10 "M"...
d1	49	49
d2	G ¼	M22x1.5
h1	63	71
h2	14	18
h3	11	15
Weight	~ 0.05 kg	~ 0.05 kg

Type	BF 10 "U"...	BF 10 "N"...
d1	49	49
d2	1 1/16-12 UN	NPT ½
h1	71	71
h2	18	18
h3	15	15
Weight	~ 0.05 kg	~ 0.05 kg

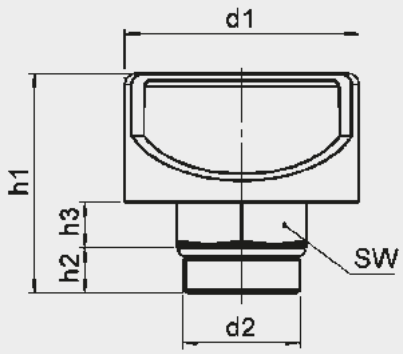
BF 3



Type	BF 3...1.X
d1	76
d2	G ¾
h1	81
h2	16
h3	17
SW	36
Weight	~ 0.35 kg

Type	BF 3...2.X	BF 3...3.X
d1	76	76
d2	G 3/8	G ½
h1	76	78
h2	12	14
h3	16	16
SW	22	27
Weight	~ 0.35 kg	~ 0.35 kg

BF 30

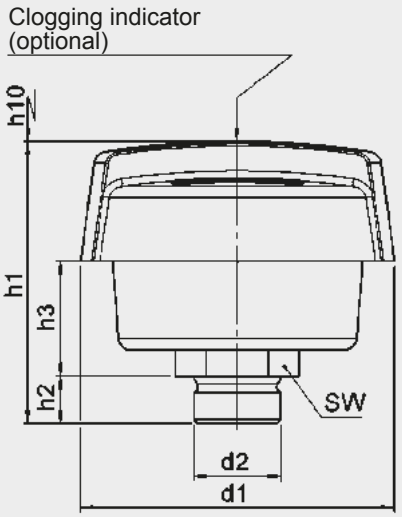


Type	BF 30 "G"...1.X
d1	83
d2	G ¾
h1	76
h2	16
h3	14
SW	32
Weight	~ 0.15 kg

Type	BF 30 "M"...1.X	BF 30 "M"...2.X
d1	83	83
d2	M42x2	M30x1.5
h1	76	76
h2	16	16
h3	16	14
SW	46	32
Weight	~ 0.15 kg	~ 0.15 kg

Type	BF 30 "U"...1.X	BF 30 "N"...1.X
d1	83	83
d2	1 1/16-12 UN	NPT ¾
h1	76	76
h2	16	16
h3	14	14
SW	32	32
Weight	~ 0.15 kg	~ 0.15 kg

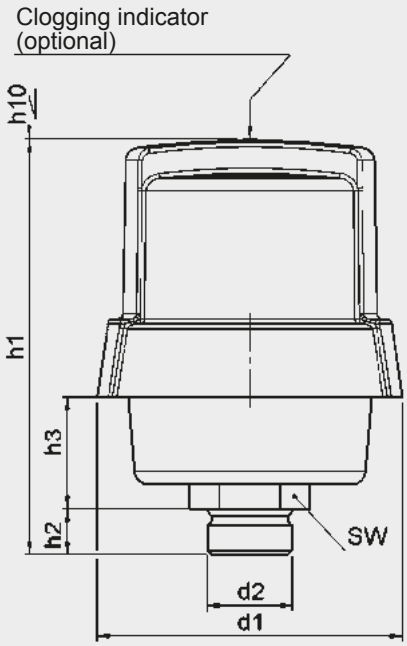
BF 7



Type	BF 7 "G"	BF 7 "M"
d1	120	120
d2	G 1	M30 x 1.5
h1	108	108
h2	18	18
h3	44	44
h10	60	60
SW	41	36
Weight	~ 0.30 kg	~ 0.30 kg

Type	BF 7 "U"	BF 7 "N"
d1	120	120
d2	1 5/16-12 UN	NPT ¾
h1	106	108
h2	18	18
h3	44	44
h10	60	60
SW	41	32
Weight	~ 0.30 kg	~ 0.30 kg

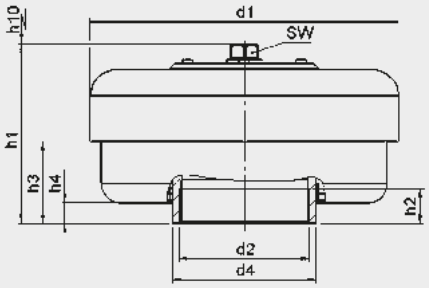
BF 72



Type	BF 72 "G"	BF 72 "M"
d1	120	120
d2	G 1	M30 x 1.5
h1	164	164
h2	18	23.5
h3	44	44
h10	90	90
SW	41	36
Weight	~ 0.40 kg	~ 0.40 kg

Type	BF 72 "U"	BF 72 "N"
d1	120	120
d2	1 5/16-12 UN	NPT ¾
h1	164	164
h2	18	18
h3	44	44
h10	90	90
SW	41	32
Weight	~ 0.40 kg	~ 0.40 kg

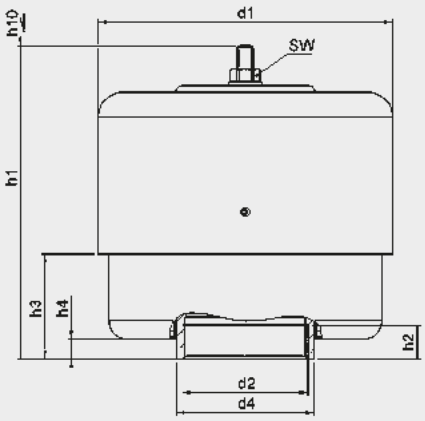
BF 5 / BF 5...RV



Type	BF 5 "G"...	BF 5 "G".../-RV
d1	177	177
d2	G 2½	G 2½
d4	Ø82.5	Ø89
h1	103	121
h2	20 +3/-5	max. 18
h3	47	65
h4	12	30
h10	90	90
Weight	~ 1.60 kg	~ 2.75 kg

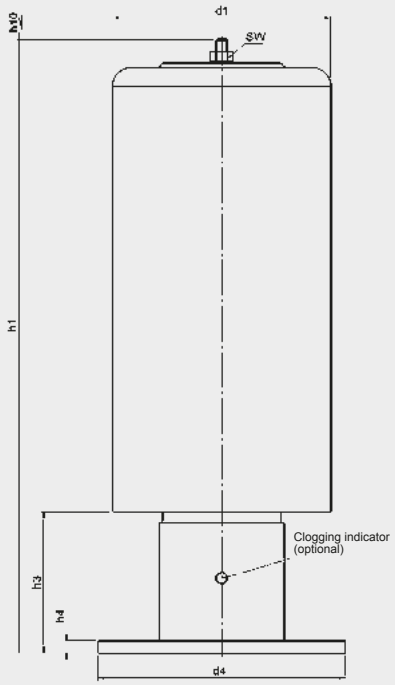
Type	BF 5 "N"...
d1	177
d2	NPT 2½
d4	Ø82.5
h1	103
h2	–
h3	47
h4	12
h10	90
Weight	~ 1.60 kg

BF 52 / BF 52...RV

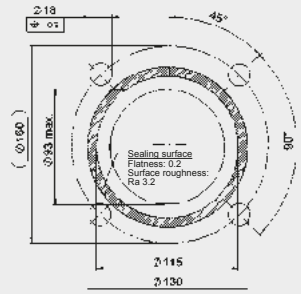


Type	BF 52 "G"...	BF 52 "G".../-RV
d1	177	177
d2	G 2½	G 2½
d4	Ø82.5	Ø89
h1	188	193
h2	20 +3/-5	max. 18
h3	63	81
h4	12	30
h10	150	150
Weight	~ 2.00 kg	~ 3.00 kg

BF 8



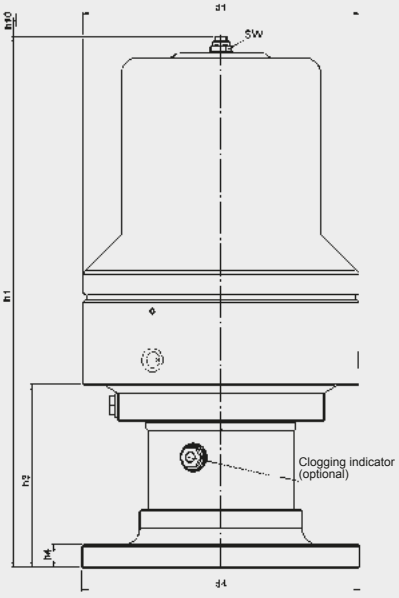
Flange connection BF 8



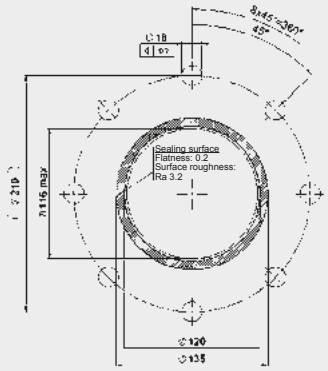
Hole pattern and sealing surface, O-ring

Type	BF 8...
d1	200
d4	200
h1	497
h3	114
h4	10
h10	400
Weight	~ 10.00 kg

BF 9



Flange connection BF 9



Hole pattern and sealing surface, O-ring

Type	BF 9...
d1	245
d4	247
h1	473
h3	163
h4	20
h10	330
Weight	~ 5.00 kg

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Tank Breather Filter with Filler Strainer ELF

up to 5500 l/min

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

Tank breather filters size 4, 10, 3 and 30 consist of an air filter top, which is connected to the mounting flange by a bayonet plate or a threaded boss, and a filler strainer.

Sizes 5 and 52 consist of a two-part threaded air filter top, with built-in oil mist trap, one or two exchangeable filter element(s) and a filler strainer.

Sizes 7 and 72 consist of a two-part flanged filter top, an exchangeable filter element and a filler strainer.

1.2 FILTER ELEMENTS

Contamination retention capacities in g

	Paper
ELF	3 µm
4	2.9
10	2.9
3	6.2
30	6.2
7	26.1
72	52.2
5	85.1
52	170.2

The filter elements are made from phenolic resin impregnated paper and cannot therefore be cleaned.

1.3 FILTER SPECIFICATIONS

Temperature range	-30 °C to +100 °C
Material of housing	Steel, zinc-plated/plastic coated (ELF 4, 3), steel (ELF 5, 52) glass fibre reinforced synthetic material (ELF 10, 30, 7, 72)
Material of filler strainer	Synthetic: ELF 10, 4, 30, 3, 7, 72 Metal: ELF 5, 52
Type of clogging indicator	VMF (return line indicator)
Pressure setting of clogging indicator	0.6 bar K pressure gauge 0.035 bar UBM indicator (others on request)

1.4 SEALS

NBR (= Perbunan) on filter
NBR / Polyurethane on element
Cardboard on mounting flange

1.5 SPECIAL MODELS AND ACCESSORIES

- lockable model (only ELFL 3)
- with check/bypass valve to support the suction characteristics of the pump Not 100% air-tight or leakage-free! (only ELF 10, 3, 30, 5 and 52)
- with anti-splash device (only ELF 10, 3, 30, 7, 72)
- with connection for a clogging indicator (only ELF 7, 72)
- with filler adapter for automotive applications (only ELF 7 and 72) - see Point 5.

1.6 SPARE PARTS

See Original Spare Parts List

1.7 CERTIFICATES AND APPROVALS

On request

1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

The standard models are suitable for use with mineral and lubrication oils. For fire-resistant and biodegradable oils, see table:

Fire-resistant fluids

ELF	HFA	HFC	HFD-R
4, 3, 5, 52	–	–	–
10, 30, 7, 72	●	●	–

- HFA oil in water emulsion (H2O content ≥ 80%)
- HFC water polyglycol solution (H2O content 35-55%)
- HFD-R synthetic, water-free phosphate ester

Biodegradable fluids

ELF	HTG	HE	HPG PAG	HPG PRG
all sizes	+	+	●	●

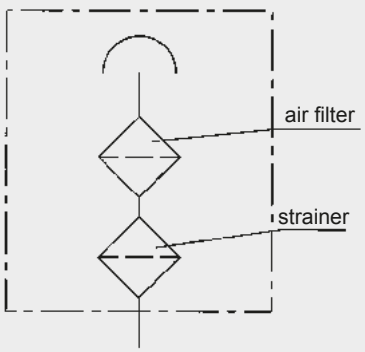
+ suitable for all
● contact our Technical Sales Department
– not suitable

- HTG vegetable oil based hydraulic fluids
- HE ester-based synthetic hydraulic fluids
- HPG polyglycol-based synthetic hydraulic fluids
- PAG sub-group of HPG: polyalkylene glycol
- PEG sub-group of HPG: polyethylene glycol

1.9 CHANGING INTERVALS

The filter elements or filters must be replaced as frequently as the fluid filters, but at least every 12 months.

Symbol



2. MODEL CODE (also order example)

2.1 COMPLETE FILTER

2.1.1 ELF 4, 10, 3, 30 and ELFL 3

ELF P 30 F 3 W 1 . X /-RV0.4

Filter type
ELF
ELFL (lockable)

Filter material
P Paper

Size
ELF 4, 10, 3, 30
ELFL 3

Type and size of connection

	Filter size 4	10	3	30
F = Flange	●	●	●	●

Filtration rating in µm
P 3 (absolute)

Type of clogging indicator
W without port, no clogging indicator

Type code

Filter size	Code	Δp [bar]
ELF 4	1.X	-
ELF 10	1.X	-
ELF 3	1.X	-
ELF 3.../-RV	4.X	0.4
ELF 3.../-RV	5.X	0.7
ELF 3.../-RV	6.X	0.2
ELF 3.../-RV	7.X	1.0
ELF 30	1.X	-

Modification number
X the latest version is always supplied

Supplementary details
AS anti-splash without check/bypass valve (not ELF 3 & 4)
KT for plastic tank systems (only ELF 30)
RV check/bypass valve (not ELF 4)
RV0.2, RV0.4, RV0.7 valve with relevant cracking pressure (only ELF 10 and 30)
SO148 metal filler strainer, 200 mm long (only ELF 3 and 30)
SO175 metal filler strainer, 100 mm long (only ELF 3 and 30)
SO394 ELF filter without strainer

2.1.2 ELF 7 and 72

ELF P 72 F 3 W 1 . X /-SO148

Filter type
ELF

Filter material
P Paper

Size
ELF 7, 72

Type and size of connection

	Filter size 7	72
F = Flange DIN 24557/Pt 2	●	●

Filtration rating in µm
P 3 (absolute)

Type of clogging indicator
W without port, no clogging indicator
K pressure gauge (measuring range -1 to +0.6 bar) (not for ELF 72)
UBM visual/analogue vacuum gauge with manual reset (pressure setting: -0.035 bar)

Type code
0 for type UBM
1 for types W and K

Modification number
X the latest version is always supplied

Supplementary details
AS anti-splash (only ELF 7, 72 without check/bypass valve)
SO148 metal filler strainer, 200 mm long
SO175 metal filler strainer, 100 mm long
SO394 ELF filter without strainer

2.1.3 ELF 5 and 52

ELF P 52 G 3 W 2 . X /-RV0.4

Filter type
ELF

Filter material
P Paper
BN Betamicron®

Size
ELF 5, 52

Type and size of connection

		Filter size 5	52
G = Thread	G1 1/2	●	●
	G2	●	●
	G2 1/2	●	●
	G3	●	●

Filtration rating in µm
P 3 (absolute)
BN 3 (absolute)

Type of clogging indicator
W without port, no clogging indicator

Type code

Code	Connection
2.X	G 2½
3.X	G 3
4.X	G 2
5.X	G 1½

Modification number
X the latest version is always supplied

Supplementary details
RV0.4 check/bypass valve with 0.4 bar pressure setting
SO479 filter suitable for HFC fluids

2.2 REPLACEMENT ELEMENT

0005 L 003 P

Size
0005 for ELF 5, 52 (on ELF 52: 2 x 0005 L...)
0007 for ELF 7
0072 for ELF 72

Type
L

Filtration rating in µm
P 003
BN 003 (only for 0005)

Filter material
P Paper
BN Betamicron®

Replacement elements cannot be ordered for ELF 4, 10, 3, 30 and ELFL 3. These filters are only available complete!

2.3 REPLACEMENT CLOGGING INDICATOR

VMF 0.6 K . X

Type
VMF Return line indicator

Pressure setting
0.6 -1 to +0.6 bar
0.035 -0.035 bar

Type
(see Point 2.1.2)

Modification number
X the latest version is always supplied

3. FILTER CALCULATION / SIZING

3.1 SINGLE PASS FILTRATION PERFORMANCE DATA FOR AIR FILTER ELEMENTS

The following separation values were established under real-life simulated conditions.
This means that the selected velocity of the flow against the filter mesh-pack was 20 cm/s and the contamination added was 40 mg/m³ of ISO MTD test dust.

Filtration rating	Retention value d...	For particle size	Filter material
3 µm	d 80	0.74 µm	Paper
	d 100	2.64 µm	

The d 80 value refers to the particle size which is filtered out at a rate of 80% during the retention test. The particle size determined by this method is called the nominal filtration rating of the air filter. The d 100 value therefore refers to the particle size which is filtered out at a rate of 100% during the single pass test. The particle size determined by this method is called the absolute filtration rating of the air filter.

Table of average dust concentrations in real life:

Urban regions with a low level of industry	3-7 mg/m³ air
General mechanical engineering	9-23 mg/m³ air
Construction industry (wheeled vehicles)	8-35 mg/m³ air
Construction industry (tracked vehicles)	35-100 mg/m³ air
Heavy industry	50-70 mg/m³ air

3.2 DIFFERENTIAL PRESSURE ACROSS BREATHER FILTER

The differential pressure (with clean element) for the various filter sizes is shown in the graphs under Point 3.4.

3.3 SIZING GUIDELINES

The rate at which contamination enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

CAUTION:

Incorrectly sized tank breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

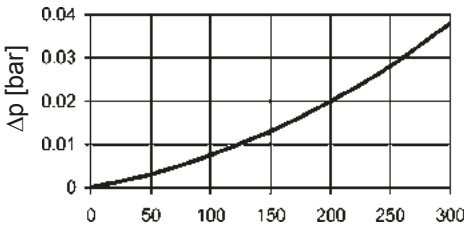
For optimum sizing the following should therefore be observed:

- Filtration rating of breather filter = filtration rating of hydraulic filter
- Only use breather filters with an absolute retention rate (d100 = x µm; x = given filtration rating)
- Max. permitted initial pressure drop: 0.01 bar (with a clean filter element and at calculated air flow)
- Determining the calculated air flow:
  $Q_A = f5 \times Q_p$
  Q_A = calculated air flow in l_N/min
  f5 = factor for operating conditions
  Qp = max. flow rate of the hydraulic pump in l/min

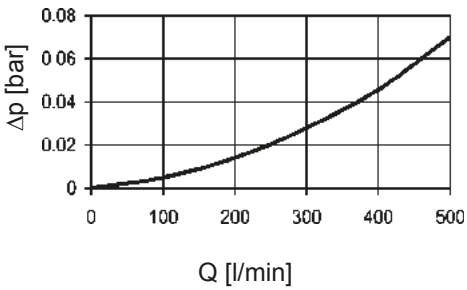
Ambient conditions	Factor f5
Low dust concentration; filter fitted with clogging indicator; continuous monitoring of the filter	1-2
Average dust concentration; filter without clogging indicator; intermittent monitoring of the filter	3-6
High dust concentration; filter without clogging indicator; infrequent or no monitoring of the filter	7-10

3.4 AIR FLOW RATE

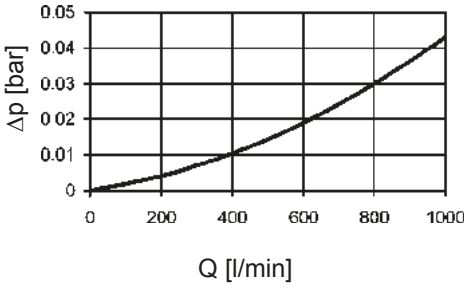
ELF 4



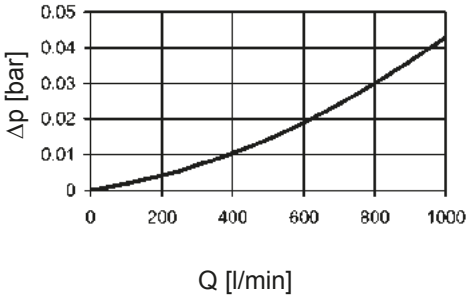
ELF 10



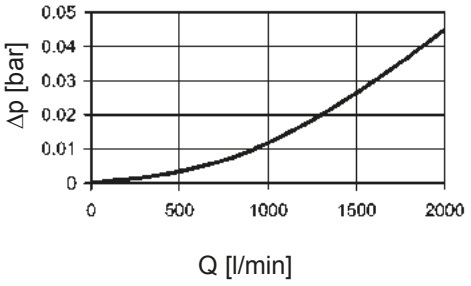
ELF 3



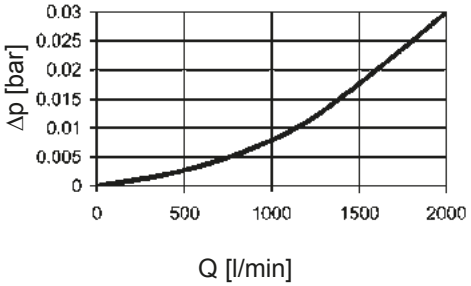
ELF 30



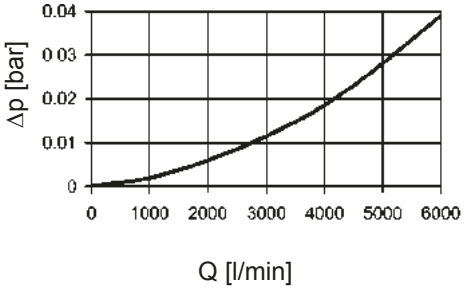
ELF 7



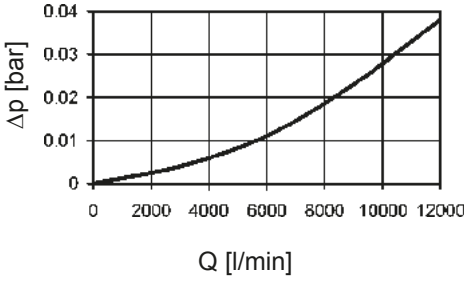
ELF 72



ELF 5



ELF 52

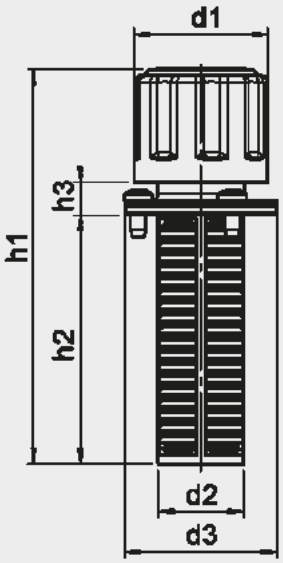


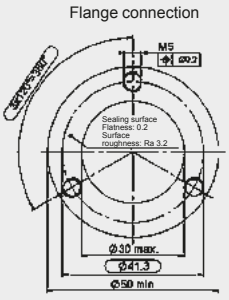
4. DIMENSIONS

Tank requirements

1. In the filter mounting interface, the tank flange should have a maximum flatness of 0.2 mm and Ra 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.

ELF 4

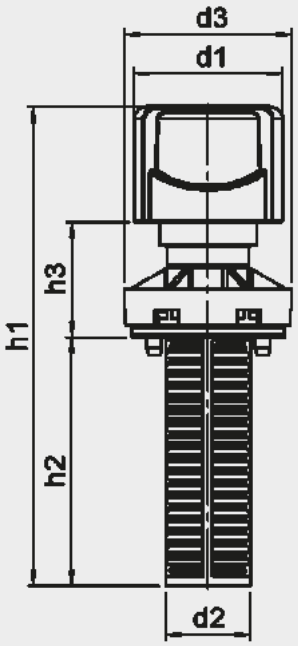


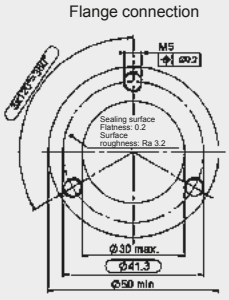


Interface

	ELF 4...
d1	44
d2	28
d3	50
h1	130
h2	82
h3	11
Weight	~ 0.15 kg

ELF 10

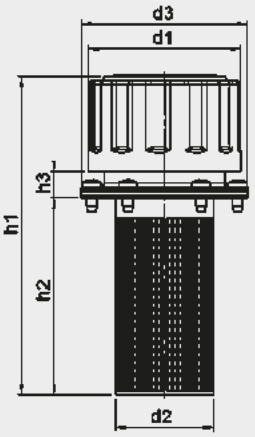




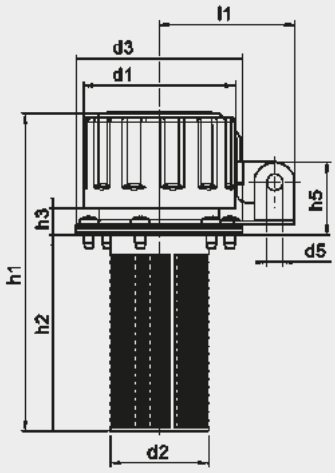
Interface

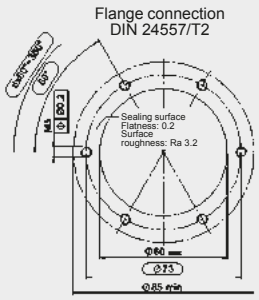
	ELF 10...
d1	49
d2	28
d3	55
h1	158
h2	82
h3	38
Weight	~ 0.10 kg

ELF 3



ELFL 3

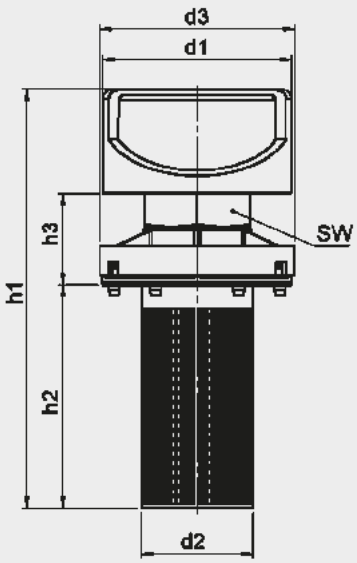


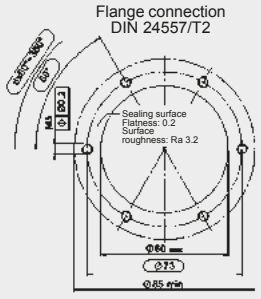


Interface to DIN 24557/Pt 2

	ELF 3.../ELFL 3...
d1	76
d2	49
d3	83
d5	8
h1	159
h2	98
h3	13
h5	36
l1	68
Weight	~ 0.30 kg

ELF 30

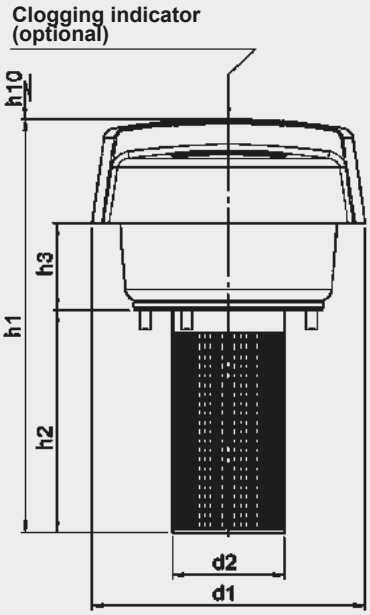


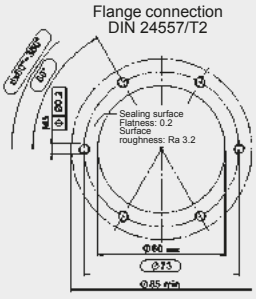


Interface to DIN 24557/Pt 2

	ELF 30...
d1	83
d2	49
d3	86
h1	185
h2	98
h3	40
SW	46
Weight	~ 0.25 kg

ELF 7

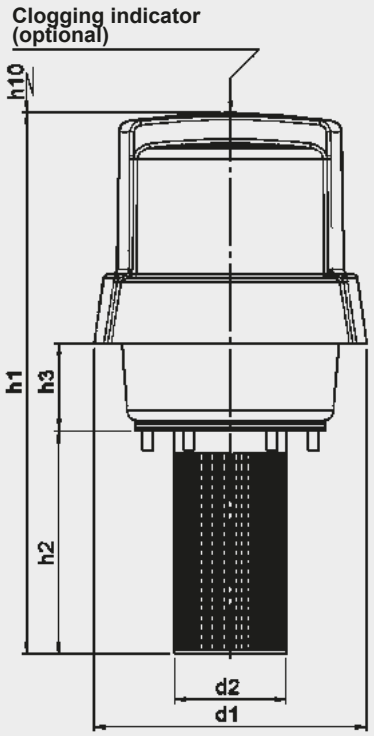


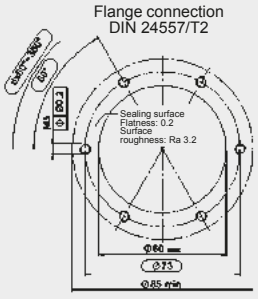


Interface to DIN 24557/Pt 2

	ELF 7...
d1	120
d2	49
h1	182
h2	98
h3	38
h10	60
Weight	~ 0.35 kg

ELF 72

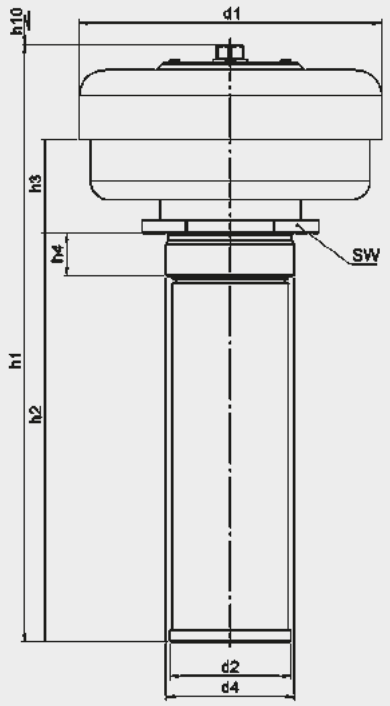




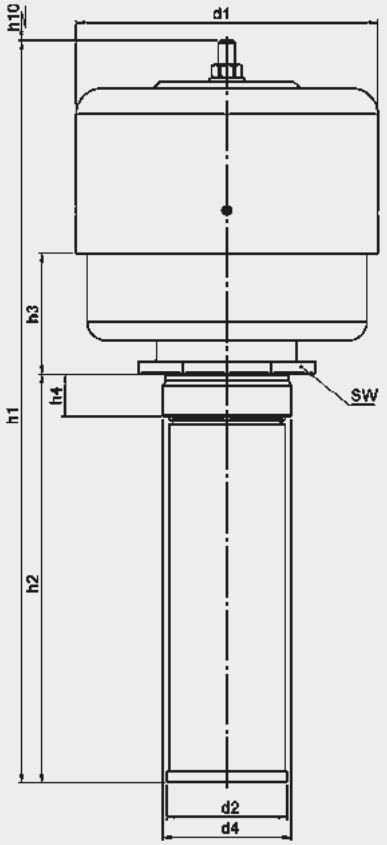
Interface to DIN 24557/Pt 2

	ELF 72...
d1	120
d2	49
h1	238
h2	98
h3	38
h10	90
Weight	~ 0.45 kg

ELF 5 / ELF 5…RV

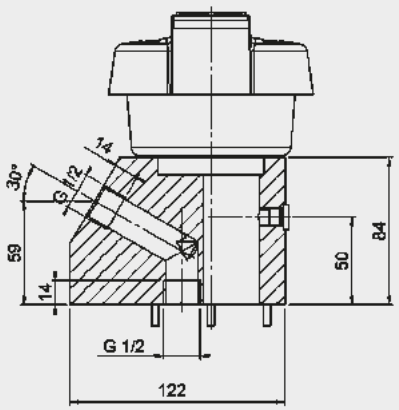


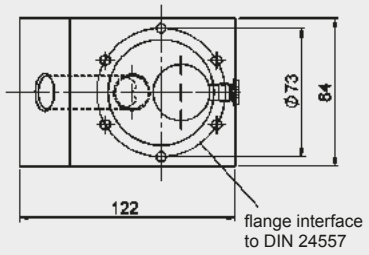
ELF 52 / ELF 52…RV



5. FILLER ADAPTER

This adapter can only be used on ELF 7 and ELF 72 filters!





		ELF 5...	ELF 5... /-RV
d1		177	
d2/d4	...2.X	G 2½ / 70.5	
	...3.X	G 3 / 70.5	
	...4.X	G 2 / 51.5	
	...5.X	G 1½ / 41.5	
h1		351	369
h2		240	
h3		55	73
h4		25	
h10		90	
SW		90	
Weight approx.	...2.X	2.10 kg	3.20 kg
	...3.X	2.15 kg	3.25 kg
	...4.X	2.10 kg	3.20 kg
	...5.X	2.05 kg	3.15 kg

		ELF 52...	ELF 52... /-RV
d1		177	
d2/d4	...2.X	G 2½ / 70.5	
	...3.X	G 3 / 70.5	
	...4.X	G 2 / 51.5	
	...5.X	G 1½ / 41.5	
h1		436	441
h2		240	
h3		71	89
h4		25	
h10		150	
SW		90	
Weight approx.	...2.X	2.30 kg	–
	...3.X	2.35 kg	3.45 kg
	...4.X	2.30 kg	3.40 kg
	...5.X	2.25 kg	3.25 kg

These filler adapters are available in the following threaded connections:

- Adapter ELF /-FA12 (G ½)
  (Part No.: 00318597)
- Adapter ELF /-FA34 (G ½)
  (Part No.: 01282563)
- Adapter ELF /-FA1 (G 1)
  (Part No.: 01274065)

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Breather Dryer BDE

1. TECHNICAL SPECIFICATIONS

1.1 DEFINITION OF THE PROBLEM

In hydraulic and lubrication systems, water ingress into the tank is a familiar problem. System operators are constantly faced with high breakdown and maintenance costs that can be traced back to water in the system. This is because water, even in its dissolved state, causes accelerated degradation of the additive components by hydrolysis. These reactions cause the oil to lose its desired characteristics and to age more rapidly. The depletion of the additives also leads to increased oxidation in the base fluid.
Water also has serious and adverse effects on the operating system components, damaging them by corrosion and hydrogen embrittlement.

1.2 FILTER HOUSING

Construction
The distinctive feature of the breather dryers BDE is that it has two separate chambers which can be filled with two desiccants, which in combination increase total water retention (two-stage dewatering).
As an option, and as a special protection of the desiccant, four valves are built into the bottom of the unit so that during system shutdown the desiccants will not become saturated.
A check valve is available as an option to prevent exhaust air from the tank/ transmission from flowing back through the desiccant. This means the desiccant is protected from oil mist and there is no re-drying of the exiting air.

1.3 FILTER MEDIUM

The built-in pleated air filter element (absolute filtration of particles > 2 µm) provides the filter with a very high contamination retention capacity (26g). In order to ensure reliable function, the entire cartridge must be replaced.
When the filter is due to be changed, the colour changes from dark red to light orange.

1.4 FILTER SPECIFICATIONS

Temperature range	-30 °C to +100 °C Storage temperature: -40 °C to +100 °C
Material of filter housing	Plastic (PA, PC and POM)
Material of filter cartridge unit	Combination of 2 different desiccants
Material of air filter element	phenolic resin impregnated paper

1.5 SEALS

NBR (= Perbunan)

1.6 SPECIAL MODELS AND ACCESSORIES

On request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

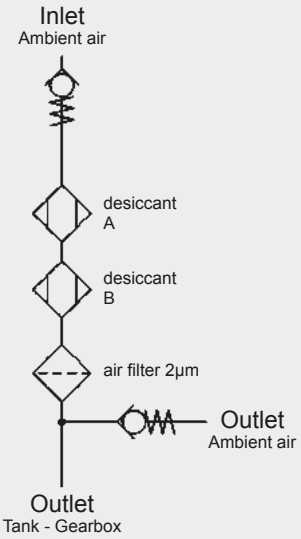
The filter cartridge actively prevents contamination particles and humidity from entering the tank. Compatible with mineral oils and bio oils as well as diesel.

The new BDE is not suitable as a breather for reservoirs containing highly flammable liquids (e.g. fuel, solvents, etc...)!

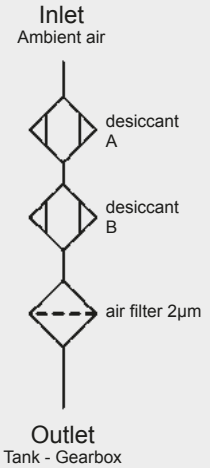
1.10 CHANGING INTERVALS

When the filter is due to be changed, the colour changes reliably from dark red to light orange.

Symbol: BDE with valves



Symbol: BDE without valves



2. MODEL CODE (also order example)

BDE 400 G 2 W 1 . X /-RV0.02

2.1 COMPLETE FILTER

Filter type
BDE

Size of filter
200, 400, 1000

Type and size of connection
F Flange (to DIN 24557)
G Thread
N Thread NPT
M Thread metric
S Slip fit

Filtration rating in µm
2 2 µm absolute

Type of clogging indicator
W without port, no clogging indicator
UBM vacuum indicator

Type code

Type code	Thread connection G	Thread connection N	Thread connection M	Slip fit connection S	Flange connection F
1	G1	NPT 1"	M42x2	1"	t2
2	BSP 3/4"	NPT 2"	–	–	–

Modification number
X the latest version is always supplied

Supplementary details
ELF with filler strainer (only for connection type F = Flange)
RV0.02 check/protection valve with 0.02 bar pressure setting
RV0.003 check/protection valve with 0.003 bar pressure setting

2.2 REPLACEMENT CARTRIDGE

BDE 400 X 2 W 0 . X

Filter type
BDE

Size
200, 400, 1000

Connection type
X replacement cartridge

Filtration rating
2 2 µm absolute

Type of clogging indicator
W without port, no clogging indicator
UBM vacuum indicator

Type code
0 replacement cartridge

Modification number
X the latest version is always supplied

3. FILTER CALCULATION / SIZING

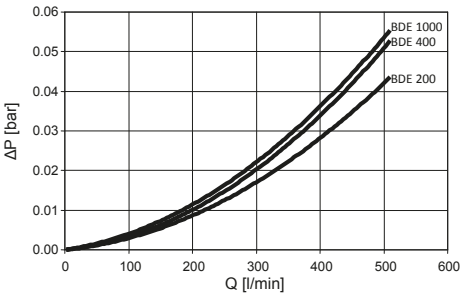
3.1 SIZING GUIDELINES

The rate at which contamination enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

CAUTION:

Incorrectly sized tank breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

Δp-Q graph:



3.2 SIZING / AIR FLOW RATE

The following table indicates the size of BDE filters for gearbox lubrication in wind power plants (according to size in megawatts):

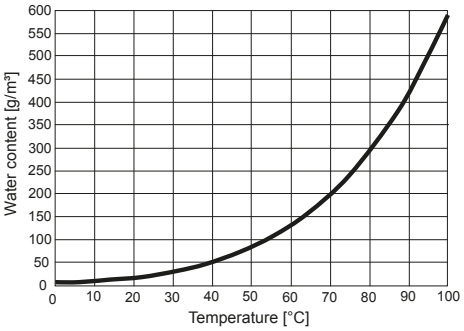
	≤ 1 MW	1-3 MW	≥ 3 MW
Standard conditions	200	400	1000
Longer service life/service intervals	400	1000	2x1000
Very humid climate	400	1000	2x1000

Additional information on sizing criteria:

Size	Optimum air flow rate * [l_{air} / min]	Max. drying capacity for average humidity [m^3_{air}]	Max. drying capacity for high humidity [m^3_{air}]	FOR HYDRAULIC TANKS		max. tank size with stat. venting, e.g. gears
				max. suction rate	max. tank size	
200	10	10	6	120 lpm	300 l	500 l
400	20	25	15	150 lpm	600 l	1000 l
1000	35	42	25	180 lpm	1000 l	2000 l

* Air flow rate with the highest drying efficiency

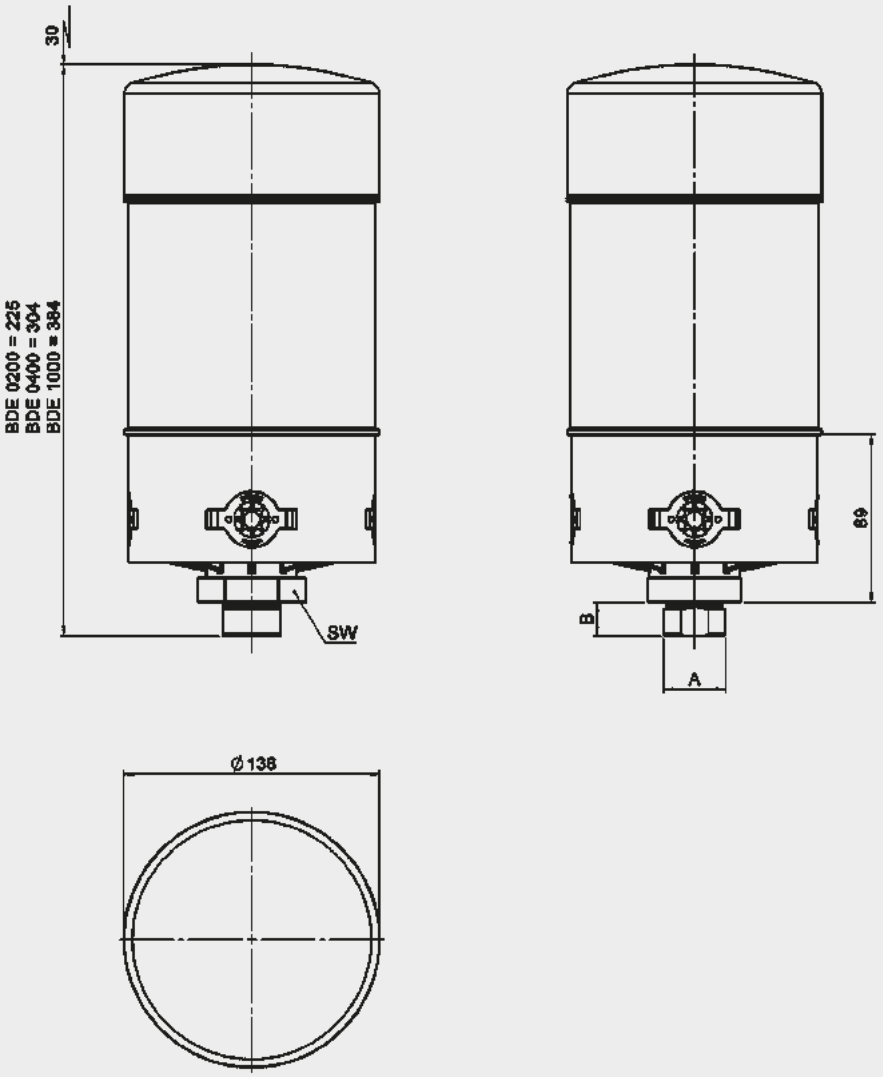
Saturation content:



3.3 WATER RETENTION CAPACITY

Size	Maximum water retention capacity
200	0.25 l
400	0.50 l
1000	0.75 l

4. DIMENSIONS



Connection	Thread length B [mm]	AF width SW [mm]
1" Slip fit connection Ø 33.4	18	50
G 1"	18	50
G 3/4"	18	50
M42 x 2	18	50
NPT 1"	18	50
NPT 2"	24	65
Flange adapter DIN24557/Pt 2	20	50

Type	Weight [kg]
BDE 200	1.7
BDE 400	2.3
BDE 1000	3.0

NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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Breather Dryers BDL, BDM

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The inline version BDL and the breather dryer BDM consist of a filter cartridge only, which is non-replaceable.

1.2 GENERAL

The breather dryer cartridges are filled with silica gel (orange) which, once completely saturated, cannot be regenerated.

A durable contamination filter above and below the silica gel prevents contamination from penetrating inside the cartridge (particle filtration > 2 µm nominal).

This ensures optimum humidity absorption.

To guarantee the performance of the protective filter layers, the entire cartridge must be replaced.

When the filter is due to be changed, the colour changes from orange to green.

1.3 FILTER SPECIFICATIONS

Temperature range	-32 °C to +100 °C
Material of filter cartridge	Plastic with silica gel filling (orange)

1.4 SEALS

NBR (= Perbunan)

1.5 SPECIAL MODELS AND ACCESSORIES

on request

1.6 SPARE PARTS

See Original Spare Parts List

1.7 CERTIFICATES AND APPROVALS

on request

1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

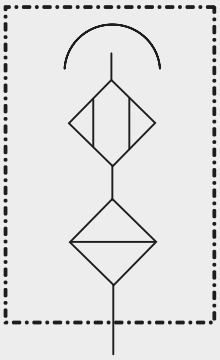
The filter cartridge actively prevents contamination particles and humidity from entering the tank. Compatible with mineral oils, bio oils and diesel fuel.

1.9 CHANGING INTERVALS

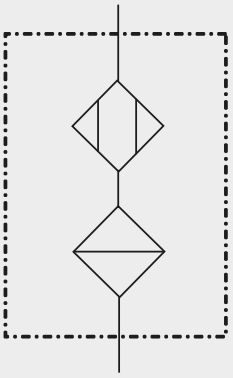
When the filter is due to be changed, the colour changes reliably from gold/ orange to green.

Symbol

BDM



BDL



2. MODEL CODE (also order example)

BDL 200 N 2 W 1 . X

2.1 COMPLETE FILTER

Filter type
BDL Inline version
BDM Mini version

Size of filter
BDL: 30, 50, 60, 200
BDM:15, 30, 50, 80

Type and size of connection
N NPT thread connection (½" female)

Filtration rating in µm
2 2 µm

Type of clogging indicator
W without port, no clogging indicator

Type code
1

Modification number
X the latest version is always supplied

3. FILTER CALCULATION / SIZING

3.1 SIZING GUIDELINES

The rate at which contamination enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

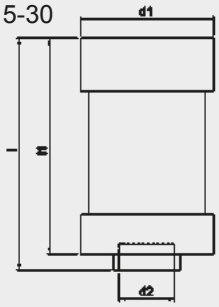
CAUTION:
Incorrectly sized tank breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

3.2 WATER RETENTION CAPACITY

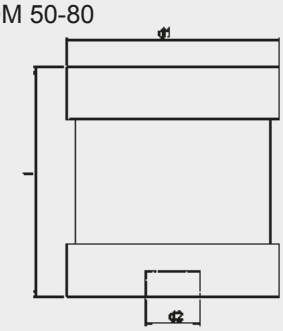
Type	H2O
BDL 30	0.03 l
BDL 50	0.05 l
BDL 60	0.06 l
BDL 200	0.19 l
BDM 15	0.01 l
BDM 30	0.03 l
BDM 50	0.05 l
BDM 80	0.08 l

4. DIMENSIONS

BDM 15-30

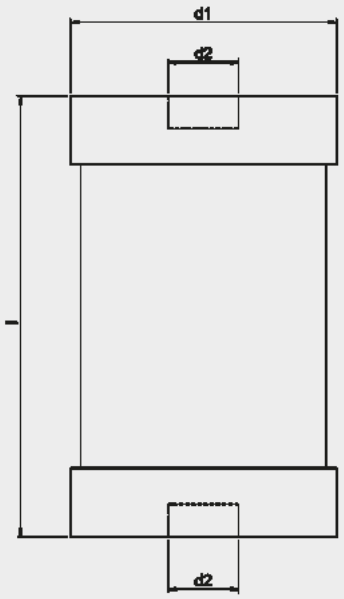


BDM 50-80



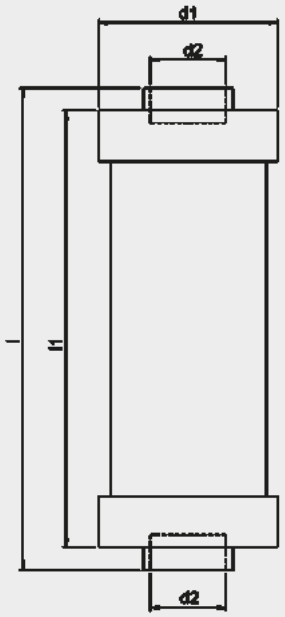
Type	BDM 15	BDM 30	BDM 50	BDM 80
d1	51	51	83	83
d2	NPT ½"	NPT ½"	NPT ½"	NPT ½"
l	59	89	57	90
l1	52	82	-	-
Weight [kg]	0.17	0.22	0.35	0.47

BDL 60-200



Type	BDL 60	BDL 200
d1	82	82
d2	NPT ½"	NPT ½"
l	135	212
Weight [kg]	0.48	0.80

BDL 30-50



Type	BDL 30	BDL 50
d1	51	51
d2	NPT ½"	NPT ½"
l	137	216
l1	124	203
Weight [kg]	0.10	0.21

NOTES

NOTE

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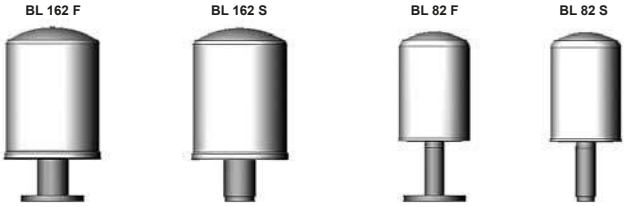
Tank Breather Filter with Spin-On Filter Cartridge BL

up to 1800 l/min



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filters consist of a spin-on filter can which screws onto a connection tube installed on the oil tank.

The connection can either be a flanged or weld version.

1.2 FILTER ELEMENTS

Contamination retention capacities in g

BL	10 µm	20 µm
82	67.6	99.4
162	192.0	201.3

The filter elements are made from phenolic resin impregnated paper and cannot therefore be cleaned.

1.3 FILTER SPECIFICATIONS

Temperature range	-30 °C to +100 °C
Material of connection tube	Steel
Material of spin-on can	Sheet steel
Type of clogging indicator	VMF (return line indicator)
Pressure setting of clogging indicator	0.6 bar (K pressure gauge)

1.4 SEALS

Perbunan (=NBR)
Cardboard on the mounting flange

1.5 SPECIAL MODELS AND ACCESSORIES

- With connection for a clogging indicator
- With filler adapter

1.6 SPARE PARTS

See Original Spare Parts List

1.7 CERTIFICATES AND APPROVALS

On request

1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

The standard models are suitable for use with mineral and lubrication oils. For fire-resistant and biodegradable oils, see table:

Fire-resistant fluids

BL	HFA	HFC	HFD-R
82	●	●	–
162	●	●	–

- HFA oil in water emulsion (H2O content ≥ 80%)
- HFC water polyglycol solution (H2O content 35–55%)
- HFD-R synthetic, water-free phosphate ester

Biodegradable fluids

BF	HTG	HE	HPG	
			PAG	PRG
82, 162	+	+	●	●

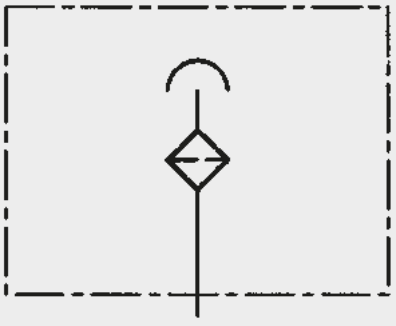
\+ suitable for all
● contact our Technical Sales Department
– not suitable

- HTG vegetable oil based hydraulic fluids
- HE ester-based synthetic hydraulic fluids
- HPG polyglycol-based synthetic hydraulic fluids
- PAG sub-group of HPG: polyalkylene glycol
- PEG sub-group of HPG: polyethylene glycol

1.9 CHANGING INTERVALS

The filter elements or filters must be replaced as frequently as the fluid filters, but at least every 12 months.

Symbol



2. MODEL CODE (also order example)

BL P 162 S 10 W 1 . X /-FA12

2.1 COMPLETE FILTER

Filter type
BL

Filter material of element
P Paper
BN Betamicron® (for BL 82: only 20 µm available)

Size of filter or element
BL: 82, 162

Type and size of connection

Type	Connection	Filter size	
		82	162
F	Flange connection	●	●
S	Weld connection	●	●

Filtration rating in µm
P 10 absolute = 3µm in air
BN 10 = 1 µm absolute in air
20 = 2 µm absolute in air

Type of clogging indicator
W without port, no clogging indicator
K pressure gauge, measurement range -1 to +0.6 bar

Type code
1 for BL 82
2 for BL 162

Modification number
X the latest version is always supplied

Supplementary details
FA12 with filler adapter G ½
FA34 with filler adapter G ¾
FA1 with filler adapter G 1
only for BL 162

2.2 REPLACEMENT ELEMENT

0080 MG 010 P

Size
0080 only BL 82
0160 only BL 162

Type
MA only BL BN 162...
MU only BL P 162...
MG only BL .. 82...

Filtration rating in µm
P : 010
BN : 010, 020 (for BL 82: only 20 µm available)

Filter material
P, BN

2.3 REPLACEMENT CLOGGING INDICATOR

VMF 0.6 K . X

Type of indicator
VMF return line pressure indicator

Pressure setting
0.6 -1 to +0.6 bar

Type of clogging indicator
K (see Point 2.1)

Modification number
X the latest version is always supplied

3. FILTER CALCULATION / SIZING

3.1 SINGLE PASS FILTRATION PERFORMANCE DATA FOR AIR FILTER ELEMENTS

The following separation values were established under real-life simulated conditions.

This means that the selected velocity of the flow against the filter mesh-pack was 20 cm/s and the contamination added was 40 mg/m³ of ISO MTD test dust.

Filtration rating	Retention value d...	For particle size	Filter material
10 µm	d 80	0.25 µm	BN
	d 100	0.84 µm	
20 µm	d 80	0.36 µm	
	d 100	1.21 µm	
10 µm	d 80	1.49 µm	P
	d 100	9.56 µm	

The d 80 value refers to the particle size which is filtered out at a rate of 80% during the retention test. The particle size determined by this method is called the nominal filtration rating of the air filter. The d 100 value therefore refers to the particle size which is filtered out at a rate of 100% during the single pass test. The particle size determined by this method is called the absolute filtration rating of the air filter.

Table of average dust concentrations in real life:

Urban regions with a low level of industry	3-7 mg/m³ air
General mechanical engineering	9-23 mg/m³ air
Construction industry (wheeled vehicles)	8-35 mg/m³ air
Construction industry (tracked vehicles)	35-100 mg/m³ air
Heavy industry	50-70 mg/m³ air

3.2 DIFFERENTIAL PRESSURE ACROSS BREATHER FILTER

The differential pressure (with clean element) for the various filter sizes is shown in the graphs under Point 3.4.

3.3 SIZING GUIDELINES

The rate at which contamination enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

CAUTION:

Incorrectly sized tank breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

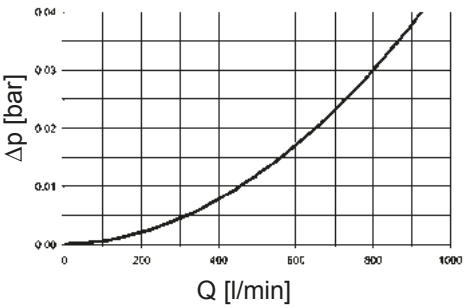
For optimum sizing the following should therefore be observed:

- Filtration rating of breather filter = filtration rating of hydraulic filter
- Only use breather filters with an absolute retention rate (d100 = x µm; x = given filtration rating)
- Max. permitted initial pressure drop: 0.01 bar (with a clean filter element and at calculated air flow)
- Determining the calculated air flow:
  $Q_A = f5 \times Q_p$
  Q_A = calculated air flow in l_N/min
  f5 = factor for operating conditions
  Qp = max. flow rate of the hydraulic pump in l/min

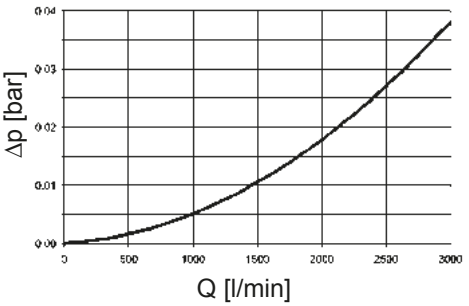
Ambient conditions	Factor f5
Low dust concentration; filter fitted with clogging indicator; continuous monitoring of the filter	1-2
Average dust concentration; filter without clogging indicator; intermittent monitoring of the filter	3-6
High dust concentration; filter without clogging indicator; infrequent or no monitoring of the filter	7-10

3.4 AIR FLOW RATE

BL 82



BL 162

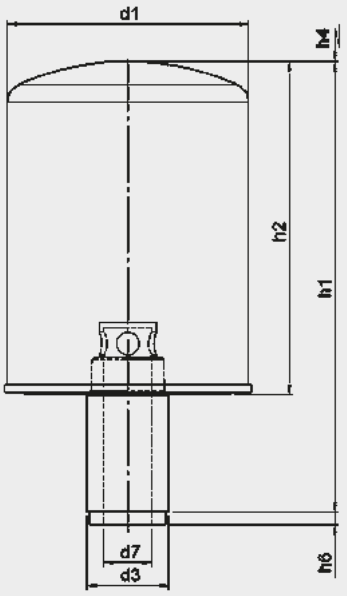


4. DIMENSIONS

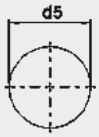
Tank requirements

1. In the filter mounting interface, the tank flange should have a maximum flatness of 0.2 mm and Ra 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter. As an alternative, the tank flange can be continuously welded from the inside.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.

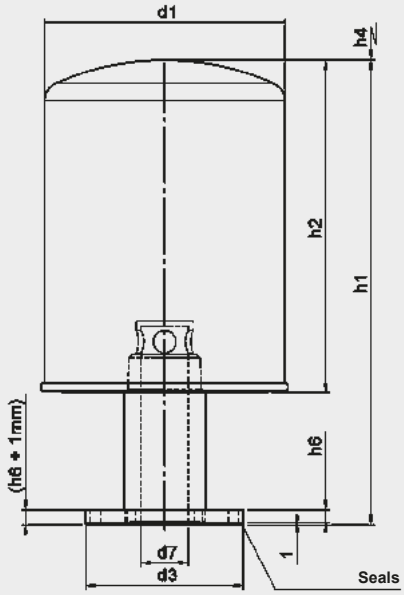
BL 82 S..., BL 162 S...



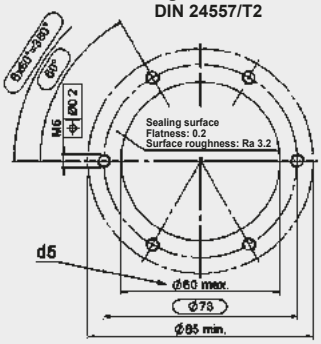
Tank connection



BL 82 F..., BL 162 F...



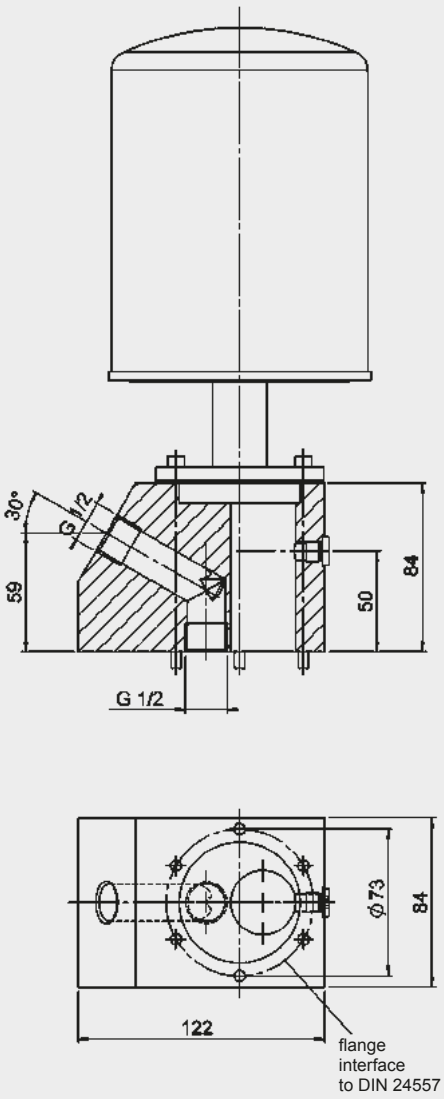
Flange connection DIN 24557/T2



	BL 82 S...	BL 162 S...
d1	94	127
d3	27	43
d5	25	41
d7	16	25
h1	187	238
h2	146	176
h4	90	90
h6	7	7
Weight	0.73 kg	1.90 kg

	BL 82 F...	BL 162 F...
d1	94	127
d3	83	83
d5	60	60
d7	16	25
h1	194	246
h2	146	176
h4	90	90
h6	7	7
Weight	1.00 kg	2.10 kg

5. FILLER ADAPTER



These filler adapters are available in the following threaded connections:

- Adapter FA12
  Connection: G ½
  (Part No.: 00318597)
- Adapter FA34
  Connection: G ¾
  (Part No.: 01282563)
- Adapter FA1
  Connection: G 1
  (Part No.: 01274065)

NOTE

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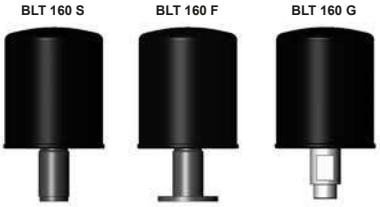
Tank Breather Filter and Dehumidifier BLT
up to 270 l/min



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction
The filters consist of a spin-on filter can which screws onto a connection tube installed on the oil tank. The connection can either be a flange, weld or threaded version.

1.2 FILTER CARTRIDGES

The replacement cartridges comply with all relevant ISO test criteria.

1.3 SEALS

Cardboard for flange model.

1.4 SPECIAL MODELS AND ACCESSORIES

On request

1.5 SPARE PARTS

See Original Spare Parts List

1.6 CERTIFICATES AND APPROVALS

On request

1.7 FILTER SPECIFICATIONS

Temperature range	-30 °C to +100 °C
Material of connection tube	Steel
Material of cartridge	Sheet steel

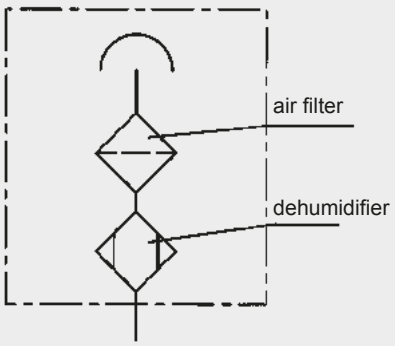
1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

The tank breather filter/dryer BLT is suitable for use with all standard mineral and lubrication oils.

1.9 CHANGING INTERVALS

The filter elements or filters must be replaced as frequently as the fluid filters, but at least every 6 months.

Symbol



2. MODEL CODE

BLT M 160 F 3 W 1 . X

2.1 COMPLETE FILTER

Filter type
BLT

Filter material
M molecular sieve

Size of filter
160

Type and size of connection

Type	Connection	Size of filter 160
F	Flange connection	●
S	Weld connection	●
G	Threaded connection	●

Filtration rating in µm
3 3 µm absolute

Type of clogging indicator
W without port, no clogging indicator

Type code
1

Modification number
X the latest version is always supplied

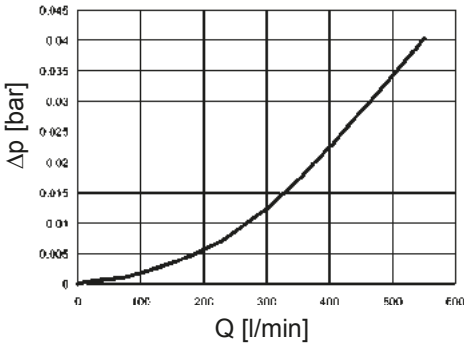
2.2 REPLACEMENT CARTRIDGE: 0160 MU 003 M

3. FILTER CALCULATION / SIZING

Differential pressure across breather filter

The differential pressure in the clean condition is shown in the graph below.

BLT 160



3.1 SIZING GUIDELINES

The rate at which contamination and humidity enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

CAUTION:
Incorrectly sized tank breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

For optimum sizing the following should therefore be observed:

- Filtration rating of breather filter = filtration rating of hydraulic filter
- Only use breather filters with an absolute retention rate (d100 = x µm; x = given filtration rating)
- Max. permitted initial pressure drop: 0.01 bar (with a clean filter element and at calculated air flow)
- Determining the calculated air flow:
  $Q_A = f5 \times Q_p$
  Q_A = calculated air flow in l_N/min
  f5 = factor for operating conditions
  Qp = max. flow rate of the hydraulic pump in l/min

Ambient conditions	Factor f5
Low dust concentration; filter fitted with clogging indicator; continuous monitoring of the filter	1-2
Average dust concentration; filter without clogging indicator; intermittent monitoring of the filter	3-6
High dust concentration; filter without clogging indicator; infrequent or no monitoring of the filter	7-10

3.2 WATER RETENTION CAPACITY

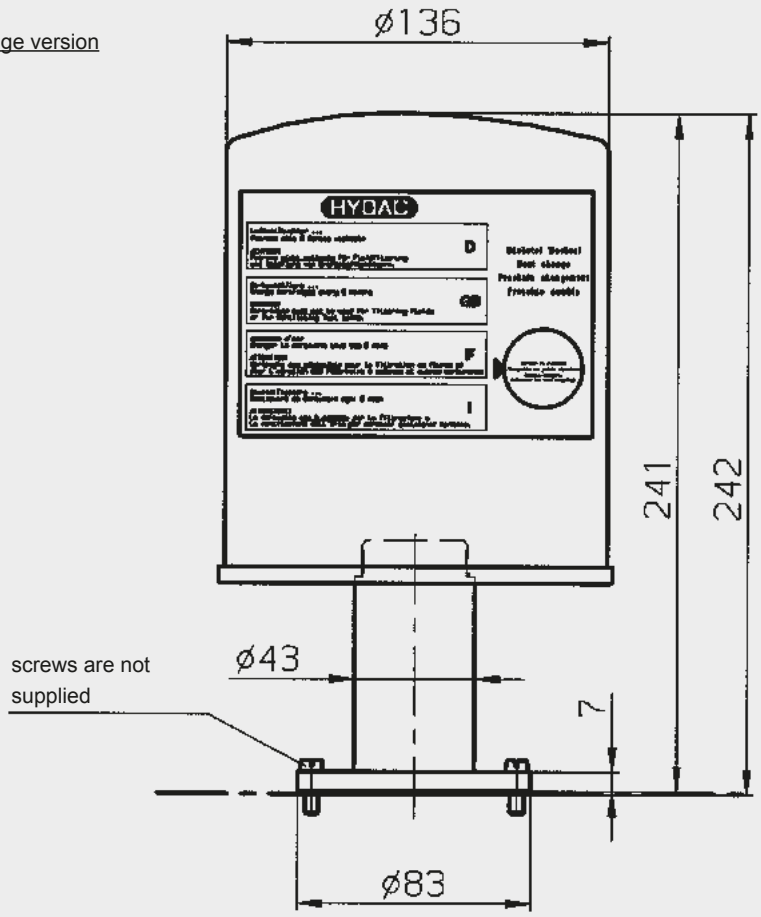
Temperature	Rel. humidity	gH_2O
0 °C	30%	190
15 °C	60%	210
25 °C	90%	230

4. DIMENSIONS

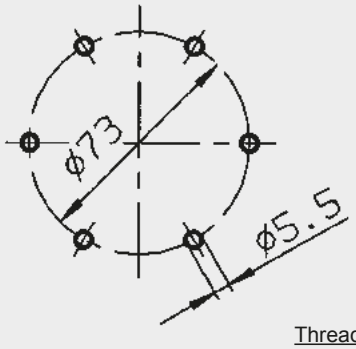
Tank requirements

1. In the filter contact area, the tank flange should have a maximum flatness of 0.3 mm and RA 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter. As an alternative, the tank flange can be continuously welded from the inside.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.

Flange version

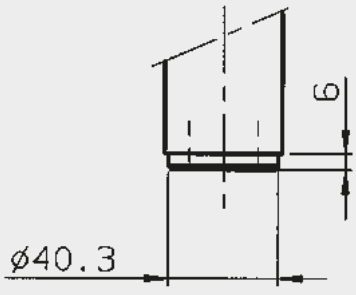


Interface to DIN 24557/Part 2

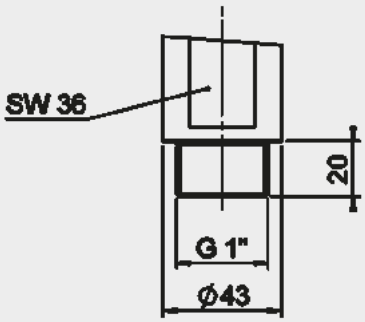


BLT	Weight
..F..	~ 2.4 kg
..S..	~ 2.0 kg
..G..	~ 1.9 kg

Weld version



Threaded version



NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications and operating conditions not described, please contact the relevant technical department. Subject to technical modifications.

HYDAC Filtertechnik GmbH
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Internet: www.hydac.com
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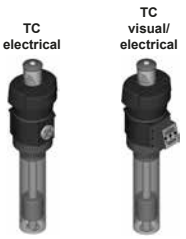
TankConditioner® TC
with Breather Filter, Float Switch and Temperature Monitoring System



1. TECHNICAL SPECIFICATIONS

1.1 UNIT CONSTRUCTION

The TankConditioner® TC is a multi-functional unit consisting of a fluid level and temperature monitoring system, an optional temperature display and a breather filter BF7 or BF 72.

1.2 FLUID LEVEL MONITORING

Values are measured using the float principle. For simple monitoring functions (e.g. pump protection or tank level monitoring) the fluid level monitoring device has two bistable switch contacts which can be turned through 180° for either N/O or N/C function.

A resolution of 10 mm makes it easy to set the switch points to suit the requirements of the system. The switch points can also be displayed via 3 LEDs (green, yellow, red), if specially requested by the customer.

Depending on the type of unit, the actual oil level can also be output as an analogue control signal for system control.

Oil level monitoring is maintenance-free for fluids which do not form a residue on the sensor tube during operation.

1.3 FLUID TEMPERATURE MONITORING

The thermal contact required for this is fitted to the end of the contact strip and therefore monitors the oil temperature in the lower part of the tank.

The normally closed contact responds at 70 °C and acts as an emergency cut-out.

If switching functions are to be carried out in conjunction with temperature monitoring (to control an oil cooler, for example) then, depending on the model, up to 2 PNP switch outputs can either be programmed hysteresis-free from 0-100 °C, or can be output as an analogue control signal.

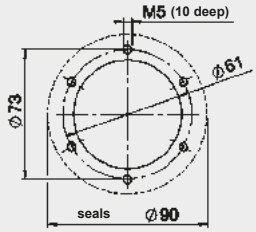
1.4 TANK BREATHER FILTER

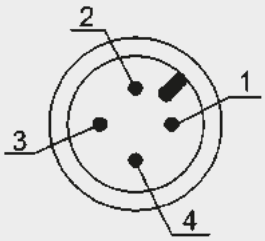
To meet the most likely customer requirements, the TankConditioner® TC is fitted with the BF 7 or BF 72 breather filter as standard.

The breather filter is designed in such a way that it is impossible to fill or top up the tank with hydraulic fluid via the filter housing (exception: version FABF). The TankConditioner® TC can be supplied without a port for a clogging indicator or with a visual-analogue clogging indicator. To make the breather filter even more maintenance-friendly, we recommend fitting a UBM type clogging indicator, which is easily visible and includes a memory function.The yellow reset button is used to reset the indicator after changing the element.

1.5 GENERAL TECHNICAL SPECIFICATIONS

Flange connection	DIN 24557/ Part 2: mounting hole Ø61
Installation position	vertical ±30°
Operating voltage	12V ... 30V DC
Electrical connection	Male: Series M12x1/ 4-pole IP67 For type S44 screened cables must be provided by the customer!
Filter element	3 µm
Air flow rate	BF 7: max. 900 l_N/min BF 72: max. 1200 l_N/min
Sensor tube / float / protective sleeve (option)	synthetic material / brass (optional stainless steel)
Nominal pressure	max. 1 bar
Temperature of fluid	max. 100 °C
Flange connection to DIN 24557 / Part 2	For pin assignment see Point 3. Dimensions





For further information, please see Point 3.

1.6 TANK FILLING OPTION

For simple applications the tank can be filled via the breather filter (see Supplementary Details code FABF).
To protect the hydraulics a filler-strainer is built into the tank flange as a coarse filter.
For high performance hydraulic systems we recommend the filling connection which allows the filling of filtered oil to be monitored (Supplementary Details FA34). The required quick release coupling is not supplied.

1.7 FILTER ELEMENTS
Contamination retention capacities in g

	Paper
BF	3 µm
7	26.1
72	52.2

1.8 SEALS

NBR (= Perbunan)
NBR and cork for version FA34

1.9 WAVE MOTION PROTECTION

Wave motion on the surface of the oil can affect the float and can therefore cause measurement errors, particularly in large tanks. A protective sleeve is therefore available in brass (type code 1.x) or stainless steel (type code 2.x) as an accessory for these applications.

1.10 FLOAT

To ensure compatibility with many standard hydraulic fluids, the TankConditioner® TC sensor tube and float are made from synthetic material and brass, with stainless steel as an option.

1.11 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

Brass version:

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743

Stainless steel version:

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD

2. MODEL CODE (also order example)

TC P 7 F 3 UBM + D 1 . X /-S12-V250 -SSR

2.1 COMPLETE UNIT

Instrument type
TankConditioner® TC

Filter material
P Paper

Size of breather filter
7, 72

Connection
F flange (to DIN 24557 / Part 2)

Filtration rating in µm
3

Type of clogging indicator
W without port, no clogging indicator
UBM with visual vacuum indicator

Type of temperature monitoring
C electrical
D visual/electrical

Type code
1 material of float: polyurethane; material of sensor tube: brass
2 material of float and sensor tube: stainless steel

Modification number
X the latest version is always supplied

Supplementary details

Required: Switch assignment:

Switch	Fluid level	Temperature
S	1	2
S	4	4

1 = fluid level contact; normal setting: L1 = rising N/O, L2 = rising N/C
2 = N/C, 4 = measuring range 4–20mA

V250 Length of the sensor tube = 250 mm
V370 Length of the sensor tube = 370 mm
V520 Length of the sensor tube = 520 mm

Optional: SSR wave protection sleeve
(material, brass or stainless steel, is indicated by type code 1 or 2,
i.e. 1 = brass / 2 = stainless steel)
FA34 filling adapter with G ¾ connection (including wave protection sleeve)
FABF filling via breather filter (including wave protection sleeve)
LED optional LED display for fluid level (green = operating;
yellow = warning; red = critical)
(for this option, please contact HYDAC)

2.2 REPLACEMENT FILTER ELEMENT

0007 L 003 P

Size
0007, 0072

Type
L

Filtration rating in µm
003

Filter material
P Paper

2.3 PREFERRED MODELS

Out of all the different models of TankConditioner® TC, with all the options available to the customer, the following are designated "standard models":

- TC P 7 F 3 UBM+C 1.0 /-S12-Vxxx
- TC P 7 F 3 UBM+D 1.0 /-S12-Vxxx
- TC P 7 F 3 UBM+C 1.0 /-S12-Vxxx-FABF
- TC P 7 F 3 UBM+D 1.0 /-S12-Vxxx-FABF
- TC P 7 F 3 UBM+D 1.0 /-S12-Vxxx-FA34
- TC P 7 F 3 UBM+C 1.0 /-S44-Vxxx-FA34

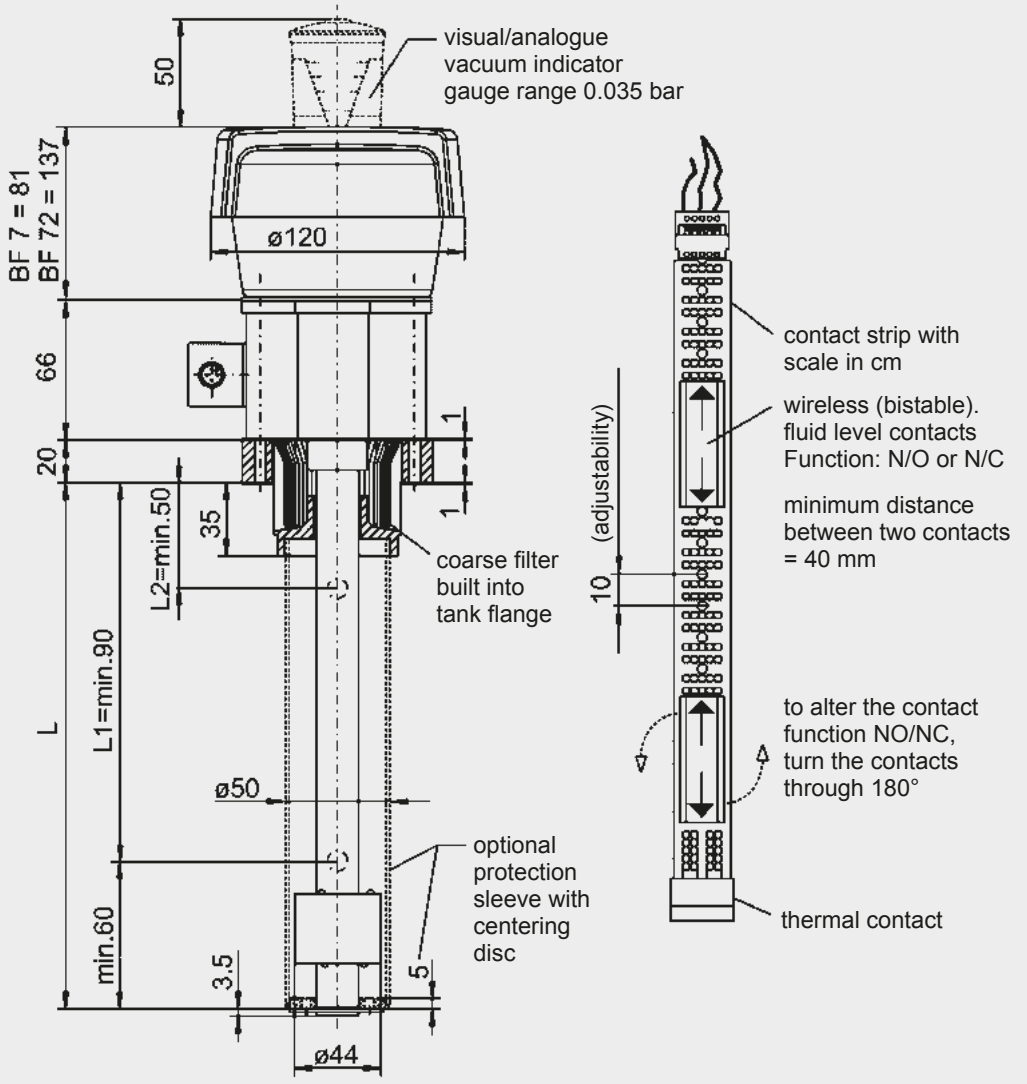
3. DIMENSIONS and TECHNICAL SPECIFICATIONS

Tank requirements

1. In the filter contact area, the tank flange should have a maximum flatness of 0.3 mm and RA 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter. As an alternative, the tank flange can be continuously welded from the inside.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.

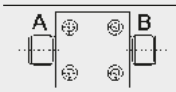
3.1 TANKCONDITIONER® TC WITH SUPPLEMENTARY CODE "S12"

Version TC...**C** 1.x /-**S12**-Vxxx...(brass/synthetic material)



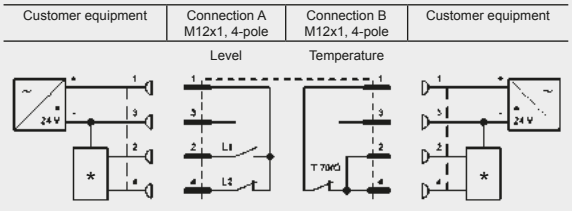
TECHNICAL SPECIFICATIONS

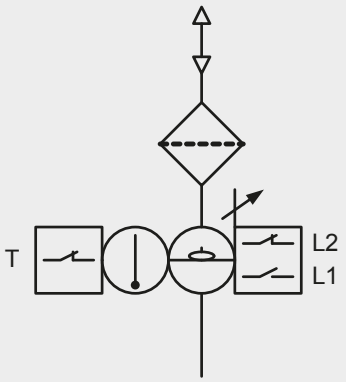
Level switch points	bistable N/O / N/C Max. 2 can be set
Resolution	10 mm
Hysteresis	4 mm
Thermal contact	T70 °C / N/C
Switching capacity	10W / VA max 30 V / DC max.
Switching current	1 A max.



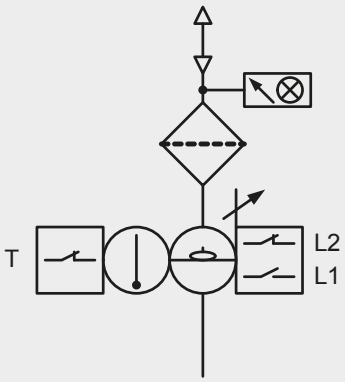
Male connections

Connection A	Connection B
Level contact(s): 1 = 12V-30V DC 2 = level L1 (+UB) 3 = not connected 4 = level L2 (+UB)	Temp. contact(s): 1 = 12V-30V DC 2 + 4 = T70 / opens (+UB) 3 = not connected





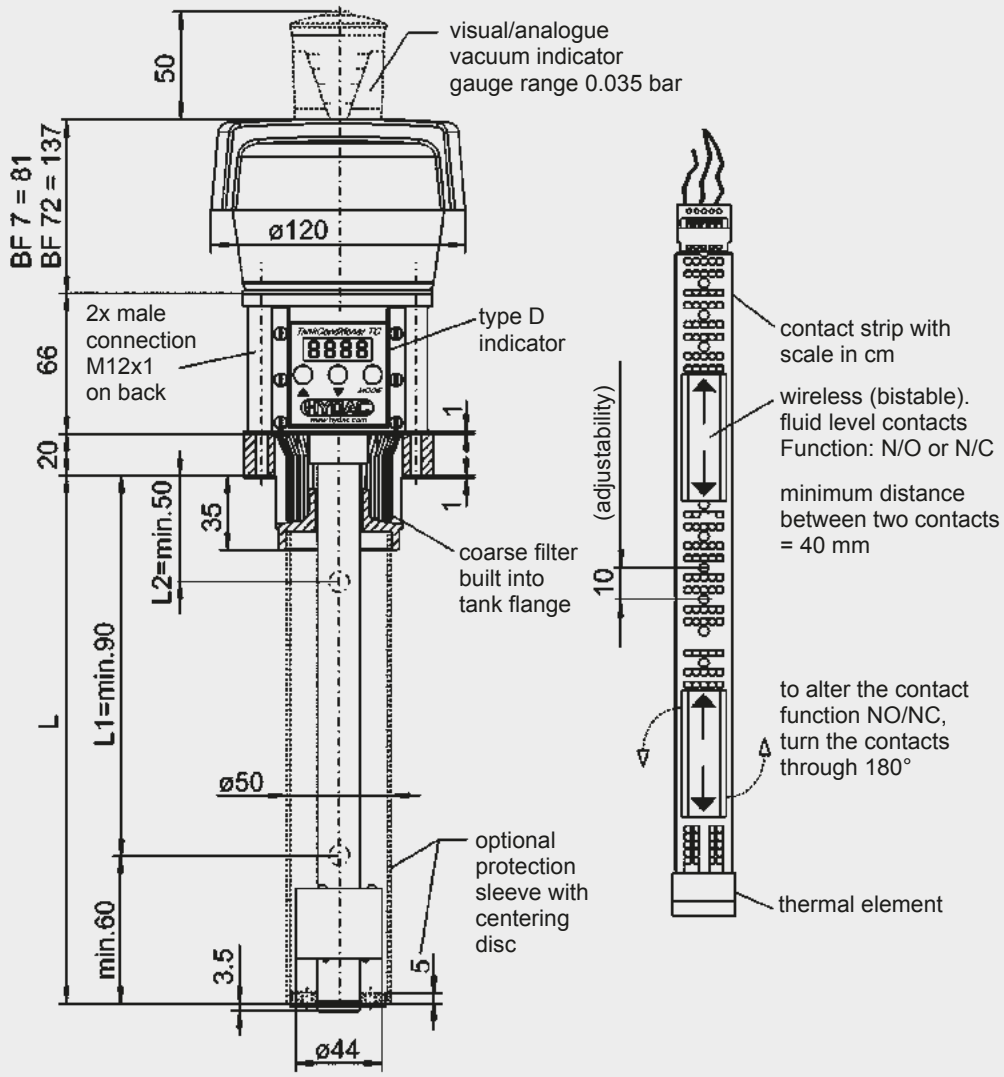
TC...W+C../-S12...



TC...UBM+C../-S12...

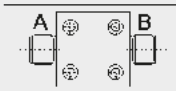
Factory normal setting for type S12: "pump protection monitoring"					
Switch points	Sensor tube length L			Contact function of fluid level contacts	Possible application
	250	370	520		
L2	150	270	420	NC - rising N/C	Warning at "min. tank level"
L1	190	310	460	NO - rising N/O	Cut-out at "min. tank level"

Version TC...**D** 1.x /-**S12**-Vxxx... (brass/synthetic material)



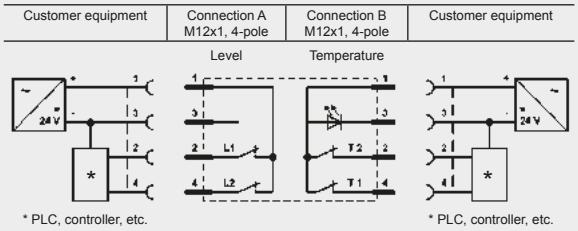
TECHNICAL SPECIFICATIONS

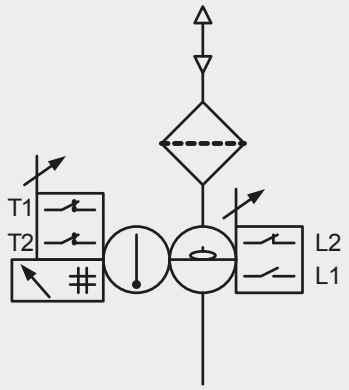
Level switch points	bistable N/O / N/C Max. 2 can be set
Resolution	10 mm
Hysteresis	4 mm
Thermal element	Pt100
Temp. switch points	Max. 2 can be set
Hysteresis	1 – 99 K can be set
Switching capacity	10W / VA max 30 V / DC max.
Switching current	1 A max.
Display for temperature monitoring	LED 3-digit (4-digit w/o unit of meas.)
Indication range	-20 °C to +120 °C (-4 ° to +248 °F)



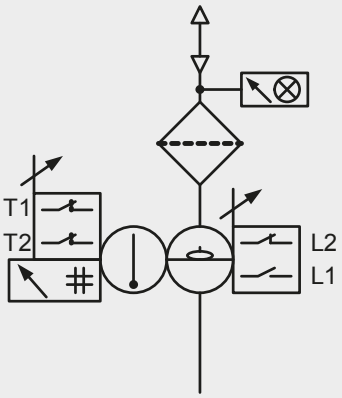
Male connections

Connection A	Connection B
Level contacts: 1 = 12V-30V DC 2 = level L1 (+UB) 3 = not connected 4 = level L2 (+UB)	Temperature contacts: 1 = 12V-30V DC 2 = temp. 2 (+UB) 3 = GND (0V) 4 = temp. 1 (+UB)





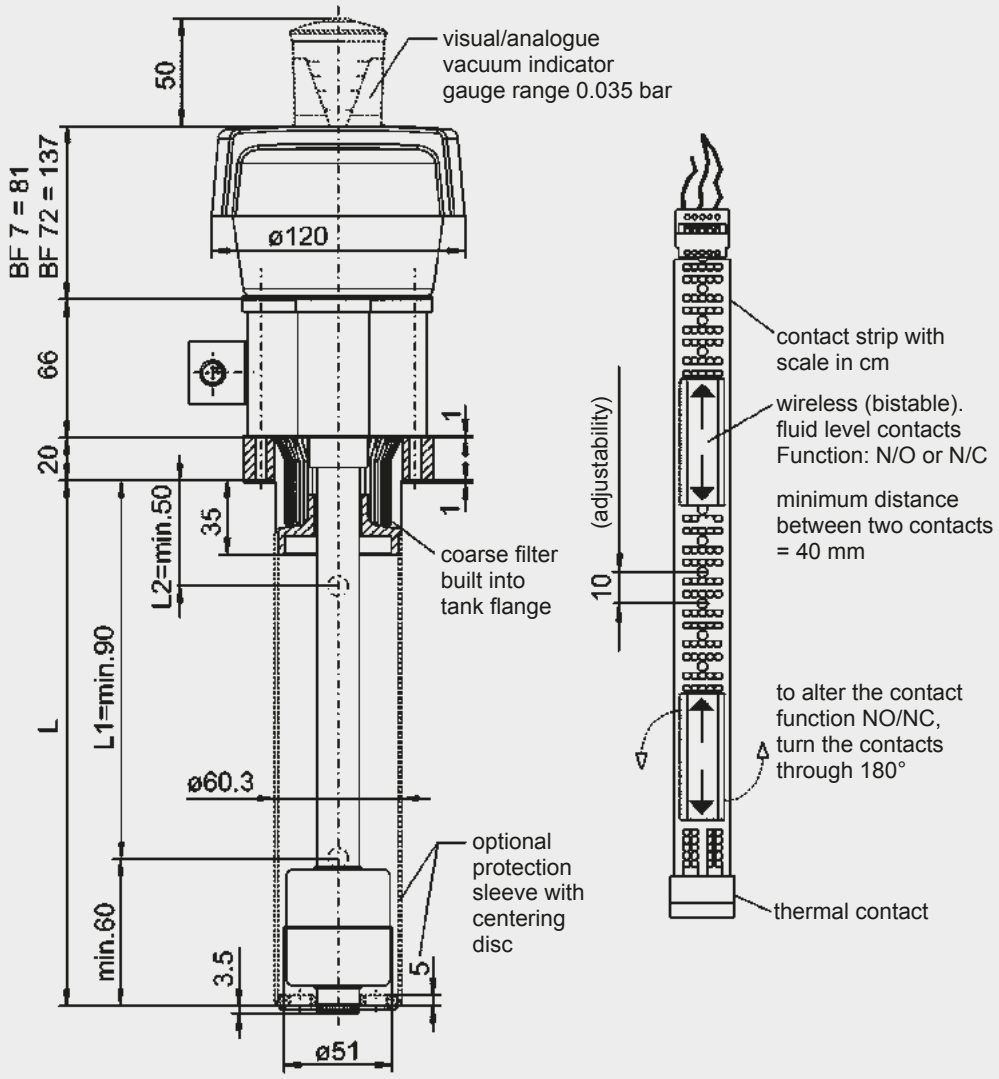
TC...W+D../-S12...



TC...UBM+D../-S12...

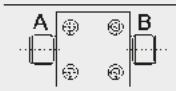
Factory normal setting for type S12: "pump protection monitoring"					
Switch points	Sensor tube length L			Contact function of fluid level contacts	Possible application
	250	370	520		
L2	150	270	420	NC - rising N/C	Warning at "min. tank level"
L1	190	310	460	NO - rising N/O	Cut-out at "min. tank level"

Version TC...**C** 2.x /-**S12**-Vxxx... (stainless steel)



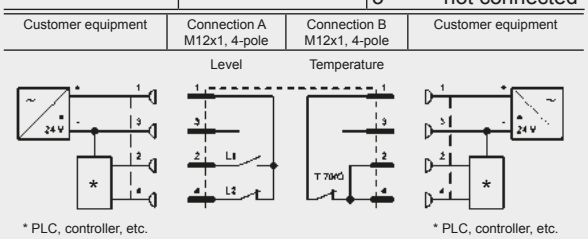
TECHNICAL SPECIFICATIONS

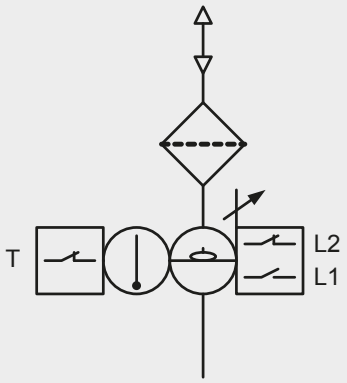
Level switch points	bistable N/O / N/C Max. 2 can be set
Resolution	10 mm
Hysteresis	4 mm
Thermal contact	T70 °C / N/C
Switching capacity	10W / VA max 30 V / DC max.
Switching current	1 A max.



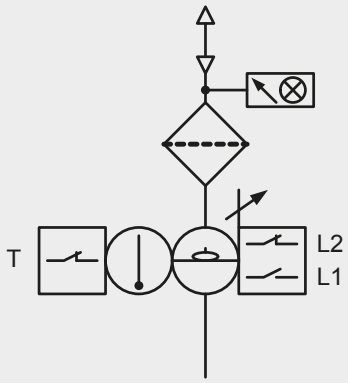
Male connections

Connection A	Connection B
Level contact(s): 1 = 12V-30V DC 2 = level L1 (+UB) 3 = not connected 4 = level L2 (+UB)	Temp. contact(s): 1 = 12V-30V DC 2 + 4 = T70 / opens (+UB) 3 = not connected





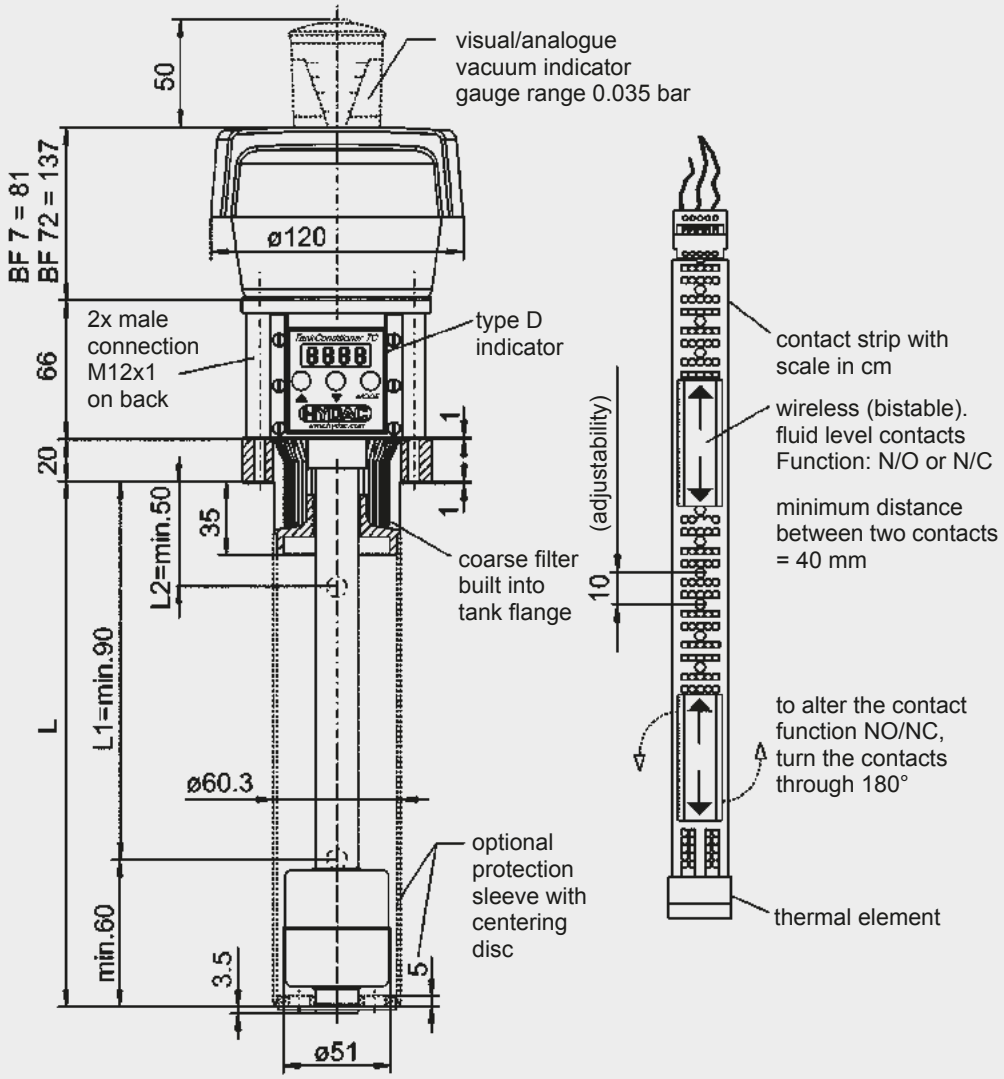
TC...W+C../-S12...



TC...UBM+C../-S12...

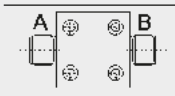
Factory normal setting for type S12: "pump protection monitoring"					
Switch points	Sensor tube length L			Contact function of fluid level contacts	Possible application
	250	370	520		
L2	150	270	420	NC - rising N/C	Warning at "min. tank level"
L1	190	310	460	NO - rising N/O	Cut-out at "min. tank level"

Version TC...**D** 1.x /-**S12**-Vxxx... (stainless steel)



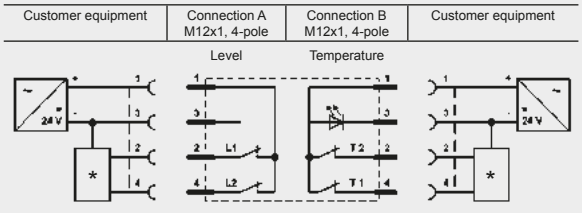
TECHNICAL SPECIFICATIONS

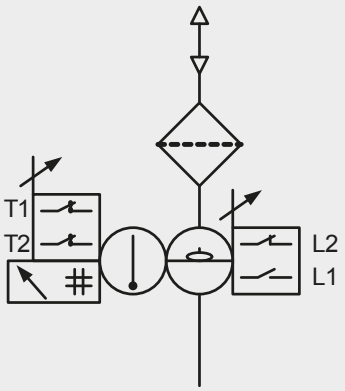
Level switch points	bistable N/O / N/C Max. 2 can be set
Resolution	10 mm
Hysteresis	4 mm
Thermal element	Pt100
Temp. switch points	Max. 2 can be set
Hysteresis	1 – 99 K can be set
Switching capacity	10W / VA max 30 V / DC max.
Switching current	1 A max.
Display for temperature monitoring	LED 3-digit (4-digit w/o unit of meas.)
Indication range	-20 °C to +120 °C (-4 ° to +248 °F)



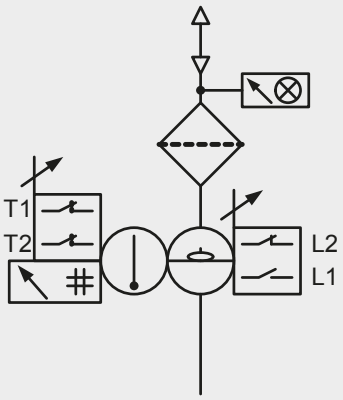
Male connections

Connection A	Connection B
Level contacts: 1 = 12V-30V DC 2 = level L1 (+UB) 3 = not connected 4 = level L2 (+UB)	Temperature contacts: 1 = 12V-30V DC 2 = temp. 2 (+UB) 3 = GND (0V) 4 = temp. 1 (+UB)





TC...W+D../-S12...

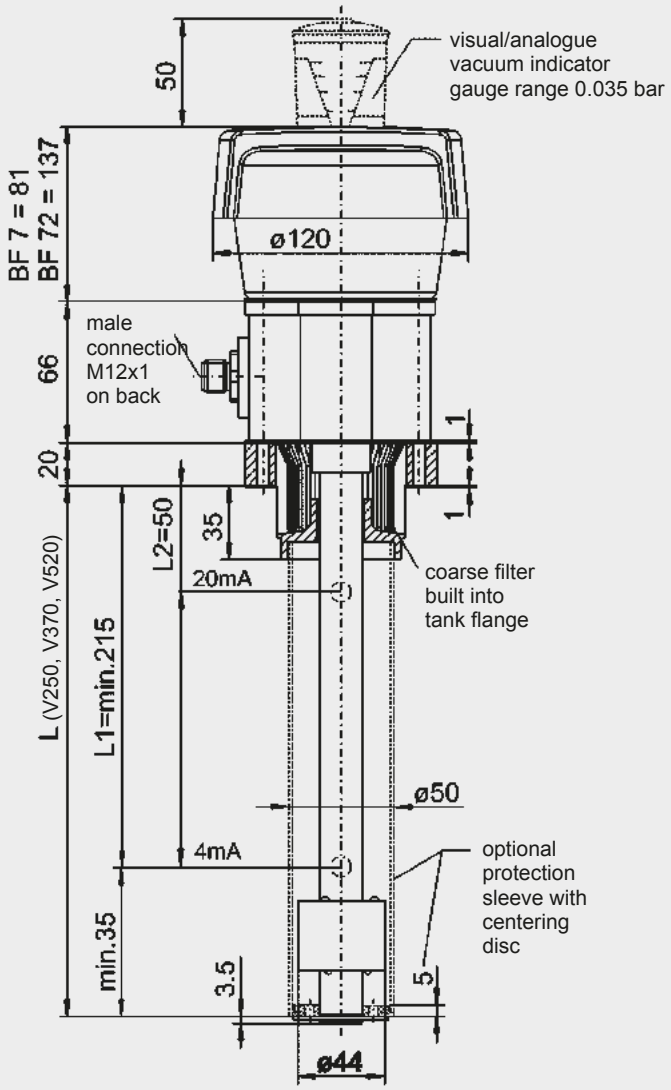


TC...UBM+D../-S12...

Factory normal setting for type S12: "pump protection monitoring"					
Switch points	Sensor tube length L			Contact function of fluid level contacts	Possible application
	250	370	520		
L2	150	270	420	NC - rising N/C	Warning at "min. tank level"
L1	190	310	460	NO - rising N/O	Cut-out at "min. tank level"

3.2 TANKCONDITIONER® TC WITH SUPPLEMENTARY CODE "S44"

Version TC...**C** 1.x /-**S44**-Vxxx... (brass/synthetic material)



TECHNICAL SPECIFICATIONS

Fluid level monitoring	
Output signal	4 – 20 mA
Meas. range for V250	165 mm
Meas. range for V370	285 mm
Meas. range for V520	435 mm
Resolution	4 mm
Hysteresis	0 – 10%
Temperature monitoring	
Output signal	4 – 20 mA
Measuring range	0 – 100 °C
Hysteresis	0 – 1 K
Ohmic resistance	RB = U – 8 V / 20 mA
Data transfer	Shielded cable must be provided!

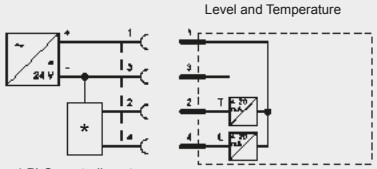
Male connections

Connection

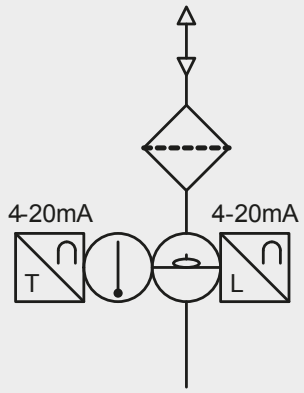
Fluid level/Temperature signals:
1 = 12V-30V DC
2 = temperature 4 – 20 mA
3 = not connected
4 = level 4 – 20 mA

Customer equipment	Connection A M12x1, 4-pole	

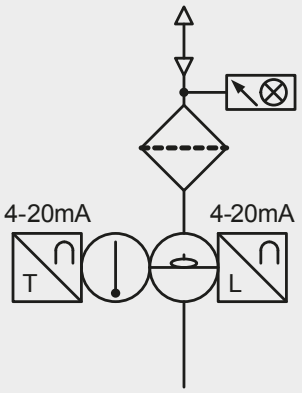
Level and Temperature



* PLC, controller, etc.

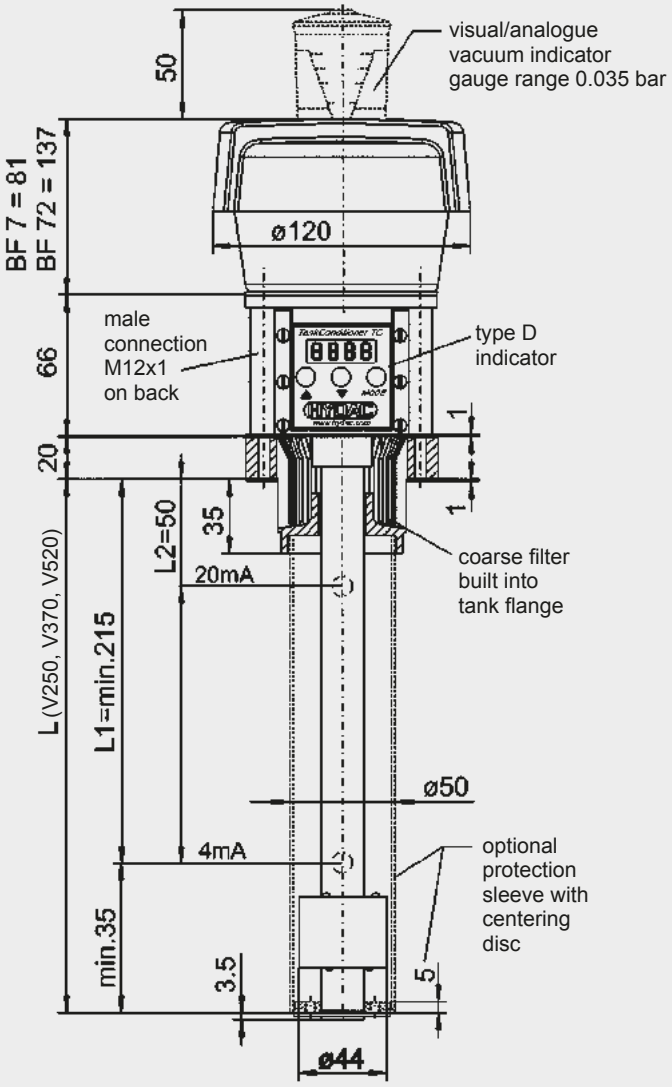


TC...W+C../-S44...



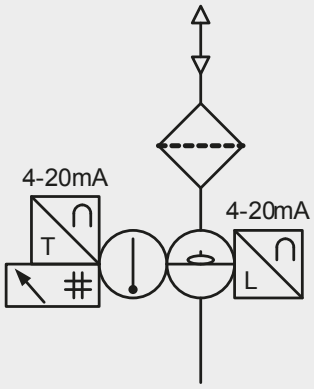
TC...UBM+C../-S44...

Version TC...**D** 1.x /-**S44**-Vxxx... (brass/synthetic material)

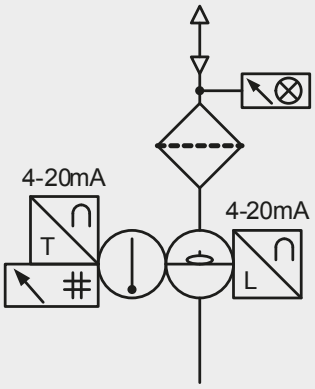


TECHNICAL SPECIFICATIONS

Fluid level monitoring	
Output signal	4 – 20 mA
Meas. range for V250	165 mm
Meas. range for V370	285 mm
Meas. range for V520	435 mm
Resolution	4 mm
Hysteresis	0 – 10%
Temperature monitoring	
Output signal	4 – 20 mA
Measuring range	0 – 100 °C
Hysteresis	0 – 1 K
Ohmic resistance	RB = U – 8 V / 20 mA
Data transfer	Screened cable must be provided!
Display for temperature monitoring	LED 3-digit (4-digit w/o unit of meas.)
Indication range	-20 °C to +120 °C (-4 ° to +248 °F)



TC...W+D../-S44...



TC...UBM+D../-S44...

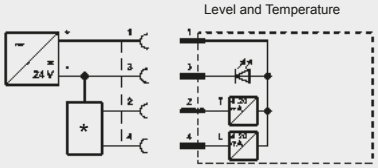
Male connections

Connection

Fluid level/Temperature signals:
1 = 12V-30V DC
2 = temperature 4 – 20 mA
3 = GND (0V)
4 = level 4 – 20 mA

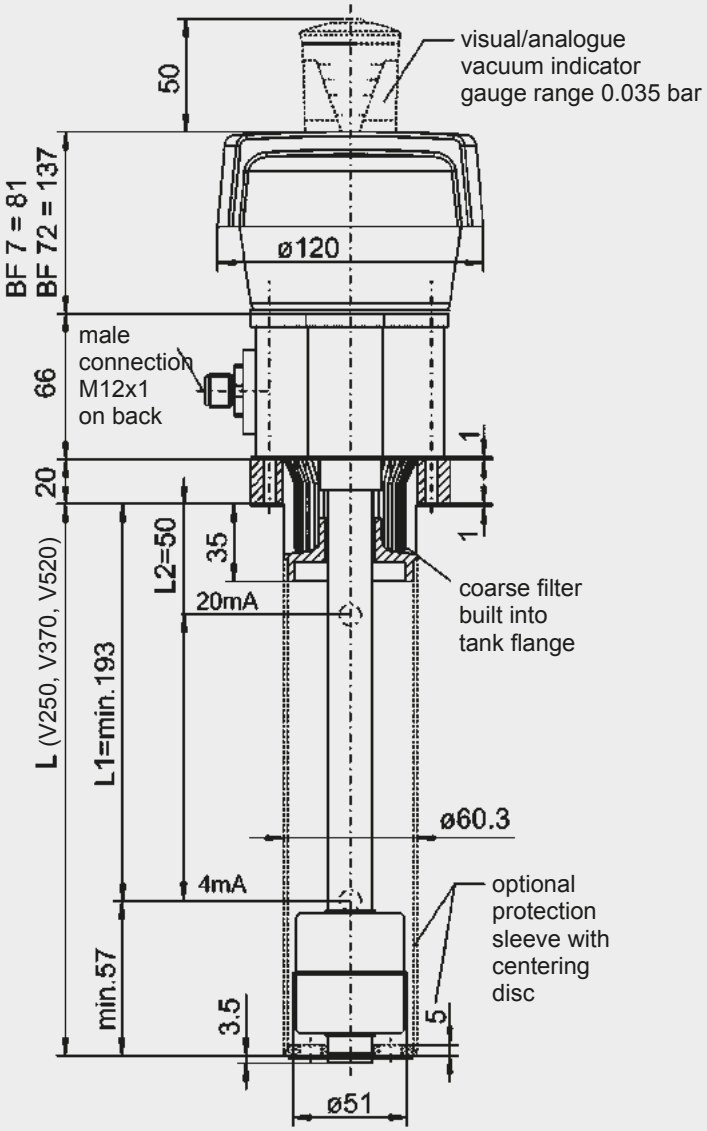
Customer equipment	Connection A M12x1, 4-pole	

Level and Temperature



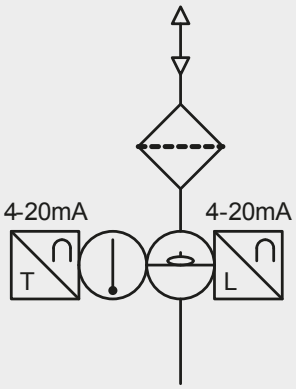
* PLC, controller, etc.

Version TC...**C** 2.x /-**S44**-Vxxx-... (stainless steel)

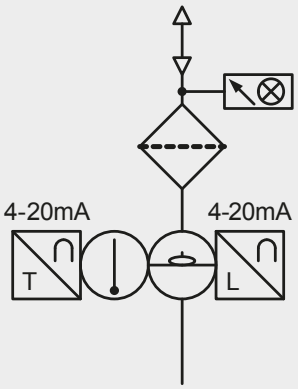


TECHNICAL SPECIFICATIONS

Fluid level monitoring	
Output signal	4 – 20 mA
Meas. range for V250	143 mm
Meas. range for V370	263 mm
Meas. range for V520	413 mm
Resolution	7.5 mm
Hysteresis	0 – 10%
Temperature monitoring	
Output signal	4 – 20 mA
Measuring range	0 – 100 °C
Hysteresis	0 – 1 K
Ohmic resistance	RB = U – 8 V / 20 mA
Data transfer	Shielded cable must be provided!



TC...W+C../-S44...



TC...UBM+C../-S44...

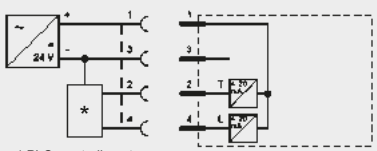
Male connections

Connection

Fluid level/Temperature signals:
1 = 12V-30V DC
2 = temperature 4 – 20 mA
3 = not connected
4 = level 4 – 20 mA

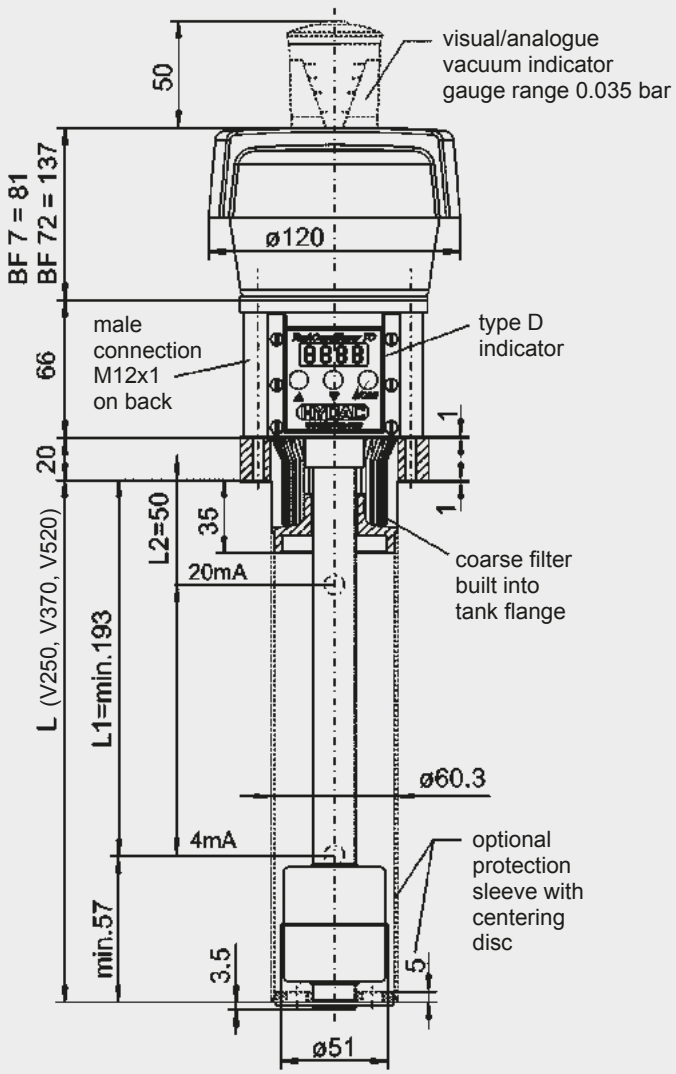
Customer equipment	Connection A M12x1, 4-pole	

Level and Temperature



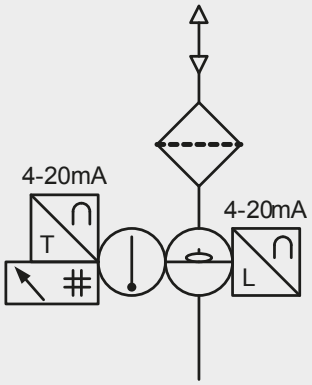
* PLC, controller, etc.

Version TC...**D** 2.x /-**S44**-Vxxx... (stainless steel)

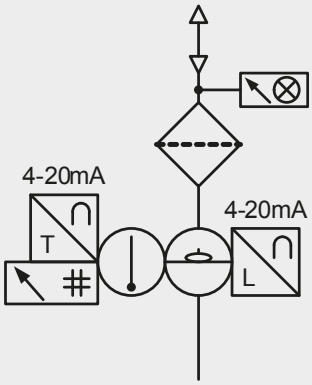


TECHNICAL SPECIFICATIONS

Fluid level monitoring	
Output signal	4 – 20 mA
Meas. range for V250	143 mm
Meas. range for V370	263 mm
Meas. range for V520	413 mm
Resolution	7.5 mm
Hysteresis	0 – 10%
Temperature monitoring	
Output signal	4 – 20 mA
Measuring range	0 – 100 °C
Hysteresis	0 – 1 K
Ohmic resistance	RB = U – 8 V / 20 mA
Data transfer	Screened cable must be provided!
Display for temperature monitoring	LED 3-digit (4-digit w/o unit of meas.)
Indication range	-20 °C to +120 °C (-4 ° to +248 °F)



TC...W+D../-S44...



TC...UBM+D../-S44...

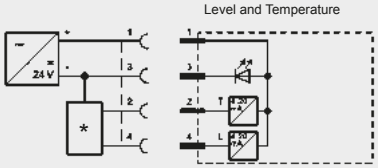
Male connections

Connection

Fluid level/Temperature signals:
1 = 12V-30V DC
2 = temperature 4 – 20 mA
3 = GND (0V)
4 = level 4 – 20 mA

Customer equipment	Connection A M12x1, 4-pole	

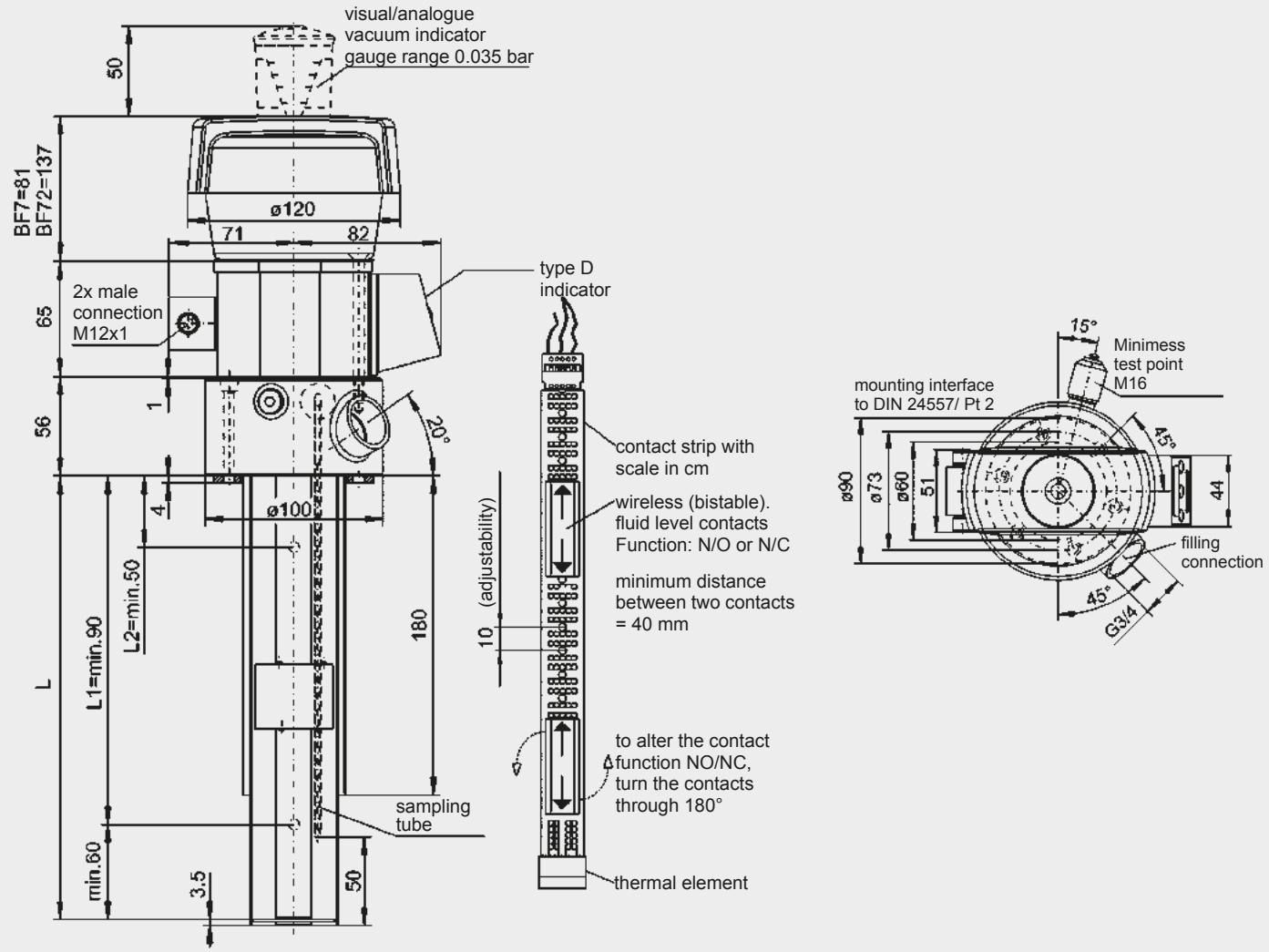
Level and Temperature



* PLC, controller, etc.

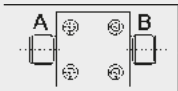
3.2 TANKCONDITIONER® TC WITH ADDITIONAL SUPPLEMENTARY CODE "FA34"

Version TC...**D** 1.x /-**S12**-Vxxx-FA34 (FA34 with filling adapter)



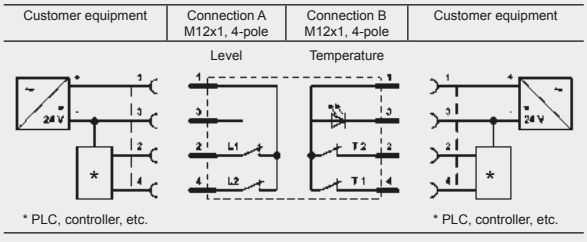
TECHNICAL SPECIFICATIONS

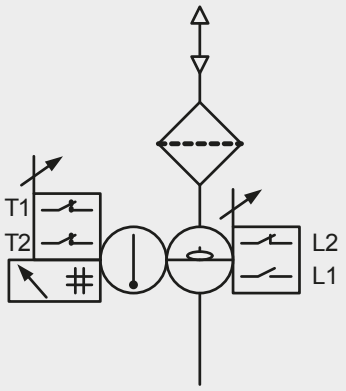
Level switch points	bistable N/O / N/C Max. 2 can be set
Resolution	10 mm
Hysteresis	4 mm
Thermal element	Pt100
Temp. switch points	Max. 2 can be set
Hysteresis	1 – 99 K can be set
Switching capacity	10W / VA max 30 V / DC max.
Switching current	1 A max.
Display for temperature monitoring	LED 3-digit (4-digit w/o unit of meas.)
Indication range	-20 °C to +120 °C (-4 ° to +248 °F)



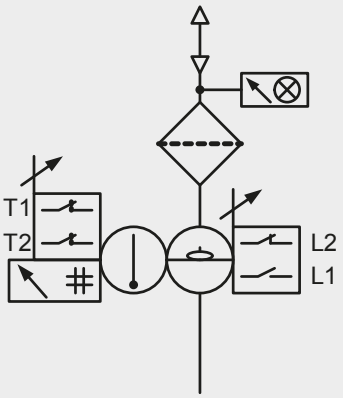
Male connections

Connection A	Connection B
Level contact(s): 1 = 12V-30V DC 2 = level L1 (+UB) 3 = not connected 4 = level L2 (+UB)	Temperature contacts: 1 = 12V-30V DC 2 = temp. 2 (+UB) 3 = GND (0V) 4 = temp. 1 (+UB)





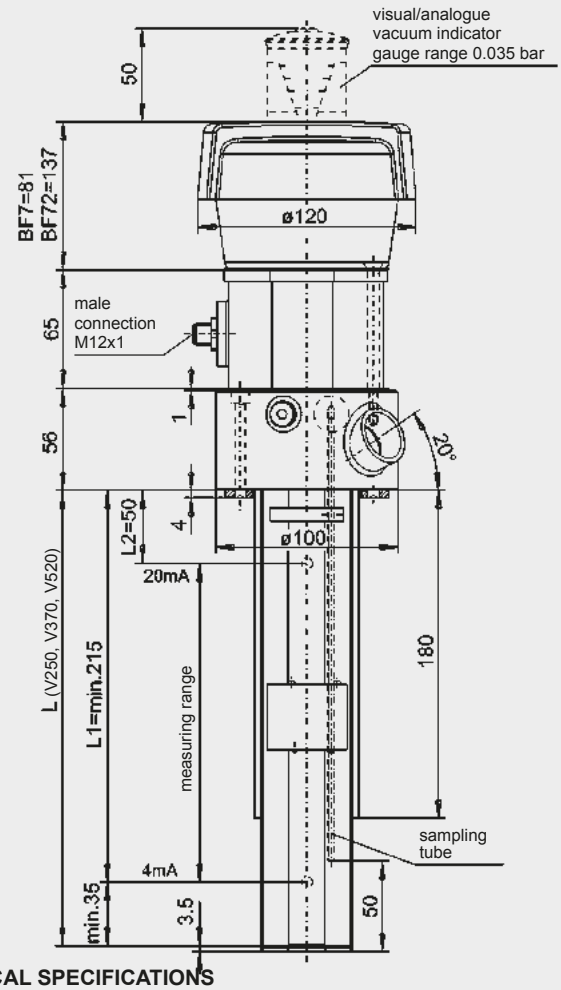
TC...W+D../-S12...

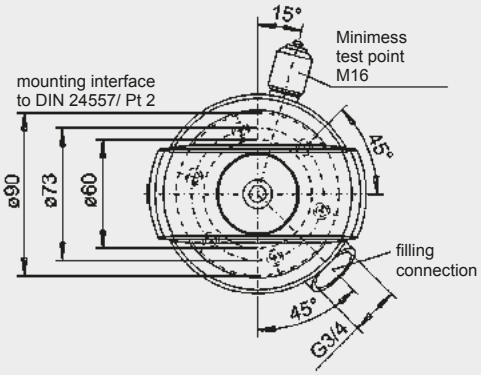


TC...UBM+D../-S12...

Factory normal setting for type S12: "pump protection monitoring"					
Switch points	Sensor tube length L			Contact function of fluid level contacts	Possible application
	250	370	520		
L2	150	270	420	NC - rising N/C	Warning at "min. tank level"
L1	190	310	460	NO - rising N/O	Cut-out at "min. tank level"

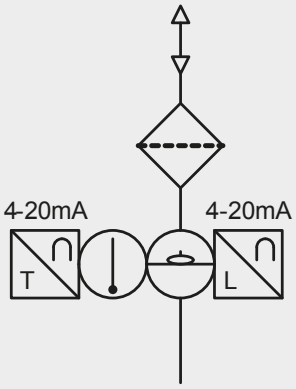
Version TC...**C** 1.x /-**S44**-Vxxx-FA34 (FA34 with filling adapter)



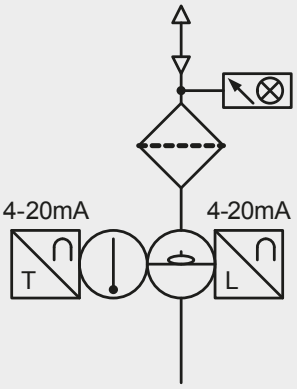


TECHNICAL SPECIFICATIONS

Fluid level monitoring	
Output signal	4 – 20 mA
Meas. range for V250	165 mm
Meas. range for V370	285 mm
Meas. range for V520	435 mm
Resolution	4 mm
Hysteresis	0 – 10%
Temperature monitoring	
Output signal	4 – 20 mA
Measuring range	0 – 100 °C
Hysteresis	0 – 1 K
Ohmic resistance	RB = U – 8 V / 20 mA
Data transfer	Shielded cable must be provided!



TC...W+C../-S44...



TC...UBM+C../-S44...

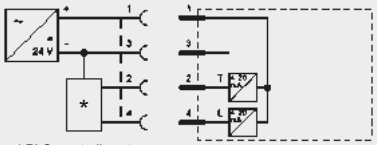
Male connections

Connection

Fluid level/Temperature signals:
1 = 12V-30V DC
2 = temperature 4 – 20 mA
3 = not connected
4 = level 4 – 20 mA

Customer equipment	Connection A M12x1, 4-pole	

Level and Temperature



* PLC, controller, etc.

NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

HYDAC Filtertechnik GmbH
Industriegebiet
D-66280 Sulzbach/Saar
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

Return Line Filter RFM with 2-Hole Mounting

Tank-top versions: up to 200 l/min, up to 10 bar

In-tank versions: up to 2,600 l/min, up to 10 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head (with 2-hole flange), filter bowl and a screw-on cover plate.

Standard equipment:

- with bypass valve
- connection for a clogging indicator (Important: for RFM 75 to 195, please state mounting position for indicator!)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943 ISO 3724, ISO 3968, ISO 11170 ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Ecomicron® (ECON2):	10 bar
Wire mesh (W/HC):	20 bar
Paper (P/HC):	10 bar
Betamicron® / Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM):	10 bar
Mobilemicron® (MM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	10 bar
Temperature range	-30 °C to +100 °C (short-term: -40 °C)
Material of filter head	Aluminium: all RFM
Material of filter bowl	Polyamide: all RFM except 210, 270
Material of cover plate	Polyamide: all RFM
Type of clogging indicator	VMF Connection thread G 1/8 (return line indication)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 MOUNTING

Tank-top or in-tank filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Extension tube (except RFM 90, 150) on request
- Tank breather filter built into head on RFM 75 to 195
- Dipstick for RFM 75, 165, 185, 195 (RFM 90 and 150 on request)
- 4-hole flange (see brochure "Return Line Filter RFM with 4-hole mounting")

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

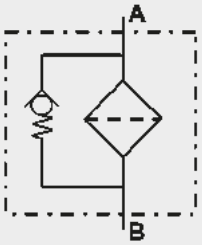
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector
- If an extension tube is to be fitted to the two-piece filter housing, the tube must be made of synthetic material or thin-wall aluminium
- Extensions must be protected by fitting a bulkhead plate or other means of protection so that no forces can be transmitted to the filter housing or the extension
- The filter can normally only be used for tank-mounting
- The filter must be fitted absolutely vertically, or after consultation with the manufacturer, only within the tolerances specified
- The filter must not be used as a suction filter
- Components (e.g. coolers) must not be installed after the filter

Symbol for hydraulic systems



E 7.106.16/11.16

2. MODEL CODE (also order example)

RFM ON 165 B C 10 D 1 . X /-L24

2.1. COMPLETE FILTER: TANK-TOP VERSION

Filter type
RFM

Filter material
ON Optimicron®
ECO/N Ecomicron® (ECON2) – not RFM SET version 2600
P/HC paper
W/HC stainless steel wire mesh
MM Mobilemicron

Size of filter or element
RFM: 75, 90, 150, 165, 185, 195

Operating pressure
B = 10 bar
V = 7 bar (for RFM with clogging indicator up to max. 7 bar operating pressure)

Type and size of connection

Type	Port	Filter size					
		75	90	150	165	185	195
B	G ½	●	X	X	●	●	●
C	G ¾	●	●	●	●	●	●
D	G 1	●	X	X	●	●	●

KIT, SET, S versions see point 2.5

X on request

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20 ECO/N: 3, 5, 10, 20 W/HC: 25, 50, 100, 200
P/HC: 10, 20 MM: 10, 15

Type of clogging indicator
Y plastic cap in indicator port
A screw plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. 7.050../..

Type code
0 without port, no clogging indicator
1-3 see point 2.4 - note position of clogging indicator!

Modification number
X the latest version is always supplied

Supplementary details
A..-B.. setting pressure of indicator and cracking pressure of bypass in bar (e.g.: A5-B6)
L... light with appropriate voltage (24, 48, 110, 220 Volt)] only for clogging indicators type "D"
LED 2 light emitting diodes up to 24 Volt
PSxx dipstick for RFM 75, 165, 185, 195 on request
PZxx dipstick for RFM 90, 150 on request
T with tank breather filter
V FPM seals
Vxxx with extension tube (where xxx is the final dimension of the extension – no extension for RFM 90, 150!)
W suitable for HFA und HFC emulsions

2.2 REPLACEMENT ELEMENT

0165 R 010 ON /-V

Size
0075, 0090, 0150, 0165, 0185, 0195, 0210, 0270, 0330, 0500, 0660, 0850, 0950, 1300, 2600

Type
R

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020 ECON2: 003, 005, 010, 020 W/HC: 025, 050, 100, 200
P/HC: 010, 020 MM: 010, 015

Filter material
ON, ECON2, P/HC, W/HC, MM

Supplementary details
V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VMF 2 D . X /-L24

Type
VMF connection thread G 1/8

Pressure setting
2 standard 2 bar, others on request

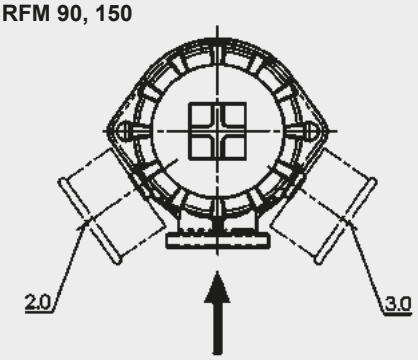
Type of clogging indicator
see Point 2.1

Modification number
X the latest version is always supplied

Supplementary details
V only for types B, BM, LE, LZ and C /-EX2G (all other clogging indicators have FPM seals as standard)
L..., LED (for descriptions, see point 2.1)

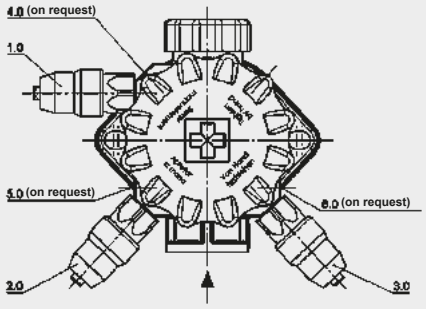
2.4 TYPE CODE: MOUNTING POSITION OF THE CLOGGING INDICATOR

RFM 90, 150



Type code	Mounting position of the clogging indicator	Type of indicator
2.X	Clogging indicator on left front, 45° to the inlet	VMF...
3.X	Clogging indicator on right front, 45° to the inlet	VMF...

RFM 75, 165, 185, 195



Type code	Mounting position of the clogging indicator	Type of indicator
1.X	Clogging indicator on left back, 90° to the inlet	VMF...
2.X	Clogging indicator on left front, 45° to the inlet	VMF...
3.X	Clogging indicator on right front, 45° to the inlet	VMF...

NOTE
Other type codes on request.

2.5 MODEL CODE: IN-TANK MOUNTING FILTER

KIT VERSION

RFM ON 165 KIT 10 W 1.0 /-V

Size
75, 90, 150, 165, 185, 195, 210, 270, 330, 500, 661, 851

In-tank mounting version
KIT bowl only with element and seal

Supplementary details
B. bypass cracking pressure (e.g. B6 = 6 bar)
DFxxx spring (where xxx is the relevant length) - on request
G threaded connection in outlet (RFM 330 to 851)
V FPM seal
Vxxx extension tube (where xxx is the final dimension of the extension)

SET VERSION, screw-on
Sizes 330 and 500

RFM ON 330 SET 10 W 1.0 /-V

Size
330, 500

In-tank mounting version
SET bowl only with element and seal, plus adapter ring

Supplementary details
B. bypass cracking pressure (e.g. B6 = 6 bar)
G threaded connection in outlet
V FPM seal
Vxxx extension tube (where xxx is the final dimension of the extension)

SET VERSION, screw-on
Sizes 950 to 2600

RFM ON 950 SET 10 W 1.0 /-SO441

Filter material (only for this version)
ECO/N Ecomicron® (ECON2)
ON Optimicron®

Size
950, 1300, 2600

In-tank mounting version
SET element only with integral contamination retainer, element location spigot and spring

Supplementary details
SO441 this code must be specified! (also required for replacement element)
V FPM seal

S VERSION, weld-in version

RFM ON 165 S 10 W 1.0 /-V

Size
75, 165, 185

In-tank mounting version
S bowl only with element, spring and seal, plus weld-in housing

Supplementary details
B. bypass cracking pressure (e.g. B6 = 6 bar)
V FPM seal
Vxxx extension tube (where xxx is the final dimension of the extension)

Note:
- Other supplementary details on request (or point 2.1)
- For replacement elements for in-tank filters, see point 2.2

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = see graphs (point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

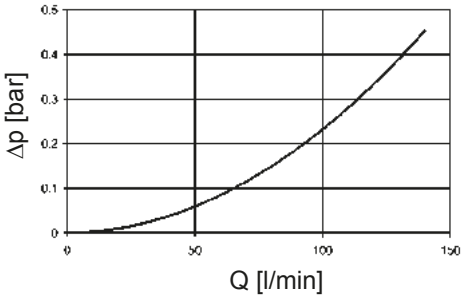
For ease of calculation, our Filter Configuration Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

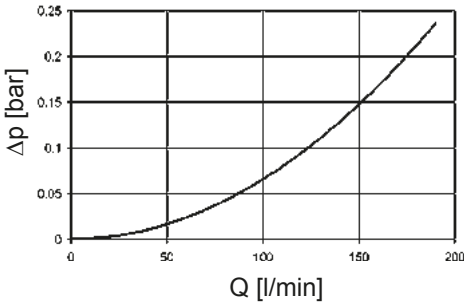
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

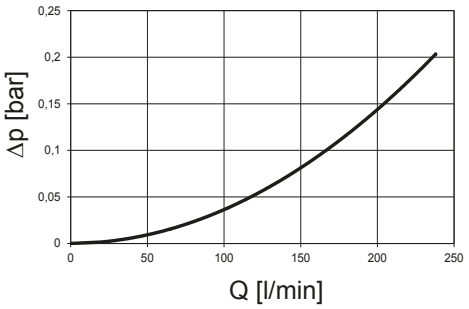
RFM 90, 150



RFM 75, 165, 185



RFM 195



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

RFM	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
75	25.6	19.4	13.4	7.31	4.80	4.40
90	22.5	13.1	9.49	6.07	4.30	3.21
150	13.4	7.80	5.65	3.61	2.55	1.91
165	14.1	9.44	7.37	4.02	2.25	2.42
185	10.4	7.44	5.74	2.93	1.65	1.41
195	7.66	5.48	4.22	2.16	1.22	1.04
210	5.66	3.28	2.55	1.53	1.00	0.88
270	3.66	2.12	1.65	0.99	0.65	0.57
330	8.09	3.72	2.73	1.48	1.28	1.02
500	5.27	2.60	1.90	1.09	0.84	0.69
600	2.35	1.23	1.10	0.61	0.42	0.34
660	3.57	1.69	1.21	0.67	0.57	0.45
850	2.77	1.31	1.00	0.58	0.44	0.36
950	2.39	1.03	0.79	0.48	0.38	0.31
1300	1.72	0.72	0.59	0.35	0.32	0.22
2600	0.84	0.36	0.29	0.18	0.16	0.11

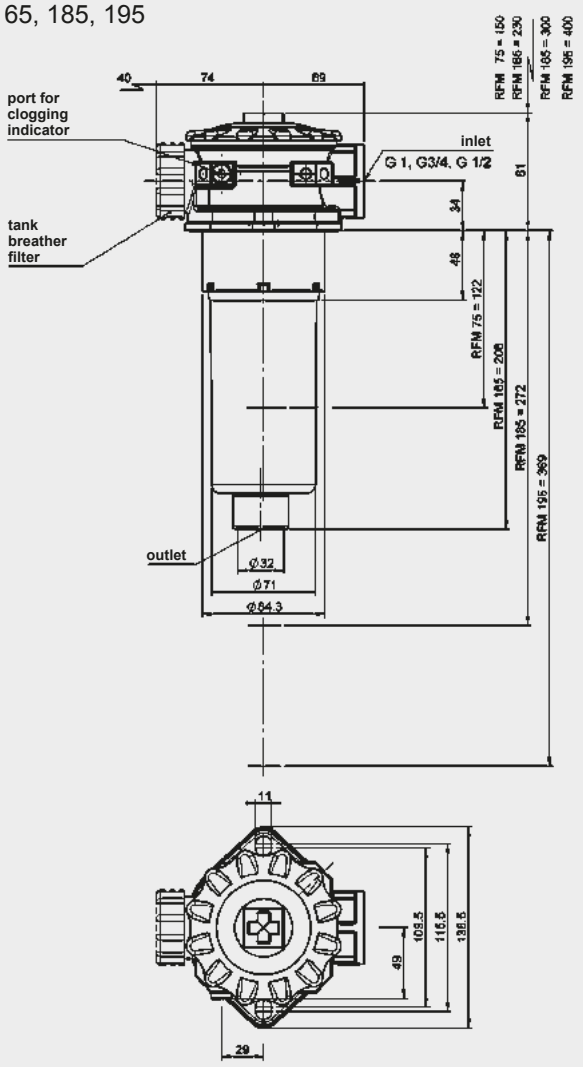
RFM	ECON2				W/HC
	3 µm	5 µm	10 µm	20 µm	–
75	22.0	14.2	8.1	4.4	0.362
90	14.9	10.1	6.7	3.2	0.312
150	8.9	6.0	4.0	1.9	0.185
165	11.2	7.8	4.5	2.4	0.199
185	8.9	6.1	3.3	1.8	0.907
195	6.6	4.5	2.4	1.3	0.668
210	–	–	–	–	0.068
270	–	–	–	–	0.044
330	4.2	2.7	1.7	1.2	0.195
500	3.0	1.9	1.3	0.8	0.128
600	–	–	–	–	–
660	1.9	1.2	0.8	0.5	0.067
850	1.5	1.0	0.7	0.4	0.052
950	1.2	0.8	0.5	0.4	0.048
1300	0.8	0.6	0.4	0.3	0.034
2600	0.4	0.3	0.2	0.1	0.017

4. DIMENSIONS

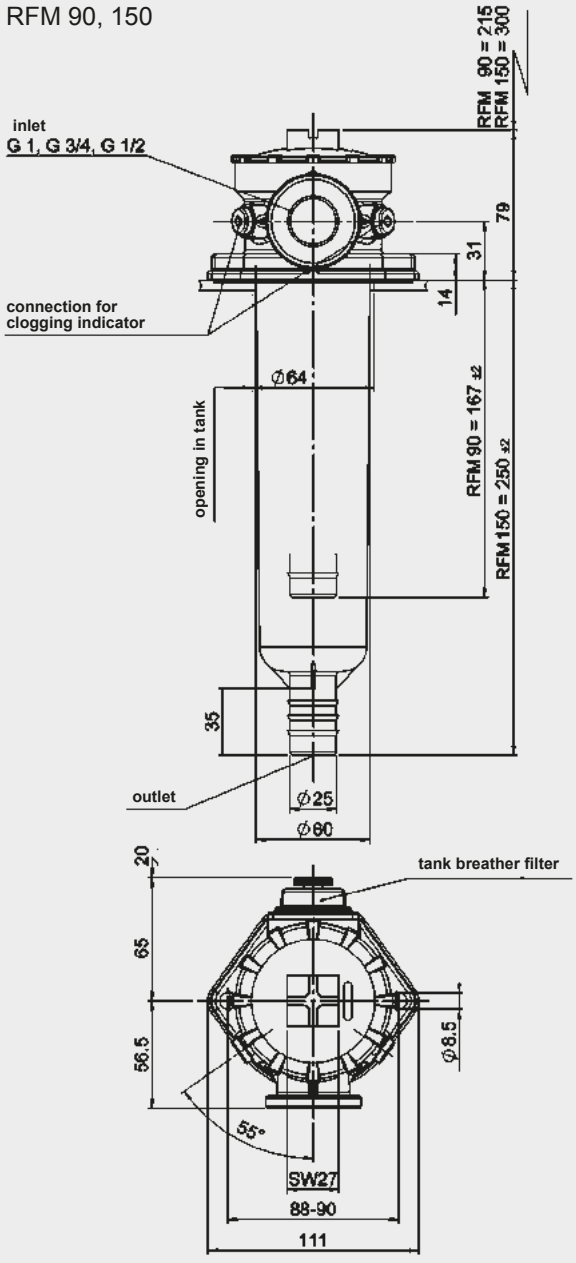
Tank requirements

1. In the filter contact area, the tank flange should have a maximum flatness of 0.3 mm and Ra 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter. As an alternative, the tank flange can be continuously welded from the inside.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.
5. When using a dipstick through a mounting screw, threadlock the screw into the thread, using Loctite 243, for example, or a similar threadlocker.

RFM 75, 165, 185, 195



RFM 90, 150



RFM	Weight incl. element [kg]	Vol. of pressure chamber [l]
75	0.90	0.60
90	0.54	0.60
150	0.75	0.80
165	1.10	0.90
185	1.14	1.10
195	1.30	1.60

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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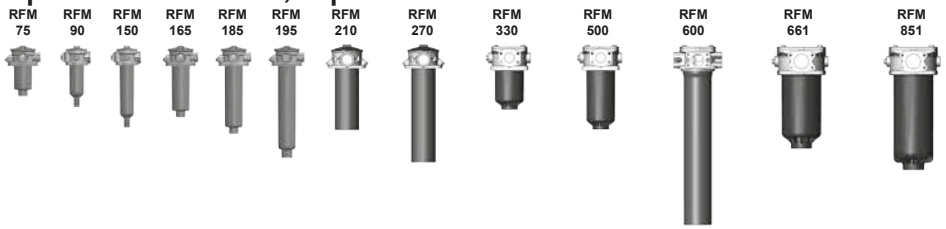
Return Line Filter RFM with 4-Hole Mounting

Tank-top mounted versions: up to 850 l/min, up to 10 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head (with 4-hole flange), filter bowl and a screw-on cover plate.

Standard equipment:

- with bypass valve
- connection for a clogging indicator (Important: please state mounting position for indicator!)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Ecomicron® (ECON2):	10 bar
Wire mesh (W/HC):	20 bar
Paper (P/HC):	10 bar
Betamicron® / Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM):	10 bar
Mobilemicron® (MM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	10 bar	
Temperature range	-30 °C to +100 °C (short-term: -40 °C)	
Material of filter head	Aluminium:	all RFM
Material of filter bowl	Polyamide:	all RFM except 210, 270, 600
	Steel:	RFM 210, 270, 600
Material of cover	Polyamide:	RFM 75 to 270
	Aluminium:	RFM 330 to 851
Type of clogging indicator	VR	threaded connection G 1/2
	VMF	threaded connection G 1/8
	(return line indication)	
Pressure setting of the clogging indicator	2 bar (others on request)	
Bypass cracking pressure	3 bar (others on request)	

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Tank-top filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Connections for filling the hydraulic system via return line element (RFM 330 and above)
- Extension tube (except RFM 90, 150) on request
- Tank breather filter built into head on RFM 75 to 270
- Dipstick for RFM 75, 165, 185, 195 (RFM 90 and 150 on request)
- 2-hole flange (see brochure "Return Line Filter RFM with 2-hole mounting")
- Multiport head on RFM 75, 165, 185, 195
- Single port version for RFM 75, 165, 185 and 195 on request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

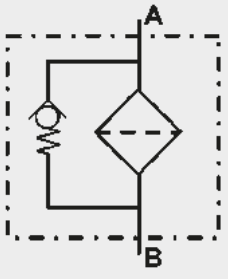
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- If an extension tube is to be fitted to the two-piece filter housing, the tube must be made of synthetic material or thin-wall aluminium.
- Extensions must be protected by fitting a bulkhead plate or other means of protection so that no forces can be transmitted to the filter housing or the extension.
- The filter can normally only be used for tank-mounting
- The filter must be fitted absolutely vertically, or after consultation with the manufacturer, only within the tolerances specified
- The filter must not be used as a suction filter
- Components (e.g. coolers) must not be installed after the filter

Symbol for hydraulic systems



E 7.106.1.2/11.16

2. MODEL CODE (also order example)

RFM ON 500 B F F 10 D 1 . X /-4L-L24

2.1. COMPLETE FILTER: TANK-TOP VERSION

Filter type

RFM

Filter material

ON	Optimicron®	ECO/N	Ecomicron® (ECON2) – not RFM 210, 270
P/HC	Paper	BN/AM	Betamicron®/Aquamicron® – only RFM 330 to 851
W/HC	Stainl. st. wire mesh	AM	Aquamicron® – only RFM 330 to 851
MM	Mobilemicron	*	RFM 600 only available with material ON!

Size of filter or element

RFM: 75, 90, 150, 165, 185, 195, 210, 270, 330, 500, 600, 661, 851

Operating pressure

B = 10 bar
V = 7 bar (for RFM with clogging indicator up to max. 7 bar operating pressure)

Additional inlet

Type	Port	Filter size 75	165	185	195	330	500	600	661	851
D	G 1	●	●	●	●					
F	G 1 ½					●	●			
K	SAE DN 40					●	●			
M	SAE DN 65								●	●
Z	To customer specification							●		

not possible on RFM 90 and 150

Type and size of port (1 inlet)

Type	Port thread	Filter size 75	90	150	165	185	195	210	270	330	500	600	661	851
B	G ½	X	X	X	X	X	X							
C	G ¾	X	●	●	X	X	X							
D	G 1	●			●	●	●	●	●					
E	G 1¼							●	●			●		
F	G 1½							●	●	●	●	●		
K	SAE DN 40									●	●	●		
L	SAE DN 50											●		
M	SAE DN 65												●	●

X on request

Filtration rating in µm

ON: 1, 3, 5, 10, 15, 20 — ECO/N: 3, 5, 10, 20 — W/HC: 25, 50, 100, 200
P/HC: 10, 20 — BN/AM: 3, 10 (only RFM 330 to 851) — AM: 40 (only RFM 330 to 851)
MM: 10, 15

Type of clogging indicator

Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B/BM visual
C electrical
D visual and electrical

for other clogging indicators see brochure no. 7.050../..

Type code

0 without port, no clogging indicator
1–4 see point 2.5 – note position of clogging indicator!

Modification number

X the latest version is always supplied

Supplementary details

4L 4-hole flange for mounting (must be specified for RFM 75 to 185)
A..-B..appropriate response pressure of clogging indicator and bypass cracking pressure in bar (e.g.: A5-B6)
BA filling port G ½ (RFM 330 to 851)
G with threaded connection in outlet (only RFM 330, 500, 661, 851)
KB without bypass valve
L... lamp with appropriate voltage (24, 48, 110, 220 volts)

only for clogging indicators type "D"

LED 2 light-emitting diodes up to 24 volts
PSxx dipstick for RFM 75, 165, 185, 195 on request
PZxx dipstick for RFM 90, 150 on request
T with air filter (only RFM 75 to 270)
V FKM seals
Vxxx with extension tube (where xxx is the final dimension of the extension – no extension possible for RFM 90, 150!)
W suitable for HFA and HFC emulsions
xxxxx only RFM 600 (see point 2.4)

2.2 REPLACEMENT ELEMENT

0500 R 010 ON /-V

Size

0075, 0090, 0150, 0165, 0185, 0195, 0210, 0270, 0330, 0500, 0600, 0660, 0850

Type

R

Filtration rating in µm

ON: 001, 003, 005, 010, 015, 020 — ECON2: 003, 005, 010, 020 — W/HC: 025, 050, 100, 200
P/HC: 010, 020 — BN4AM: 003, 010 — AM: 040
MM: 010, 015

Filter material

ON, ECON2, P/HC, W/HC, BN4AM, AM, MM

Supplementary details

V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VR 2 D . X /-L24

Type

VR connection thread G 1/2
VMF connection thread G 1/8
] return line indicator

Pressure setting

2 standard 2 bar, others on request

Type of clogging indicator

see Point 2.1

Modification number

X the latest version is always supplied

Supplementary details

V only for VMF types B, BM, LE, LZ and C /-EX2G (all other clogging indicators have FKM seals as standard)

L..., LED (for descriptions, see point 2.1)

2.4 PORT CONFIGURATION RFM 600

Since there are numerous options for machining the ports on the head of the RKM 600, the code B**Z**x is selected here as standard.
In order to determine the position and size of the ports, a 5-letter code is added as supplementary detail. This is determined using the table below.
Unused ports are indicated by a "0".

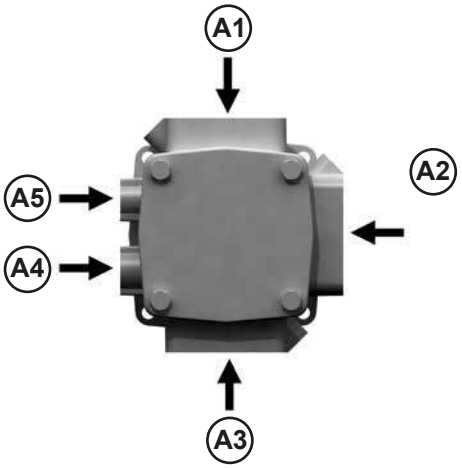
for RFM 600...B**ZK**

Port	A1	A2	A3	A4	A5
G ¾					C
G 1				D	
G 1¼	E	E	E		
SAE DN 40	K	K	K		
plugged	0	0	0	0	0

for RFM 600...B**ZL**

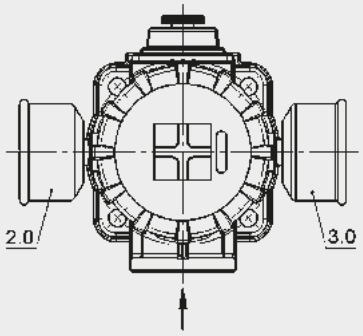
Port	A1	A2	A3	A4	A5
G ¾					(C)
G 1				D	
G 1½	F	(F)	F		
SAE DN 50	L	L	(L)		
plugged	(0)	0	0	(0)	0

Example:
RFM BN/HC 600 BZL 10 A 1.0 /-0FL0C



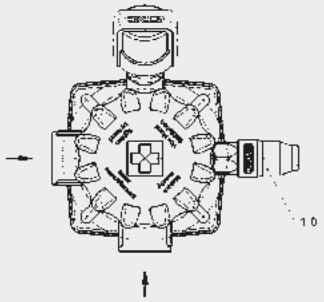
2.5 TYPE CODE: INSTALLATION POSITION OF THE CLOGGING INDICATOR

RFM 90, 150 .../-4L



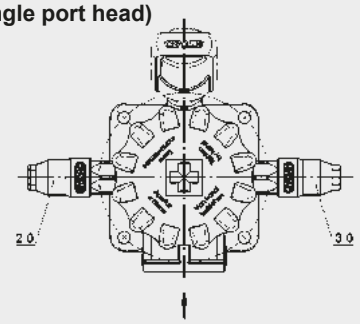
Type code	Mounting position of the clogging indicator	Type of indicator
2.X	Clogging indicator on left, 90° to the inlet	VMF...
3.X	Clogging indicator on right, 90° to the inlet	VMF...

RFM 75, 165, 185, 195 .../-4L (Multiport head)



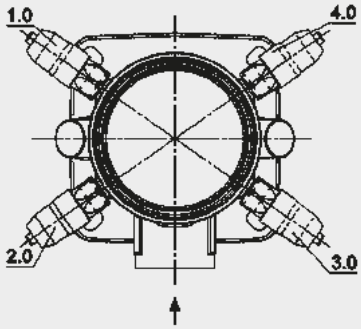
Type code	Mounting position of the clogging indicator	Type of indicator
1.X	see drawing	VMF...

On request:
RFM 75, 165, 185, 195 .../-4L
(Single port head)



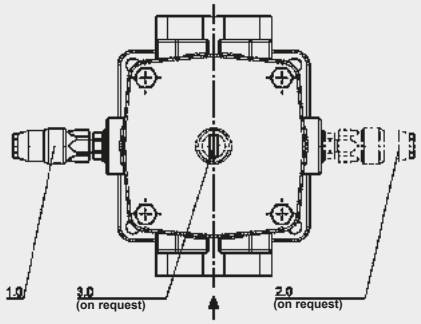
Type code	Mounting position of the clogging indicator	Type of indicator
2.X	Clogging indicator on left, 90° to the inlet	VMF...
3.X	Clogging indicator on right, 90° to the inlet	VMF...

RFM 210, 270



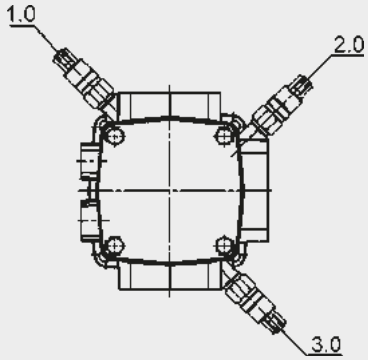
Type code	Mounting position of the clogging indicator	Type of indicator
1.X	Clogging indicator on left back, 135° to the inlet	VMF...
2.X	Clogging indicator on left front, 45° to the inlet	VMF...
3.X	Clogging indicator on right front, 45° to the inlet	VMF...
4.X	Clogging indicator on right back, 135° to the inlet	VMF...

RFM 330, 500



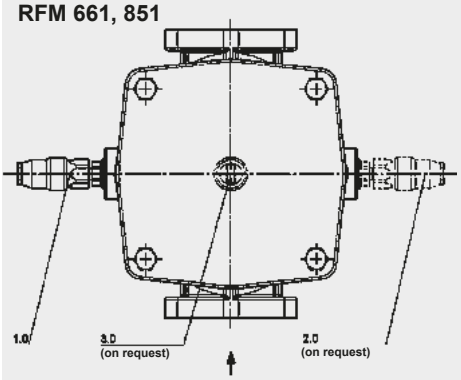
Type code	Mounting position of the clogging indicator	Type of indicator
1.X	Clogging indicator on left, 90° to the inlet	VR...

RFM 600



Type code	Mounting position of the clogging indicator	Type of indicator
1.X	see drawing	VMF...
2.X	see drawing	VMF...
3.X	see drawing	VMF...

RFM 661, 851



Type code	Mounting position of the clogging indicator	Type of indicator
1.X	Clogging indicator on left, 90° to the inlet	VR...

NOTE
Other type codes on request.

2.6 RETURN LINE FILTERS
RFM ALL-PLASTIC

The RFM All-Plastic filter provides a cost-effective alternative to the standard RFM product range.

This filter is an all-plastic version with a simple hose connection as the return line port.

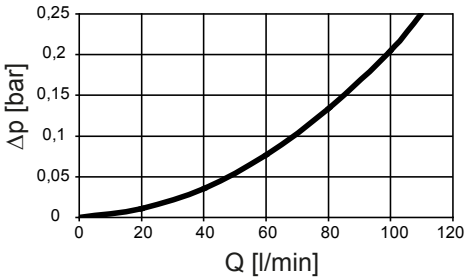
The well-known HYDAC element technology is of course available for these filter types

Nominal pressure: 7 bar
Flow rate up to 100 l/min
Temperature range: -30 °C to +100 °C

Δp-Q HOUSING CURVES
BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.

In this case, the differential pressure changes proportionally to the density.



Model Code

RFMP ON 165 Y HB 10 A 1 .X /-4L-B6

Type
RFMP

Filter material
ON Optimicron®
ECO/N Ecomicron®
MM Mobilemicron

Size
165

Operating pressure
Y 7 bar

Type of connection
HB Hose connection (hose barb)

Filtration rating
ON 1, 3, 5, 10, 15, 20 ECO/N 3, 5, 10, 20
MM 8, 10, 15

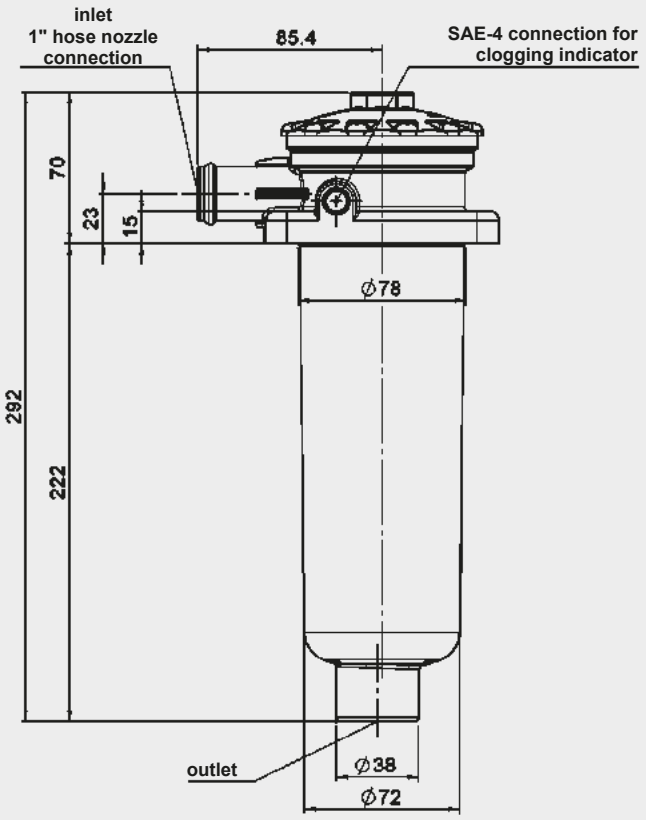
Type of clogging indicator (VA)
A steel blanking plug in indicator port

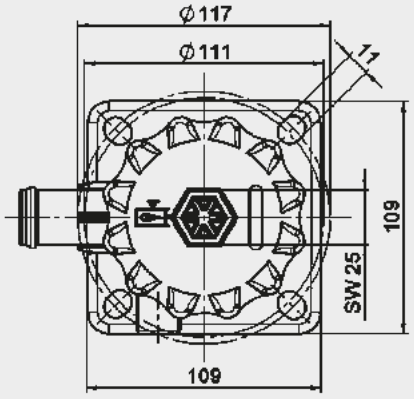
Type code
1

Modification number
X the latest version is always supplied

Supplementary details
4L 4-hole flange for mounting = **must be specified!**
B6 Bypass 6 bar

DIMENSIONS





3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing} =$ (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

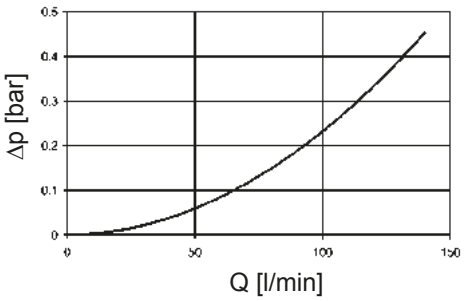
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

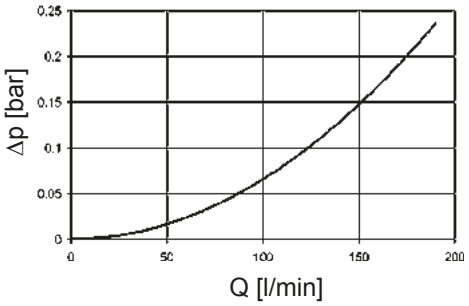
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

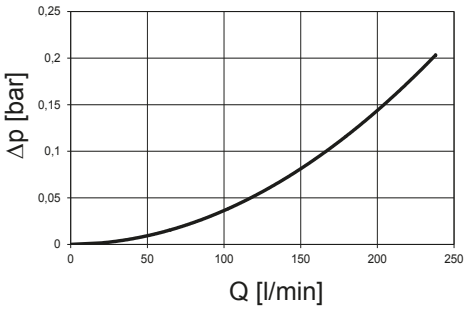
RFM 90, 150



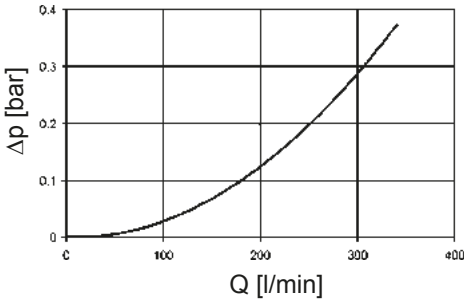
RFM 75, 165, 185



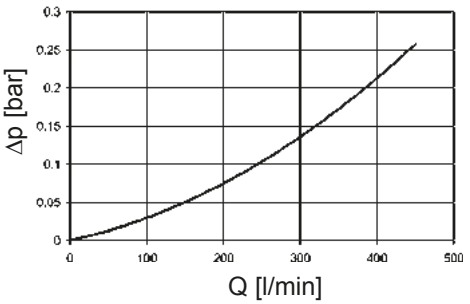
RFM 195



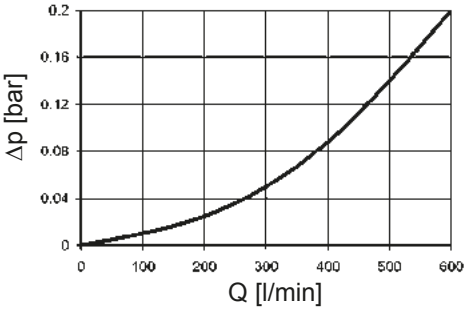
RFM 210, 270



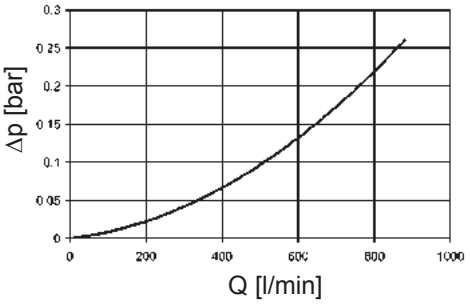
RFM 330, 500



RFM 600



RFM 661, 851



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

RFM	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
75	25.6	19.4	13.4	7.31	4.80	4.40
90	22.5	13.1	9.49	6.07	4.30	3.21
150	13.4	7.80	5.65	3.61	2.55	1.91
165	14.1	9.44	7.37	4.02	2.25	2.42
185	10.4	7.44	5.74	2.93	1.65	1.41
195	7.66	5.48	4.22	2.16	1.22	1.04
210	5.66	3.28	2.55	1.53	1.00	0.88
270	3.66	2.12	1.65	0.99	0.65	0.57
330	8.09	3.72	2.73	1.48	1.28	1.02
500	5.27	2.60	1.90	1.09	0.84	0.69
600	2.35	1.23	1.10	0.61	0.42	0.34
660	3.57	1.69	1.21	0.67	0.57	0.45
850	2.77	1.31	1.00	0.58	0.44	0.36

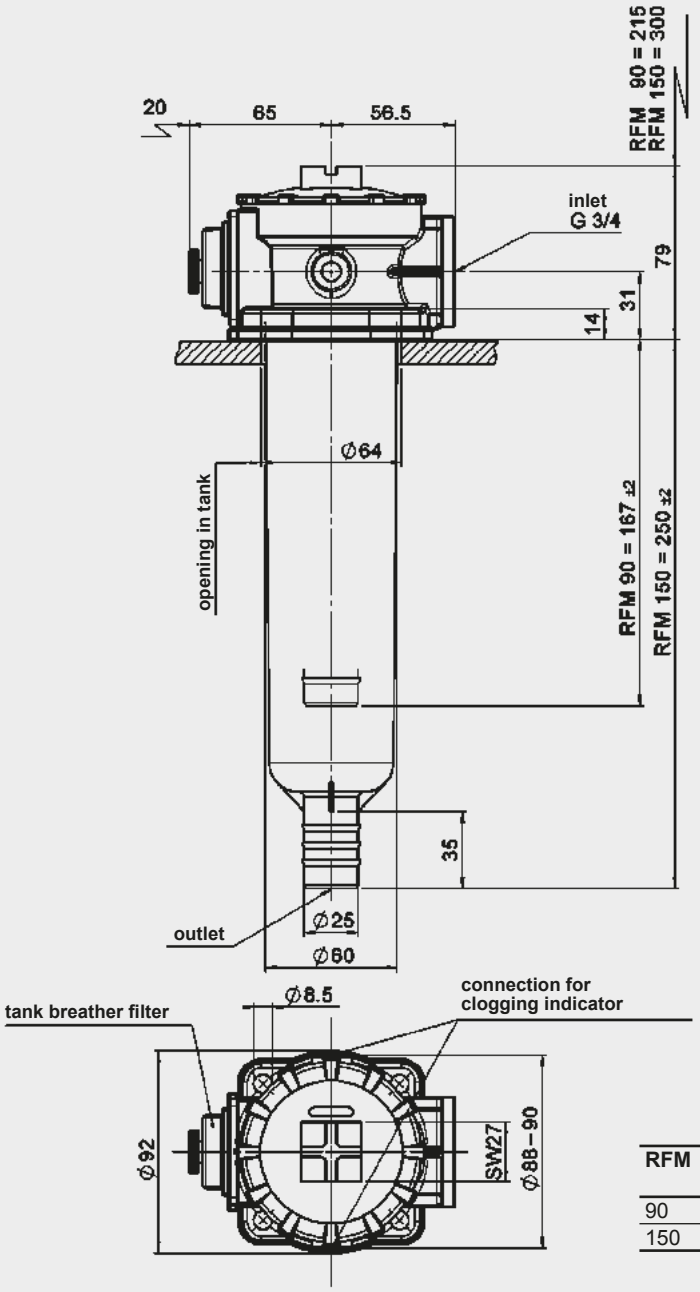
RFM	ECON2				W/HC
	3 µm	5 µm	10 µm	20 µm	–
75	22.0	14.2	8.1	4.4	0.362
90	14.9	10.1	6.7	3.2	0.312
150	8.9	6.0	4.0	1.9	0.185
165	11.2	7.8	4.5	2.4	0.199
185	8.9	6.1	3.3	1.8	0.907
195	6.6	4.5	2.4	1.3	0.668
210	–	–	–	–	0.068
270	–	–	–	–	0.044
330	4.2	2.7	1.7	1.2	0.195
500	3.0	1.9	1.3	0.8	0.128
600	–	–	–	–	–
660	1.9	1.2	0.8	0.5	0.067
850	1.5	1.0	0.7	0.4	0.052

4. DIMENSIONS

Tank requirements

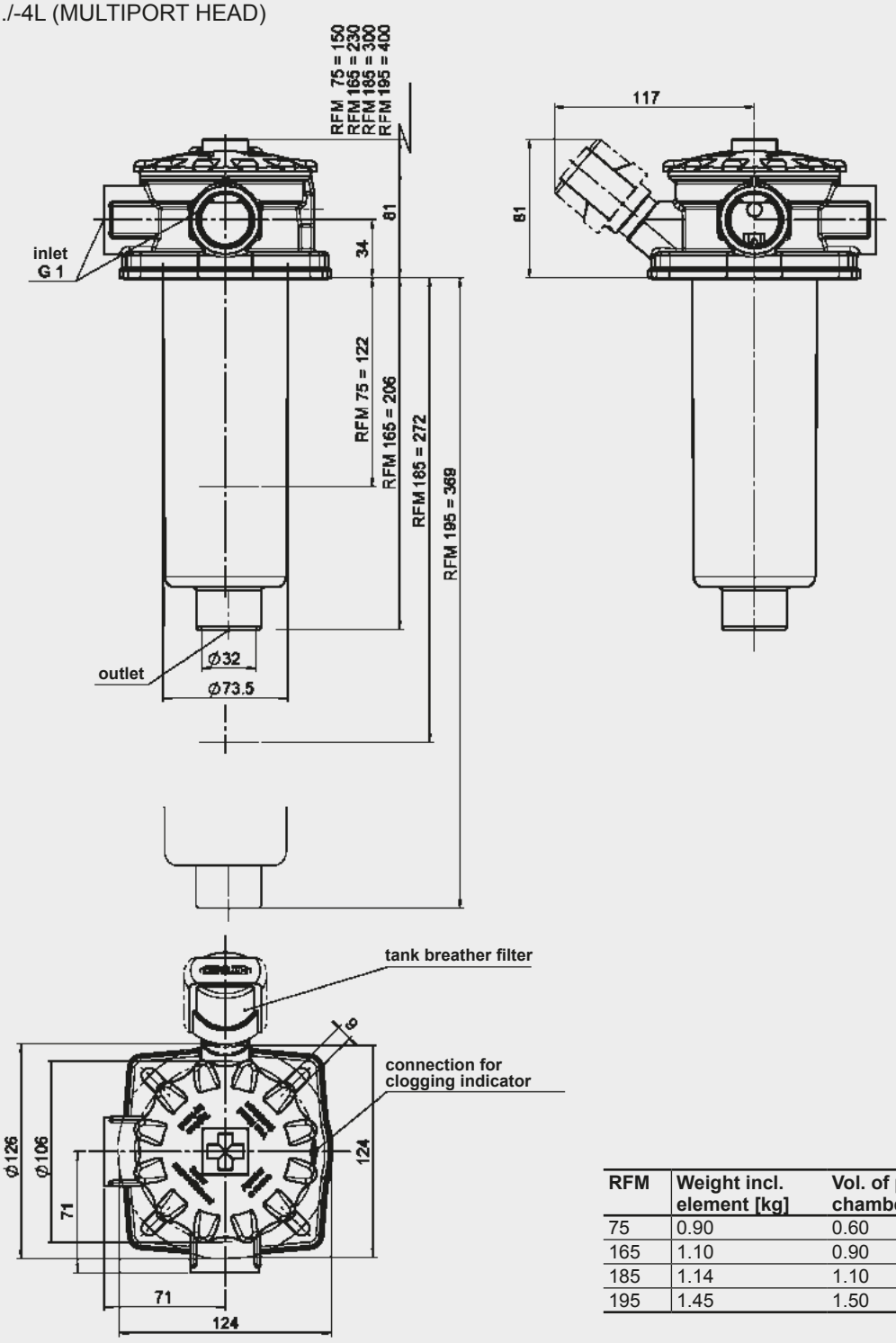
1. In the filter contact area, the tank flange should have a maximum flatness of 0.3 mm and Ra 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter. As an alternative, the tank flange can be continuously welded from the inside.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.
5. When using a dipstick through a mounting screw, threadlock the screw into the thread, using Loctite 243, for example, or a similar threadlocker.

RFM 90, 150 .../-4L



RFM	Weight incl. element [kg]	Vol. of pressure chamber [l]
90	0.54	0.60
150	0.75	0.80

RFM 75, 165, 185, 195 .../-4L (MULTIPORT HEAD)

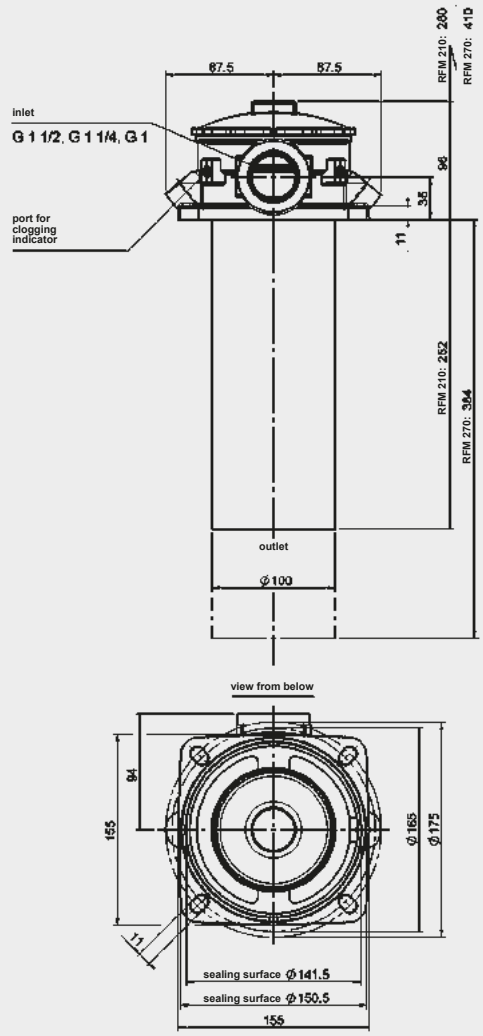


RFM	Weight incl. element [kg]	Vol. of pressure chamber [l]
75	0.90	0.60
165	1.10	0.90
185	1.14	1.10
195	1.45	1.50

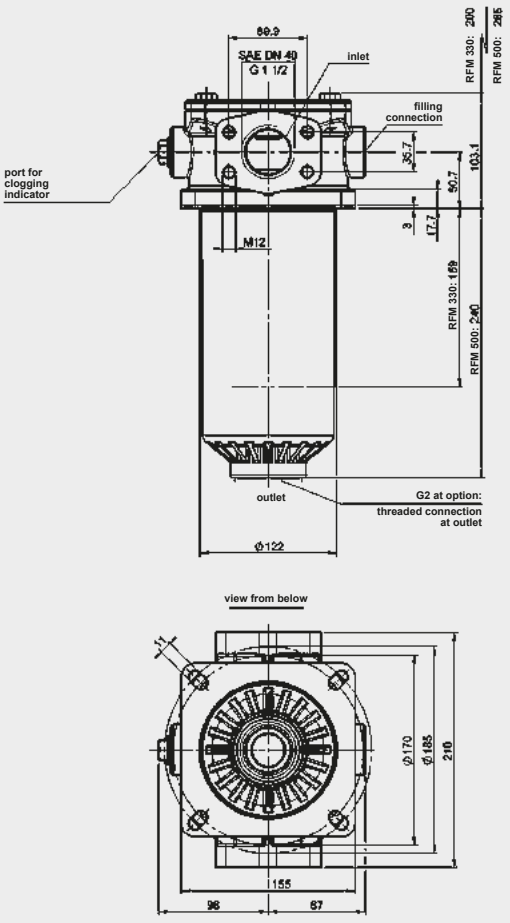
MULTIPORT HEAD

ON REQUEST:
SINGLE PORT HEAD

RFM 210, 270

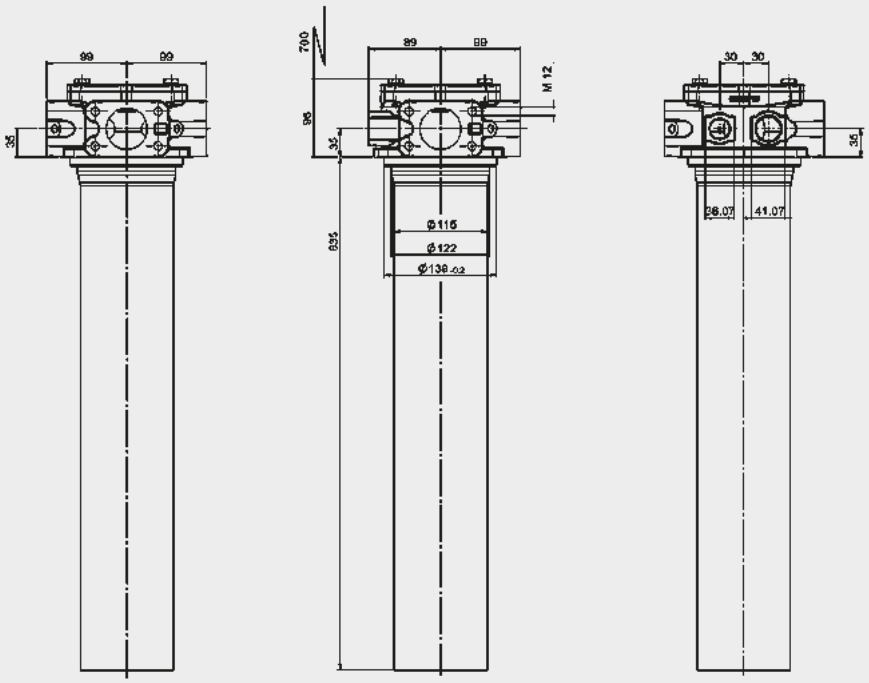


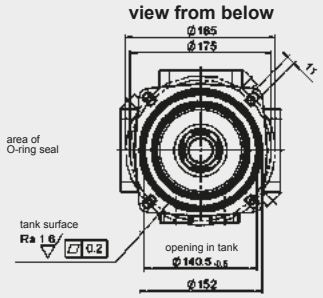
RFM 330, 500



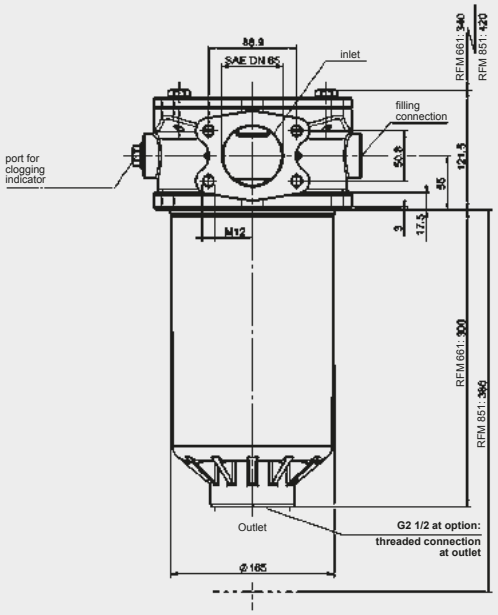
RFM	Weight incl. element [kg]	Vol. of pressure chamber [l]
210	3.10	2.20
270	4.30	3.60
330	3.90	2.00
500	4.50	3.00

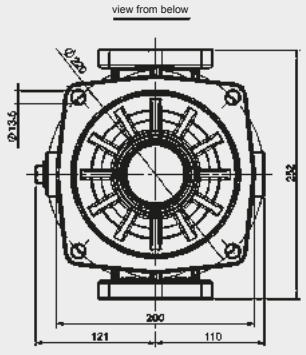
RFM 600





RFM 661, 851





RFM	Weight incl. element [kg]	Vol. of pressure chamber [l]
600	7.30	7.70
661	9.00	7.20
851	10.50	8.50

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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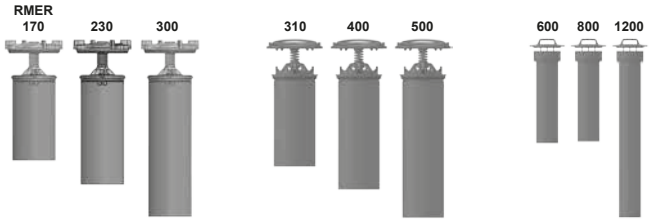
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

Return Line Filter RMER

Element flow direction from in to out
In-tank versions:
up to 1,100 l/min, up to 10 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a housing tube, filter cover plate and an element location spigot.

The element is top-removable.

Standard equipment:

- bypass valve
- magnetic core built into cover plate
- element location spigot

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Contamination retention capacities in g

Glass fibre (ULP)		
RMER *	10 µm	25 µm
170	22.3	27.2
230	31.3	38.1
300	57.4	70.0
310	48.8	59.5
400	65.2	79.5
500	78.9	96.2
600	153.0	170.0
800	207.0	230.0
1200	306.0	340.0

Glass fibre with pre-filter (UHC)		
RMER *	10 µm	20 µm
170	36.4	44.4
230	47.6	58.1
300	77.7	94.8
310	67.8	83.3
400	91.2	111.3
500	117.0	142.7
600	408.0	459.0
800	552.0	621.0
1200	816.0	918.0

* 5 µm on request

Available pressure stability values:

Glass fibre (ULP):	6 bar
Glass fibre with pre-filter (UHC):	6 bar
Wire mesh (WR):	6 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	up to 10 bar
Temperature range	-30 °C to +120 °C
Material of housing tube	Steel
Material of cover plate	Size 170, 230, 300: EN-GJL-250 Size 310, 400, 500: EN-AC-46100 Size 600, 800, 1200: EN-GJS-400-15
Bypass cracking pressure	Size 170, 230, 300: 2.5 bar Size 310, 400, 500: 2.5 bar Size 600, 800, 1200: 3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

In-tank filter

1.6 SPECIAL MODELS AND ACCESSORIES

- without magnetic core
- with protective tube
- different inlet void height
- additional protective tube for RMER 170 to 500

Others on request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

Test certificate 2.2
Other approvals on request

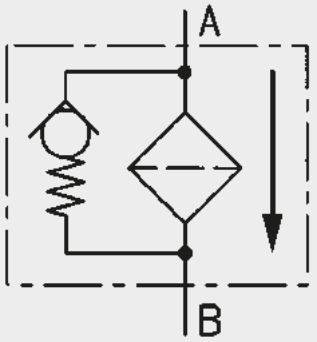
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

RMER ULP 800 SET 10 W 1 . X /-V

2.1 IN-TANK MOUNTED FILTER VERSION

Filter type
RMER

Filter material of element
ULP Glass fibre
UHC Glass fibre with pre-filter
WR Wire mesh

Size of filter or element
RMER: 170, 230, 300, 310, 400, 500, 600, 800, 1200

In-tank version
SET housing tube and filter cover plate only

Filtration rating in µm
ULP : 10, 25 *
UHC : 10, 20 *
WR : 25, 40, 60

Type of clogging indicator
W without port, no clogging indicator

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
no details = standard bypass cracking pressure
B. special bypass cracking pressure (e.g. B2 = 2 bar)
OM without magnetic core
SSR with protective tube
V FPM seals

2.2 REPLACEMENT ELEMENT

0800 R 010 ULP /-V

Size
0170, 0230, 0300, 0310, 0400, 0500, 0600, 0800, 1200

Type
R Return line filter element – flow direction from in to out

Filtration rating in µm
ULP : 010, 025 *
UHC : 010, 020 *
WR : 025, 040, 060

Filter material
ULP, UHC, WR

Supplementary details
V (for descriptions, see point 2.1)

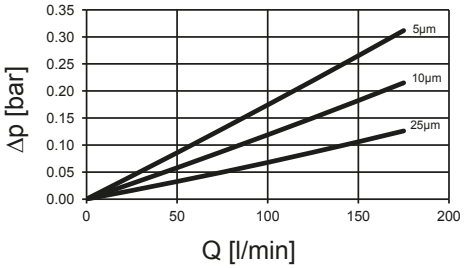
* 5 µm on request

3. FILTER CALCULATION / SIZING

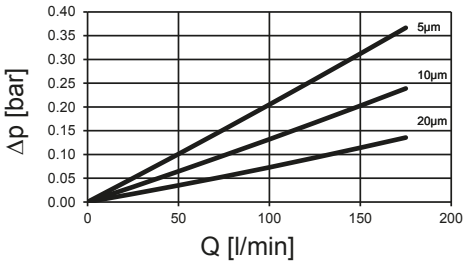
3.1 GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.

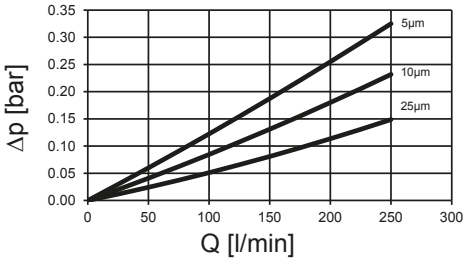
RMER 170: ULP



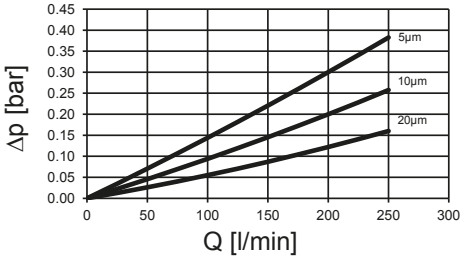
RMER 170: UHC



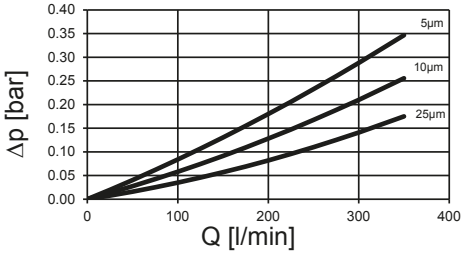
RMER 230: ULP



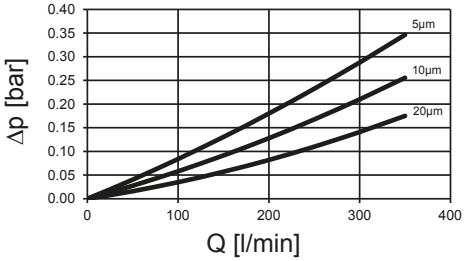
RMER 230: UHC



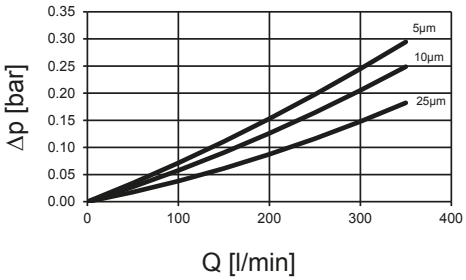
RMER 300: ULP



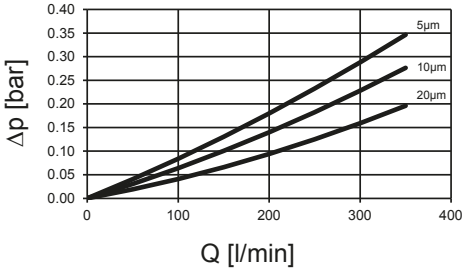
RMER 300: UHC



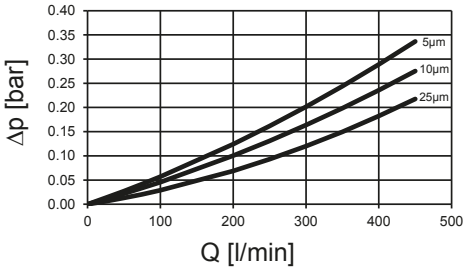
RMER 310: ULP



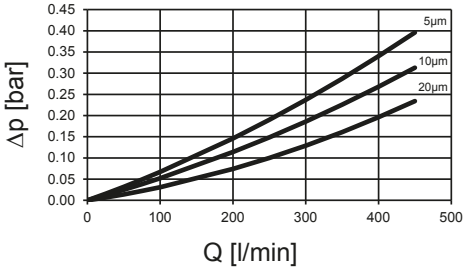
RMER 310: UHC



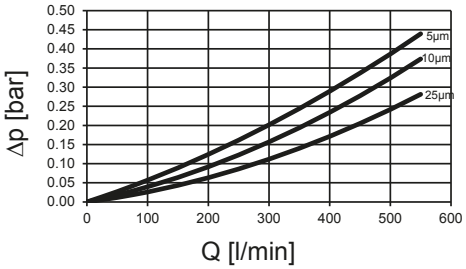
RMER 400: ULP



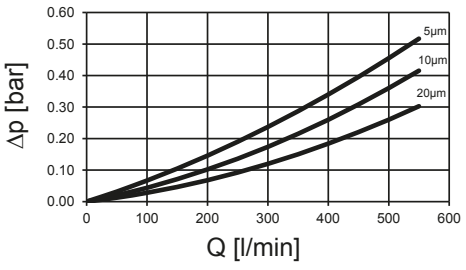
RMER 400: UHC



RMER 500: ULP



RMER 500: UHC



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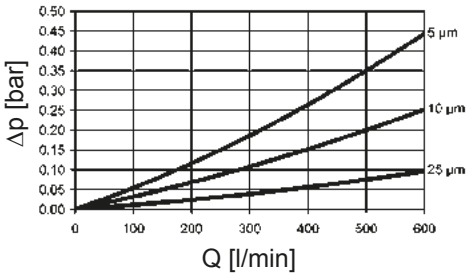

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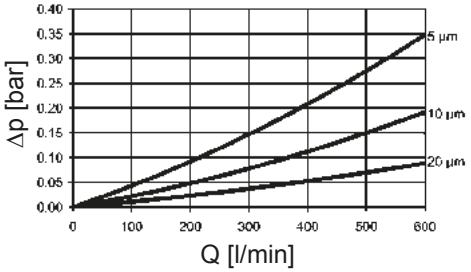
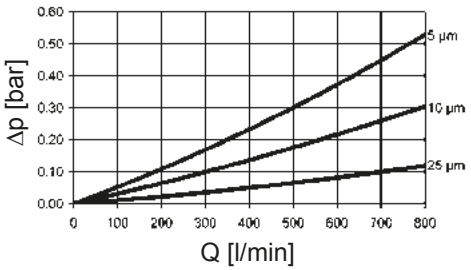
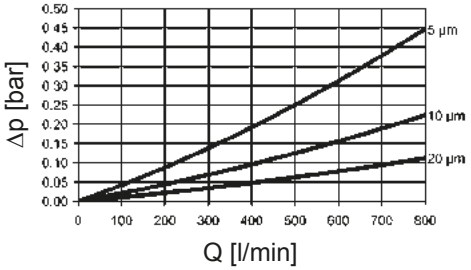


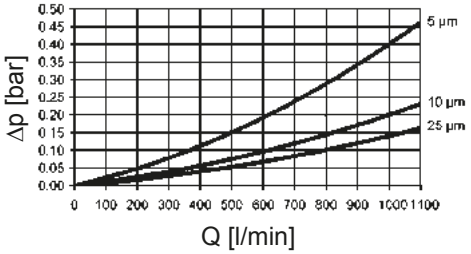
RMER 800: ULP



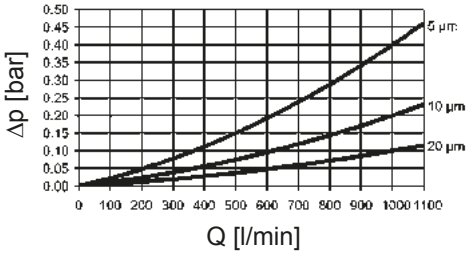
RMER 800: UHC



RMER 1200: ULP

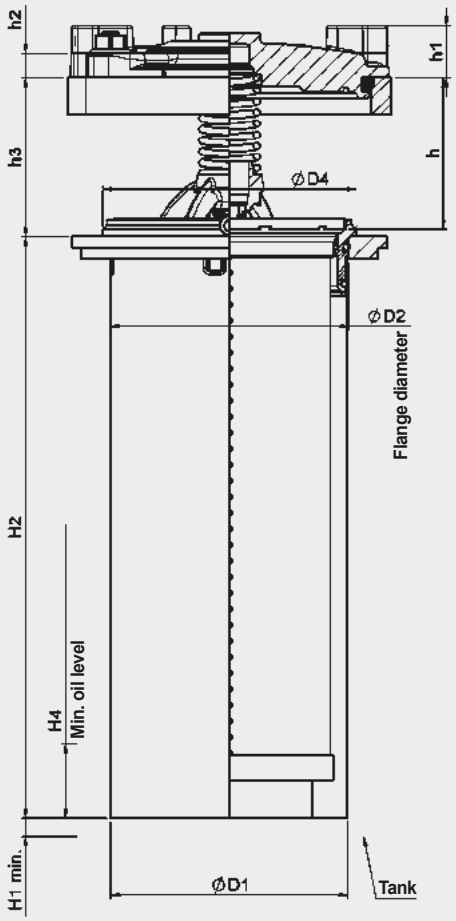


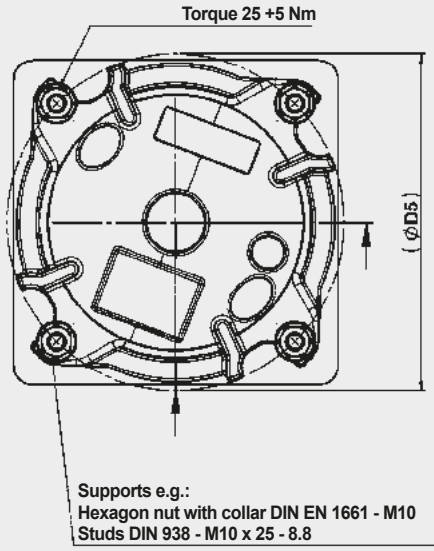
RMER 1200: UHC



4. DIMENSIONS

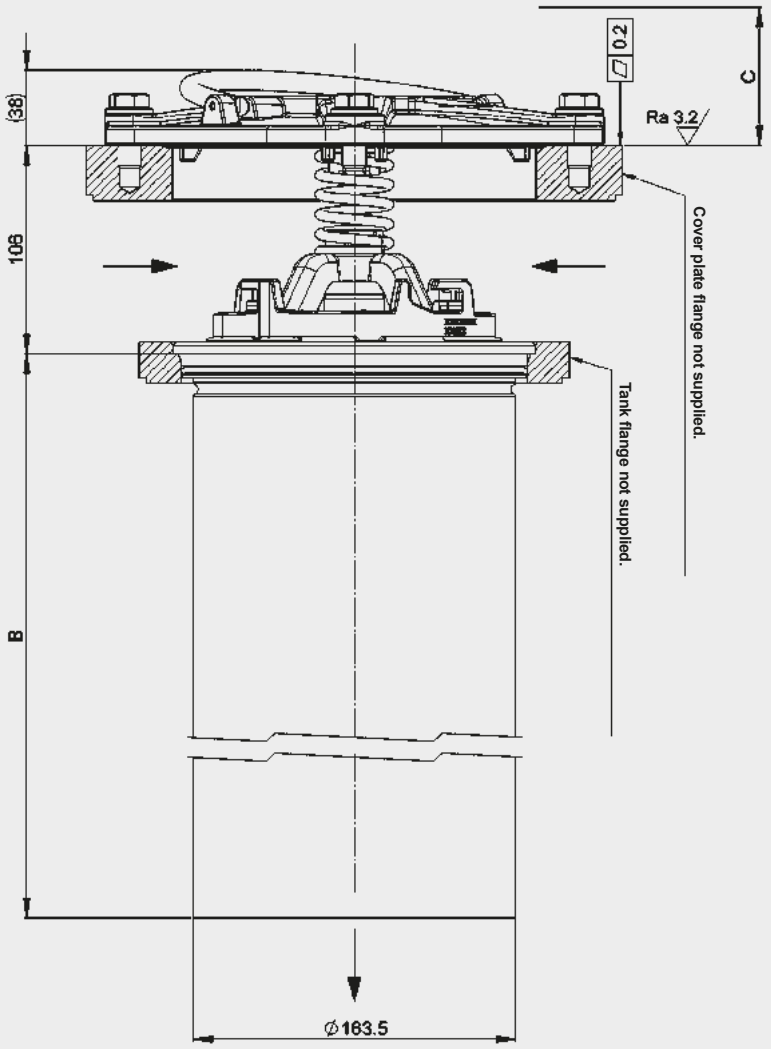
RMER 170, 230, 300

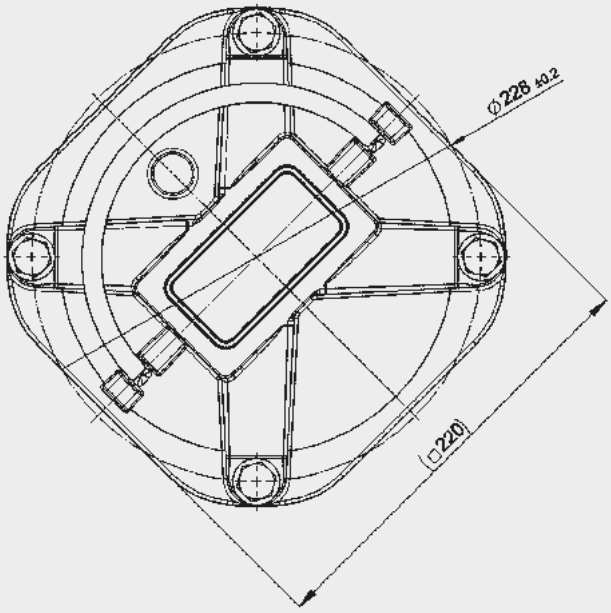




RMER	Design	H1	H2	H3	H4	h	h1	h2	h3	ØD1	Ø D2	Ø D3	ØD4
170	X	10	232	–	155	82	28	13	77	–	113	182	–
	B		243	–	40				86	128	129		137
	L	5		102	10								
	R			126									
230	X	10	303	–	203				77	–	113		–
	B		314	–	40				86	128	129		137
	L	5		102	10								
	R			163									
300	X	10	399	–	267				77	–	113		–
	B		410	–	40				86	128	129		137
	L	5		102	10								
	R			200									

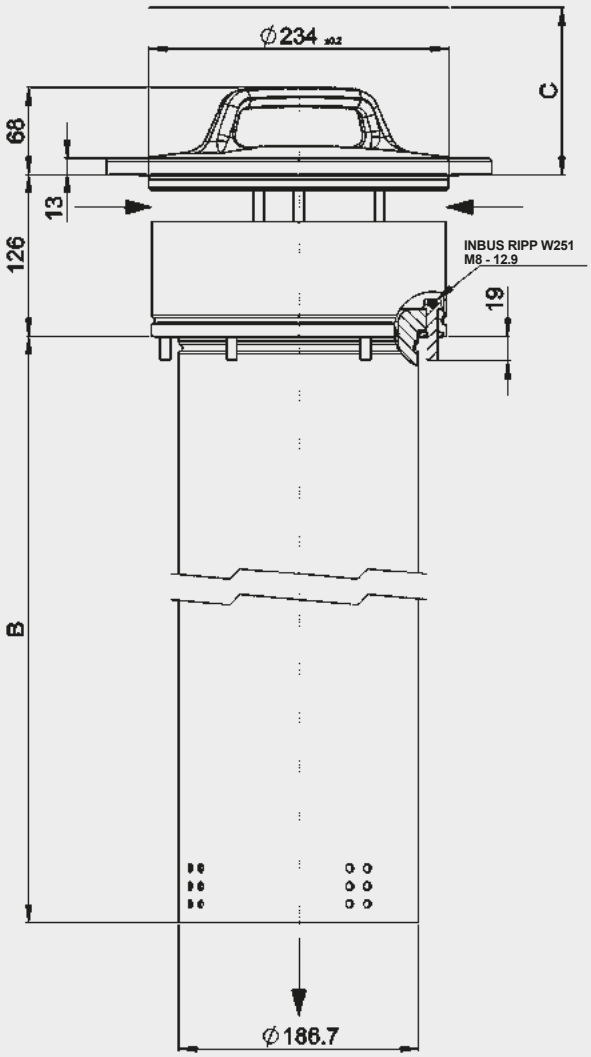
RMER 310, 400, 500

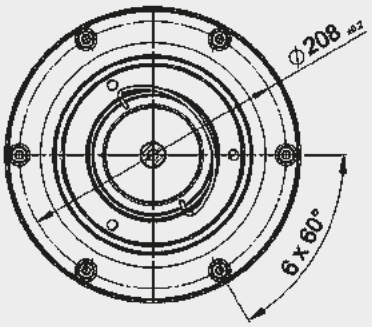


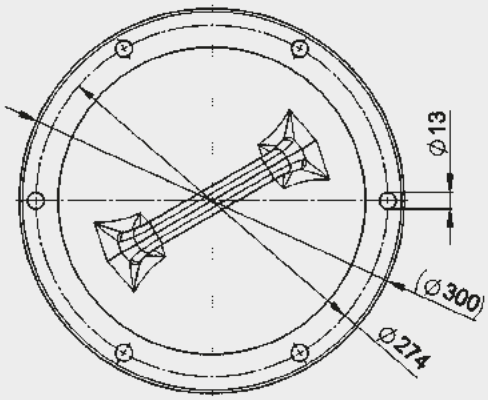


RMER	B	C min.	Weight incl. element [kg]
310	354	460	5.3
400	444	550	6.5
500	554	660	7.6

RMER 600, 800, 1200







RMER	B	C min.	Weight incl. element [kg]
600	694	570	23.9
800	680	685	25.2
1200	1324	1005	32.1

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

HYDAC Filtertechnik GmbH
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Tel.: 0 68 97 / 509-01
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Return Line Filter RMTR

Element flow direction from in to out
In-tank versions:
up to 1,100 l/min, up to 10 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a housing tube, filter cover plate and an element location spigot.

The element is top-removable.

Standard equipment:

- bypass valve
- magnetic core built into cover plate
- element location spigot

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Contamination retention capacities in g

Glass fibre (ULP)			
RMTR	5 µm	10 µm	25 µm
600	85	153	170
800	115	207	230
1200	170	306	340

Glass fibre with pre-filter (UHC)			
RMTR	5 µm	10 µm	20 µm
600	272	408	459
800	368	552	621
1200	544	816	918

Available pressure stability values:

Glass fibre (ULP):	6 bar
Glass fibre with pre-filter (UHC):	6 bar
Wire mesh (WR):	6 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	up to 10 bar
Temperature range	-30 °C to +120 °C
Material of housing tube	Steel
Material of cover	EN-GJL-250
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

In-tank filter

1.6 SPECIAL MODELS AND ACCESSORIES

- without magnetic core
- with element location spigot
- outlet grille in openings in protective tube

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

Test certificate 2.2
Other approvals on request

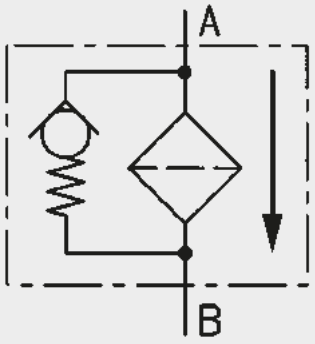
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

RMTR ULP 800 SET 10 W 1 . X /-V

2.1 IN-TANK MOUNTED FILTER VERSION

Filter type
RMTR

Filter material of element
ULP Glass fibre
UHC Glass fibre with pre-filter
WR Wire mesh

Size of filter or element
RMTR: 600, 800, 1200

In-tank version
SET housing tube, filter cover plate and element location spigot only

Filtration rating in µm
ULP : 5, 10, 25
UHC : 5, 10, 20
WR : 25, 40, 60

Type of clogging indicator
W without port, no clogging indicator

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
no details = standard bypass cracking pressure
B. special bypass cracking pressure (e.g. B6 = 6 bar)
OM without magnetic core
SSRA outlet grille in openings in protective tube
V FPM seals

2.2 REPLACEMENT ELEMENT

0800 R 010 ULP /-V

Size
0600, 0800, 1200

Type
R Return line filter element – flow direction from in to out

Filtration rating in µm
ULP : 005, 010, 025
UHC : 005, 010, 020
WR : 025, 040, 060

Filter material
ULP, UHC, WR

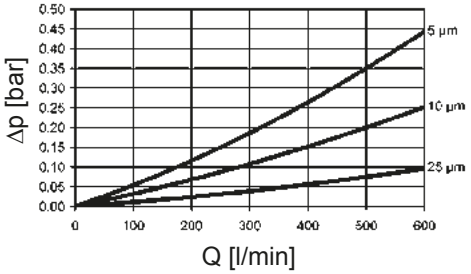
Supplementary details
V (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

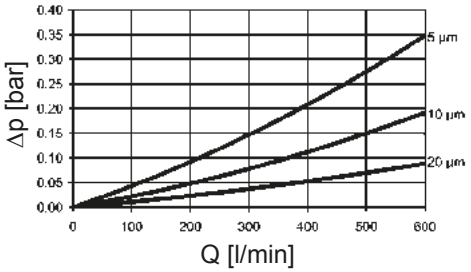
3.1 GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30mm²/s.

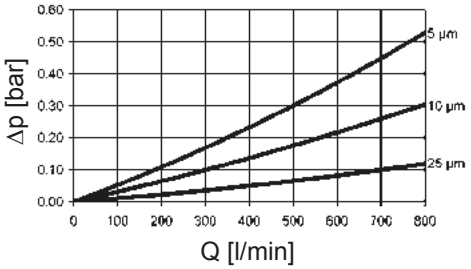
RMTR 600: ULP



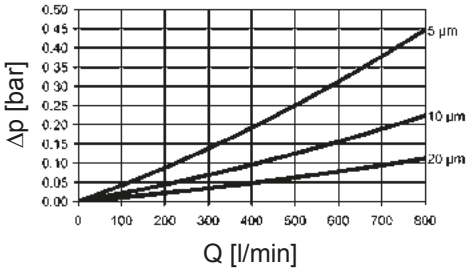
RMTR 600: UHC



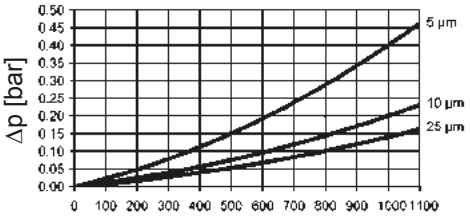
RMTR 800: ULP



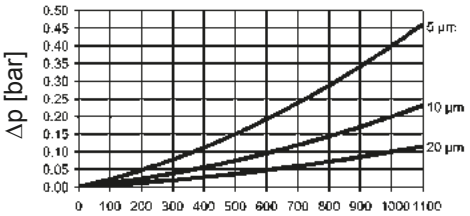
RMTR 800: UHC



RMTR 1200: ULP

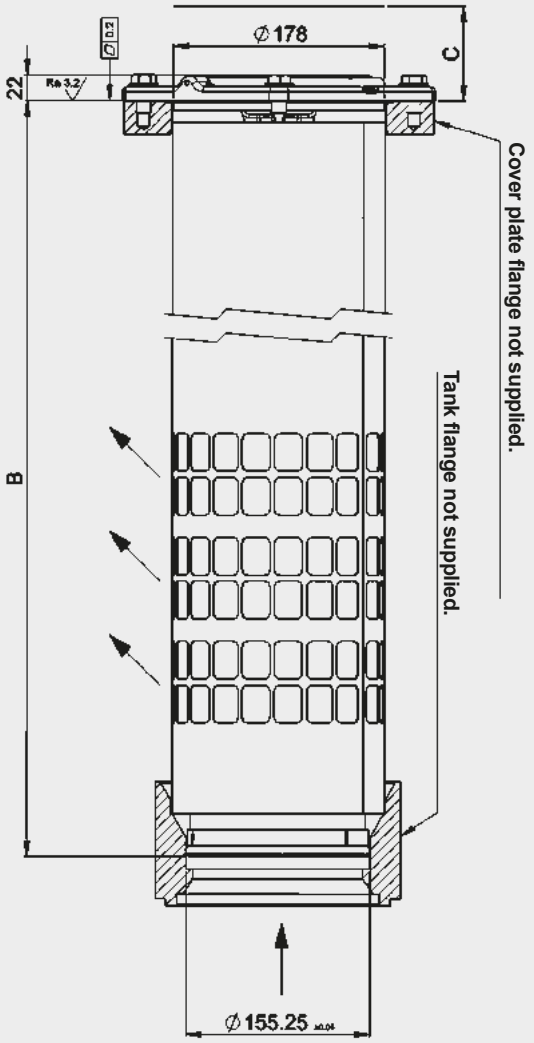


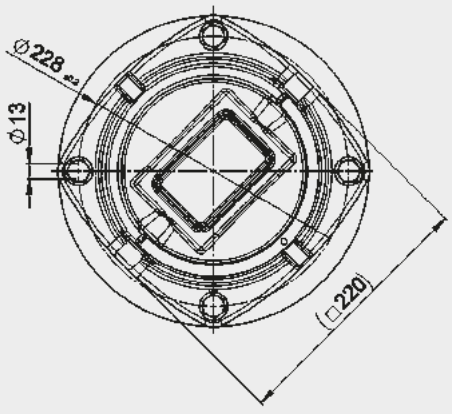
RMTR 1200: UHC



4. DIMENSIONS

RMTR 600, 800, 1200





RMTR	B	C min.	Weight incl. element [kg]
600	775	770	11.0
800	1030	1025	12.2
1200	1250	1245	15.4

NOTE

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Subject to technical modifications.

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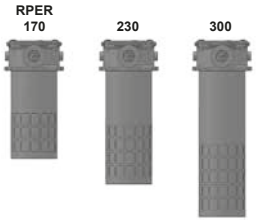
Return Line Filter RPER

Element flow direction from in to out
In-tank versions:
up to 300 l/min, up to 10 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a housing tube, filter cover plate and an element location spigot.

The element is top-removable.

Standard equipment:

- bypass valve
- magnetic core built into cover plate
- protective tube (perforated plate)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Contamination retention capacities in g

Glass fibre (ULP)		
RPER *	10 µm	25 µm
170	22.3	27.2
230	31.3	38.1
300	57.4	70.0

Glass fibre with pre-filter (UHC)		
RPER *	10 µm	20 µm
170	36.4	44.4
230	47.6	58.1
300	77.7	94.8

* 5 µm on request

Available pressure stability values:

Glass fibre (ULP):	6 bar
Glass fibre with pre-filter (UHC):	6 bar
Wire mesh (WR):	6 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	up to 10 bar
Temperature range	-30 °C to +120 °C
Material of housing tube	Cast aluminium
Material of cover	Die-cast aluminium
Material of tube	Steel
Bypass cracking pressure	2.5 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

In-tank filter

1.6 SPECIAL MODELS AND ACCESSORIES

- without magnetic core
- without protective tube
- outlet grille in openings in protective tube

Others on request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

Test certificate 2.2
Other approvals on request

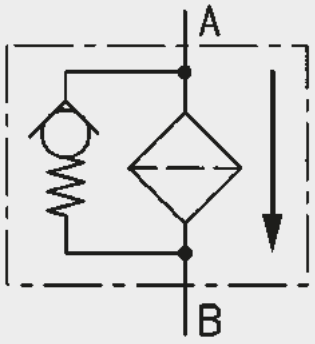
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

RPER ULP 230 B F 10 C 1 . X /-V

2.1 IN-TANK MOUNTED FILTER VERSION

Filter type
RPER

Filter material of element
ULP Glass fibre
UHC Glass fibre with pre-filter
WR Wire mesh

Size of filter or element
RPER: 170, 230, 300

Operating pressure
B 10 bar

Type and size of connection

Type	Port	Filter size		
		170	230	300
F	G 1 ½	●	●	●
K	SAE DN 40	●	●	●

Others on request

Filtration rating in µm
ULP* : 10, 25
UHC*: 10, 20
WR : 25, 40, 60

Type of clogging indicator
W without port for clogging indicator
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. 7.050../..

Type code
0-3 see point 2.4

Modification number
X the latest version is always supplied

Supplementary details
no details = standard bypass cracking pressure 2.5 bar
B. special cracking pressure of bypass (e.g. B2 = 2 bar)
L…. light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light emitting diodes up to 24 Volt
OM without magnetic core
V FPM seals
] only for clogging indicators type "D"

2.2 REPLACEMENT ELEMENT

0230 R 010 ULP /-V

Size
0170, 0230, 0300

Type
R Return line filter element – flow direction from in to out

Filtration rating in µm
ULP* : 010, 025
UHC*: 010, 020
WR : 025, 040, 060

Filter material
ULP, UHC, WR

Supplementary details
V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VMF 1.2 C . X /-V

Type
VMF connection thread G 1/8

Pressure setting
0.8 0.8 bar
1.2 1.2 bar
1.8 1.8 bar

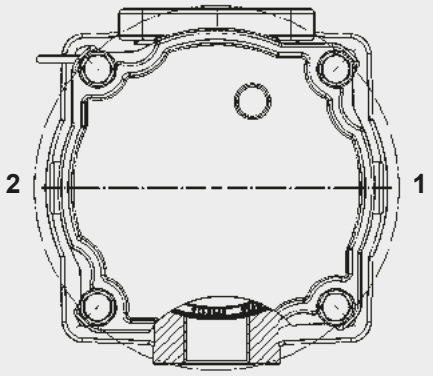
Type of clogging indicator
(see point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V (for descriptions, see point 2.1)

* 5 µm on request

2.4 TYPE CODE



Threaded connection

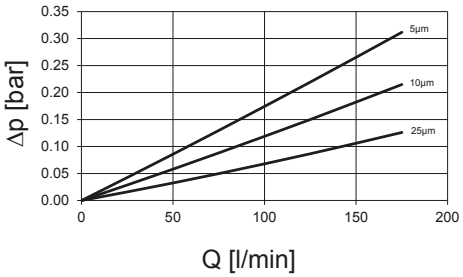
Type code	Mounting position of clogging indicator
0.x	Plain, undrilled
1.x	Bore at pos. 1
2.x	Bore at pos. 2
3.x	Bore in both positions, plugged

3. FILTER CALCULATION / SIZING

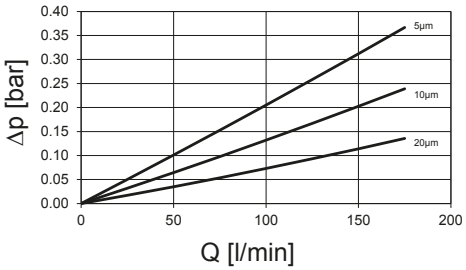
3.1 GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30mm²/s.

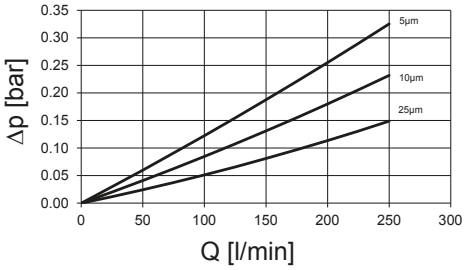
RPER 170: ULP



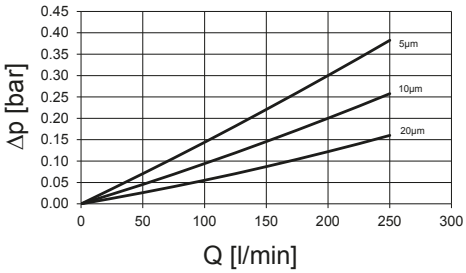
RPER 170: UHC



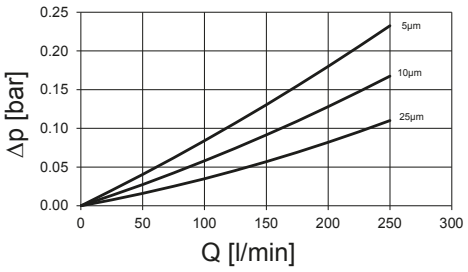
RPER 230: ULP



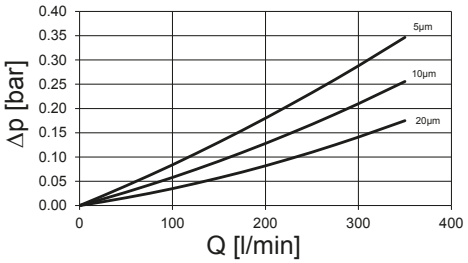
RPER 230: UHC



RPER 300: ULP

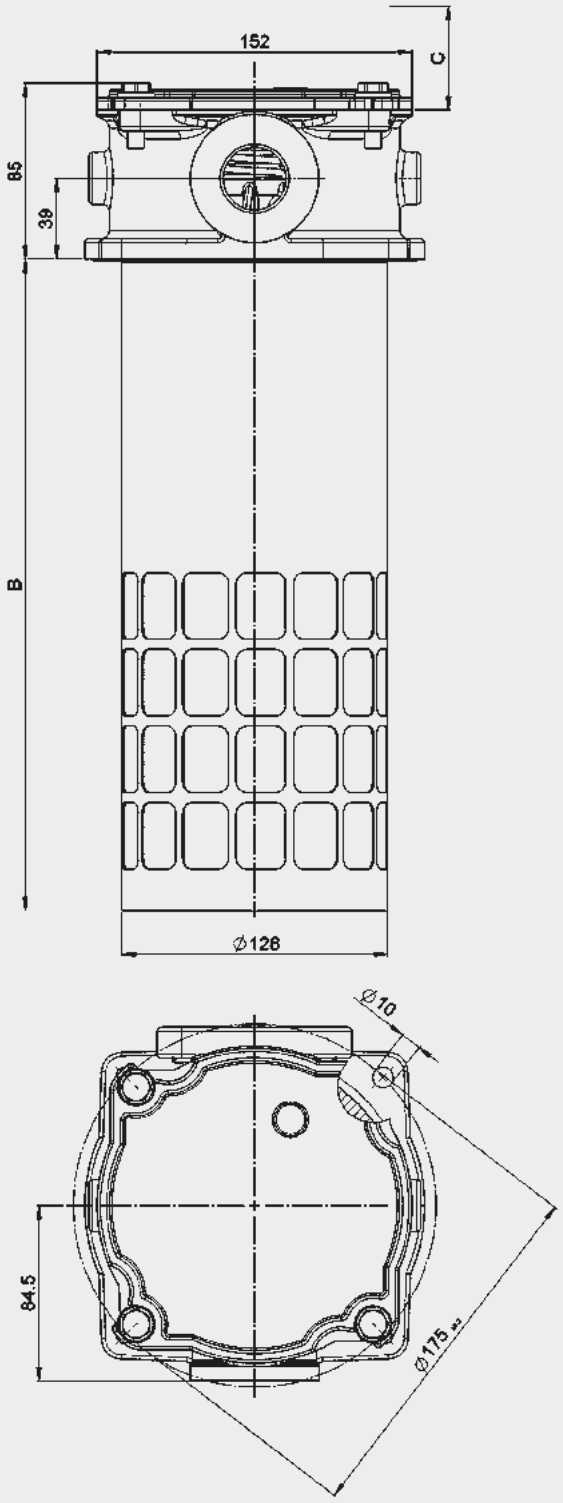


RPER 300: UHC



4. DIMENSIONS

RPER 170, 230, 300



RPER	B	C min.	Weight incl. element [kg]
170	244	300	3.2
230	314	370	4.1
300	404	460	5.0

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Tel.: 0 68 97 / 509-01
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E-Mail: filter@hydac.com

Return line and Suction Boost Filter RKM

up to 850 l/min, up to 10 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head, filter bowl and a screw-on or bolt-on cover plate.

Standard equipment:

- with bypass valve
- with back-pressure valve
- without anti-cavitation valve

Application

RKM return line & suction boost filters are ideally suited for use in equipment with two or more circuits. In particular this filter is the "first choice" for mobile machinery using hydrostatic drives (e.g. wheel loaders, fork-lift trucks, harvesting machines), if the return flow is greater than the flow required on the suction side under operating conditions.

Function

The return flow of the operating hydraulics is supplied to the filter via one or several inlets "A" and is cleaned by the filter element (full flow return line filtration). A pressure of 0.5 bar (standard) is applied inside the element by the back-pressure valve "V1".

This ensures that the filtered return line flow is available to the hydrostatic feed pumps connected in "B" ports (full flow suction boost filtration). The risk of cavitation is significantly reduced. The excess flow is drained to the tank via port "T". A bypass valve "V2" (standard = 2.5 bar) is fitted to relieve excessive back-pressures in the element (important on cold starts when viscosity is high). This valve arrangement ensures that only finely filtered oil is available to the suction port during operation (exception: RKM 350).

With optional valve "V3", oil can be drawn from the tank for short periods, e.g. initial filling, venting after changing element.

1.2 FILTER ELEMENTS

The filter elements used in RKM filters are notable for low back-pressures, especially at high viscosities (e.g. cold starts).

1.3 FILTER SPECIFICATIONS

Nominal pressure	10 bar
Temperature range	-30 °C to +100 °C (short-term: -40 °C)
Material of filter head	Aluminium
Material of filter bowl	Steel (all RKM except RKM 300) Polyamide (RKM 300)
Material of cover plate	Polyamide (RKM 80 to 251, 350) Aluminium (RKM 300, 400, 800)
Type of clogging indicator	VMF – Connection thread G 1/8
Pressure setting of the clogging indicator	-0.2 bar (vacuum pressure) 2 bar (back-pressure) (others on request)
Bypass cracking pressure (V2)	2.5 bar (others on request)
Setting for back-pressure valve (V1)	0.5 bar (others on request)

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170 ISO 16889

Filter elements are available with the following pressure stability values:

Mobilemicron® (MM): 10 bar

1.4 SEALS

Perbunan (=NBR)

1.5 MOUNTING

Tank-top filter

1.6 SPECIAL MODELS AND ACCESSORIES

- with bleed valve
- with multiport head (only RKM 80 to 251; see point 2.4)
- with integral thermal bypass valve (only RKM 151, 201, 251; see point 2.5)
- with anti-cavitation valve (V3)

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

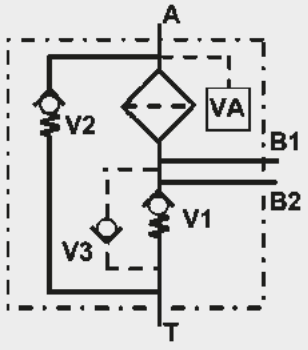
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC und HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



VA = clogging indicator

2. MODEL CODE (also order example)

RKM MM 300 B T F 10 W 0 . X /-NR-EV

2.1 COMPLETE FILTER

Filter type
RKM

Filter material of element
MM Mobilemicron

Size of filter or element
RKM: 80, 100, 120, 151, 201, 251, 300, 350, 400, 800

Operating pressure
B = 10 bar
V = 7 bar (for RKM with clogging indicator up to max. 7 bar operating pressure)

Type and size of suction line

Type	Connection	Filter size 80	100	120	151	201	251	300	350	400	800
T	2 x CS1¼				●	●	●	●			
V	2 x G1				●	●	●				
X	1 x G1	●	●	●					●		
Y	1 x G¾	●	●	●							
Z	to customer spec.	●	●	●	●*	●*	●*			●	●

Type and size of return line

Type	Connection	Filter size 80	100	120	151	201	251	300	350	400	800
C	1 x G¾	●	●	●							
D	1 x G1	●	●	●							
E	1 x G1¼				●	●	●				
F	1 x CS1½							●			
G	1 x G1½								●		
Z	to customer spec.	●°	●°	●°	●*°	●*°	●*°			●	●

° only in conjunction with multiport head

* only in conjunction with thermal bypass valve

Filtration rating in µm
MM: 8, 10, 15

Type of clogging indicator
W without port for clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
F pressure switch
K return line & vacuum pressure gauge
R return line pressure gauge
UF vacuum switch
→ for other clogging indicators see brochure no. 7.050../..

Type code
0 no indicator
1-5 see point 2.6

Modification number
X the latest version is always supplied

Supplementary details
no details = standard (without anti-cavitation valve; seals NBR; bypass valve 2.5 bar; back-pressure valve 0.5 bar)
B3-CV3.5 bypass valve with 3 bar cracking pressure and back-pressure valve with 3.5 bar cracking pressure (only RKM 350)
B6-CV3 bypass valve with 6 bar cracking pressure and back-pressure valve with 3 bar cracking pressure (only RKM 100, 300)
ES vent plug
EV air bleed valve
NR anti-cavitation valve (not on RKM 350)
NRF125 anti-cavitation valve and coarse strainer 125 µm (not on RKM 350)
ND pressure release valve in back-pressure valve
UT filter suitable for use when immersed horizontally in oil
→ for symbols see point 2.7
V FPM seals
xxxxx only RKM 80 to 251 (see point 2.4)
xxxxxxxx only RKM 400 and 800 (see point 2.4)
THxx only RKM 151, 201, 251 (see point 2.5)

2.2 REPLACEMENT ELEMENT

0300 RK 010 MM /-V

Size
0080, 0100, 0120, 0151, 0201, 0251, 0300, 0350, 0400, 0800

Type
RK

Filtration rating in µm
MM 008, 010, 015

Filter material
MM

Supplementary details
V FPM seal

2.3 REPLACEMENT CLOGGING INDICATOR

VMF 2 F . X

The return line indicator monitors the level of contamination in the element.
The vacuum indicator monitors the suction side pressure.

Type
VMF thread G 1/8

Pressure setting
0.2 -0.2 bar (vacuum pressure)
2 2 bar (back-pressure)
→ others on request

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
V only for types B, BM, LE, LZ and C /-EX2G (all other clogging indicators have FPM seals as standard)

2.4 PORT CONFIGURATION RKM 80 TO 251 MULTIPORT HEAD AND RKM 400 AND 800

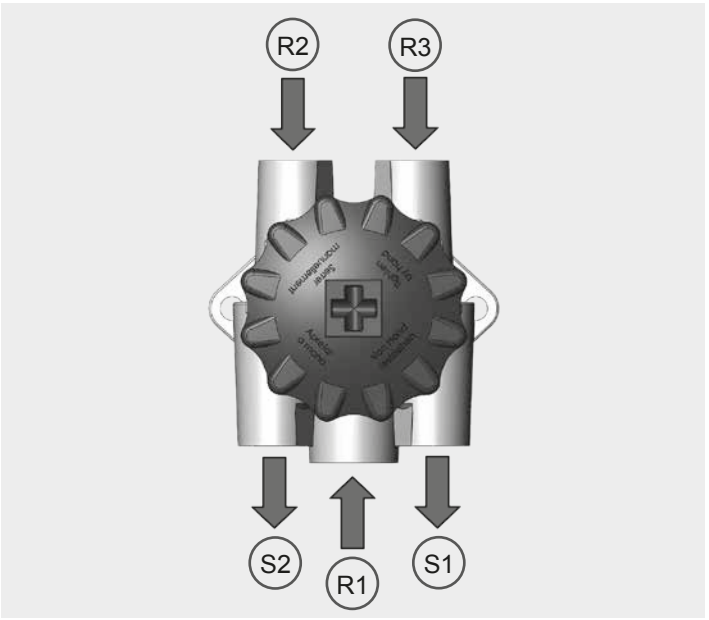
Since there are numerous options for machining the ports on the multiport head and the head of the RKM 400/800, the general code BZZ is selected here. In order to determine the position and size of the ports, a 5-digit or a 9-digit code is added as a supplementary detail. This is determined using the table below. Unused ports are indicated by a "0".

R = return port; S = suction port

Port configuration RKM 80, 100, 120 Multiport

Position in code	1	2	3	4	5
Connection	R1	R2	R3	S1	S2
G ½		(B)	(B)	B	B
G ¾	(C)	C	C	(C)	(C)
G1	D				
Port plugged	0	0	0	0	0
Special port	Z	Z	Z	Z	Z

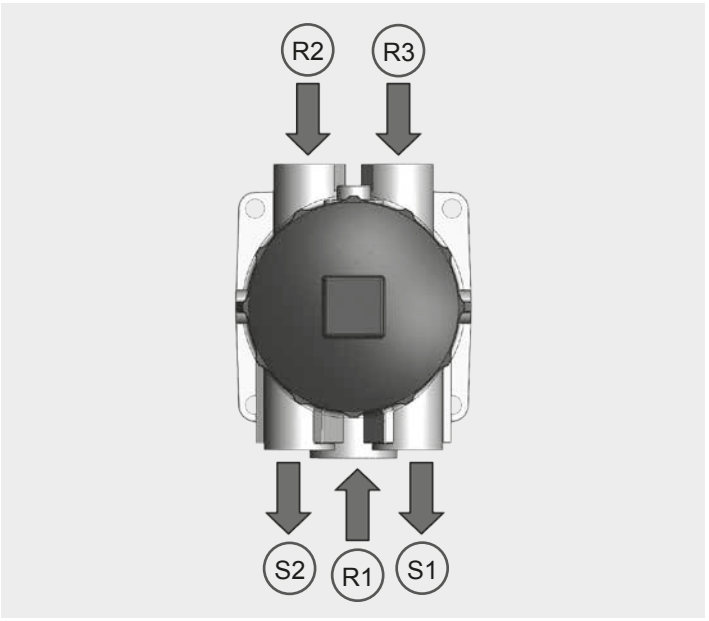
Example: RKM MM 100 BZZ 15 W 1.0 /-CBBCC



Port configuration RKM 151, 201, 251 Multiport

Position in code	1	2	3	4	5
Port	R1	R2	R3	S1	S2
G ¾		(C)	(C)	C	C
G 1	D	D	D	(D)	(D)
G 1¼	(E)				
Port plugged	0	0	0	0	0
Special port	Z	Z	Z	Z	Z

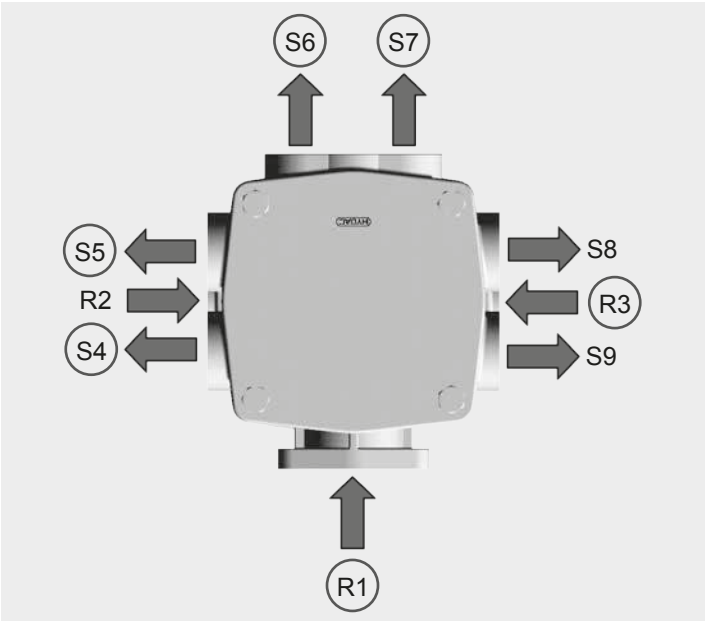
Example: RKM MM 201 BZZ 15 W 1.0 /-ECCDD



Port configuration RKM 400 and 800

Position in code	1	2	3	4	5	6	7	8	9
Port	R1	R2	R3	S4	S5	S6	S7	S8	S9
SAE DN 50	(1)								
SAE DN 65	2								
G1		1	1	A	A	1	1	A	A
G1¼		2	(2)	B	B	(2)	(2)	B	B
G1½		3	3	(C)	(C)	3	3	C	C
Port plugged		(0)	0	0	0	0	0	(0)	(0)
Special port		Z	Z	Z	Z	Z	Z	Z	Z

Example: RKM MM 400 BZZ 15 A 1.0 /-102CC2200



2.5 PORT CONFIGURATION RKM 151, 201, 251 WITH THERMAL BYPASS VALVE

The part flow which requires cooling can be directed via separate ports via the thermal valve. During a cold start, the spool of the thermal valve shuts off the flow to the cooler so that the fluid flows directly through the filter element. The position of the spool is regulated by the oil temperature. From approx. 50-60 ºC the inlet to the cooler is completely open (diagram 1).

Alternative connection option according to diagram 2: A hose connects the inlet line of the cooler to the thermal valve.

The connection configuration is determined by agreement with the customer.

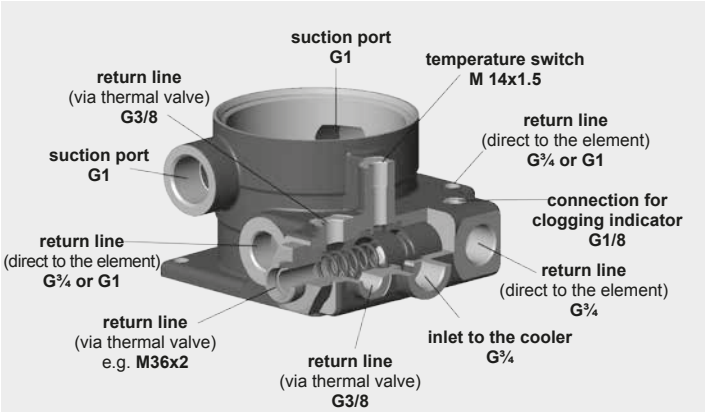


Diagram 1

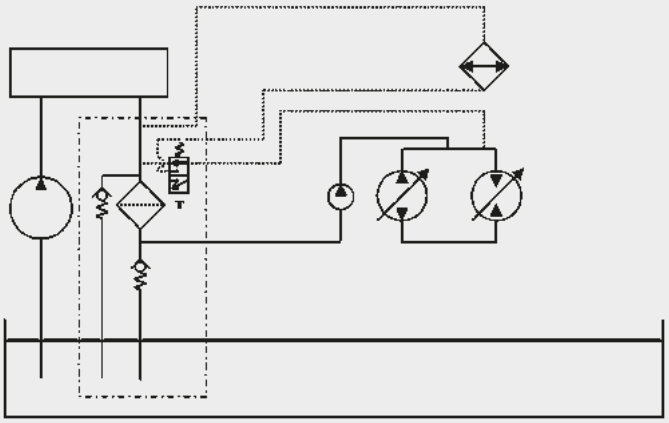
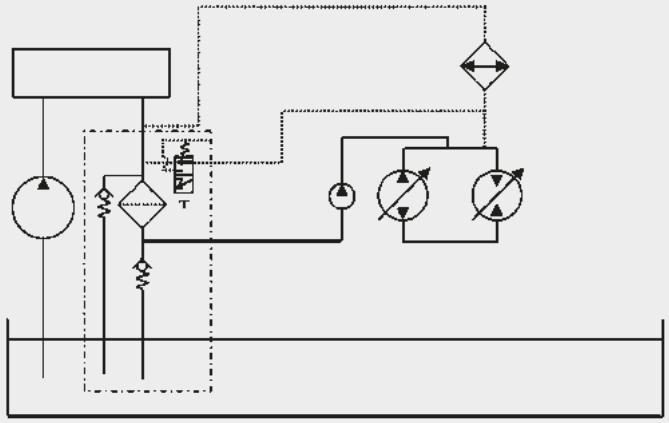
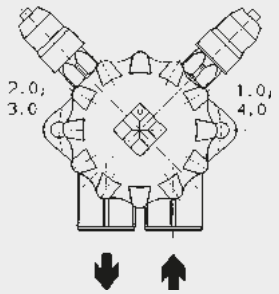


Diagram 2



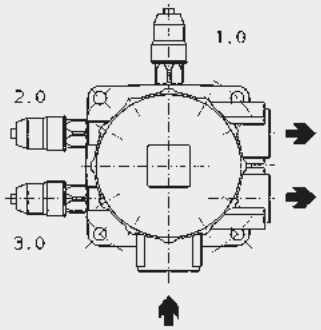
2.6 TYPE CODE

RKM 80, 100, 120



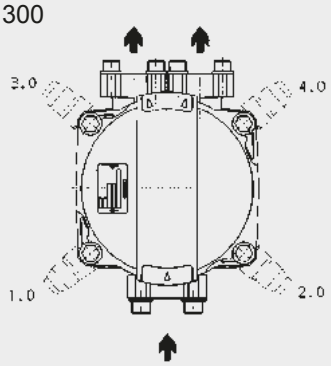
Type code	Type of clogging indicator	Measuring
1.X	Return line	Before filter element
2.X	Return line	Before filter element
3.X	Vacuum	After filter element
4.X	Vacuum	After filter element
5.X	2 indicators: Return line & vacuum	Before & after element

RKM 151, 201, 251



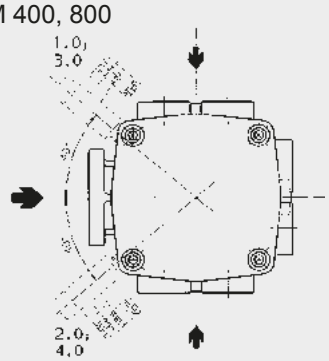
Type code	Type of clogging indicator	Measuring
1.X	Return line	Before filter element
2.X	Return line	Before filter element
3.X	Vacuum	After filter element
5.X	2 indicators: Return line & vacuum	Before & after element

RKM 300



Type code	Type of clogging indicator	Measuring
1.X	Return line	Before filter element
2.X	Return line	Before filter element
3.X	Vacuum	After filter element
4.X	Vacuum	After filter element
5.X	2 indicators: Return line & vacuum	Before & after element

RKM 400, 800

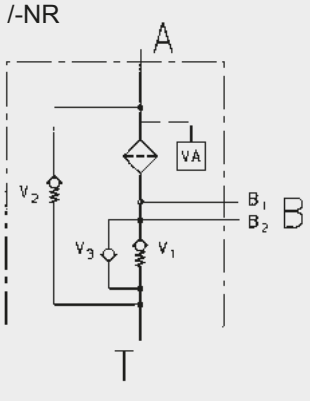


Type code	Type of clogging indicator	Measuring
1.X	Return line	Before filter element
2.X	Return line	Before filter element
3.X	Vacuum	After filter element
4.X	Vacuum	After filter element
5.X	2 indicators: Return line & vacuum	Before & after element

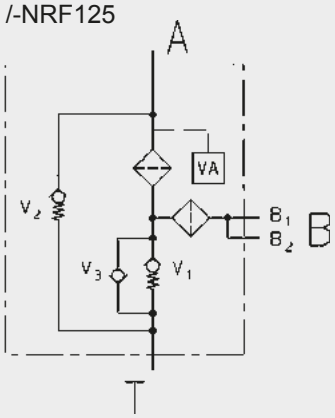
Other indicator configurations on request!

2.7 SYMBOLS

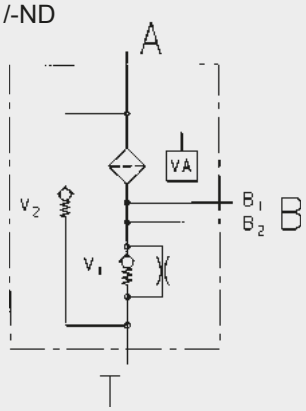
/-NR



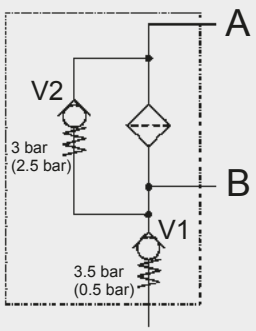
/-NRF125



/-ND



RKM 350



3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

3.1 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

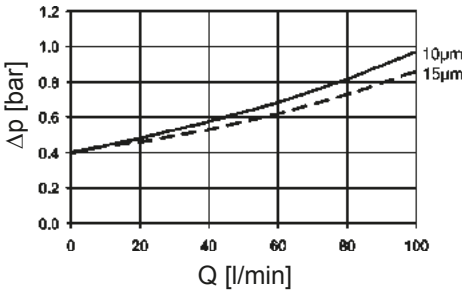
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

RKM	MM		
	8 µm	10 µm	15 µm
80	2.70	2.70	1.60
100	1.80	1.80	1.10
120	1.40	1.40	0.90
151	1.00	1.00	0.65
201	0.75	0.75	0.47
251	0.58	0.58	0.36
300	0.62	0.62	0.39
350	0.30	0.30	0.20
400	0.56	0.56	0.35
800	0.44	0.44	0.27

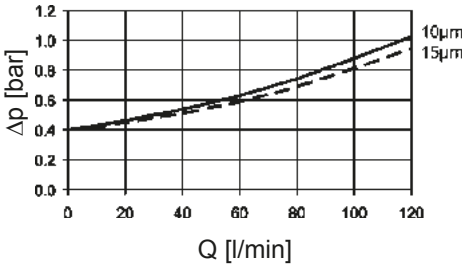
3.2 Δp-Q HOUSING CURVES INCLUDING ELEMENT BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

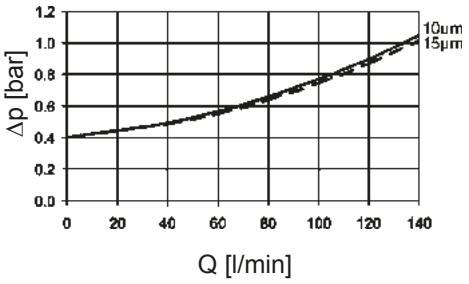
RKM 80



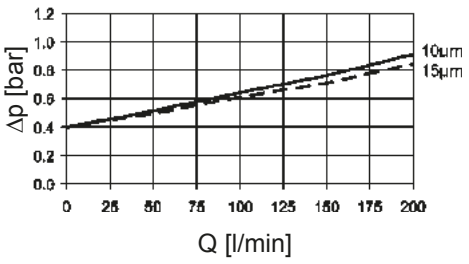
RKM 100



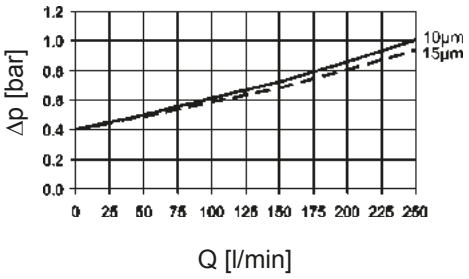
RKM 120



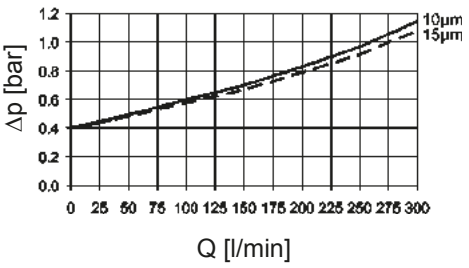
RKM 151



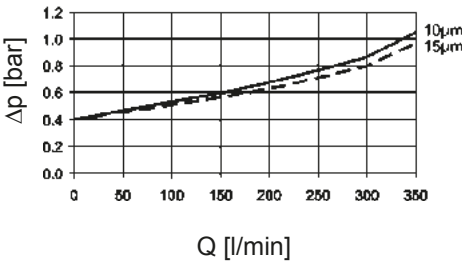
RKM 201



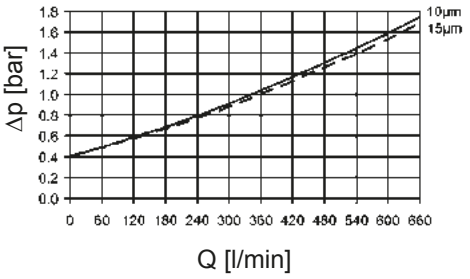
RKM 251



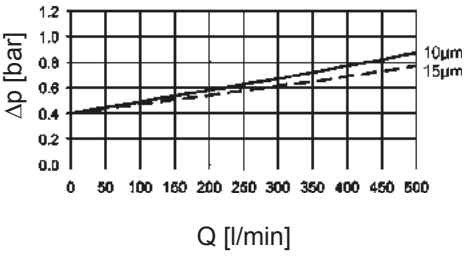
RKM 300



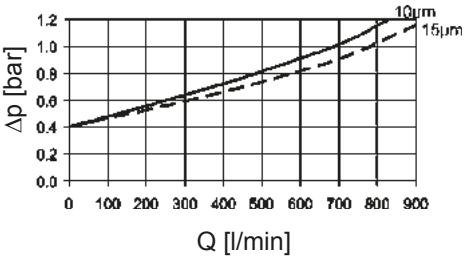
RKM 350



RKM 400



RKM 800



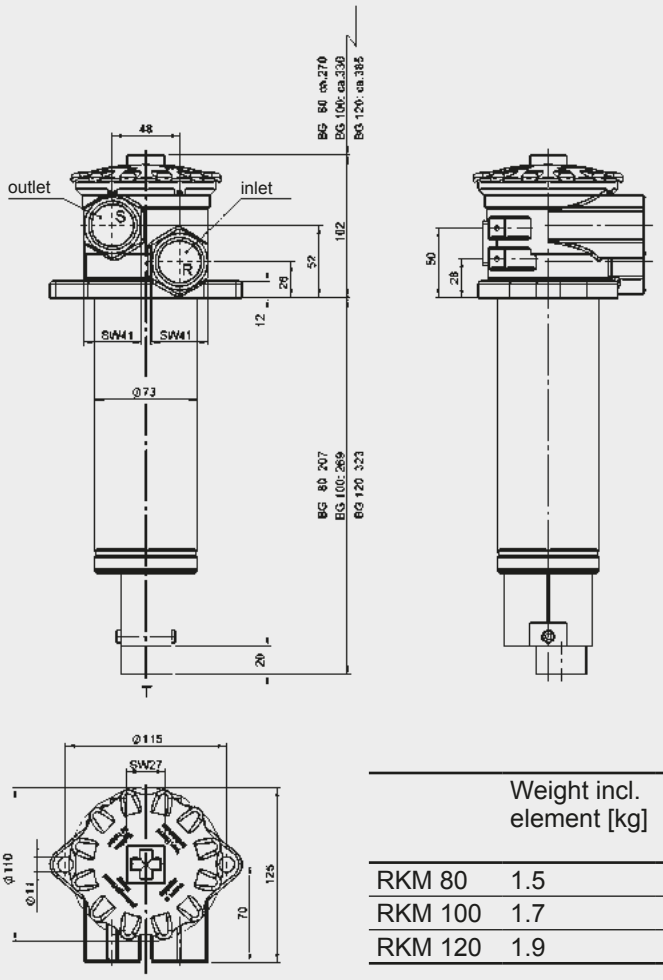
4. DIMENSIONS

RKM 80, 100, 120

Tank requirements

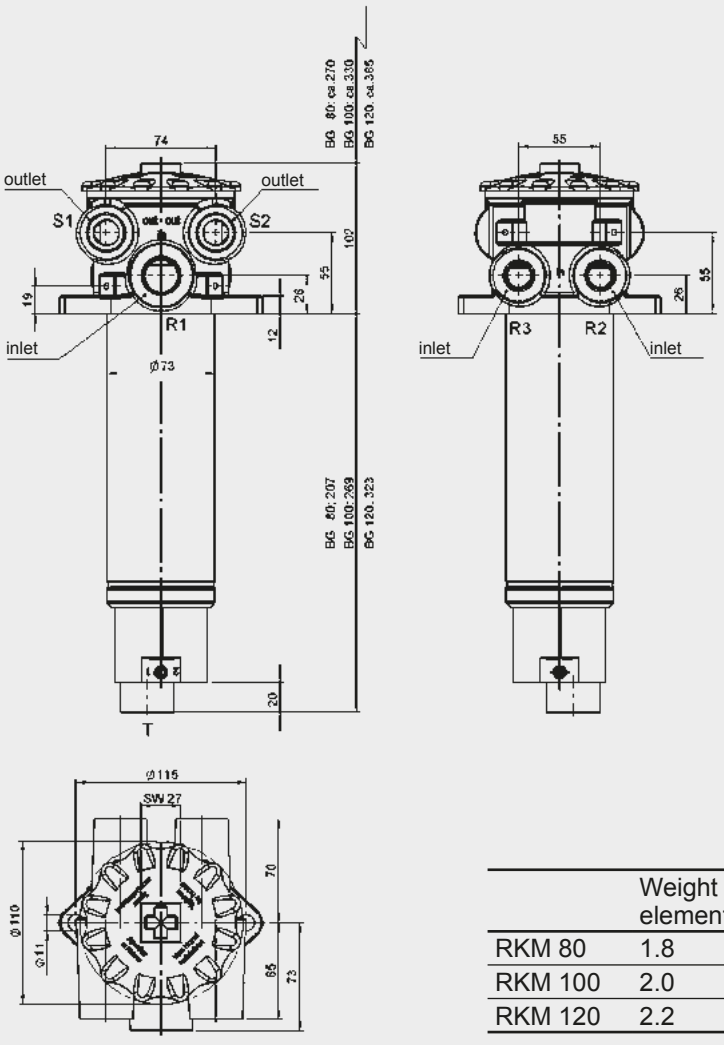
1. In the filter contact area, the tank flange should have a maximum flatness of 0.3 mm and Ra 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter.

   As an alternative, the tank flange can be continuously welded from the inside.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.
5. When using a dipstick through a mounting screw, threadlock the screw into the thread, using Loctite 243, for example, or a similar threadlocker..



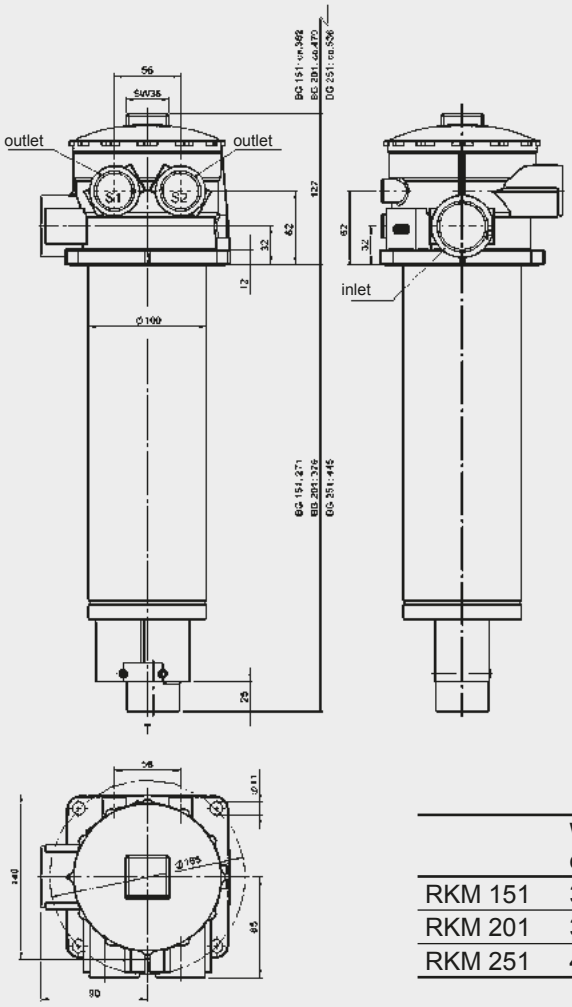
	Weight incl. element [kg]	Volume of pressure chamber [l]
RKM 80	1.5	0.80
RKM 100	1.7	1.00
RKM 120	1.9	1.20

RKM 80, 100, 120 Multiport



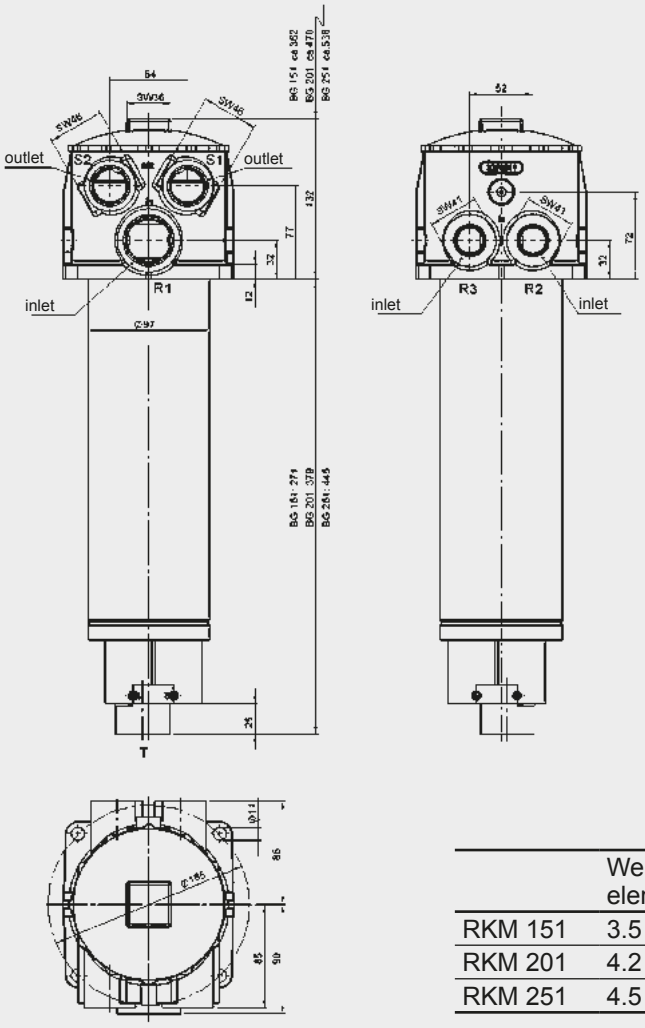
	Weight incl. element [kg]	Volume of pressure chamber [l]
RKM 80	1.8	0.80
RKM 100	2.0	1.00
RKM 120	2.2	1.20

RKM 151, 201, 251



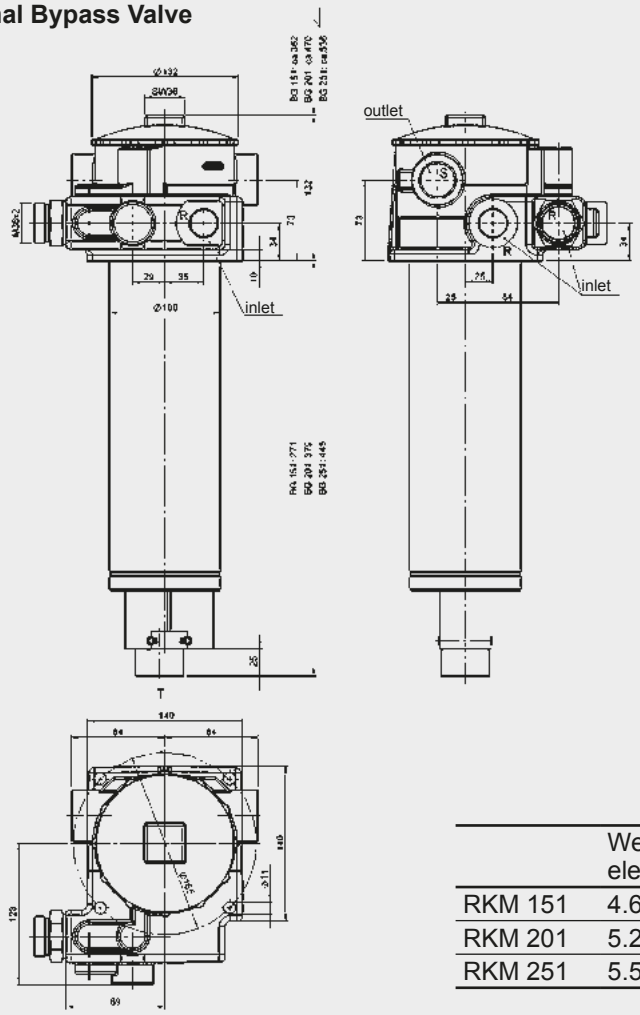
	Weight incl. element [kg]	Volume of pressure chamber [l]
RKM 151	3.1	2.20
RKM 201	3.7	2.50
RKM 251	4.0	3.00

RKM 151, 201, 251 Multiport



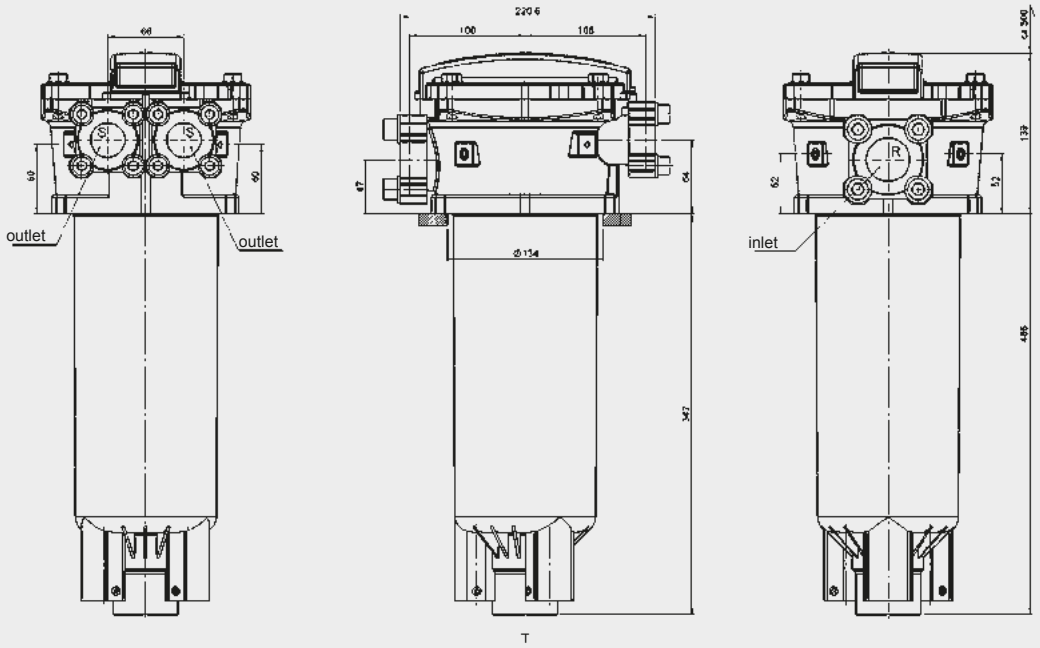
	Weight incl. element [kg]	Volume of pressure chamber [l]
RKM 151	3.5	2.20
RKM 201	4.2	2.50
RKM 251	4.5	3.00

RKM 151, 201, 251 with Thermal Bypass Valve

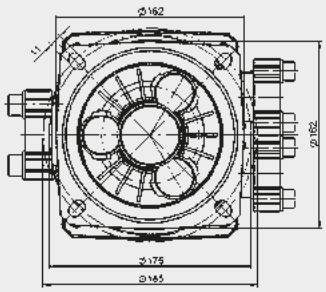


	Weight incl. element [kg]	Volume of pressure chamber [l]
RKM 151	4.6	2.20
RKM 201	5.2	2.50
RKM 251	5.5	3.00

RKM 300

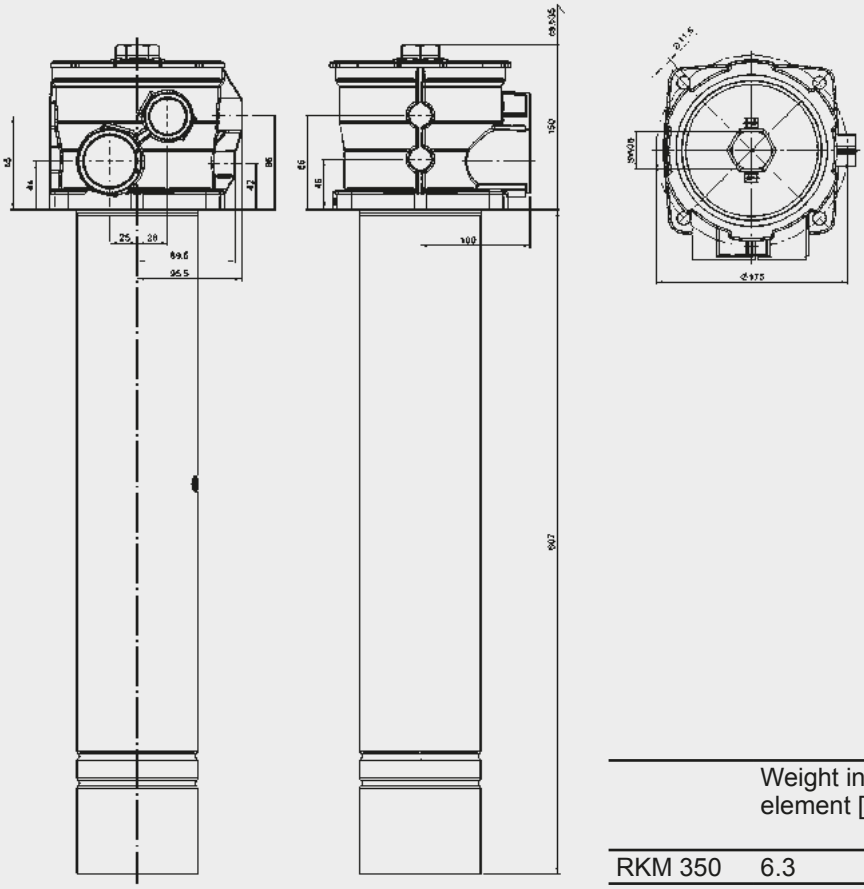


View from below



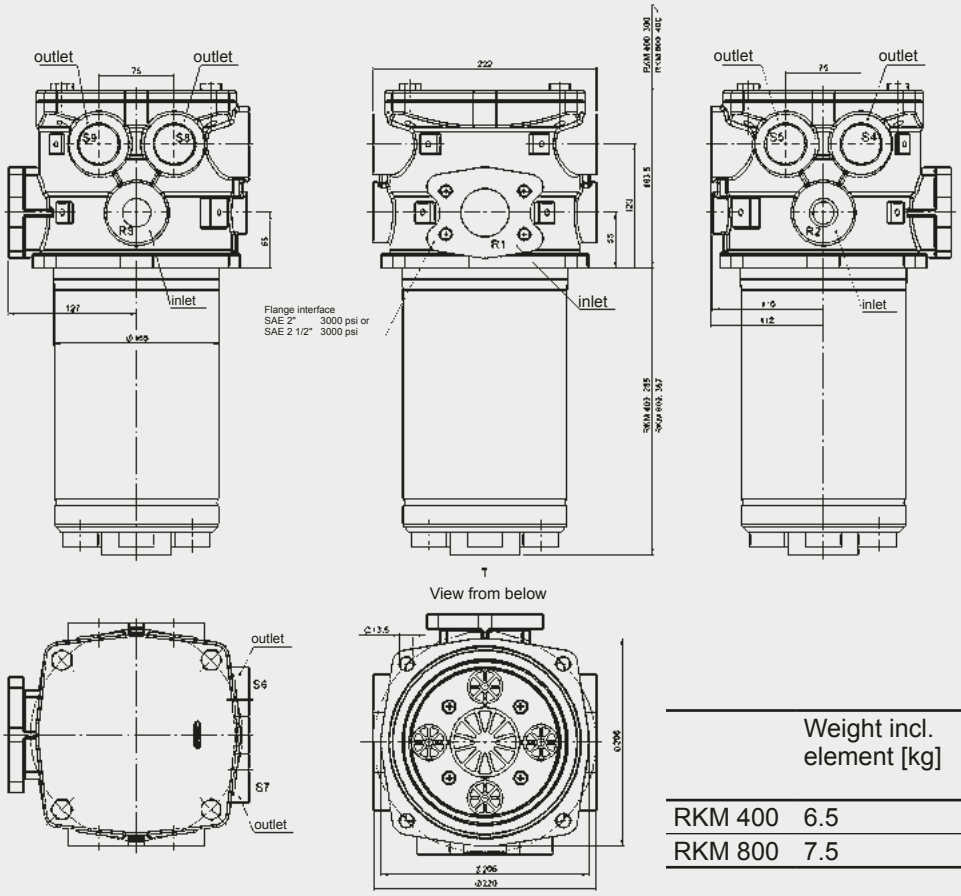
	Weight incl. element [kg]	Volume of pressure chamber [l]
RKM 300	4.6	4.00

RKM 350



	Weight incl. element [kg]	Volume of pressure chamber [l]
RKM 350	6.3	6.00

RKM 400, 800



	Weight incl. element [kg]	Volume of pressure chamber [l]
RKM 400	6.5	8.50
RKM 800	7.5	10.00

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications and operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Return Line
Suction Boost Filter RKM.
The New Generation.

Optimized for service. Optimized for efficiency. Quality protected.

E 7.124.2/11.16

RKM – New for Mobile:

Space saving

the need for at least
one filter is eliminated

Reduced maintenance costs

reduces maintenance
by at least half

First class component protection

excellent filtration efficiency
of the filter element which is
optimized for cold starts

Increased operating reliability

new High Efficiency
filter element technology

Warranty security

individual branding

The New Generation: The New Optimum.

First class pump protection
cavitation is reliably prevented

Flexible use
numerous connection options

Improved ease of maintenance
new design optimized for service

Long service life
high contamination retention

Guaranteed HYDAC quality
thanks to HYDAC Quality Protection

Your Professional Partner for Mobile Applications.

With over 8,000 employees worldwide, HYDAC is one of the leading suppliers for fluid technology, hydraulic and electronic equipment.
With 45 overseas companies and over 500 sales and service partners we are a global player.

Our wide range of products, combined with our established expertise in all aspects of mobile machines, ensures HYDAC is qualified to be your professional partner for the mobile sector. Especially in the area of hydraulic filtration, you will benefit from decades of HYDAC experience and development successes.

Our quality and environment certification to ISO 9001/2000 and ISO 18001 denote first class quality and responsible management of our resources.

All from one supplier.

HYDAC will help find the solution for you!

From first class components right up to turnkey system solutions, from support during commissioning to maintenance and optimization, from professional filtration, to oil condition monitoring and expert cooling.

First class laboratory and testing expertise in the HYDAC Technical Centre

The new Technical Centre, specifically designed for filters and filter monitoring, is equipped with the most up-to-date instruments and test rigs. It offers a huge range of options for fluid analysis and filtration efficiency tests.

In our new laboratories, highly qualified staff are dedicated to continuously improving products and developing applications as well as carrying out analyses to customer specification – always tailored to the particular operating conditions.

In addition to the central facility at our headquarters there are further laboratories and mobile fluid laboratories in several HYDAC centres in Germany and overseas.

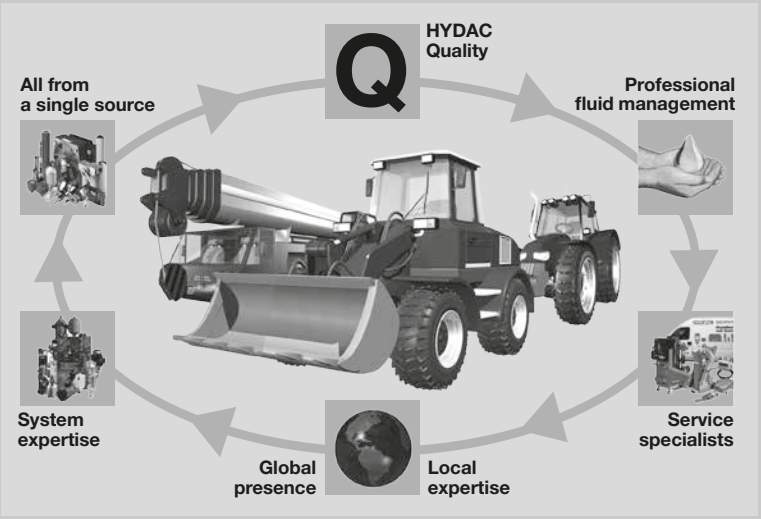
Just one example of the numerous filter testing procedures: **Multipass test rig.**

Oil analysis in the HYDAC laboratory at company headquarters.

With Us, You and Your Fluids are in the Safest Hands.

The specialists at HYDAC have a good knowledge of your fluid and welcome the opportunity to help you reduce the burden of fluid service. You will see for yourself the clear benefit of having a hydraulic or lubrication system that works perfectly, leaving you to concentrate fully on your area of expertise.

When you have decided on a HYDAC filter concept for your mobile machine, you are not "just" buying a filter, but are benefitting at the same time from the HYDAC network of expertise and service, available worldwide:



Highest level of operating reliability for mobile applications.

In HYDAC you have a professional partner for all aspects of fluid cleanliness

This product overview shows just a single filter type. The whole filter range from HYDAC covers approximately fifty other types – the majority of which have been developed for mobile applications.
In addition, new individual solutions are constantly being developed, partly in active development partnership with the manufacturers.

HYDAC filters offer you the following advantages.

Low costs
the filter elements and housings are optimized for the mobile sector

Easy maintenance
simple element change and easy-to-install filter housing

High level of operating reliability
filter media have high filtration efficiency for exceptional cleanliness classes and benefit from a high level of production quality

Low operating costs
particularly low pressure drops across filter and filter element for low energy consumption

All components and systems from one company
providing comprehensive system know-how and integrated system approach

Worldwide availability and advice
provided by our worldwide network of regional offices, agents and service partners

Protection of the spare part business
thanks to special features such as "Brand Labelling" and "Quality Protection"

Return Line Suction Boost Filter RKM.

Filter housing optimized for service.

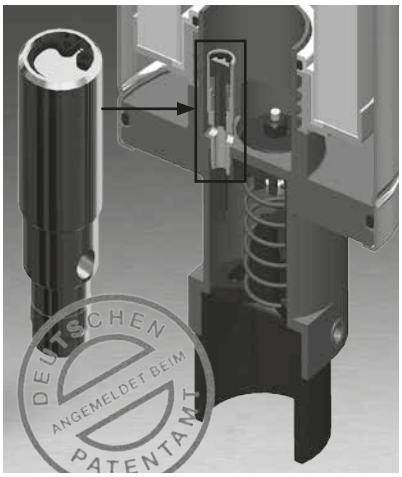
Never before has the RKM been so easy to service:
The element is, as previously, lifted with the filter bowl out of the ...tank-mounted head of the filter.
What's new is that the element is now firmly screwed **to the bowl**. It will not become loose and can be lifted out smoothly. In addition, the convenient removal handle makes for a clean and easy element change.

Special advantage: the optional patented oil drain valve opens automatically to the tank when the filter cover plate is opened.

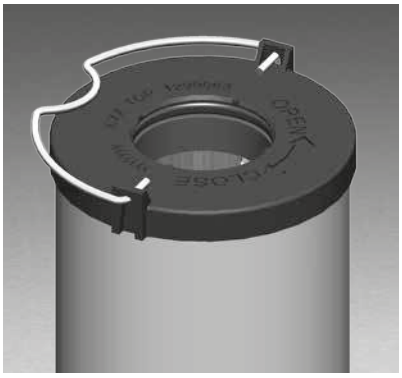
Customer benefits of the new generation:

- **Improved ease of maintenance no risk of injury**
since the element is securely attached to bowl and a convenient removal handle is provided
- **Cleaner element change** element

firmly attached to bowl
and automatic oil drain valve available (as an option)



Patented oil drain valve.



Element with removal handle.

Filter elements optimized for efficiency.

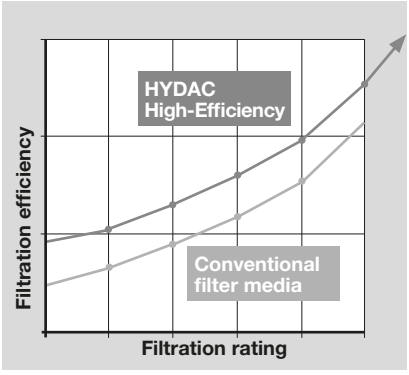
In the Return Line & Suction Boost Filter RKM special "Mobilemicron" **filter elements have always** been used which have an exceptionally good pressure drop characteristic.
In other words, for the same ambient conditions and flow rate, Mobilemicron elements produce significant lower Δp than comparable hydraulic elements.

For the new generation we have gone one better: **Mobilemicron elements in a High-Efficiency version** achieve particularly high separation rates.
That means **still greater efficiency** for these already highly efficient Mobilemicron filter elements.

Customer benefits of the new generation:

- **Excellent component protection and increased machine availability**
due to the outstanding filtration efficiency of the new High Efficiency elements
- **Protection of the shaft seals of the hydrostatic drive**
particularly low pressure drop across the element (especially during cold start)


Mobilemicron filter elements.



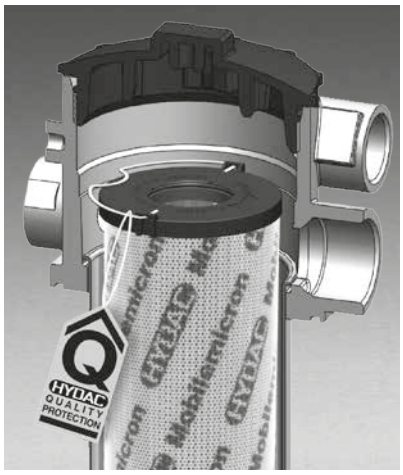
High-efficiency graph.

Quality Protection.

The new RKM is equipped with a "Quality Protection solution".
The anti-copying measures built into the top quality original elements prevent counterfeit elements being fitted.
In addition, the RKM elements can of course be overprinted as usual with your company logo (Brand labelling).
Overprinting also supports the exclusive use of original elements.

Customer benefits of the new generation:

- **Outstanding quality of the replacement element**
and with that, long service life of element and components, guaranteed cleanliness and high level of operating reliability
- **Safeguarding of the spare parts business**
particularly for OEMs
- **Guaranteed spare part quality**
and therefore oil cleanliness in respect of warranty claims


Quality Protection. (Integrated anti-copying design)


Brand Labelling. (Element with customer logo)

E 7.124.2/11.16

The New Generation: Optimized for Service.

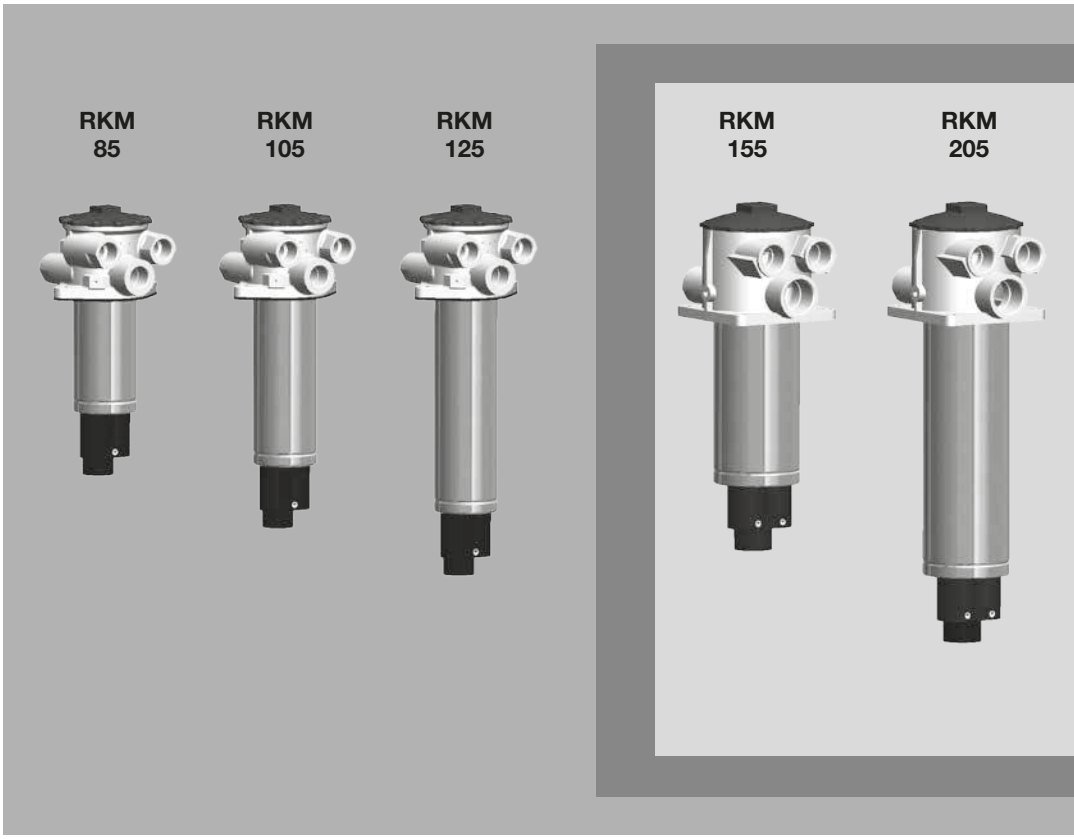
A filter crammed with cutting-edge technology.

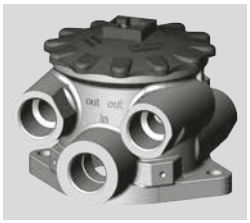
The new RKM has not only been optimized in terms of service, efficiency and quality, but it also triumphs in terms of other beneficial refinements.

On this double page you will see the choice of possible RKM configurations. Each of the versions illustrated is the result of a specific customized solution. In other words, these are not "off the shelf" products but have developed from specific requests from the mobile sector.

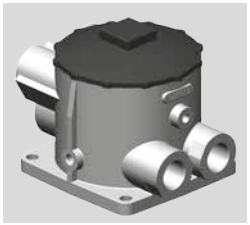
The result is a range with matchless flexibility and a wealth of ideas. Further details can be found in the current brochure no. 7.108.2..

Needless to say, with the varied RKM standard range as your starting point, there is always the option of developing new RKM solutions individually tailored to your application and requirement profile. Please view this selection as a "appetizer" and let us know what solutions you are seeking.





Head of RKM 85 - 125 Multiport.



Head of RKM 155 - 255 Multiport.

RKM 85 – 255 and 405 – 805 Variety of connections with "RKM Multiport".

Almost all RKM sizes are available with a Multiport filter head. The huge number of possible combinations of return line and suction boost connections and the different port positions means that the filter can be quickly configured to suit individual customers.

For sizes 405 and 805 there are for example nearly 200,000 (!) versions available (see table below).

Particular advantages of having variety of connections:

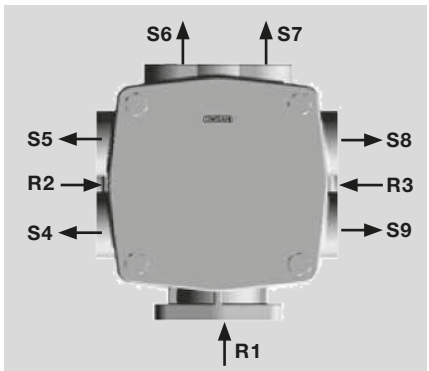
- **Space and cost saving**
- **Reduction in components**
  Need for blocks, hoses and threaded connections is eliminated
- **Reduced risk of leakage**
- **Great flexibility**

RKM 155 – 305 with Cost-Saving connection "CS".

The patented CS connection is designed to speed up and simplify the mounting of hoses by using just four screws supplied with the filter.

Particular advantages of this version:

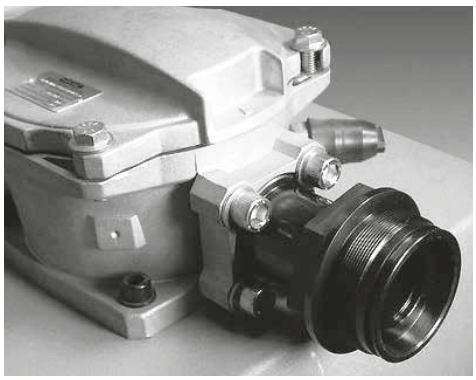
- **Simplified installation**
  Whereas in the case of conventional SAE flanges four screws, four washers and two installation fittings are required per hose connection, the CS connection does not require any other additional installation fitting.
- **Improved cold start performance**
  compared to standard threaded connections, due to lower pressure drop on suction side.



Variety of connections with **RKM Multiport.**

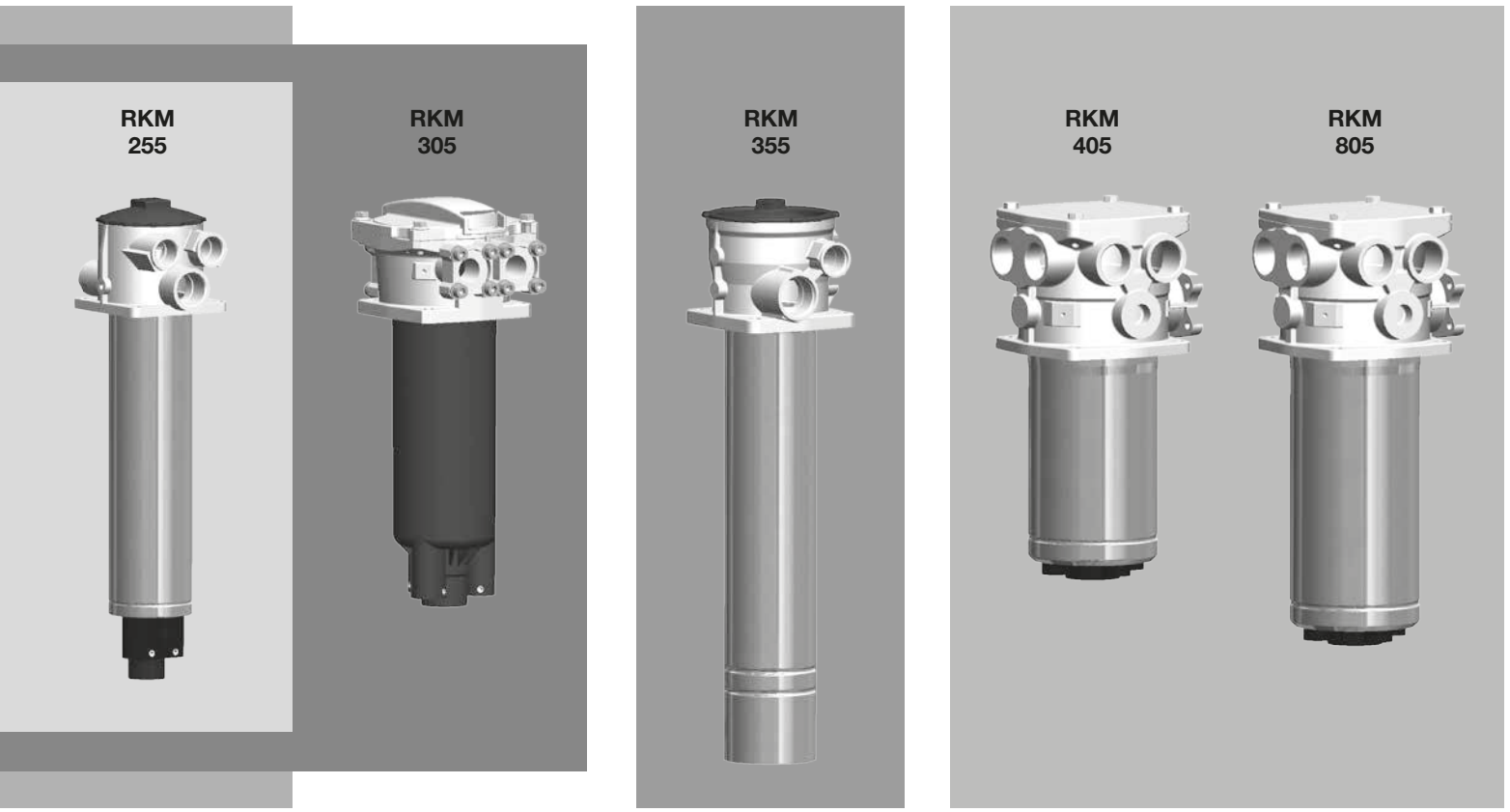
	Return lines			Suction lines					
Connection	R1	R2	R3	S4	S5	S6	S7	S8	S9
SAE DN 50	✓	×	×	×	×	×	×	×	×
SAE DN 65	✓	×	×	×	×	×	×	×	×
G 1	×	✓	✓	✓	✓	✓	✓	✓	✓
G 1¼	×	✓	✓	✓	✓	✓	✓	✓	✓
G 1½	×	✓	✓	✓	✓	✓	✓	✓	✓

Connection options for return lines and suction lines.



Advantageous **cost-saving connection.**

Optimized for efficiency. Quality protected.

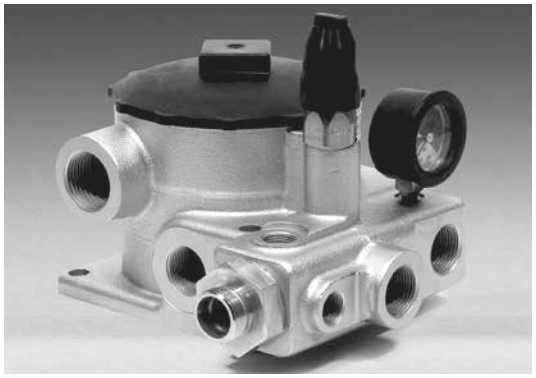


RKM 155 – 255 with thermal bypass valve

For the RKM 155 - 255, a temperature controlled cooler bypass valve can be built directly into the filter head, on request. This "intelligent" valve varies the volume of the fluid to be cooled depending on the temperature of the operating fluid.

Particular advantages of this version:
Enhanced protection of the shaft seals during cold start
because the built-in temperature-controlled valve provides huge savings in Δp, particularly compared to externally piped cooler bypass valves which use check valves. Also in comparison to externally piped thermal valves, significant improvements in Δp are achieved.

Drastically reduced time and effort for installation (Plug & Play),
because the complete package is supplied ready-to-install (reduction in components) and the need for blocks and fittings is largely eliminated.



RKM head with built-in thermal bypass valve and numerous connection options (Multiport).

RKM 355 with cooler bypass valve.

The valve "V1" is used here as a cooler bypass valve.

It protects the cooler from excessive pressures. If the back pressure increases at the cooler during cold start, the valve opens and part of the flow drains directly to the tank.

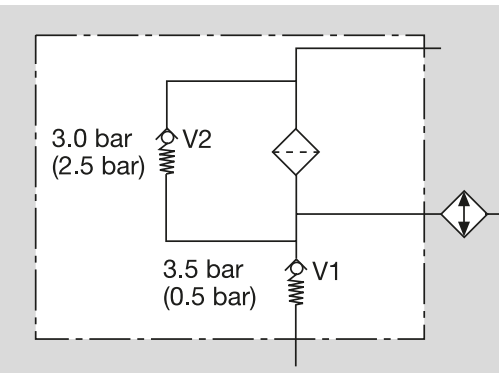
In order to ensure full flow cooling, the element bypass valve discharges to the cooler.

Particular advantages of this version:

Space and cost saving
Cooler bypass valve built into the filter

Increased operating safety
Cooler always supplied with finely filtered oil

Pressure protection of the cooler



Function of the RKM 355 with cooler bypass valve.

HYDAC RKM: Two Filters in One.

A design that saves money.

By using a HYDAC Return Line & Suction Boost Filter RKM you will benefit from:

Space saving
Just one filter required instead of two

Easy maintenance
Half the time required for installation and maintenance

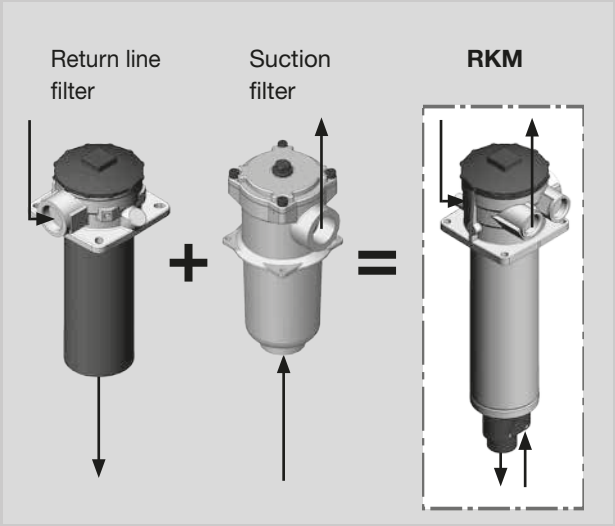
Cost saving
Lower investment, storage and service costs

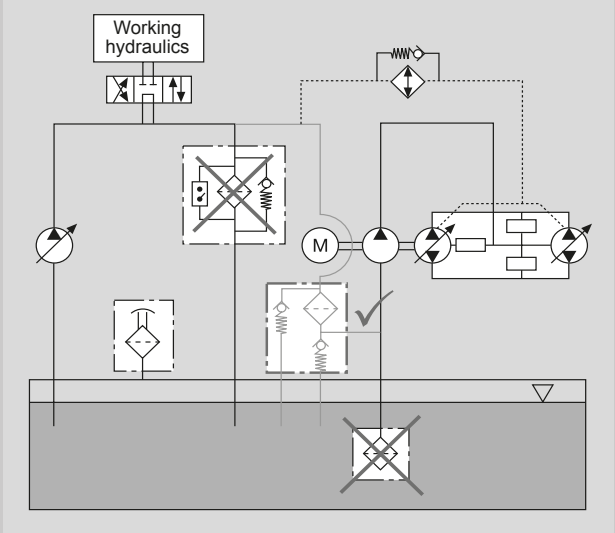
Increased operating safety
Cavitation at the pump is reliably prevented and finely filtered oil is supplied even in the suction line.

One filter.
Two functions.
All the advantages.

The RKM combines the advantages of a return line filter with those of a suction filter in a single filter!

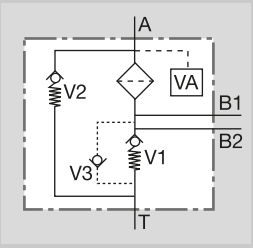
Return line & suction boost filters are particularly suitable for use in machines with two or more circuits, such as for example in mobile working machines with hydrostatic traction drives (wheel loaders, forklifts).





Application example for the RKM in mobile machines.

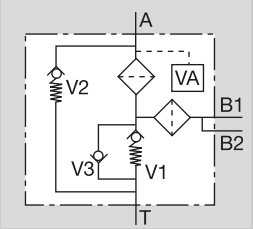
Function.



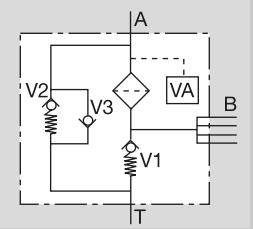
The return line flow Q_R is supplied to the element via one or more inlets "A".
Once the element has been subjected to flow from the outside to the inside, the back-pressure valve "V1" in the element builds 0.5 bar positive pressure.
Particularly in cold start conditions this positive pressure supports the suction characteristics of the pump(s) connected to "B" (e.g. boost pumps). This considerably reduces the risk of cavitation.

Ensure that the return line volume in operating conditions is always greater than the volume which is supplied on the suction side. The surplus volume drains to tank via "T". The bypass valve "V2" is fitted to relieve excessive back-pressure.
Part of the flow then drains directly to tank, bypassing the element. This configuration of valves ensures that only finely filtered oil reaches the suction port during operation*. The gradual increase of the valve characteristics contributes to keeping the back pressure in the return lines sufficiently low, even with high viscosity levels.
With optional valve "V3", oil can be drawn from the tank for short periods*, e.g. for initial filling and for venting.

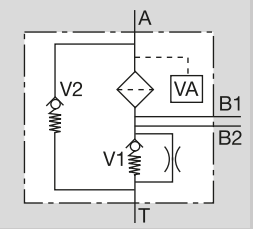
Further options:



Anti-cavitation valve* with coarse strainer
for filtered oil also in anti-cavitation mode



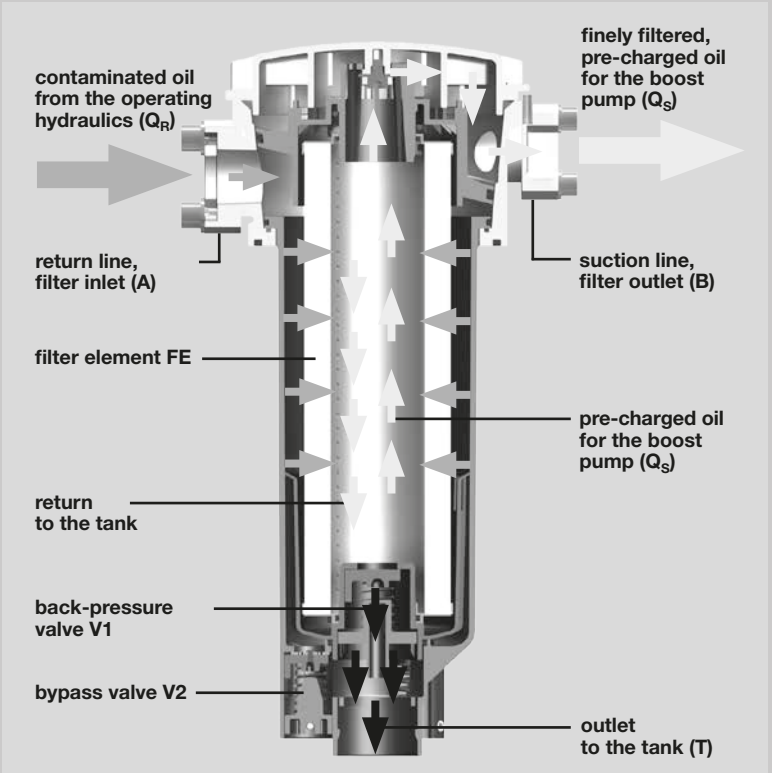
Anti-cavitation valve* in the element bypass valve "V2"
for finely filtered oil also in anti-cavitation mode



Throttle in back-pressure valve "V1"
for reducing pressure and draining oil

VA = clogging indicator

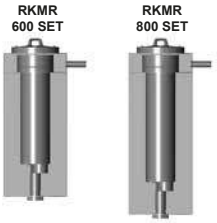
*** not for RKM 355**



Function of the RKM.

Return Line Suction Filter RKMR

Element flow direction from in to out
In-tank versions:
up to 800 l/min, up to 10 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter cover plate and an element location spigot. The element is top-removable.

Standard equipment:

- bypass valve
- magnetic core built into cover plate

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Contamination retention capacities in g

	Glass fibre (ULP)		
RKMR KIT	5 µm	10 µm	25 µm
600	85	153	170
800	115	207	230

	Glass fibre with pre-filter (UHC)		
RKMR KIT	5 µm	10 µm	20 µm
600	272	408	459
800	368	552	621

Filter elements are available with the following pressure stability values:

Glass fibre (ULP): 6 bar

Glass fibre with pre-filter (UHC): 6 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	up to 10 bar
Temperature range	-30 °C to +120 °C
Material of housing tube	Steel
Material of cover plate	EN-GJS-500
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

In-tank filter

1.6 SPECIAL MODELS AND ACCESSORIES

- without magnetic core
- air bleed valve in cover plate
- protective strainer for bypass and anti-cavitation valve

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

Test certificate 2.2
Other approvals on request

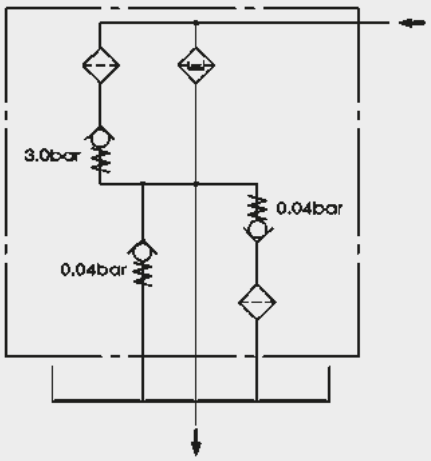
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

RKMR ULP 800 KIT 10 W 1 . X /-V

2.1 COMPLETE FILTER

Filter type
RKMR

Filter material of element
ULP Glass fibre
UHC Glass fibre with pre-filter

Size of filter or element
RKMR: 600, 800

In-tank version
KIT filter cover plate and element spigot only

Filtration rating in µm
ULP : 5, 10, 25
UHC : 5, 10, 20

Type of clogging indicator
W without port, no clogging indicator

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
no details = standard bypass cracking pressure B3 = 3 bar
B. special bypass cracking pressure
V FPM seals
OM without magnetic core
NRF protective strainer for anti-cavitation valve
BRF protective strainer for bypass valve

2.2 REPLACEMENT ELEMENT

0800 R 010 ULP /-V

Size
0600, 0800

Type
R

Filtration rating in µm
ULP : 005, 010, 025
UHC : 005, 010, 020

Filter material
ULP, UHC

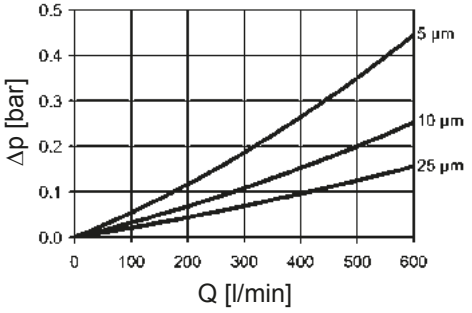
Supplementary details
V (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

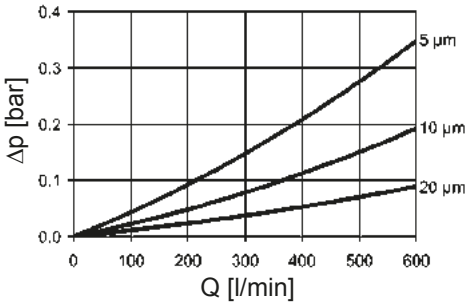
3.1 GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm³ anda kinematic viscosity of 30 mm²/s.

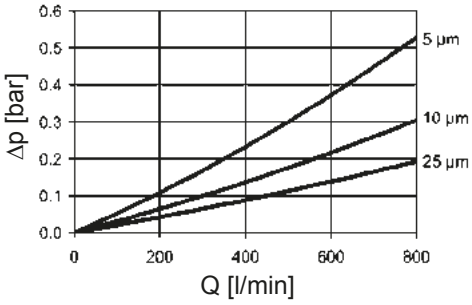
RKMR 600 KIT: ULP



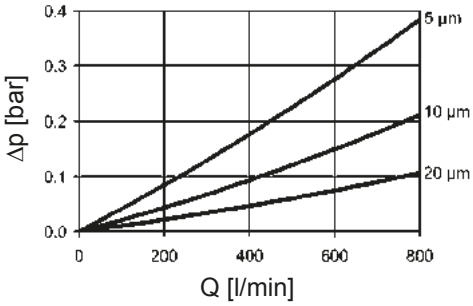
RKMR 600 KIT: UHC



RKMR 800 KIT: ULP

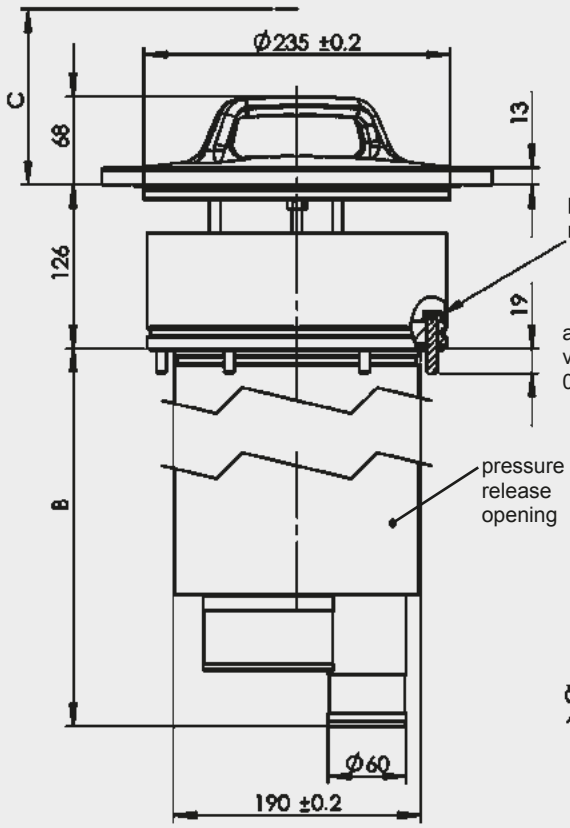


RKMR 800 KIT: UHC

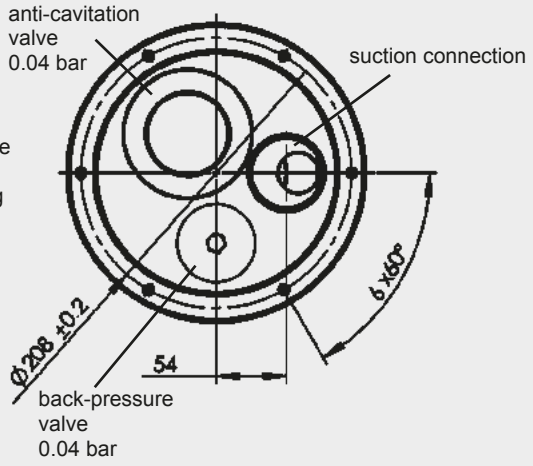


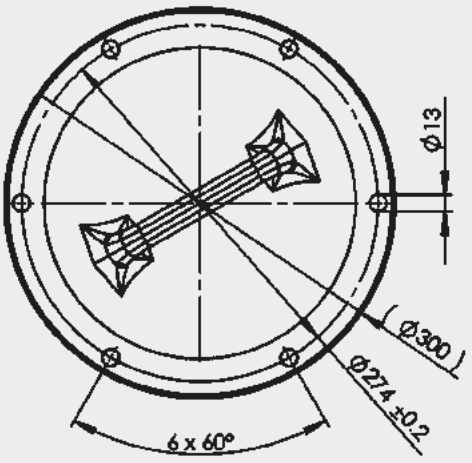
4. DIMENSIONS

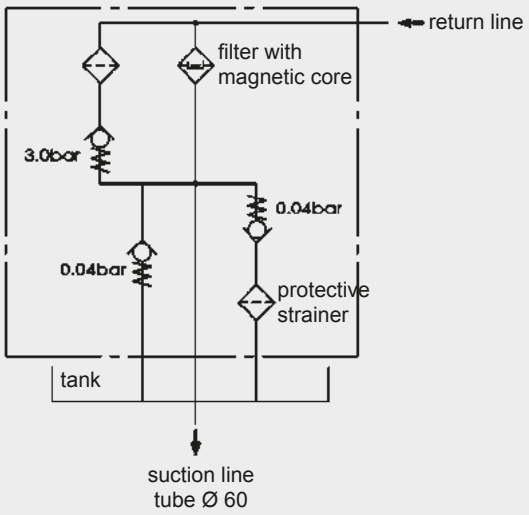
RKMR 600 - 800 KIT



View from above (without cover plate)







RKMR KIT	B	C min.	Weight incl. element [kg]
600	695	570	29.4
800	807	685	32.4

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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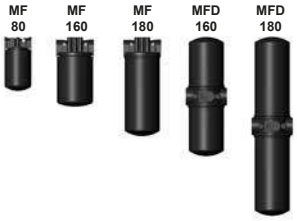
D-66280 Sulzbach/Saar
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

Spin-On Filter MF/MFD
up to 300 l/min, up to 8 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter consists of a filter head with built-in bypass valve and a screw-on filter cartridge.

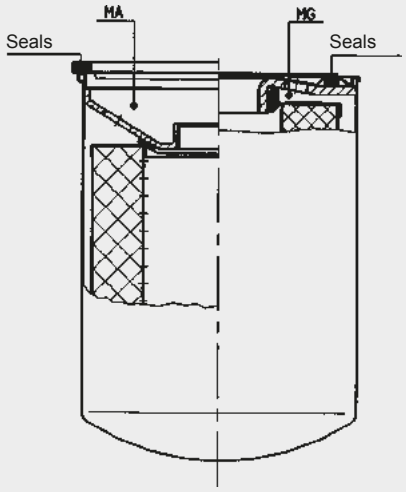
Standard equipment:

- with bypass valve

1.2 FILTER CARTRIDGES

MG: Cartridge connection thread, to ISO 228
Sealing on inside
(Note: the seal on the 0080 MA cartridge is also on the inside!)

MA: Cartridge connection, UN thread sealing on the outside



1.3 FILTER SPECIFICATIONS

Nominal pressure	8 bar
Temperature range	-30 °C to +100 °C
Pressure setting of clogging indicator: Δp_a	Type E: 0 to 16 bar Type F: 1.5 or 2 bar Type UE: 0 to -1.0 bar Type UF: -0.2 bar
Type of clogging indicator	VMF (return line indicator)
Material of filter head	Aluminium
Material of filter cartridge	Sheet steel
Bypass cracking pressure	MF 80: 1.7 bar (standard) MF 160/180: 2 bar (standard) MFD 1.7 bar (standard)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

Without bypass or with other bypass cracking pressures

1.7 SPARE PARTS

See Original Spare Parts List

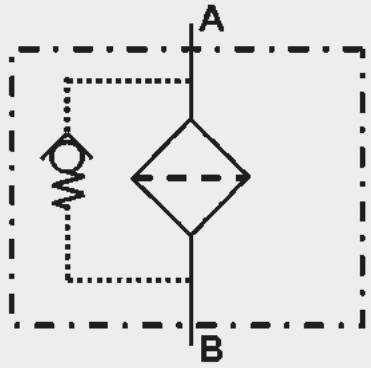
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils to DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)

MF BN 160 A U E 10 F 1 .X /-KB

2.1 COMPLETE FILTER

Filter type
MF (all sizes; 1 filter cartridge)
MFD (sizes 160 and 180; 2 filter cartridges)

Filter material
BN Betamicron®
P Paper (only MF 80 and MF/MFD 160)

Size of filter or cartridge
MF: 80, 160, 180
MFD: 160, 180

Operating pressure
A 8 bar

Type of cartridge connection
G thread to ISO 228 (G ¾ on size 80; G 1¼ on size 160)
U UN thread (1-12 UNF on size 80, 1½ x 16 UN-2B on size 160/180)

Type and size of port

Type	Connection	Filter size		
		80	160	180
C	G ¾	MF	–	–
E	G1 ¼	–	MF	MF
F	G1 ½	–	MFD	MFD

Filtration rating in µm
BN 3, 5, 10, 20
P 10

Type of clogging indicator
A steel blanking plug in indicator port
E pressure gauge
F pressure switch
(pressure indicators)
UE vacuum gauge
UF vacuum switch
(vacuum indicators)
for other clogging indicators see brochure no. 7.050../..

Type code
0
1 - 8 see Point 2.4

Modification number
X the latest version is always supplied

Supplementary details
B. cracking pressure of bypass (e.g. B0.2 = 0.2 bar; B0.25 = 0.25 bar)
KB without bypass valve (only for size 160/180)

2.2 REPLACEMENT CARTRIDGE

0160 MA 010 BN

Size
0080, 0160, 0180

Type
MG for filters with cartridge connection G (= thread to ISO 228); paper filter material only (exception: MF 80: 20 BN)
MA for filters with cartridge connection U (= UN thread)

Filtration rating in µm
BN 003, 005, 010, 020 (for MF 80: MA = only 10 µm; MG = 20 µm)
P 010

Filter material
BN, P

2.3 REPLACEMENT CLOGGING INDICATOR

VMF 2 F . X

Type of indicator
VMF Return line pressure indicator

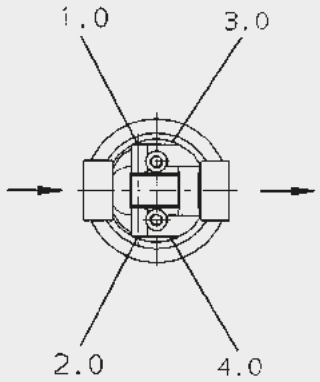
Pressure setting
2 2 bar standard for size 160/180
1.5 1.5 bar standard for size 80
(see Point 1.3)

Type of clogging indicator
F (see Point 2.1)

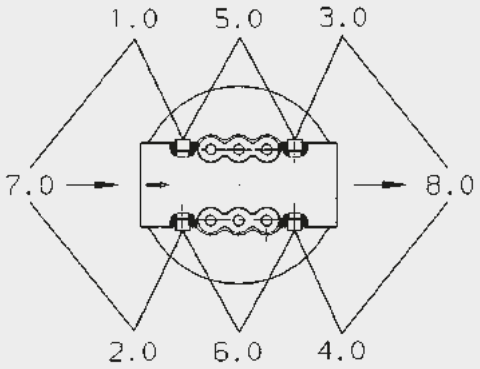
Modification number
X the latest version is always supplied

2.4 MOUNTING POSITION OF THE CLOGGING INDICATOR

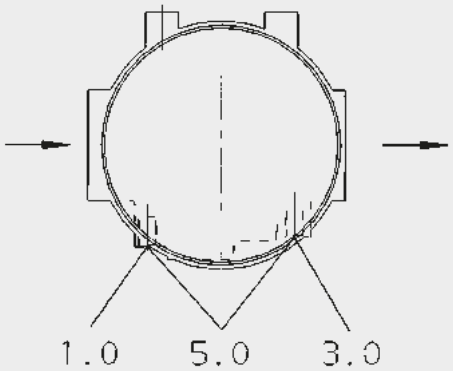
MF 80



MF 160/180



MFD 160/180



For MF filters

Type code	Mounting position of clogging indicator	Application of complete filter	Type of indicator	Specials
0.X	Without clogging indicator, screw plug in all indicator ports			–
1.X	Filter inlet: on left	Return line filter	Pressure indicator	–
2.X	Filter inlet: on right	Return line filter	Pressure indicator	–
3.X	Filter outlet: on left	Suction filter	Vacuum indicator	- with byp. cracking press. 0.2 bar (.../-B0.2) - without bypass valve (.../-KB) --> only BG160/180
4.X	Filter outlet: on right	Suction filter	Vacuum indicator	- with byp. cracking press. 0.2 bar (.../-B0.2) - without bypass valve (.../-KB) --> only BG160/180
5.X	Filter inlet & outlet: on left	Pressure filter	Pressure and vacuum indicator	–
6.X	Filter inlet & outlet: on right	Pressure filter	Pressure and vacuum indicator	–
7.X	Filter inlet: on right and left	Return line filter	Pressure indicator	–
8.X	Filter outlet: on right and left	Suction filter	Vacuum indicator	Only for sizes 160 und 180, on versions: - with byp. cracking press. 0.2 bar (.../-B0.2) - without bypass valve (.../-KB)

For MFD filters

Type code	Mounting position of clogging indicator	Application of complete filter	Type of indicator	Specials
0.X	Without clogging indicator, screw plug in all indicator ports			–
1.X	Filter inlet: on right	Return line filter	Pressure indicator	–
3.X	Filter outlet: on right	Suction filter	Vacuum indicator	Only on versions: - with byp. cracking press. 0.2 bar (.../-B0.2) - without bypass valve (.../-KB)
5.X	Filter inlet & outlet: on right	Pressure filter	Pressure and vacuum indicator	–

2.5 CARTRIDGE SELECTION TABLE

Filter type MF

Size 80	Cartridge
MF P 80 AGC 10 ...	0080 MG 010 P
MF BN 80 AUC 10 ...	0080 MA 010 BN
MF BN 80 AGC 20 ...	0080 MG 020 BN
Size 160	**Cartridge**
MF P 160 AGE 10...	0160 MG 010 P
MF BN 160 AUE 3...	0160 MA 003 BN
MF BN 160 AUE 5...	0160 MA 005 BN
MF BN 160 AUE 10...	0160 MA 010 BN
MF BN 160 AUE 20...	0160 MA 020 BN
Size 180	**Cartridge**
MF BN 180 AUE 3...	0180 MA 003 BN
MF BN 180 AUE 5...	0180 MA 005 BN
MF BN 180 AUE 10...	0180 MA 010 BN
MF BN 180 AUE 20...	0180 MA 020 BN

Filter type MFD

Size 80	Cartridge
–	not available
–	not available
–	not available
Size 160	**Cartridge**
MFD P 160 AGF 10...	0160 MG 010 P
MFD BN 160 AUF 3...	0160 MA 003 BN
MFD BN 160 AUF 5...	0160 MA 005 BN
MFD BN 160 AUF 10...	0160 MA 010 BN
MFD BN 160 AUF 20...	0160 MA 020 BN
Size 180	**Cartridge**
MFD BN 180 AUF 3...	0180 MA 003 BN
MFD BN 180 AUF 5...	0180 MA 005 BN
MFD BN 180 AUF 10...	0180 MA 010 BN
MFD BN 180 AUF 20...	0180 MA 020 BN

2.6 CHANGING THE CARTRIDGE

Filter cartridge type MG:

Unscrew filter cartridge (using a strap wrench, if necessary). Lubricate seal on the new cartridge. Screw in new cartridge until contact is made with the sealing surface. Then hand-tighten. Check for leakage and tighten further if necessary.

Filter cartridge type MA:

Unscrew filter cartridge (using a strap wrench, if necessary). Lubricate new seal and insert it into the filter head. Screw in new cartridge until contact is made with the sealing surface. Then hand-tighten. Check for leakage and tighten further if necessary.

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

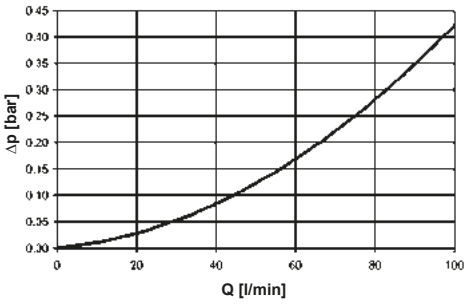
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

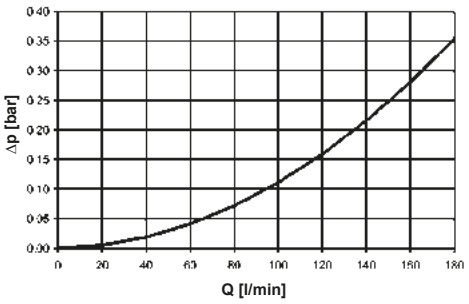
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

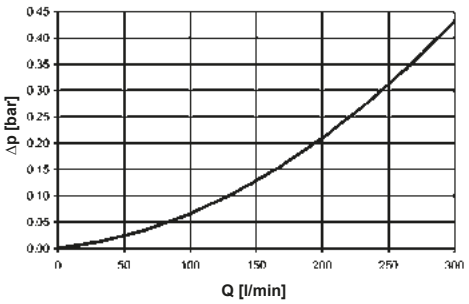
MF 80



MF 160, 180



MFD 160, 180



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

BN	Filtration rating			
	3 µm	5 µm	10 µm	20 µm
80	–	–	4.3	2.5
160	4.3	3.6	2.0	1.1
180	2.2	1.9	1.1	0.6

3.3 SIZING GUIDELINES

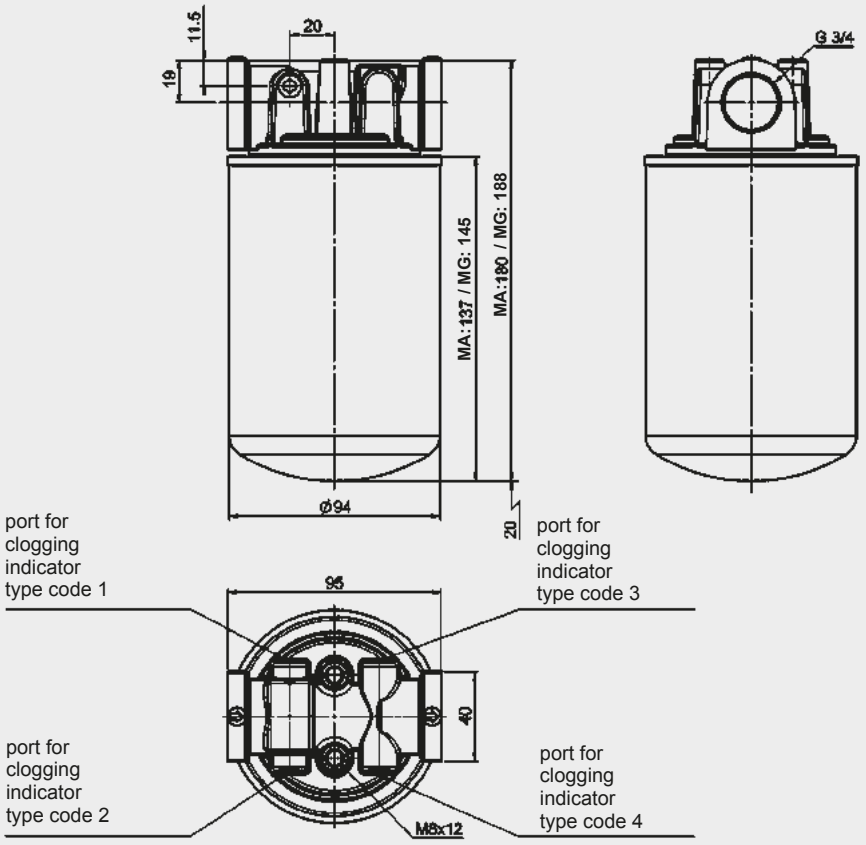
Filters should be calculated on the basis of a total differential pressure with clean element and at operating temperature; for use as:

Suction filter:	0.03 - 0.05 bar
Return line filter:	0.3 - 0.5 bar
Pressure filter:	0.3 - 0.5 bar

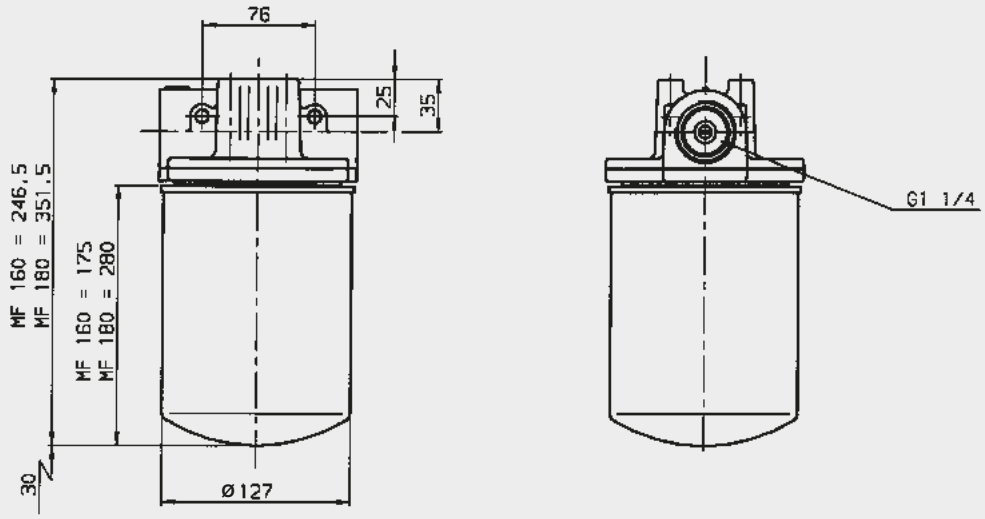
However, cold start conditions must be taken into account.

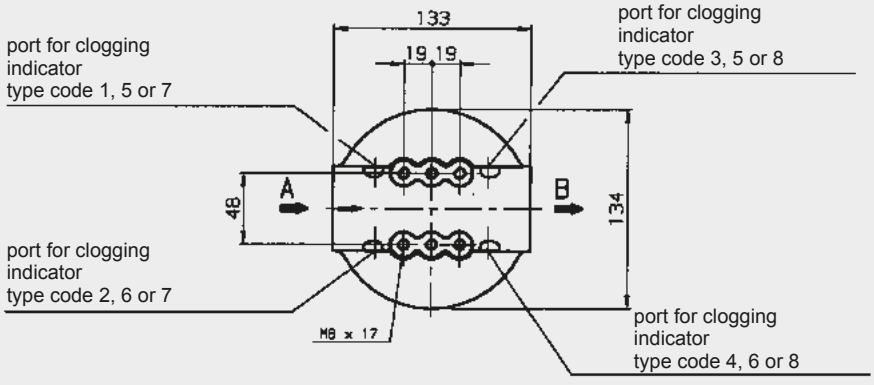
4. DIMENSIONS

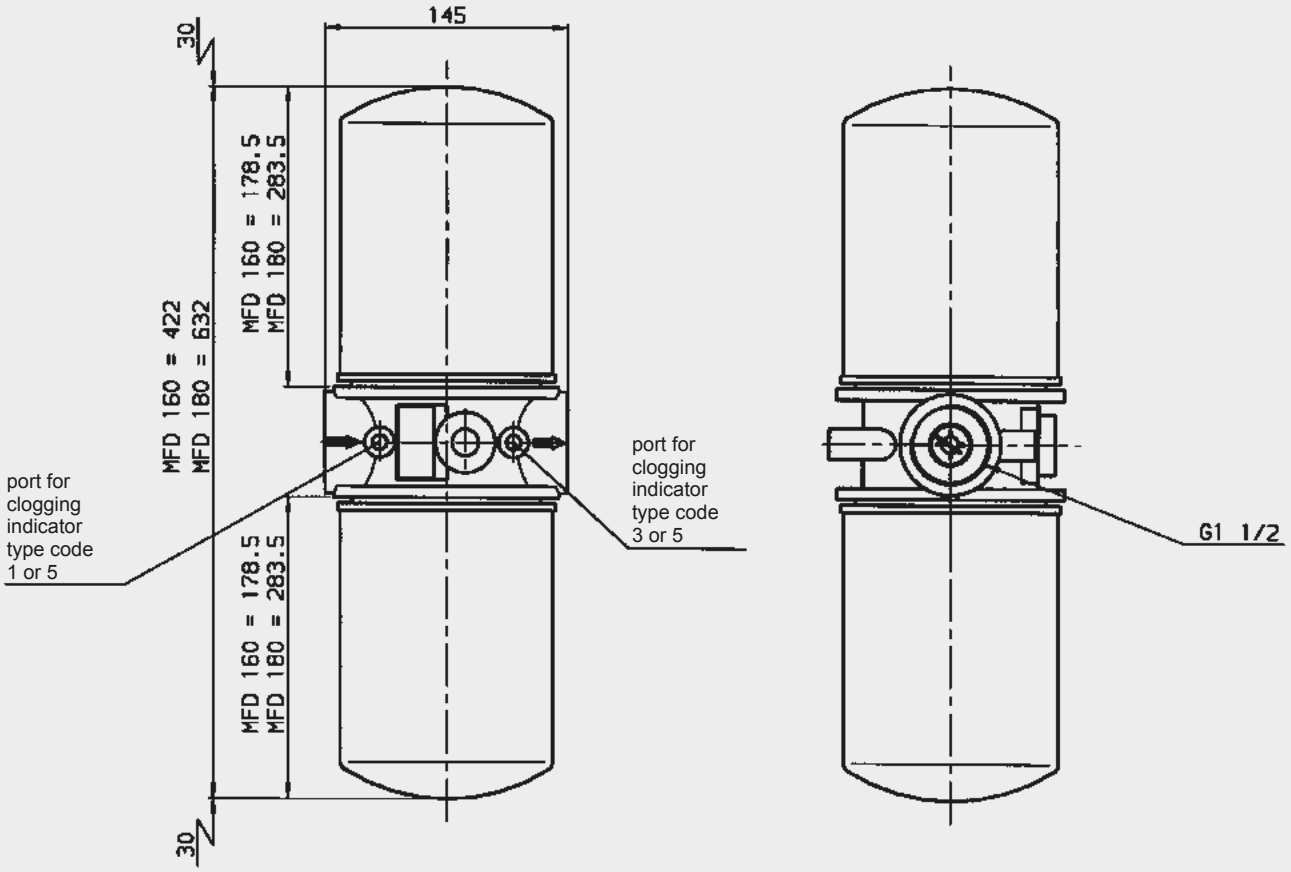
MF 80

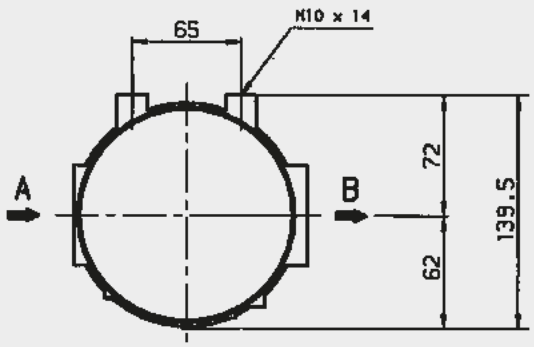


MF 160/180









Summary

Filter type	Port size Inlet / Outlet	Port size Cartridge	Weight incl. element [kg]	Vol. of pressure chamber [l]
MF 80	G¾	G¾, 1-12 UNF	0.9	1.00
MF 160	G1¼	G1¼, 1⅝x16 UN-2B	2.3	2.00
MF 180	G1¼	1⅝x16 UN-2B	2.8	3.30
MFD 160	G1½	G1¼, 1⅝x16 UN-2B	3.7	4.00
MFD 180	G1½	1⅝x16 UN-2B	4.5	6.60

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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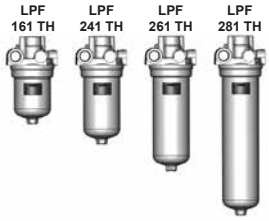
E-Mail: filter@hydac.com

Inline Filter LPF

With Integrated Thermal Bypass Valve up to 140 l/min, up to 50 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl. Standard equipment:

- integrated thermal bypass valve
- bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Mobilemicron® (MM):	10 bar

1.3 SEALS

Perbunan (=NBR)

1.4 INSTALLATION

Inline filter

1.5 SPECIAL DESIGNS AND ACCESSORIES

- Seals in FPM, EPDM
- Without bypass valve
- No clogging indicator port

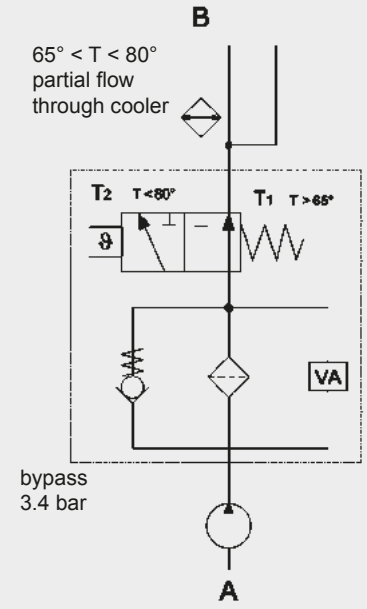
1.6 FILTER SPECIFICATIONS

Nominal pressure	50 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-10 °C to +100 °C
Material of filter head	EN-GJS-400
Material of filter bowl	Aluminium
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3.4 bar

1.7 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



VA = clogging indicator

1.8 FILTER CALCULATION / SIZING

Curves on request!

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

	ON					
	1µm	3µm	5µm	10µm	15µm	20µm
161	17.71	10.67	8.76	4.97	3.41	3.04
241	10.86	6.54	5.37	3.05	2.09	1.87
261	7.19	4.33	3.56	2.02	1.38	1.24
281	4.47	2.69	2.21	1.25	0.86	0.77

2. MODEL CODE

2.1 COMPLETE FILTER

Type	Filter material	Size	Pressure range	Type of connection	Filtration rating [µm]	Type of clogging indicator*	Type code	Modification number	Supplementary details
LPF	**ON =** Optimicron® (glass fibre) **MM =** Mobilemicron® (plastic fibre)	**161** **241** **261** **281**	**G =** 50 bar	**I** = 1/16-12UN **Z** = customer specific (other connections on request)	**ON:** **1, 3, 5, 10, 15, 20** **MM:** **8, 10, 15**	**A** = steel blanking plug in indicator port **B** = visual **C** = electrical **D** = visual/ electrical	**1**	**.x =** The latest version is always supplied	TH = with integrated thermal bypass It is essential to quote this code! V = FPM seal L.. = light with appropr. voltage (24, 48 110, 220 volts)

* for other clogging indicators see brochure no. 7.050../..

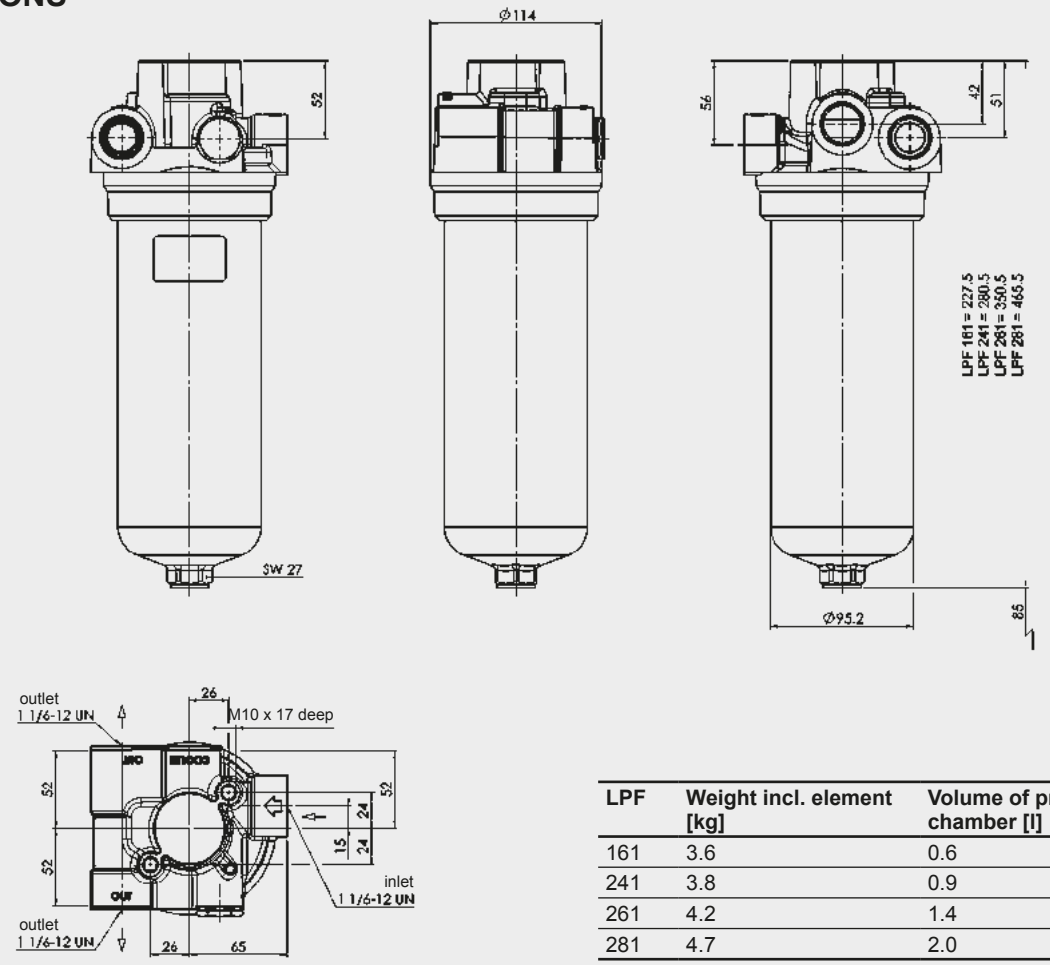
2.2 REPLACEMENT ELEMENT

Size	Type	Filtration rating [µm]	Filter material	Supplementary details
0161 **0241** **0261** **0281**	**RD =** Return line element for pressure filter	**ON:** 001, 003, 005, 010, 015, 020 **MM:** 008, 010, 015	**ON** **MM**	**B3.4 =** with bypass valve (cracking press. 3.4 bar) **B6 =** with bypass valve (cracking press. 6 bar) **KB =** without bypass valve

2.3 REPLACEMENT CLOGGING INDICATOR

Type	Pressure setting	Type of clogging indicator*	Modification number	Supplementary details
VM	**2 =** standard 2 bar	**W** = no port, no indicator **B** = visual **C** = electrical **D** = visual/ electrical	**.x =** The latest version is always supplied	**-V =** FKM seal

3. DIMENSIONS



LPF	Weight incl. element [kg]	Volume of pressure chamber [l]
161	3.6	0.6
241	3.8	0.9
261	4.2	1.4
281	4.7	2.0

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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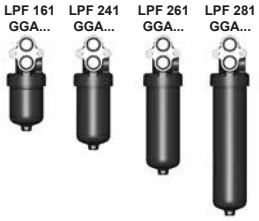
E-Mail: filter@hydac.com

Filter LPF

Flange-Mounted, With Integrated Cooler Bypass Valve up to 260 l/min, up to 50 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl. The built-in check valve in the filter head supplies partial flow to the cooler.

Standard equipment:

- cooler bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Mobilemicron® (MM):	10 bar

1.3 SEALS

Perbunan (=NBR)

1.4 INSTALLATION

Inline filter

1.5 SPECIAL DESIGNS AND ACCESSORIES

- Seals in FPM, EPDM
- Without clogging indicator connection

1.6 FILTER SPECIFICATIONS

Nominal pressure	50 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-10 °C to +120 °C
Material of filter head	EN-GJS-400
Material of filter bowl	Aluminium
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3.4 bar

1.7 SPARE PARTS

See Original Spare Parts List

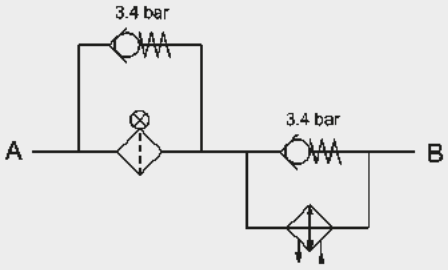
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFC and HFD
- Operating fluids with high water content (>50% water content) on request

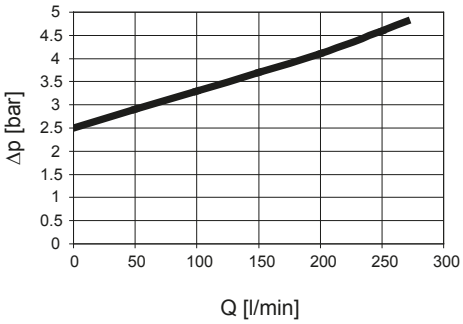
Symbol for hydraulic systems



1.10 FILTER CALCULATION / SIZING

GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30mm²/s.



The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

	ON					
	1µm	3µm	5µm	10µm	15µm	20µm
161	17.71	10.67	8.76	4.97	3.41	3.04
241	10.86	6.54	5.37	3.05	2.09	1.87
261	7.19	4.33	3.56	2.02	1.38	1.24
281	4.47	2.69	2.21	1.25	0.86	0.77

E 7.574.1.3/11.16

2. MODEL CODE

2.1 COMPLETE FILTER

Type	Filter material of element	Size	Pressure range	Inlet / outlet to cooler	Type of connection	Filtration rating [µm]	Type of clogging indicator*	Type code	Modification number	Supplementary details
LPF	**ON =** Optimicron® (flass fibre) **MM =** Mobilemicron® (plastic fibre)	**161** **241** **261** **281**	**G =** 50 bar	**G =** M27x2	**A =** 2 mounting holes	**ON:** **1, 3, 5, 10, 15, 20** **MM:** **8, 10, 15**	**W =** without port, no clogging indicator **A =** steel plug in indicator port **B =** visual **C =** electrical **D =** visual/ electrical	**1**	**.x =** The latest version is always supplied	V = FPM seal L.. = light with appropr. voltage (24, 48 110, 220 volts)

* for other clogging indicators see brochure no. 7.050../..

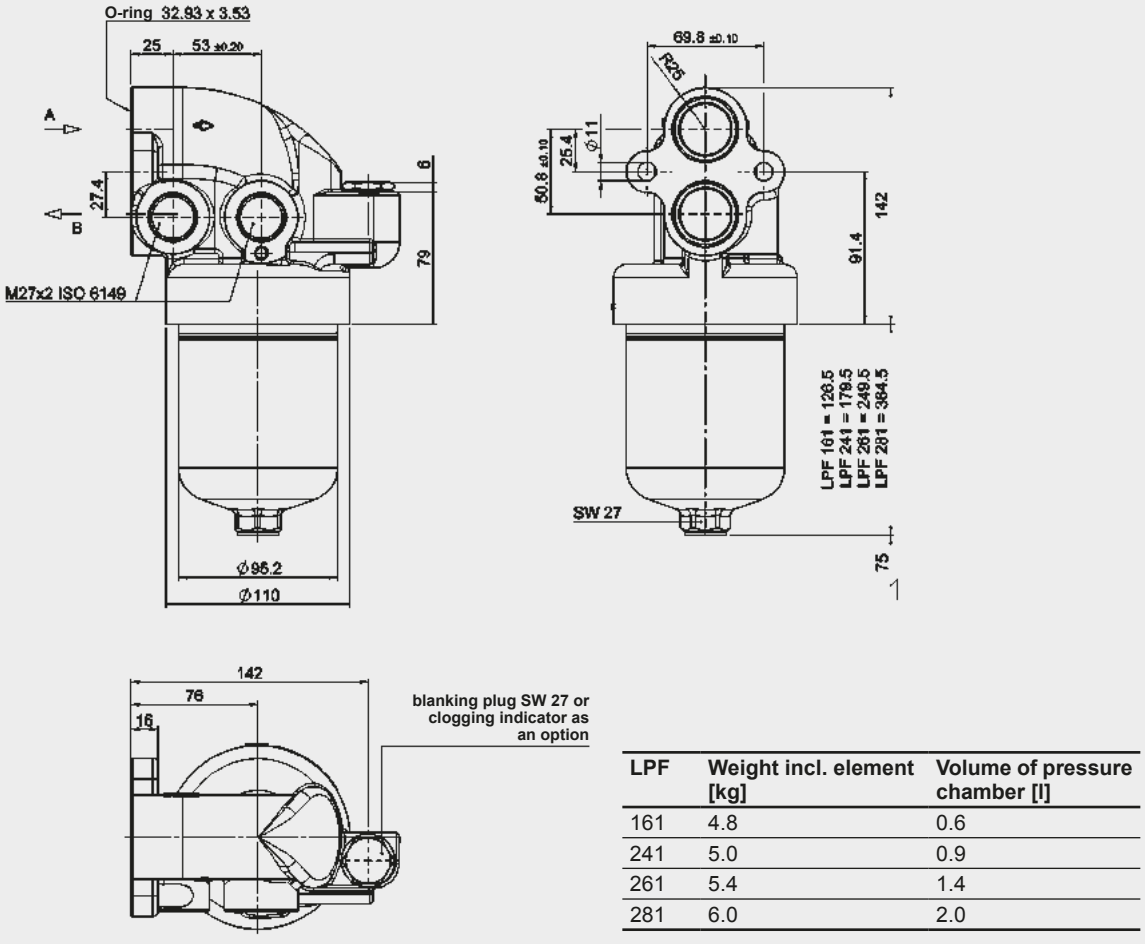
2.2 REPLACEMENT ELEMENT

Size	Type	Filtration rating [µm]	Filter material	Supplementary details
0161 **0241** **0261** **0281**	**RD =** Return line element for pressure filter	**ON:** 001, 003, 005, 010, 015, 020 **MM:** 008, 010, 015	**ON =** Optimicron® **MM =** Mobilemicron®	**B3.4** = with bypass valve (cracking press. 3.4 bar) **B6** = with bypass valve (cracking press. 6 bar) **KB** = without bypass valve

2.3 REPLACEMENT CLOGGING INDICATOR

Type	Pressure setting	Type of clogging indicator*	Modification number	Supplementary details
VM	**2 =** standard 2 bar	**W** = no port, no indicator **B** = visual **C** = electrical **D** = visual/ electrical	**.x =** The latest version is always supplied	**-V =** FPM seal

3. DIMENSIONS



LPF	Weight incl. element [kg]	Volume of pressure chamber [l]
161	4.8	0.6
241	5.0	0.9
261	5.4	1.4
281	6.0	2.0

NOTE

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For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

HYDAC Filtertechnik GmbH
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Tel.: 0 68 97 / 509-01
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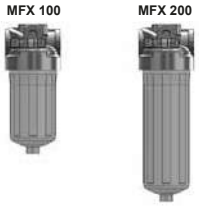
Internet: www.hydac.com
E-Mail: filter@hydac.com

Inline Filter MFX
up to 130 l/min, up to 50 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- 4 possible positions for a clogging indicator
- bypass valve

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 16889

Filter elements are available with the following pressure stability values:

Betamicron® (BN4HC):	20 bar
Ecomicron® (ECON2):	10 bar
Mobilemicron® (MM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	50 bar
Fatigue strength (without BF clogging indicator)	At nominal pressure 10^6 cycles from 0 to nominal pressure 300,000 cycles at 70 bar
Temperature range	-10 °C to +80 °C
Material of filter head	Aluminium
Material of filter bowl	Aluminium
Type of clogging indicator	VM (Diff. pressure indicator up to 210 bar operating pressure) VL (Diff. pressure indicator up to 50 bar operating pressure)
Setting pressure of the clogging indicator	Standard 2.5 bar, optional 1 bar (others on request)
Bypass cracking pressure	Standard 3.5 bar, optional 1.7 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

INLINE FILTER

1.6 SPECIAL MODELS AND ACCESSORIES

Seals in EPDM (on request)

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

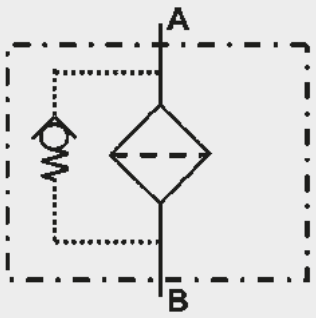
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 MAINTENANCE INSTRUCTIONS

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

MFX BN/HC 100 G I 10 BF 4 . X /-B3.5

2.1 COMPLETE FILTER

Filter type
MFX

Filter material
BN/HC Betamicron® (BN4HC)
ECO/N Ecomicron® (ECON2)
MM Mobilemicron

Size of filter or element
MFX: 100, 200

Operating pressure
G = 50 bar

Type and size of connection

Type	Connection	Filter size 100	200
C	G ¾	●	●
D	G 1	●	●
E	M26 x 1.5	●	●
I	1 1/16-12 UN	●	●
K	1 5/16-12 UN	●	●
L	M33 x 2	●	●

Filtration rating in µm
BN/HC, ECO/N : 5, 10, 20
MM : 8, 10, 15

Type of clogging indicator
W without port (no clogging indicator)
A plastic blanking plug in indicator port
B visual, manual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..
BF visual, mobile (only on type codes 3.X and 4.X)

Type code
1-4 see point 2.5 – Installation position of the clogging indicator

Modification number
X the latest version is always supplied

Supplementary details
B3.5 standard: bypass cracking pressure 3.5 bar *
B. special bypass cracking pressure (e.g. B1.7 = 1.7 bar)
] A bypass is essential and must be selected!
L... light with appropriate voltage (24, 48, 110, 220 volts)
LED 2 light-emitting diodes up to 24 volts
W suitable for HFA and HFC emulsions
] only for clogging indicator indicators type "D"

2.2 Preferred models

MFX ..... 100/200 G C .... BF 4.X/-A1.0
MFX ..... 100/200 G C .... W 0.X
MFX ..... 100/200 G C .... A 2.X

MFX ..... 100/200 G D .... BF 4.X/-A1.0
MFX ..... 100/200 G D .... W 0.X
MFX ..... 100/200 G D .... A 2.X

2.3 REPLACEMENT ELEMENT

0100 MX 010 BN4HC /-B3.5

Size
0100, 0200

Type
MX

Filtration rating in µm
BN4HC, ECON2 : 005, 010, 020
MM : 008, 010, 015

Filter material
BN4HC, ECON2, MM

Supplementary details
W (for descriptions, see point 2.1)
B3.5 standard: bypass cracking pressure 3.5 bar
B. special bypass cracking pressure (e.g. B1.7 = 1.7 bar)
] A bypass is essential and must be selected!

* If an MFX filter is set up with a 3.5 bar bypass valve and clogging indicator (VA), the response pressure of the VA is automatically 2.5 bar (=A2.5)

2.4 REPLACEMENT CLOGGING INDICATOR

VM 2.5 D . X /-L24

Type of indicator
VM Diff. pressure indicator up to 210 bar operating pressure
VL Diff. pressure indicator type "BF" up to 50 bar operating pressure and max. operating temperature of -10 °C to +80 °C

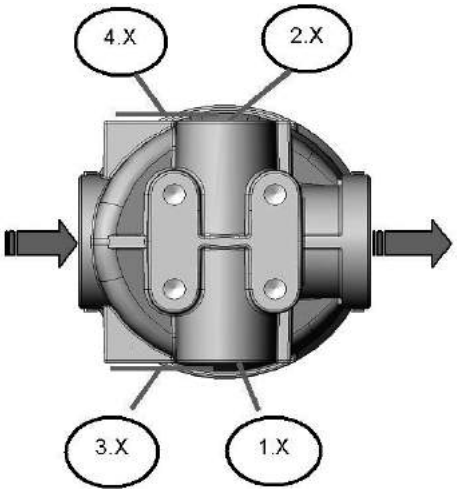
Pressure setting
2.5 standard 2.5 bar, others on request

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, W (for descriptions, see point 2.1)

2.5 TYPE CODE: INSTALLATION POSITION OF THE CLOGGING INDICATOR



Type code 3.X and 4.X only possible with indicator type "BF"!

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = given in graphs (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

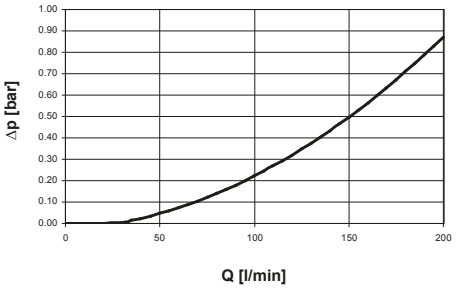
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

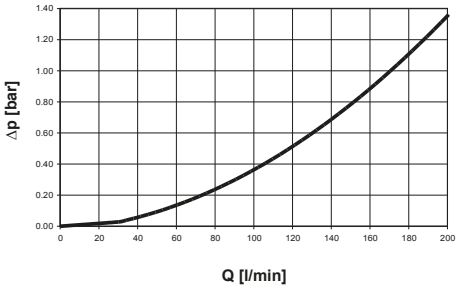
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

MFX 100/200: G1



MFX 100/200: G 3/4



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

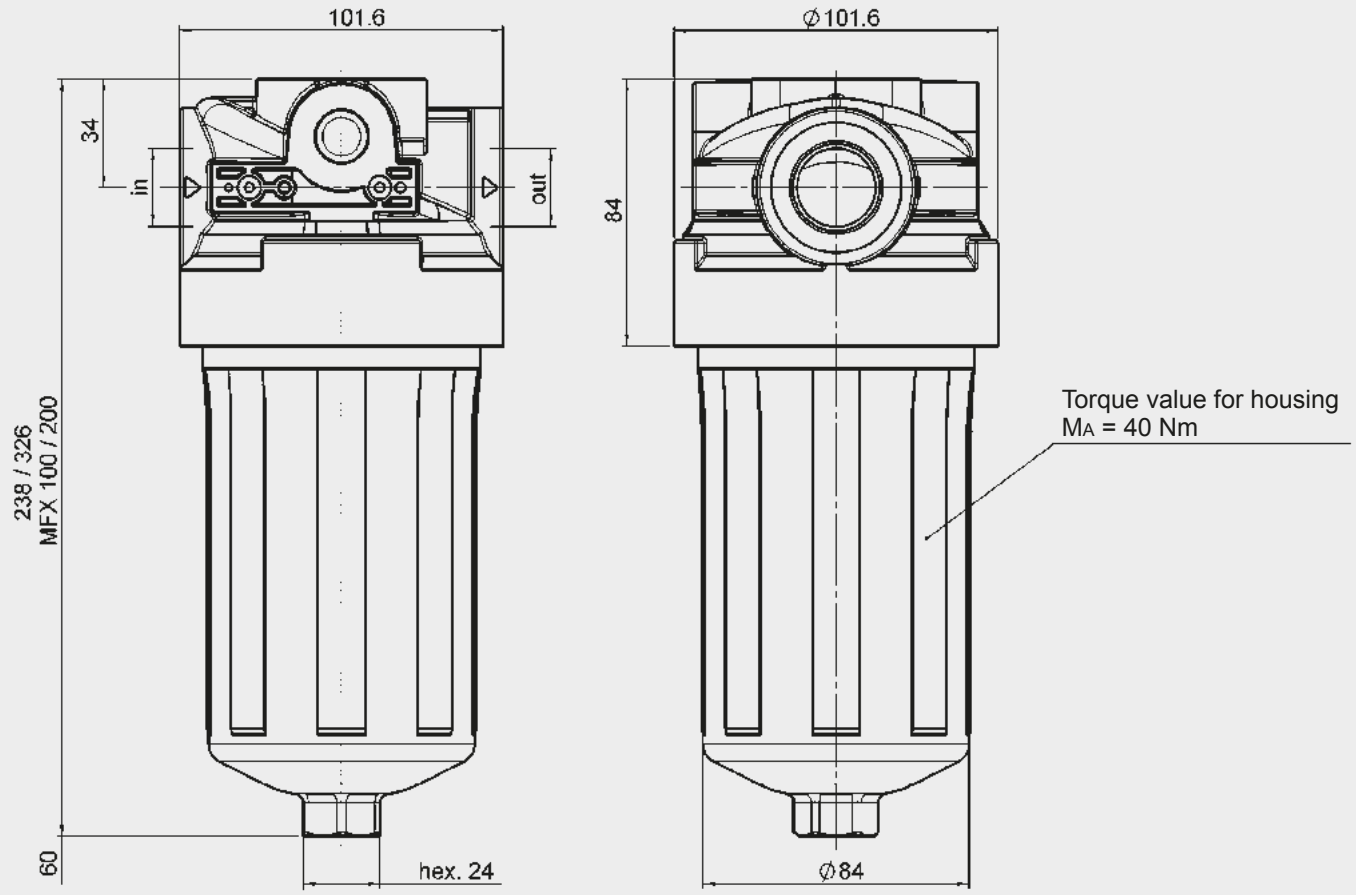
MFX	BN4HC			
	3 µm	5 µm	10 µm	20 µm
100	12.0	9.0	4.6	3.4
200	7.0	5.3	2.7	2.0

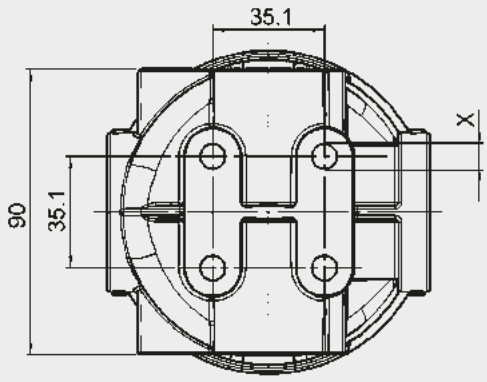
MFX	ECON2				MM*	
	3 µm	5 µm	10 µm	20 µm	10 µm	15 µm
100	13.00	10.00	6.50	4.80	2.70	2.20
200	8.00	5.90	3.80	2.80	1.60	1.30

* 8 µm values on request!

4. DIMENSIONS

MFX 100/200





MFX 100/200...	Mounting x
...G C...	M10 – 13 [0.5] deep
...G D...	M10 – 13 [0.5] deep
...G E...	M10 – 13 [0.5] deep
...G I...	3/8 – 16 UNC, 13 [0.5] deep
...G K...	3/8 – 16 UNC, 13 [0.5] deep
...G L...	M 10 – 13 [0.5] deep

MFX	Weight incl. element [kg]	Volume of pressure chamber [l]
100	1.46	0.71
200	1.74	1.12

NOTE

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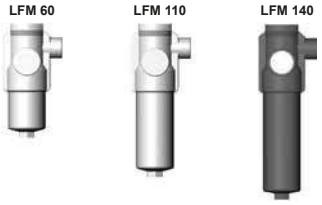
Inline Filter LFM with Differential Pressure Relief Valve

up to 120 l/min, up to 63 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- differential pressure controlled relief valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:
Optmicron® (ON): 20 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	63 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-30 °C to +100 °C (LFM 140: -30 °C to -10 °C: p_{max}=31.5 bar)
Material of filter head	Aluminium
Material of filter bowl	Aluminium (steel for LFM 140)
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3.5 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

With pressure release / oil drain plug (SO184)

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

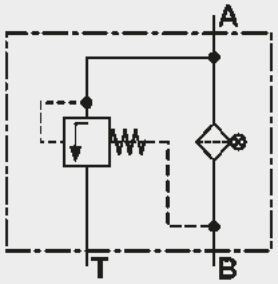
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 MAINTENANCE INSTRUCTIONS

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

LFM ON 110 F C 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
LFM

Filter material
ON Optimicron®

Size of filter or element
LFM: 60, 110, 140

Operating pressure
F = 63 bar

Type and size of connection

Type	Port	Filter size		
		60	110	140
C	G ¾	●	●	●

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20

Type of clogging indicator
Y plastic blanking plug in indicator port
A stainless steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
DBV5.5 opening pressure of pressure relief valve 5.5 bar
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light-emitting diodes up to 24 Volt
] only for clogging indicators type "D"
SO184 pressure release/oil drain screw
V FPM seals

2.2 REPLACEMENT ELEMENT

0110 D 010 ON /-V

Size
0060, 0110, 0140

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020

Filter material
ON

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 2 D . X /-L24

Type of indicator
VM differential pressure indicator up to 210 bar operating pressure

Pressure setting
2 standard 2 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

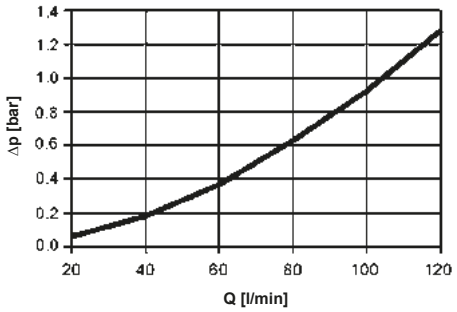
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

LFM 60/110/140

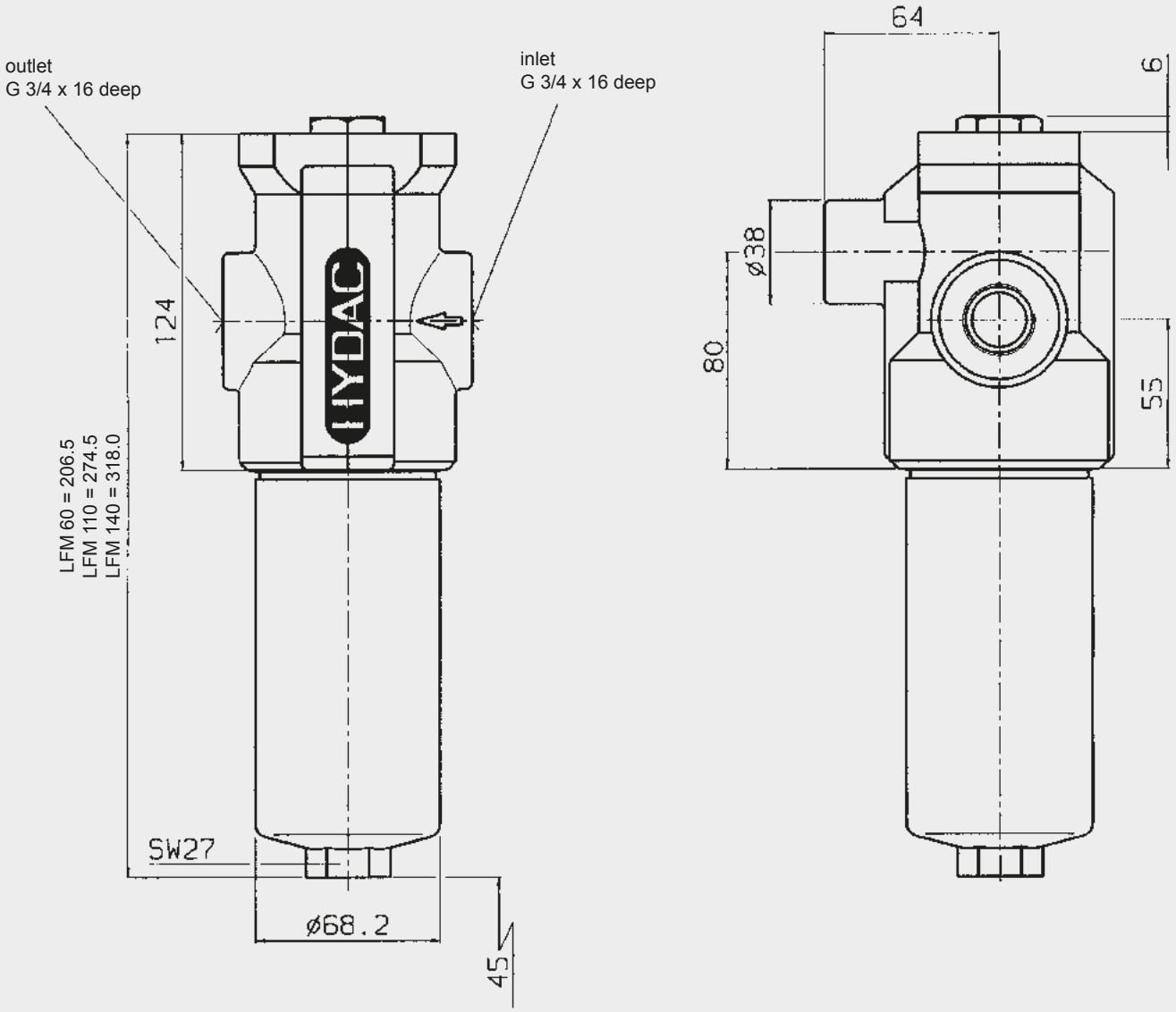


3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

LFM	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
60	53.5	26.0	18.3	12.1	9.78	6.32
110	25.8	13.4	9.61	6.06	4.63	2.99
140	19.9	11.5	7.39	4.38	3.54	2.29

4. DIMENSIONS



LFM	Weight incl. element [kg]	Vol. of pressure chamber [l]
60	1.9	0.20
110	2.3	0.33
140	4.5	0.40

NOTE

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Subject to technical modifications.

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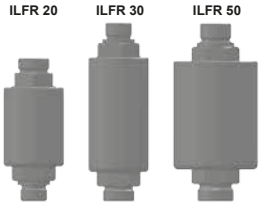
Inline Filter ILFR

In-tank versions: up to 50 l/min, up to 140 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations.

They consist of a filter housing and a fixed filter element.

Standard equipment:

- without bypass valve

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Wire mesh (WR): 6 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	up to 140 bar
Temperature range	-30 °C to +100 °C
Material	Steel

1.4 SEALS

Perbunan (=NBR)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- On request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

Test certificate 2.2
Other approvals on request

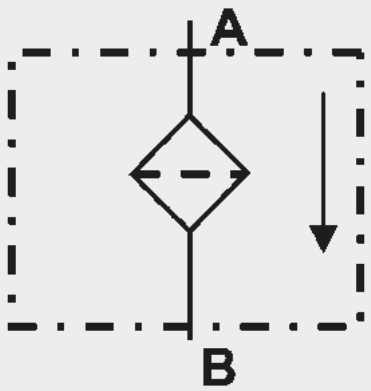
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS DIN ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

1.10 MAINTENANCE INSTRUCTIONS

- Filter housings must be earthed.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

ILFR WR 30 J G D 60 W 1 . X /-AA

2.1 IN-TANK MOUNTED FILTER VERSION

Filter type
ILFR

Filter material of element
WR Wire mesh

Size of filter or element
ILFR: 20, 30, 50

Operating pressure
J 140 bar

Type and size of port - inlet

Type	Port	Filter size 20	30	50
D	M22x1.5	●		
G	M26x1.5		●	
H	M30x2			●

Type and size of port - outlet

Type	Port	Filter size 20	30	50
D	M22x1.5		●	
G	M26x1.5	●		●

Filtration rating in µm
WR: 60

Type of clogging indicator
W without port, no clogging indicator

Type code
1

Modification number
X the latest version is always supplied

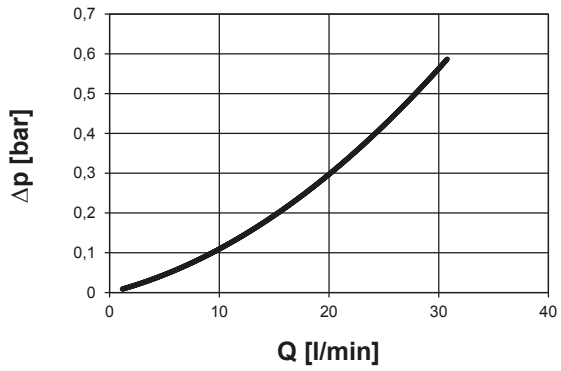
Supplementary details
AA connection type: male/male
V FPM seals

3. FILTER CALCULATION / SIZING

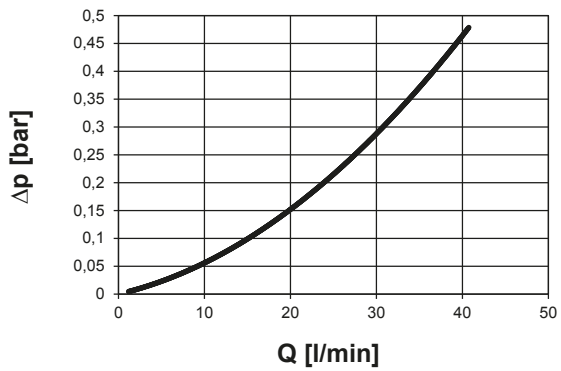
3.1 GRAPHS FOR COMPLETE FILTER

The curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30mm²/s.

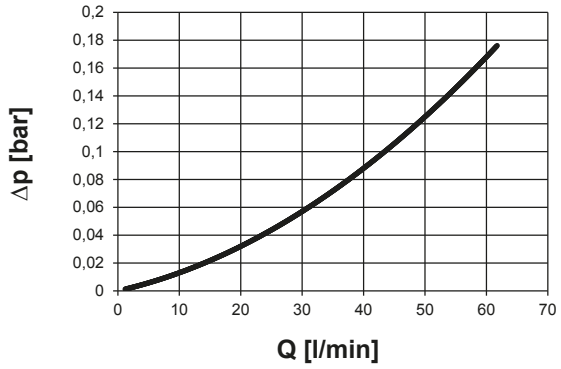
ILFR 20



ILFR 30

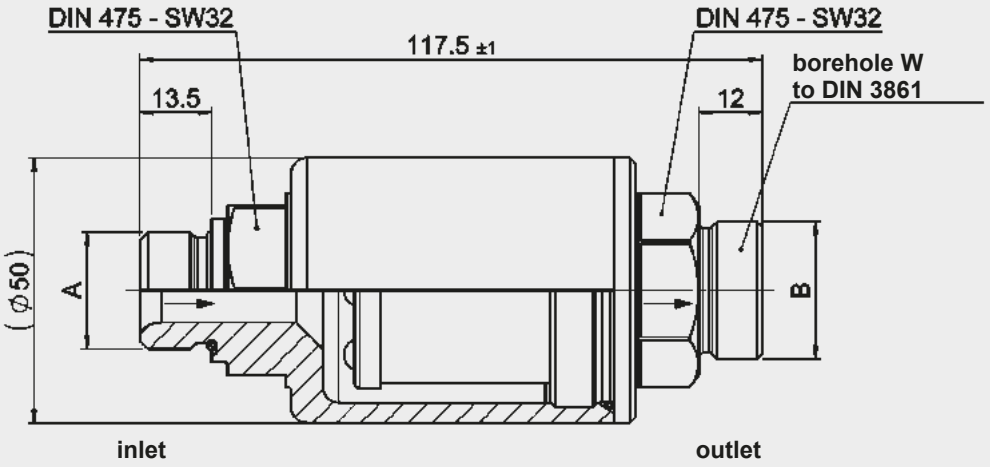


ILFR 50

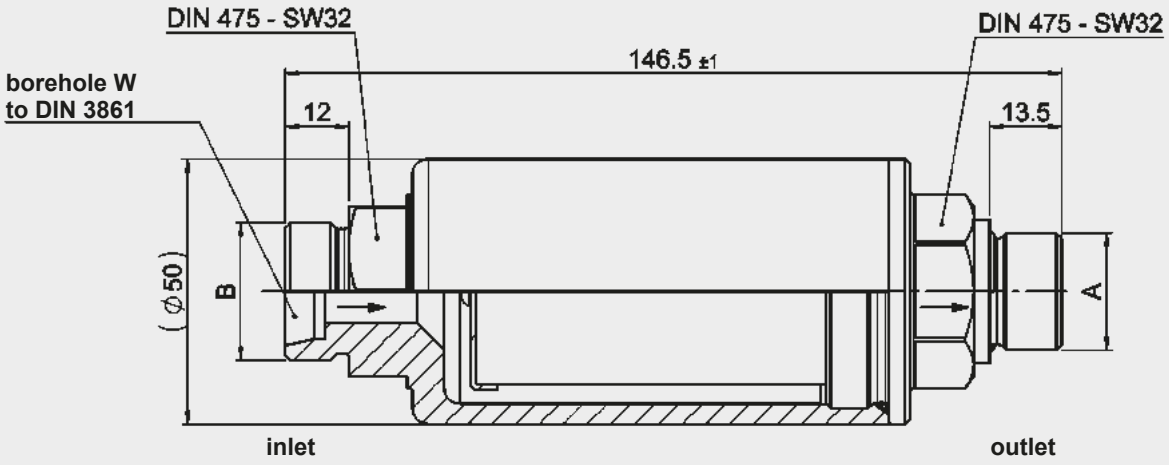


4. DIMENSIONS

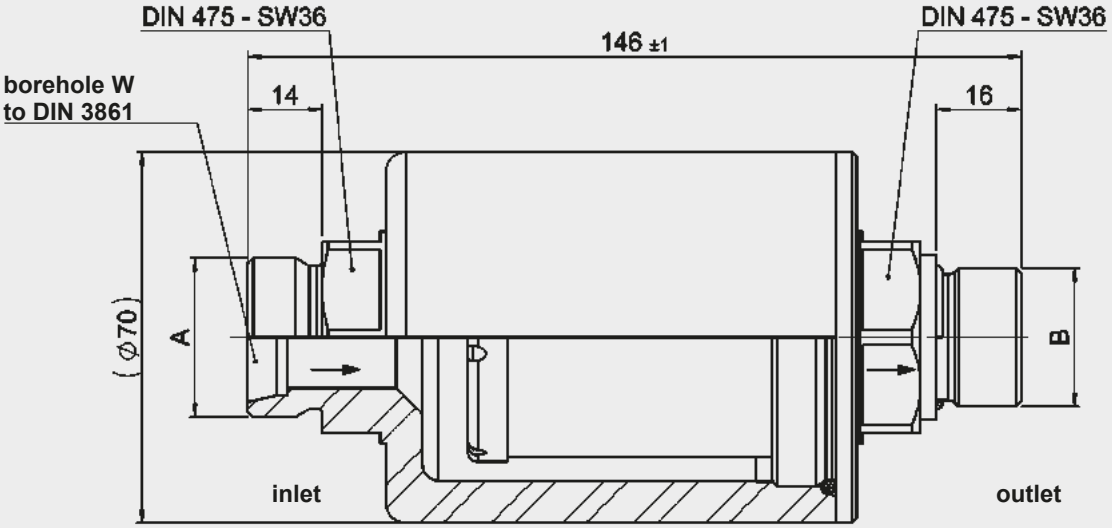
ILFR 20



ILFR 30



ILFR 50



ILFR	A	B	Weight incl. element [kg]
20	M22x1.5	M26x1.5	0.56
30	M26x1.5	M22x1.5	0.80
50	M30x2	M26x1.5	1.62

NOTES

NOTE

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Subject to technical modifications.

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Inline Filter MFM
up to 100 l/min, up to 280 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- bypass valve
- connection for a clogging indicator on the top of the head (4 mounting holes)
- filters are supplied phosphated and primed

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:
Optimicron® (ON): 20 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	280 bar
Fatigue strength	0 to 280 bar, min. 10^7 cycles 0 to 320 bar, min. 10^5 cycles
Temperature range	-10 °C to +100 °C (-30 °C to -10 °C: p_{max}= 140 bar)
Material of filter head	EN-GJS-400-15
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Bypass cracking pressure	7 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION
As inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

Connection for a clogging indicator on the side of the head (3 mounting holes)

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

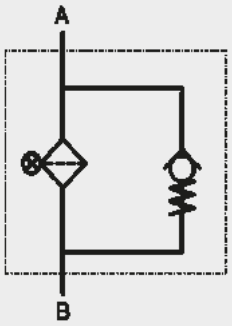
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

1.10 MAINTENANCE INSTRUCTIONS

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

MFM ON 55 O D 10 D 4 . X /-L24-B7

2.1 COMPLETE FILTER

Filter type
MFM

Filter material
ON Optimicron®

Size of filter or element
MFM: 35, 55, 75, 95

Operating pressure
O = 280 bar

Type and size of connection

Type	Connection	Filter size			
		35	55	75	95
A	M18 x 1.5	●	●	●	●
B	G ½	●	●	●	●
D	M22 x 1.5	●	●	●	●
H	G ¾	●	●	●	●

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20

Type of clogging indicator
W without port (no clogging indicator)
A plastic blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
3 clogging indicator port on side of head - 3 mounting holes
4 clogging indicator port on top of head - 4 mounting holes

Modification number
X the latest version is always supplied

Supplementary details
B7 standard: bypass cracking pressure 7 bar
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light-emitting diodes up to 24 Volt
] only for clogging indicators type "D"
V FPM seals
W suitable for HFA and HFC emulsions
WAL right-angled bracket for side mounting, inlet on left (only possible for type code 4.x)
WAR right-angled bracket for side mounting, inlet on right (only for type code 4.x)

2.2 REPLACEMENT ELEMENT

0055 D 010 ON /-V

Size
0035, 0055, 0075, 0095

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020

Filter material
ON

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type of indicator
VD differential pressure indicator up to 450 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see Point 3.2)

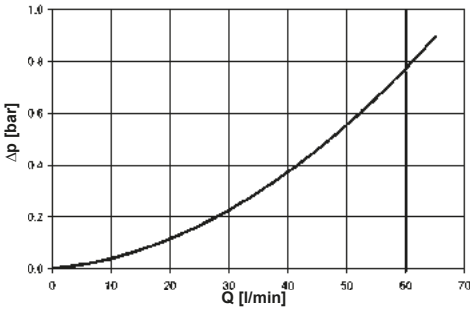
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

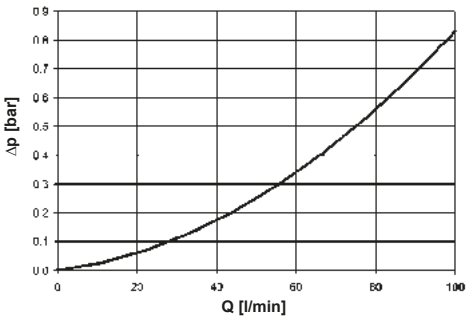
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

MFM - Port M18 x 1.5 / G ½



MFM - Port M22 x 1.5 / G ¾



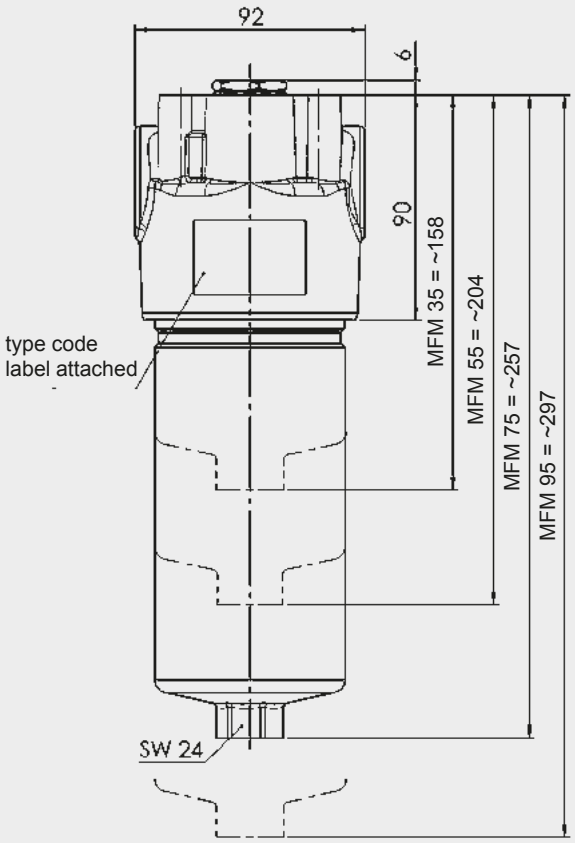
3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

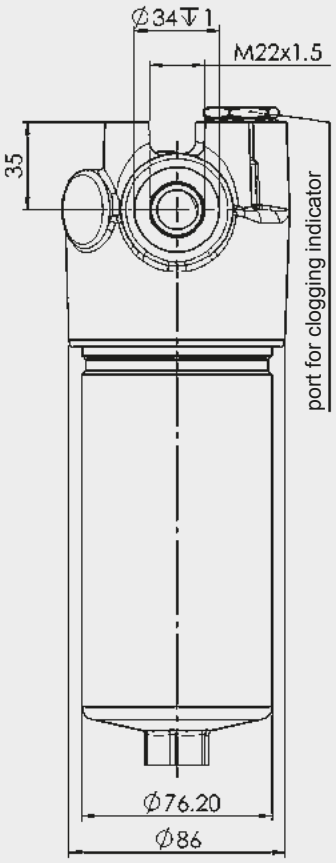
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

MFM	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
35	50.2	21.3	17.1	13.7	10.0	7.44
55	26.0	12.3	9.9	7.90	5.17	3.84
75	16.7	8.4	6.75	5.4	3.33	2.48
95	13.2	6.74	5.4	4.33	2.62	1.92

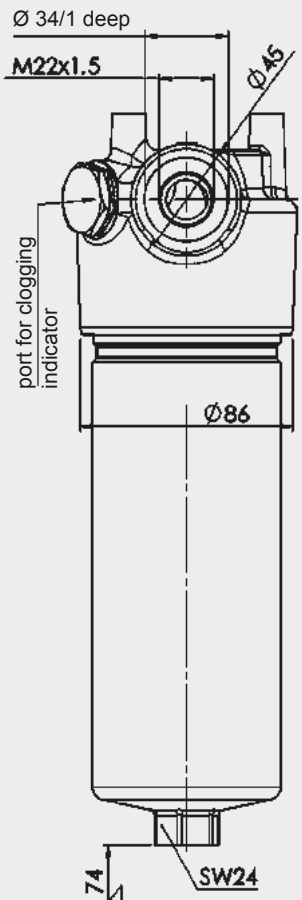
4. DIMENSIONS

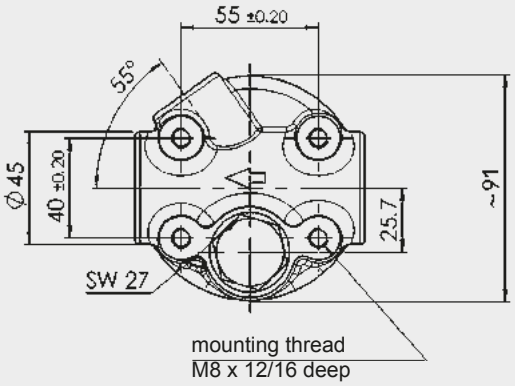
STANDARD VERSION 4.X

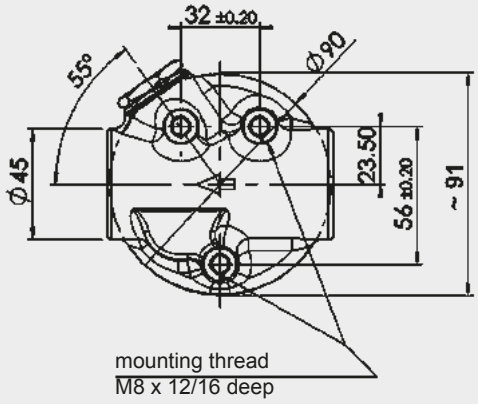




SPECIAL VERSION 3.X







MFM	Weight incl. element [kg]	Vol. of pressure chamber [l]
35	3.7	0.24
55	4.2	0.39
75	4.7	0.56
95	5.1	0.69

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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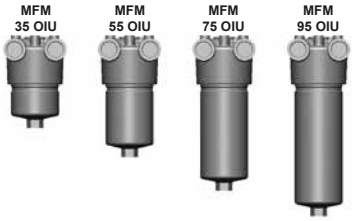
Inline Filter MFM

Inlet and Outlet on Same Side up to 100 l/min, up to 280 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.
Standard equipment:

- bypass valve
- without clogging indicator port (3 mounting holes)
- filters are supplied phosphated and primed

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON): 20 bar
Other filtration ratings on request.

1.3 SEALS

Perbunan (=NBR)

1.4 INSTALLATION

Inline filter

1.5 SPECIAL MODELS AND ACCESSORIES

Connection for a clogging indicator in the head

1.6 FILTER SPECIFICATIONS

Nominal pressure	280 bar
Temperature range	-10 °C to +100 °C (-30 °C to -10 °C: p_{max}= 140 bar)
Material of filter head	EN-GJS 400-15
Material of filter bowl	Cold extruded steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Bypass cracking pressure	7 bar (others on request)

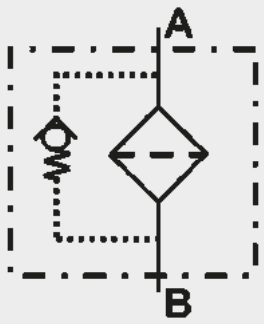
1.7 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

1.8 MAINTENANCE INSTRUCTIONS

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



1.9 FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

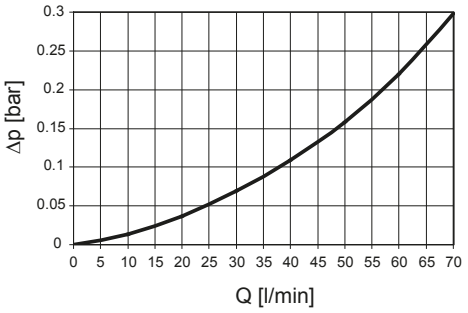
$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = please refer to the housing curve

$\Delta p_{element}$ = Q • SK*/1000 • viscosity/30 (*gradient coefficient)

HOUSING CURVE

The housing curve applies to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30mm²/s.



The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

MFM	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
35	50.2	21.3	17.1	13.7	10.0	7.44
55	26.0	12.3	9.9	7.90	5.17	3.84
75	16.7	8.4	6.75	5.4	3.33	2.48
95	13.2	6.74	5.4	4.33	2.62	1.92

2. MODEL CODE

2.1 COMPLETE FILTER

Type	Filter material	Size	Pressure range	Type of connection	Filtration rating [µm]	Type of clogging indicator*	Type code	Modification number	Supplementary details
MFM	**ON** = Optimicron®	**35** **55** **75** **95**	**O** = 280 bar	**B** = G 1/2 **D** = M22x1.5 **H** = G 3/4 **Z** = customer-specific	**1** **3** **5** **10** **15** **20**	**W** = without port **A** = steel plug in indicator port **B** = visual **C** = electrical **D** = visual/ electrical	**3** = 3 mounting holes	**.x** = The latest version is always supplied	**B7** = standard cracking pressure of bypass 7 bar **OIU** = standard: outlet and inlet on same side It is essential to include this information! **V** = FPM seal

2.2 REPLACEMENT ELEMENT

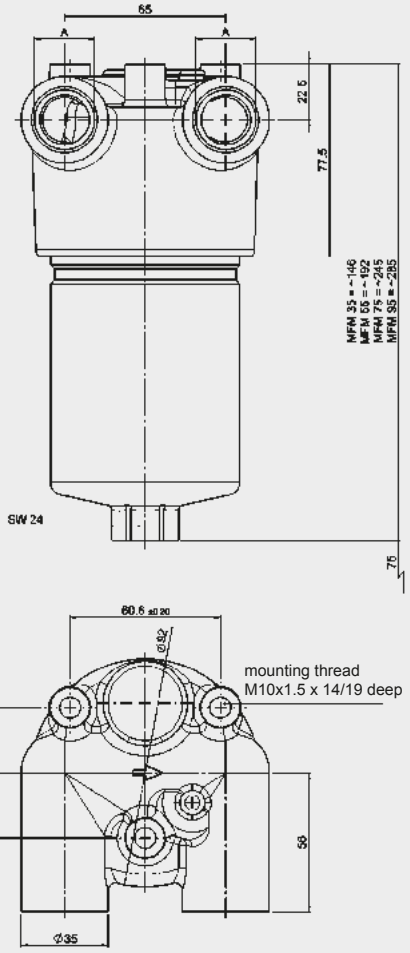
Size	Type	Filtration rating [µm]	Filter material	Supplementary details
0035 **0055** **0075** **0095**	**D**	**001** **003** **005** **010** **015** **020**	**ON** = Optimicron®	**V** = FPM seal

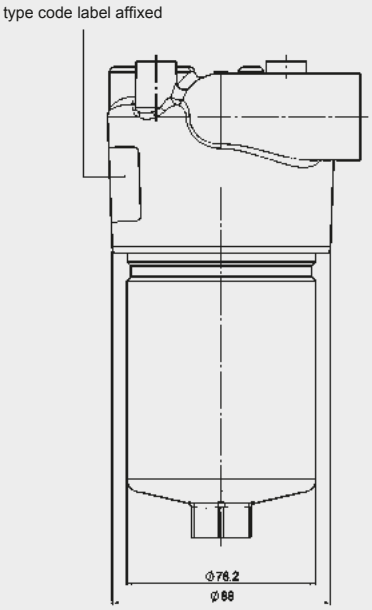
2.3 REPLACEMENT CLOGGING INDICATOR

Type	Pressure setting	Type of clogging indicator*	Modification number	Supplementary details
VD	**5** = standard 5 bar	**A** = steel plug in indicator port **B** = visual **C** = electrical **D** = visual/ electrical	**.x** = The latest version is always supplied	**V** = FPM seal

* for other clogging indicators see brochure no. 7.050../..

3. DIMENSIONS





MFM	A	Weight incl. element [kg]	Volume of pressure chamber [l]
35	G ½ M22 x 1.5 G 3/4	3.7	0.24
55		4.2	0.39
75		4.7	0.56
95		5.1	0.69

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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E-Mail: filter@hydac.com

Inline Filter MFM

Ports in L-configuration up to 100 l/min, up to 280 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.
Standard equipment:

- with bypass valve
- without clogging indicator connection
- filters are supplied phosphated and primed

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON): 20 bar

1.3 SEALS

Perbunan (=NBR)

1.4 INSTALLATION

As inline filter

1.5 SPECIAL MODELS AND ACCESSORIES

Connection for a clogging indicator in the head

1.6 FILTER SPECIFICATIONS

Nominal pressure	280 bar
Temperature range	-10 °C to +100 °C (-30 °C to -10 °C: p_{max}= 140 bar)
Material of filter head	EN-GJS 400-15
Material of filter bowl	Cold extruded steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Bypass cracking pressure	7 bar (others on request)

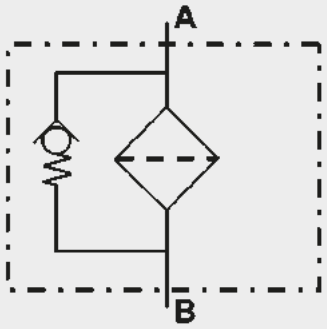
1.7 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

1.8 MAINTENANCE INSTRUCTIONS

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



1.9 FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

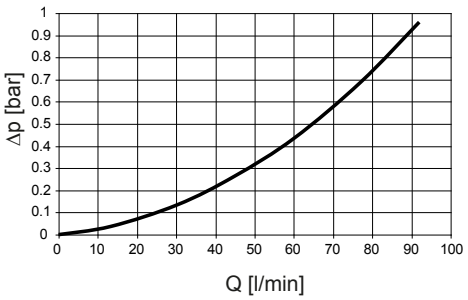
$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = please refer to the housing curve

$\Delta p_{element}$ = Q • SK*/1000 • viscosity/30 (*gradient coefficient)

HOUSING CURVE

The housing curve applies to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30mm²/s.



The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

MFM	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
35	50.2	21.3	17.1	13.7	10.0	7.44
55	26.0	12.3	9.9	7.90	5.17	3.84
75	16.7	8.4	6.75	5.4	3.33	2.48
95	13.2	6.74	5.4	4.33	2.62	1.92

2. MODEL CODE

2.1 COMPLETE FILTER

Type	Filter material	Size	Pressure range	Head design	Type of connection	Filtration rating [µm]	Type of clogging indicator*	Type code	Modification number	Supplementary details
MFM	**ON** = Optimicron®	**35** **55** **75** **95**	**O** = 280 bar	**L** = flow in L-configuration	**A** = M18x1.5 **B** = G 1/2 **D** = M22x1.5 **Inlet:** bore d15 with O-ring seal	**1** **3** **5** **10** **15** **20**	**W** = without port, no clogging indicator **A** = steel plug in indicator port **B** = visual **C** = electrical **D** = visual/ electrical	**1**	**.x** = The latest version is always supplied	**B7** = standard cracking pressure of bypass 7 bar It is essential to include this information! **V** = FPM seal

2.2 REPLACEMENT ELEMENT

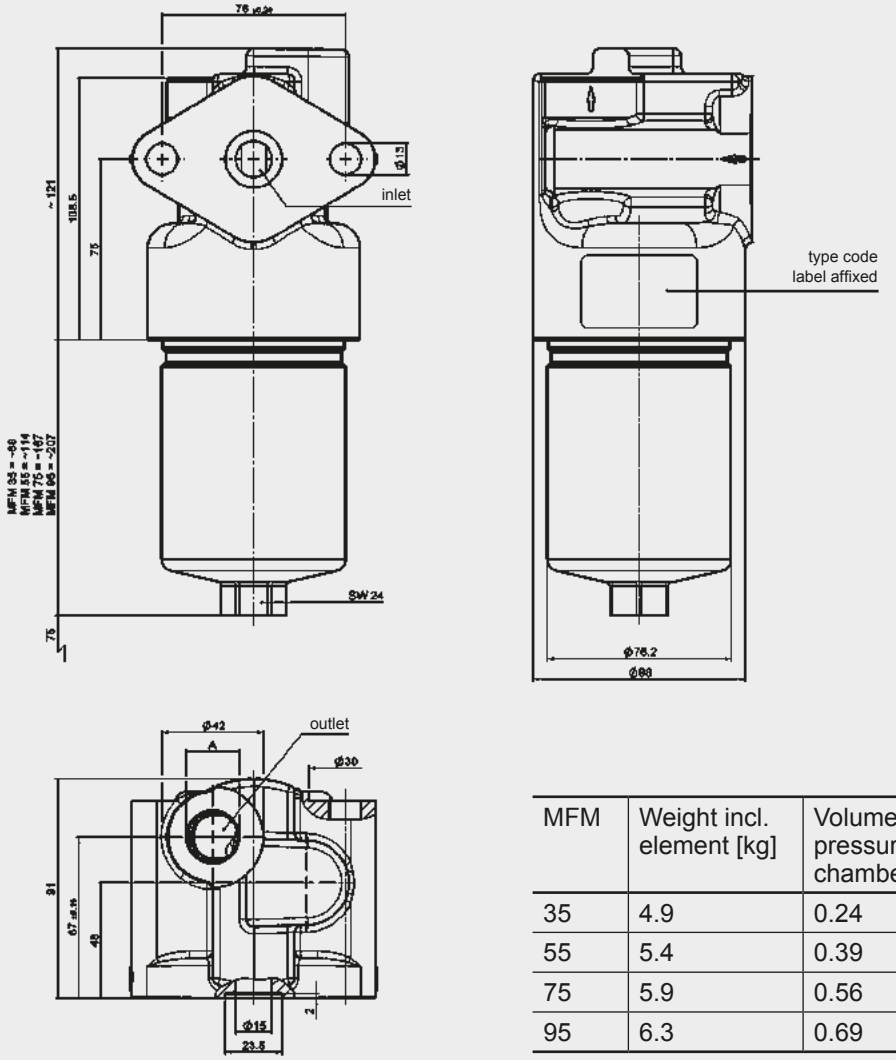
Size	Type	Filtration rating [µm]	Filter material	Supplementary details
0035 **0055** **0075** **0095**	**D**	**001** **003** **005** **010** **015** **020**	**ON** = Optimicron®	**V** = FPM seal

2.3 REPLACEMENT CLOGGING INDICATOR

Type	Pressure setting	Type of clogging indicator*	Modification number	Supplementary details
VD	**5** = standard 5 bar	**A** = steel plug in indicator port **B** = visual **C** = electrical **D** = visual/ electrical	**.x** = The latest version is always supplied	**V** = FPM seal

* for other clogging indicators see brochure no. 7.050../..

3. DIMENSIONS



MFM	Weight incl. element [kg]	Volume of pressure chamber [l]
35	4.9	0.24
55	5.4	0.39
75	5.9	0.56
95	6.3	0.69

NOTE

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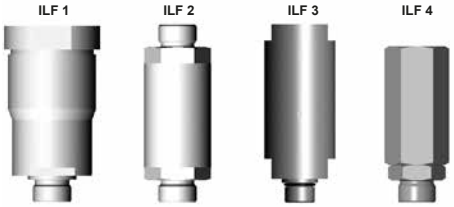
Internet: www.hydac.com
E-Mail: filter@hydac.com

Inline Filter ILF
up to 120 l/min, up to 350 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter housing and a screw-in cover plate.

Standard equipment:

- without bypass valve (only for ILF 1, ILF 3 and ILF 4)
- with bypass valve (only for ILF 2 and ILF 3)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BH4HC):	210 bar
Wire mesh (W):	up to 100 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	ILF 1, 2, 3: 350 bar The permitted operating pressure will be reduced according to the max. permitted value of the threaded connection used! ILF 4: 160 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-10 °C to +100 °C
Material of filter housing and cover plate	ILF 1, 2, 3: Steel 52-3 ILF 4: Aluminium
Cracking pressure of bypass: optional:	ILF 2: 5.5 bar ILF 3: 3 or 6 bar

1.4 SEALS

Perbunan (=NBR)

1.5 INSTALLATION

As inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Bypass valve for ILF 3
- Others on request see original spare parts list

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS DIN ISO 2943

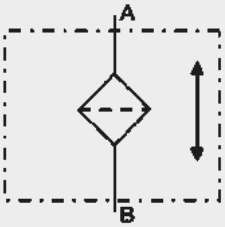
- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

1.10 MAINTENANCE INSTRUCTIONS

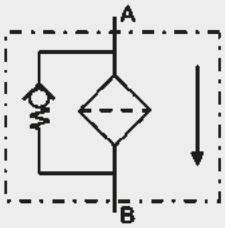
- Filter housings must be earthed.

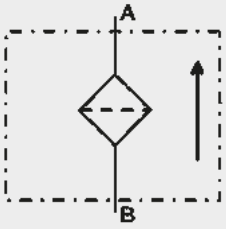
Symbol for hydraulic systems

ILF 1

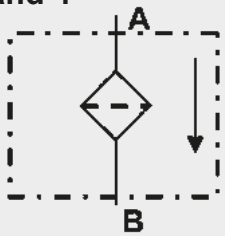


ILF 2





ILF 3 and 4



E 7.569.3/11.16

2. MODEL CODE (also order example)

ILF W 2 R F F 100 W 1 . X /-B5.5-IA

2.1 COMPLETE FILTER

Filter type
ILF

Filter material
W wire mesh
ON Optimicron® (only ILF 3)
BH/HC Betamicron® (only ILF 3)

Size of filter or element
ILF: 1, 2, 3, 4

Operating pressure
K = 160 bar (only ILF 4)
R = 350 bar
The permitted operating pressure will be reduced according to the max. permitted value of the threaded connection used!

Type and size of port - inlet

Type	Port	Filter size 1	2	3	4
A	M18x1.5	●	●		
B	G ½			X	
D	M22x1.5	●	●	●	
F	M24x1.5	●	●		●
H	M30x2		●		

NOTE:
Same port size at inlet and outlet (for ILF 1 and 2)
Please see Point 4 "Dimensions"!

X = only possible for female threads
(Supplementary detail code: II)

Type and size of port - outlet

Type	Port	Filter size 1	2	3	4
A	M18x1.5	●	●		
B	G ½			X	
D	M22x1.5	●	●	●	●
F	M24x1.5	●	●		
H	M30x2		●		

X = only possible for female threads
(Supplementary detail code: II)

Filtration rating in µm
ON, BH/HC : 10, 20 (only ILF 3)
W : 40, 80[1], 100, 200 Others on request

Type of clogging indicator
W without port, no clogging indicator

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
B5.5 standard: bypass cracking pressure 5.5 bar = **required info for ILF 2**[2]
B3 or B6 = **required info for ILF 3** (if bypass valve is required!)
V FPM seals

Connection type = **Required info: (1st letter = inlet; 2nd letter = outlet)**

ILF1	-AI	--	(-IA*)	--
ILF2	--	-AA	-IA	--
ILF3	-AI	-AA	--	-II
ILF4	-AI	--	--	--

NOTICE:
Same port size at inlet and outlet (for ILF 1 and 2)
* = selection of flow direction for ILF1 only possible for initial installation
-- = not possible!
Please see Point 4 "Dimensions"!

A = external connection; **I** = internal connection
[1] only for ILF 4
[2] not possible for ILF 1 and ILF 4

2.2 REPLACEMENT ELEMENT

HE03119932 100 -W /-V

Size
0015 R [3] ⎫
0015 D [3] ⎭ only for ILF 3
HE1468 only for ILF 1
HE03119932 only for ILF 2

Filtration rating in µm
ON, BH4HC : 10, 20 (only ILF 3)
W : 40, 100, 200 Others on request

Filter material
ON, BH4HC, W

Supplementary details
B3 standard: bypass opening pressure for R elements
B6 special bypass cracking pressure 6 bar (only for BN4HC elements)
V (for descriptions, see Point 2.1)

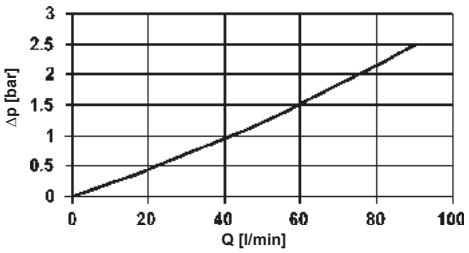
Replacement element for ILF 4 not available. These filters are only available complete!
[3] Replacement element 0015 R... (bypass version) or 0015 D... (version without bypass)

3. FILTER CALCULATION / SIZING

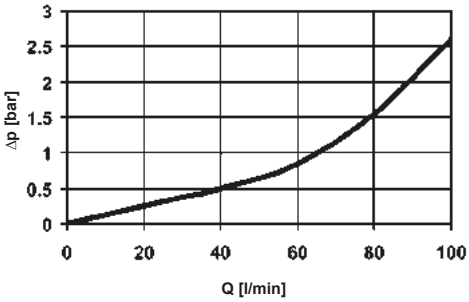
3.1 HOUSING CURVES

The curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30mm²/s.

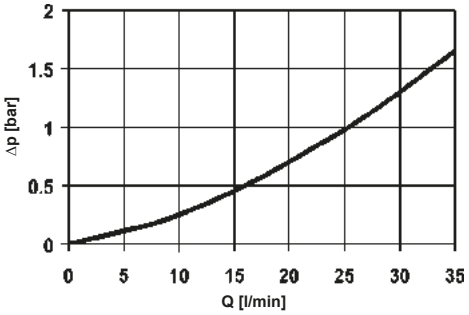
ILF 1



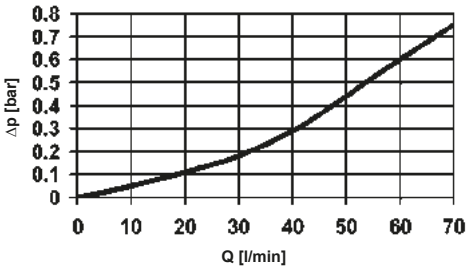
ILF 2



ILF 3

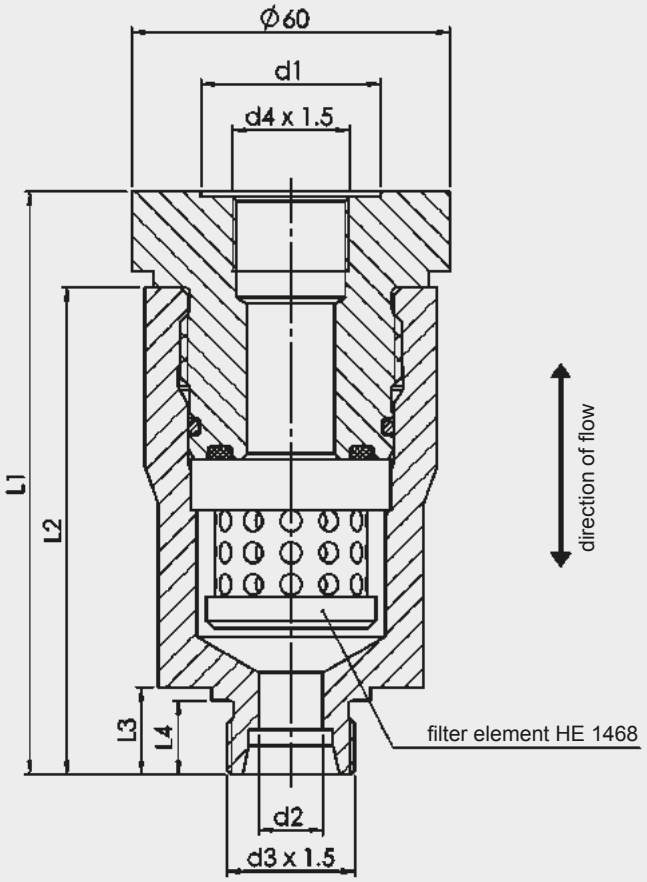


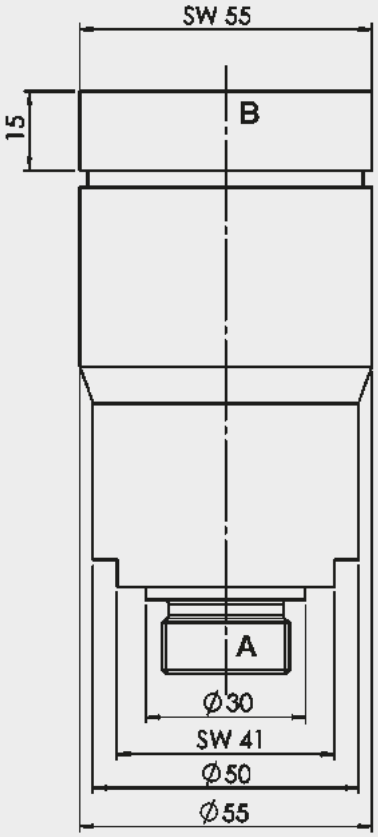
ILF 4



4. DIMENSIONS

ILF 1



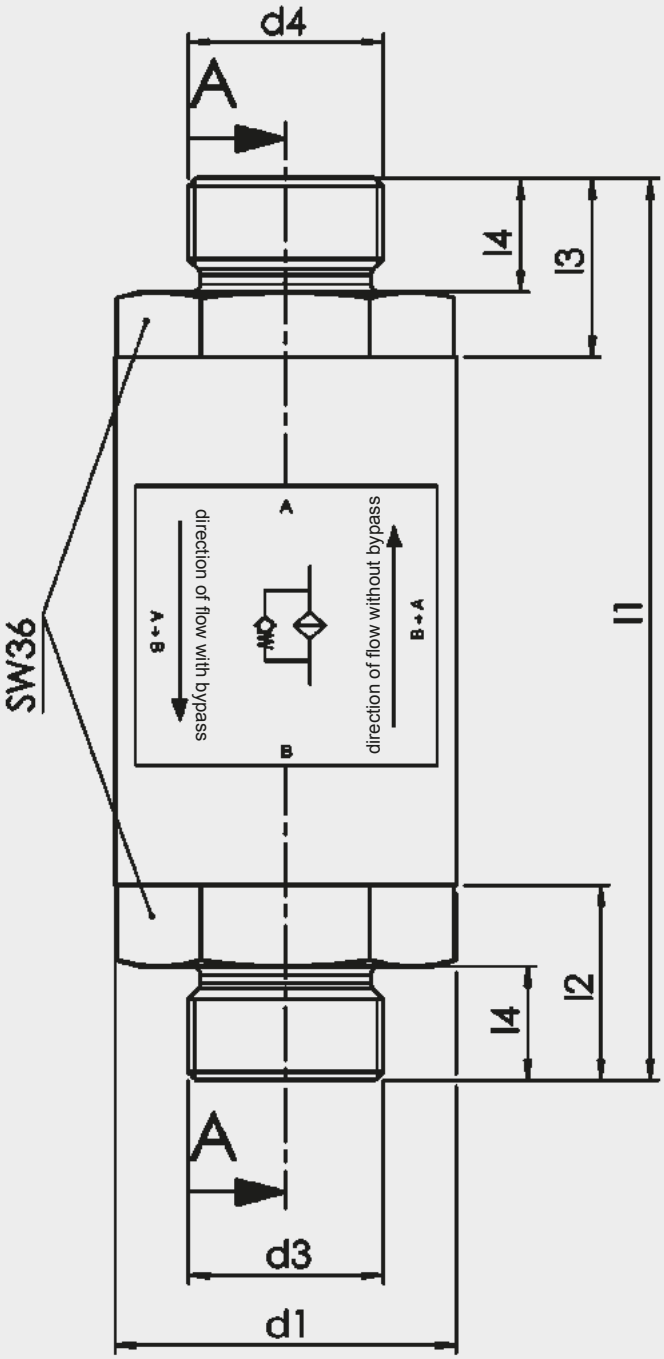


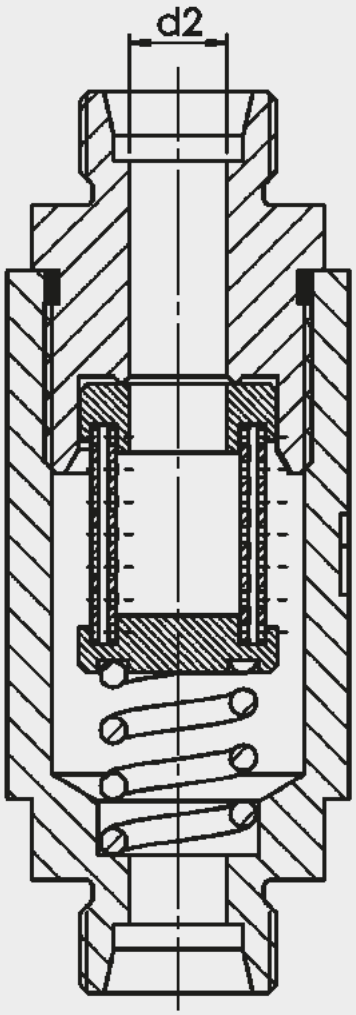
preferred direction from A to B!

Alternating flow is not possible!

ILF	d1	d2	d3	d4	L1	L2	L3	L4	Weight incl. element [kg]	Vol. of pressure chamber [l]
1	28	10	M18	M18	108	90	13.5	11	1.40	0.03
	34	12	M22	M22	109	91	14,5	12	1.39	
	34	12	M24	M24	110	92	16.5	14	1.39	

ILF 2



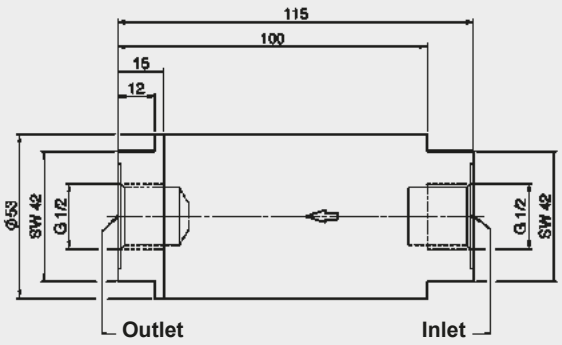


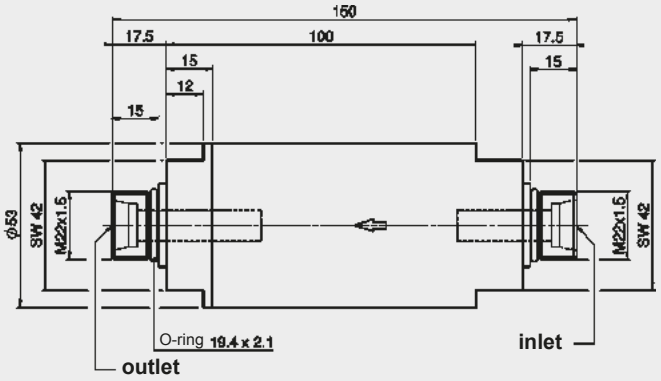
A-A

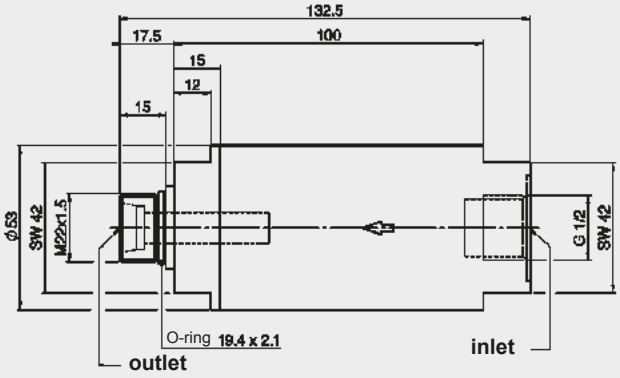
ILF	d1	d2	d3	d4	L1	L2	L3	L4	Weight incl. element [kg]	Vol. of pressure chamber [l]
2	42	9	M18x1.5	M18x1.5	107	22	22	12	0.77	0.04
		12	M22x1.5	M22x1.5	111	24	22	14	0.78	
		12	M24x1.5*	M24x1.5*	111	24	22	14	0.79	
		12	M30x2	M30x2	115	26	24	16	0.83	

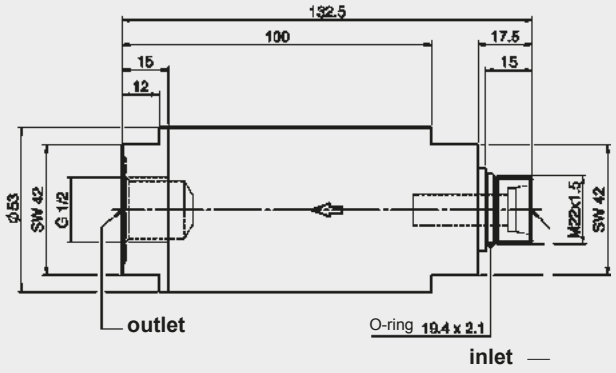
* Preferred types

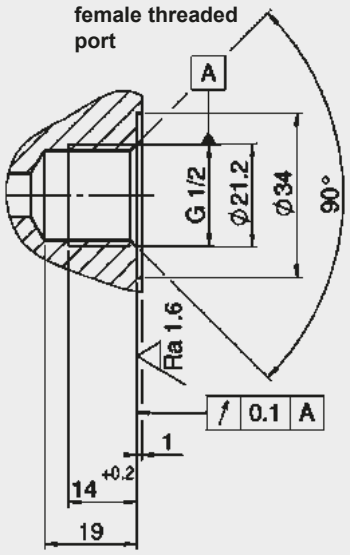
ILF 3





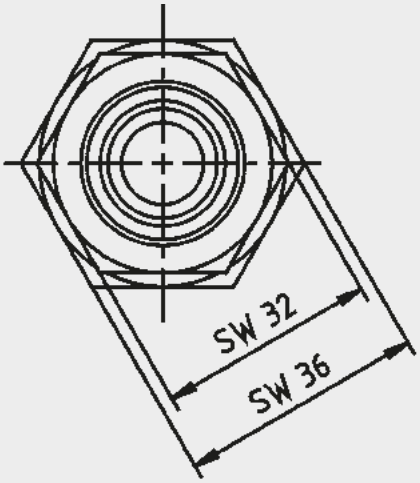


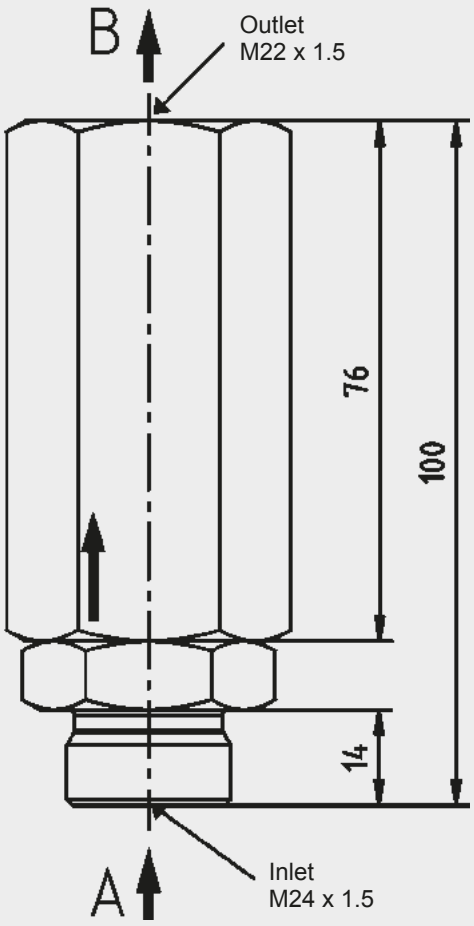




ILF	Weight incl. element [kg]	Vol. of pressure chamber [l]
3	approx. 1.4	0.07

ILF 4





NOTE

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Subject to technical modifications.

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E-Mail: filter@hydac.com

Pressure Filter DFM with Differential Pressure Relief Valve

up to 280 l/min, up to 400 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- differential pressure controlled relief valve
- without pressure release / oil drain plug
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:
Betamicron® (BH4HC): 210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	400 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-30 °C to +100 °C (-30 °C to -10 °C: p_{max}= 200 bar)
Material of filter head	EN-GJS-400-15
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Cracking pressure of differential pressure controlled relief valve	20 bar (others on request) **NOTE:** On request, ON elements (pressure stability up to 20 bar) can also be used at lower cracking pressures.

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

With pressure release / oil drain plug (SO184)

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

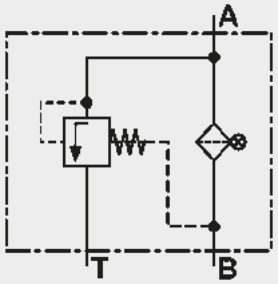
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 MAINTENANCE INSTRUCTIONS

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

DFM BH/HC 240 S E 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
DFM

Filter material of element
BH/HC Betamicron® (BH4HC)

Size of filter or element
DFM: 160, 240, 280

Operating pressure
S = 400 bar

Type and size of connection

Type	Port	Filter size		
		160	240	280
E	G1 ¼	●	●	●

Filtration rating in µm
BH/HC : 3, 5, 10, 20

Type of clogging indicator
Y plastic blanking plug in indicator port
A stainless steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light-emitting diodes up to 24 Volt
] only for clogging indicators type "D"
SO184 pressure release/oil drain screw
V FPM seals

2.2 REPLACEMENT ELEMENT

0240 D 010 BH4HC /-V

Size
0160, 0240, 0280

Type
D

Filtration rating in µm
BH4HC: 003, 005, 010, 020

Filter material
BH4HC

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type of indicator
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing} =$ (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

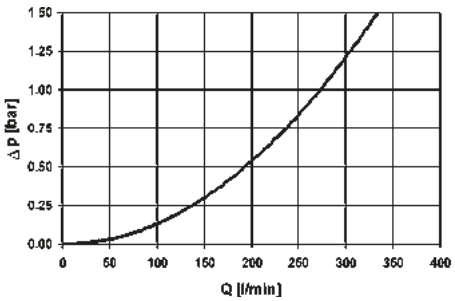
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

DFM 160/240/280

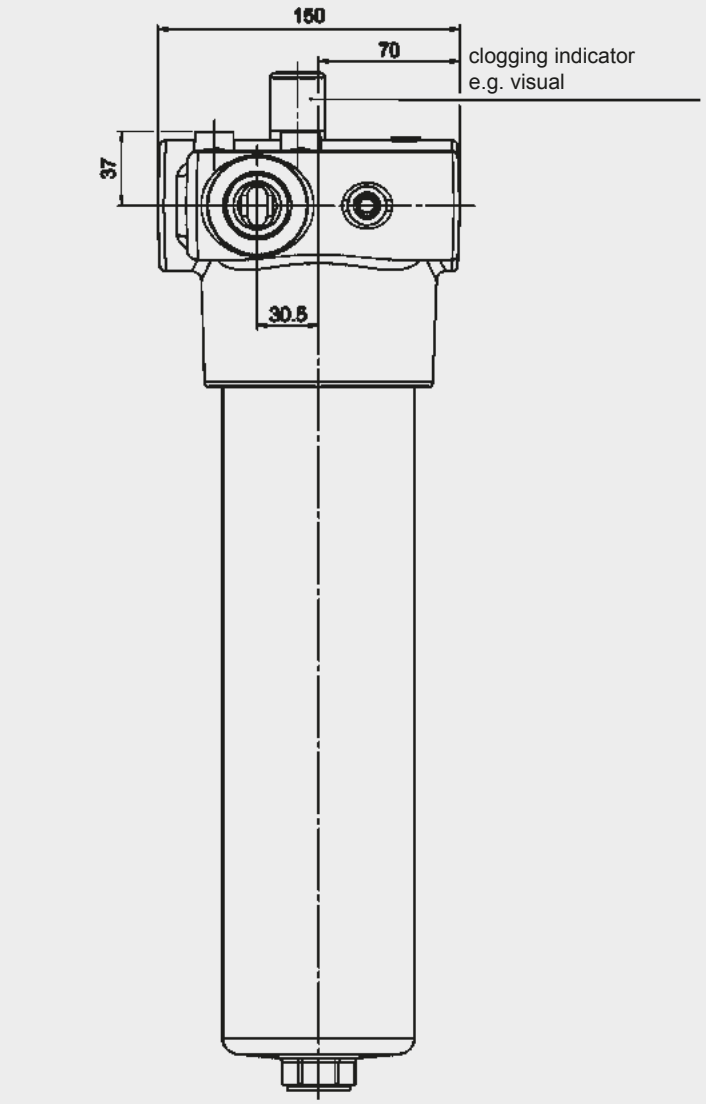


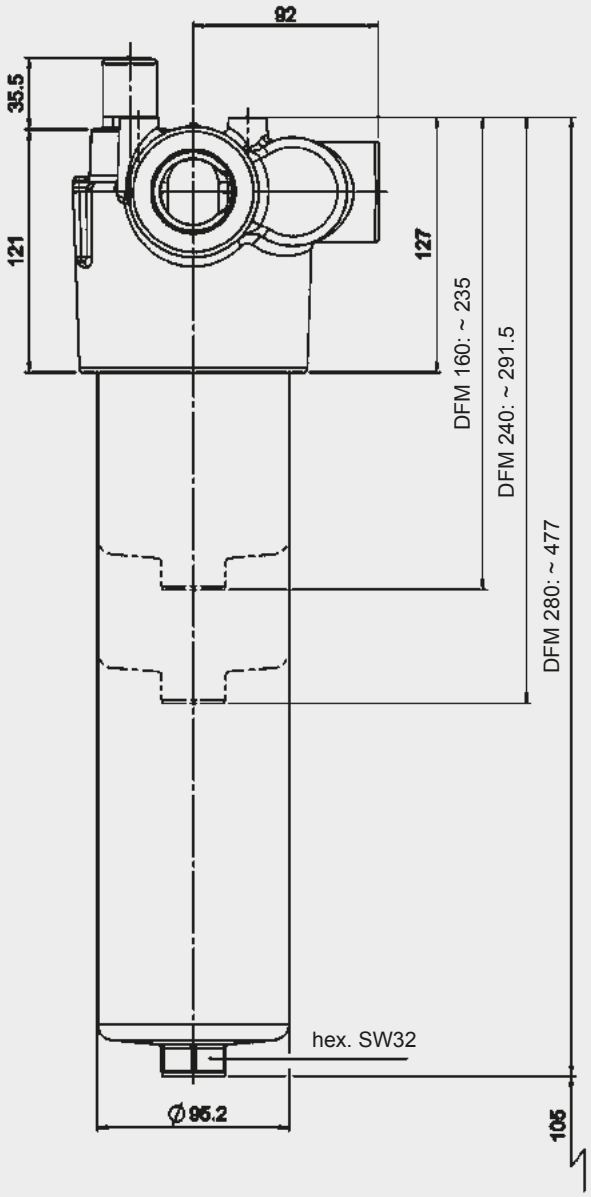
3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

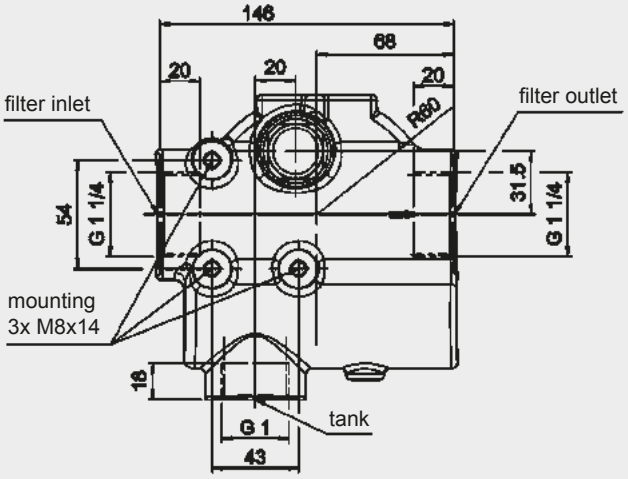
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

DFM	BH4HC			
	3 µm	5 µm	10 µm	20 µm
160	16.8	10.4	5.9	4.4
240	10.6	6.8	3.9	2.9
280	5.7	3.4	1.8	1.6

4. DIMENSIONS







DFM	Weight incl. element [kg]	Volume of pressure chamber [l]
160	11.0	0.6
240	12.5	0.8
280	17.1	1.45

NOTE

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Pressure Filter HFM
up to 140 l/min, up to 400 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- bypass valve
- connection for a clogging indicator on the top of the head (4 mounting holes)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:
Optimicron® (ON): 20 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	400 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-10 °C to +100 °C (-30 °C to -10 °C: p_{max}= 200 bar)
Material of filter head	EN-GJS 400-15
Material of filter bowl	Cold extruded steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Bypass cracking pressure	7 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

INLINE FILTER

1.6 SPECIAL MODELS AND ACCESSORIES

On request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

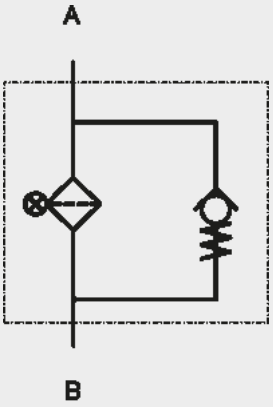
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

1.10 MAINTENANCE INSTRUCTIONS

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

HFM ON 75 S J 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
HFM

Filter material
ON Optimicron®

Size of filter or element
HFM: 75, 95

Operating pressure
S = 400 bar

Type and size of connection

Type	Port	Filter size	
		75	95
H	G ¾	●	●
J	G 1	●	●

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20

Type of clogging indicator
W without port (no clogging indicator)
A screw plug in indicator port
B visual
C electrical
D visual and electrical
(for other clogging indicators, see brochure no. 7.050../..)

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
B7 standard: bypass cracking pressure 7 bar
L... light with appropriate voltage (24, 48, 110, 220 volts) (only for clogging indicator indicators type "D")
LED 2 light-emitting diodes up to 24 volts (only for clogging indicator indicators type "D")
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0075 D 010 ON /-V

Size
0075, 0095

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020

Filter material
ON

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type of indicator
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see Point 3.2)

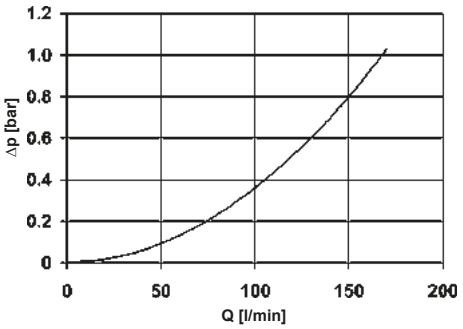
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

HFM

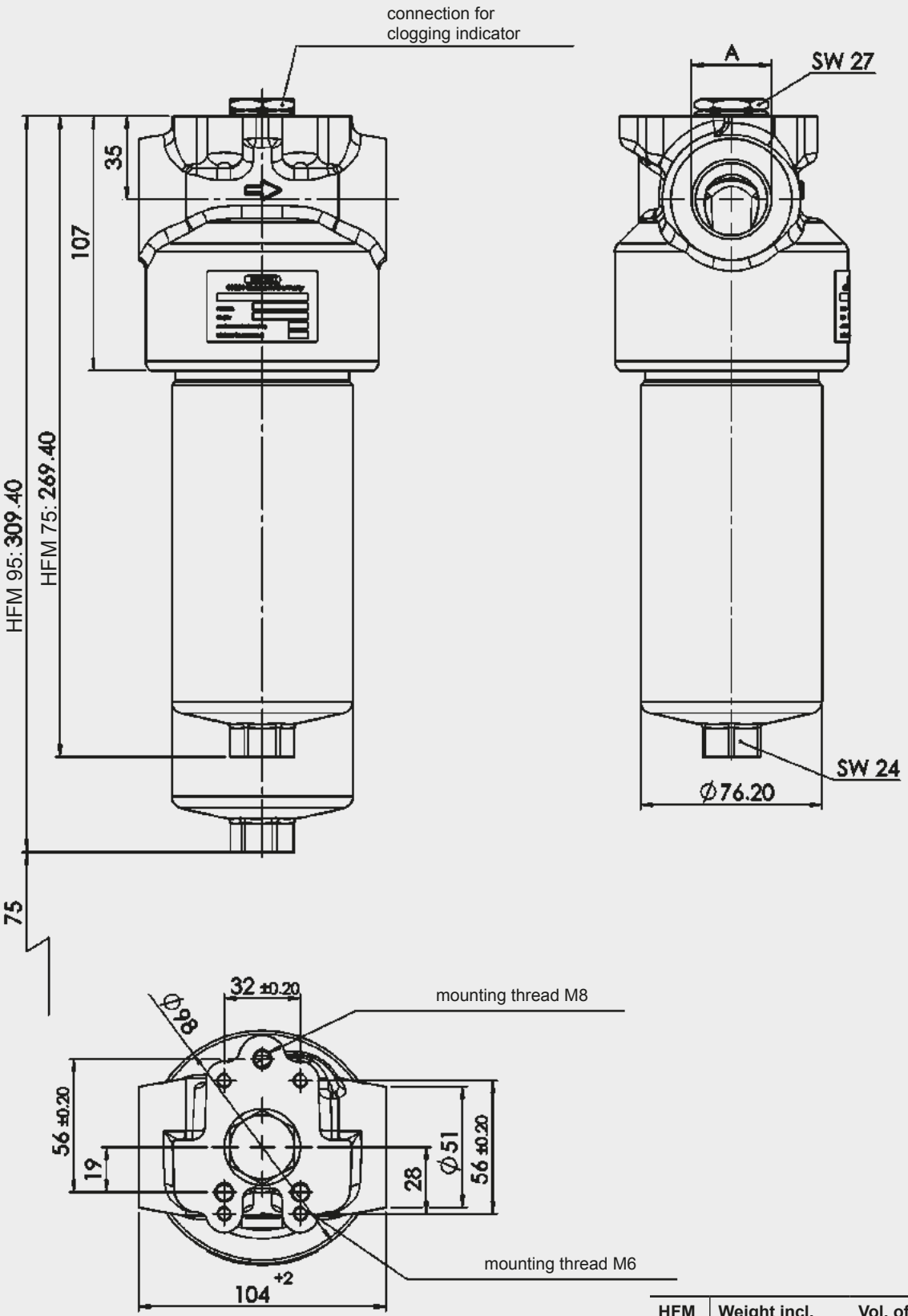


3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

HFM	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
75	16.7	8.40	6.75	5.40	3.33	2.48
95	13.2	6.74	5.40	4.33	2.62	1.92

4. DIMENSIONS



HFM	Weight incl. element [kg]	Vol. of pressure chamber [l]
75	5.6	0.56
95	6.1	0.69

NOTE

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Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

Suction Filter SF/SFM/SFF and Suction Filter Elements S/S..

up to 500 l/min

Filters:

Elements:

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. The SF filters consist of a filter housing and a bolt-on cover plate. The SFM and SFF filters consist of a filter head with filter bowl and bolt-on cover plate (on the SFF there is a foot valve in the base of the filter bowl).

Standard equipment:

- bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

The suction filter elements S are designed to be screwed into the suction lines of pumps.
It is essential that suction filter elements are always installed well below the minimum oil level.
The suction filter elements S.. are designed to be mounted simply onto the outside of the tank. They are used in devices with hoses that are exposed to little mechanical load. Elements can be changed very simply.

Standard equipment:

- without bypass valve

Filter elements are available with the following pressure stability values:

Paper (P):	5 bar
Wire mesh (W):	5 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	Suction operation	
Temperature range	-10 °C to +100 °C	
Material of SF filter	Cover plate: Housing:	aluminium aluminium
Material of SFM filter	Cover plate: Filter head: Filter bowl:	aluminium aluminium polyamide
Material of SFF filter	Cover plate: Filter head: Filter bowl:	GGG40 aluminium steel
Material of S elements	Filter mesh: End caps: Central tube:	wire mesh polyamide steel, zinc-plated
Material of S.. elements	Filter mesh: End caps: Central tube:	wire mesh on request on request
Type of clogging indicator	VR Connection thread G ½ V1/4 Conn. thread NPT (only SFF)	
Pressure setting of the clogging indicator	0.2 to 1 bar (others on request)	
Bypass cracking pressure	0.25 bar (SFF filter) 0.3 bar (SF and SFM filter) (others on request)	
Cracking pressure of bypass valve for suction filter elements S (optional)	0.2 bar	

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Tank-top or inline filter.

1.6 SPECIAL MODELS AND ACCESSORIES

On request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

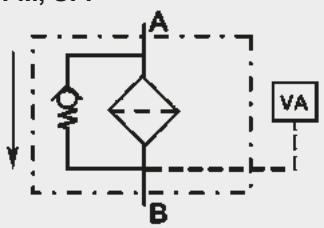
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

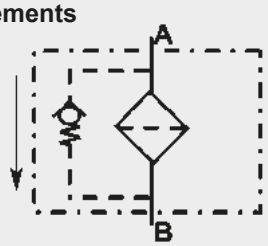
1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems SF, SFM, SFF



S elements



VA = clogging indicator

E 7.406.3/11.16

2. MODEL CODE (also order example)

SF W 330 W L 10 UE 1 . X /-V

2.1 COMPLETE FILTER

Filter type
SF, SFM, SFF

Filter material
P paper (not for SFF)
W stainless steel wire mesh

Size of filter or element
SF: 60, 110, 160, 240, 330
SFM: 330
SFF: 400, 500

Operating pressure
W suction operation

Type and size of connection

Type	Connection	Filter size SF 60	SF 110	SF 160	SF 240	SF 330	SFM 330	SFF 400	SFF 500
C	G ¾	●	●						
E	G 1¼			●	●				
F	G 1½						●		
G	G 2					●			
K	SAE DN 40 (1½")						●		
L	SAE DN 50 (2")					●			
M	SAE DN 65 (2½")							●	
P	SAE DN 100 (4")								●

Filtration rating
P: 10, 20 (not for SFF)
W: 75, 125

Clogging indicator version
A screw plug in indicator port
UE negative pressure gauge
UF negative pressure switch
for other clogging indicators see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
KB without bypass valve
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT FOR SF / SFM / SFF FILTERS

0330 RS 075 W /-V

Size
0060, 0110, 0160, 0240, 0330, 0400, 0500

Type
RS

Filtration rating in µm
P: 010, 020 (not for SFF)
W: 075, 125

Filter material
P, W

Supplementary details
SFF must be added to model code for SFF filter
V, W (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VR 1 UE . X /-V

Type
VR connection thread G ½ (only for SF and SFM filters)
V1/4 connection thread NPT (only for SFF filters)

Pressure setting
1 1 bar (for type UE)
0.2 0.2 bar (for type UF)

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
V (for descriptions, see Point 2.1)

2.4 SUCTION FILTER ELEMENT S

0050 S 125 W /-B0.2

Size
0015, 0025, 0050, 0100, 0180

Type
S

Filtration rating in µm
075, 125

Filter material
W

Supplementary details
B0.2 special cracking pressure of bypass 0.2 bar;
no details = standard

2.5 SUCTION FILTER ELEMENT S..

0070 SGD 125 W

Size
0040, 0060, 0070, 0110

Type
SHB* suction filter element hose connection (38.1 and 32)

SUI* suction filter element UN thread (1 1/16-12 UN and 1 5/16-12UN)

SG.* suction filter element thread (G ¾ , G 1, G 1½)

Filtration rating in µm
125

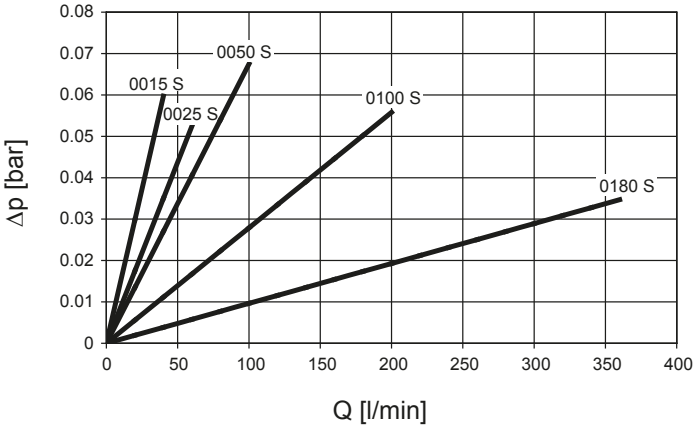
Filter material
W

*for further details on the designation, please see Point 5

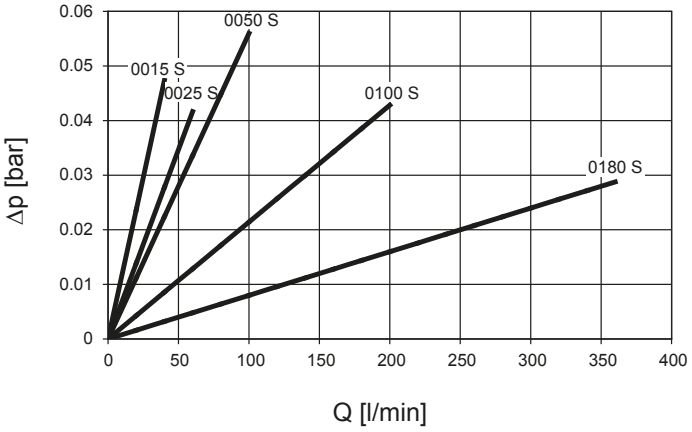
3. FILTER CALCULATION / SIZING S AND S..

3.1 ΔP-Q-GRAPHS FOR SUCTION FILTER ELEMENTS S (AT 30 MM²/S)

75 µm

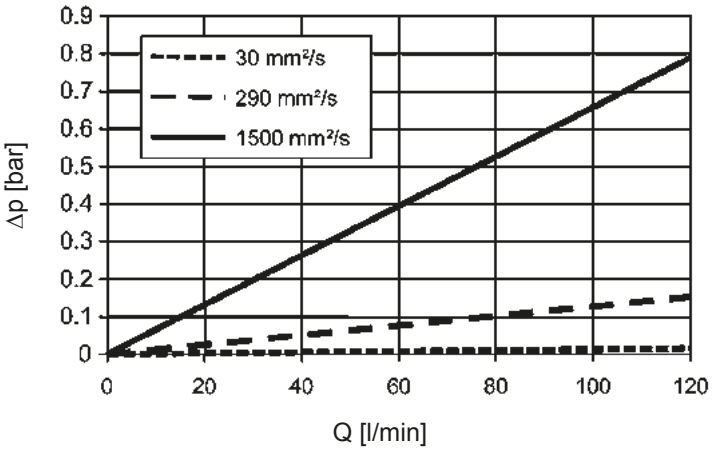


125 µm



3.2 ΔP-Q-GRAPHS FOR SUCTION FILTER ELEMENTS S.. FOR MOUNTING ON OUTSIDE OF TANK

Size 0060 and 0070



Size 0040 and 0110 on request.

4. FILTER CALCULATION / SIZING SF, SFM, SFF

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 4.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 4.2)

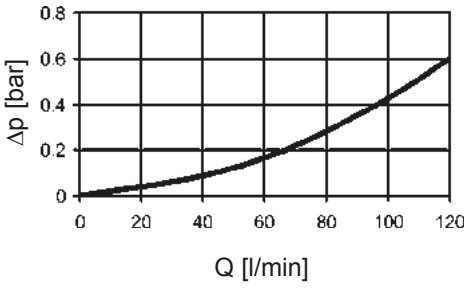
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

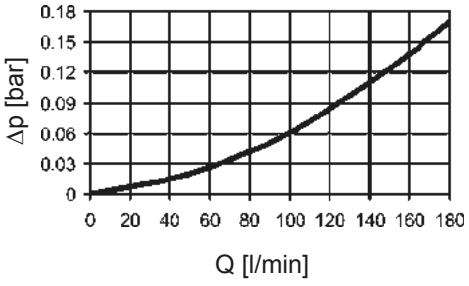
4.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

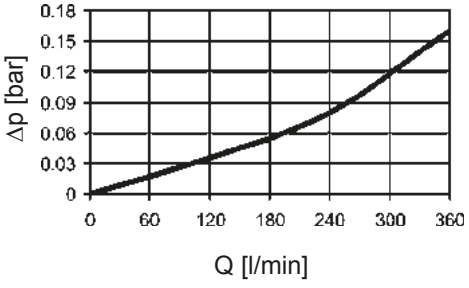
SF 60, 100



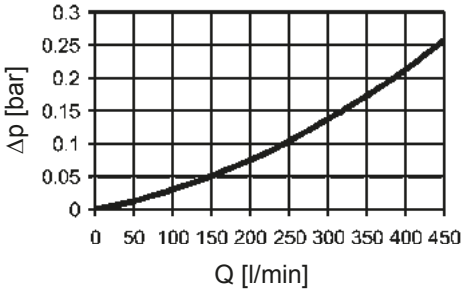
SF 160, 240



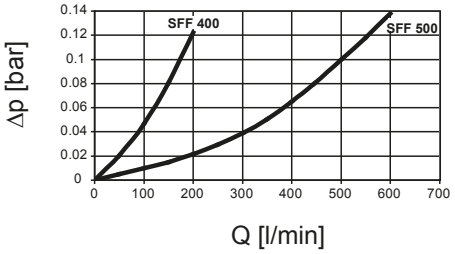
SF 330



SFM 330



SFF 400, 500

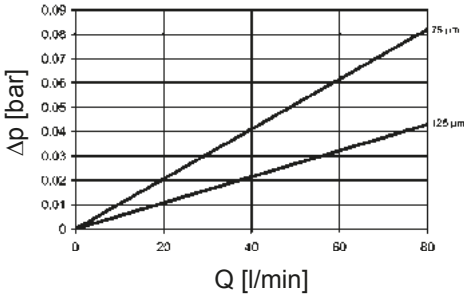


4.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS (FOR SF/SFM/SFF FILTERS)

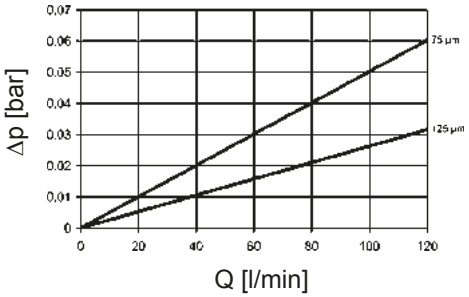
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

RS	W	
	75 µm	125 µm
60	1.03	0.54
110	0.52	0.26
160	0.36	0.19
240	0.25	0.13
330	0.19	0.10
400	0.20	0.16
500	0.20	0.16

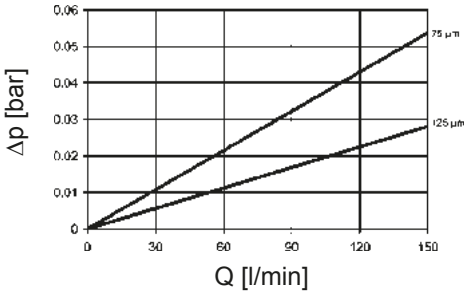
60 W



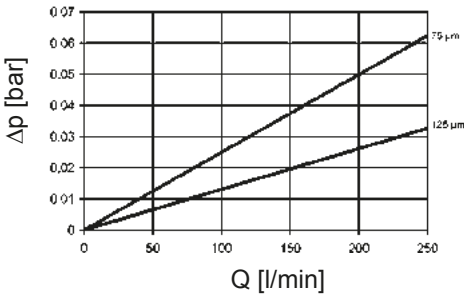
110 W



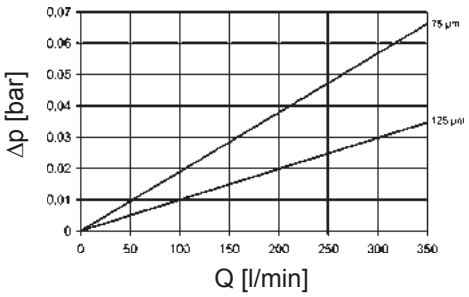
160 W



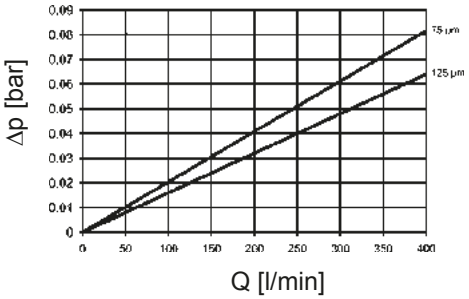
240 W



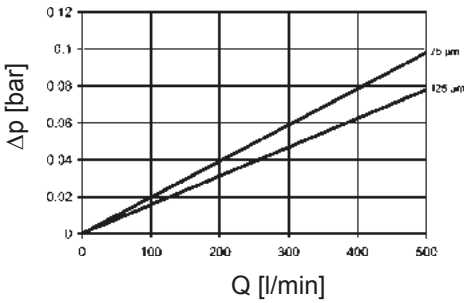
330 W



400 W



500 W

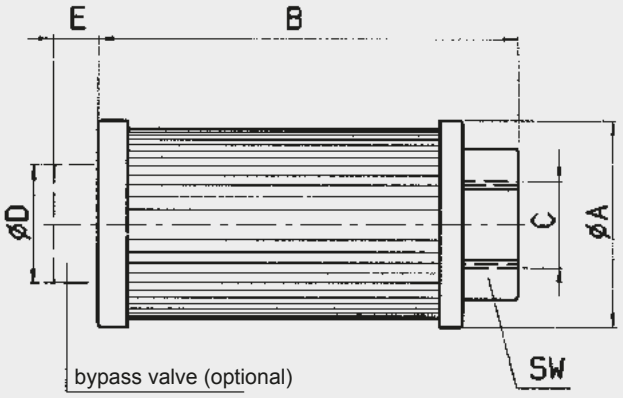


5. DIMENSIONS

Tank requirements

1. In the filter contact area, the tank flange should have a maximum flatness of 0.3 mm and RA 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter.
   As an alternative, the tank flange can be continuously welded from the inside.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.

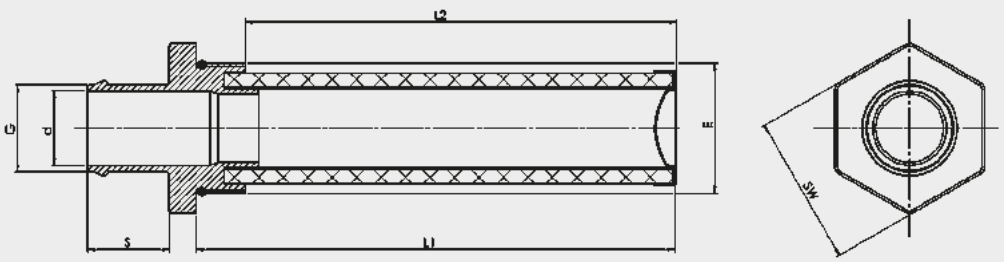
Suction filter element S



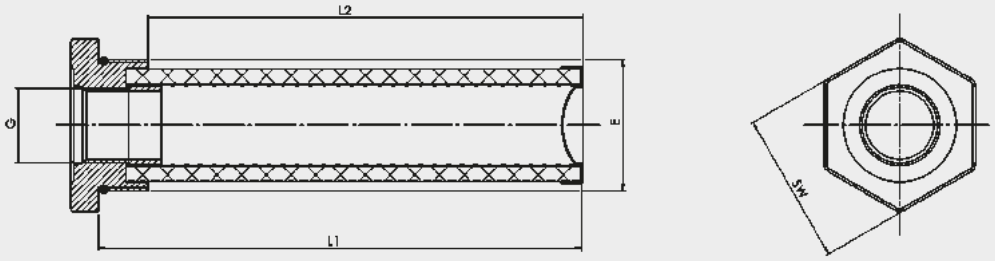
Types	A	B	C	D (ISO 228)	E	SW	Flow rate l/min
0015 S	44	104	G ½	24	10.5	30	15
0025 S	63	127	G ¾	36	13.5	46	25
0050 S	63	159	G 1	36	13.5	46	50
0100 S	86	210	G 1½	46	18.5	69	100
0180 S	86.5	311	G 2	46	18.5	69	180

Suction filter element S.. for mounting on the outside of tank

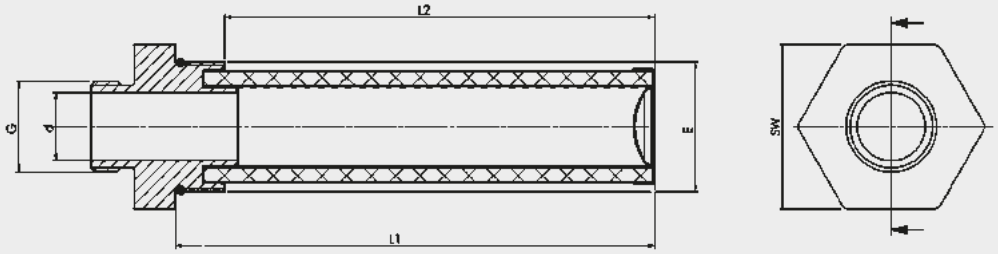
Type SHB



Type SUI

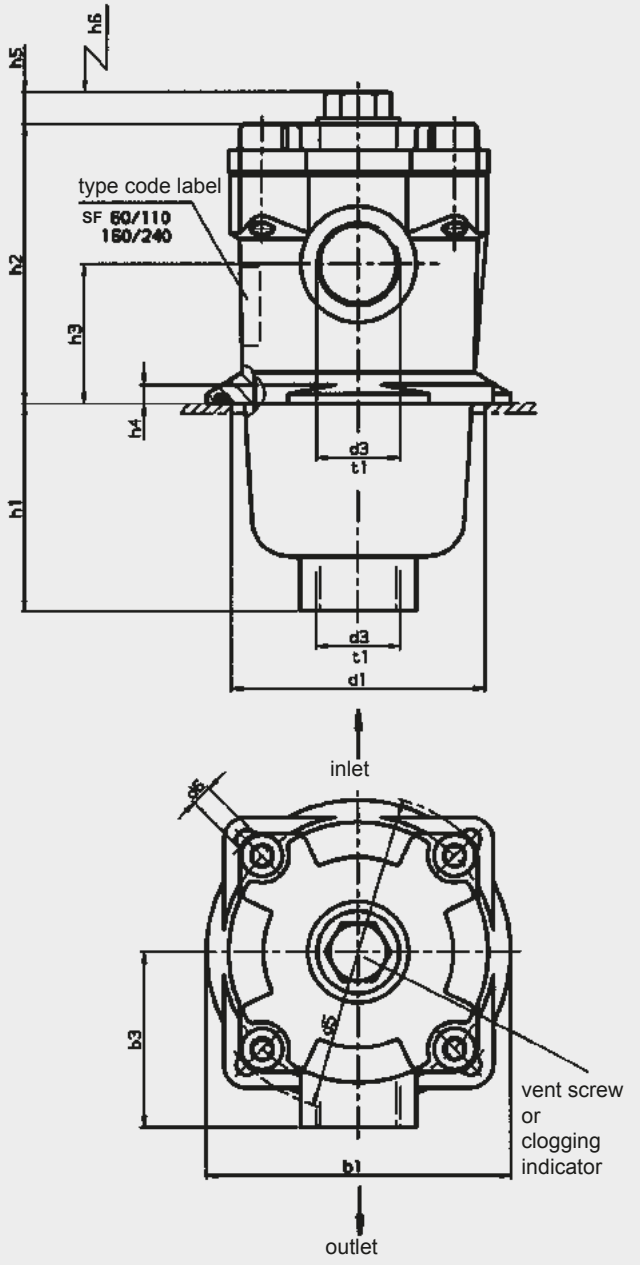


Type SGx

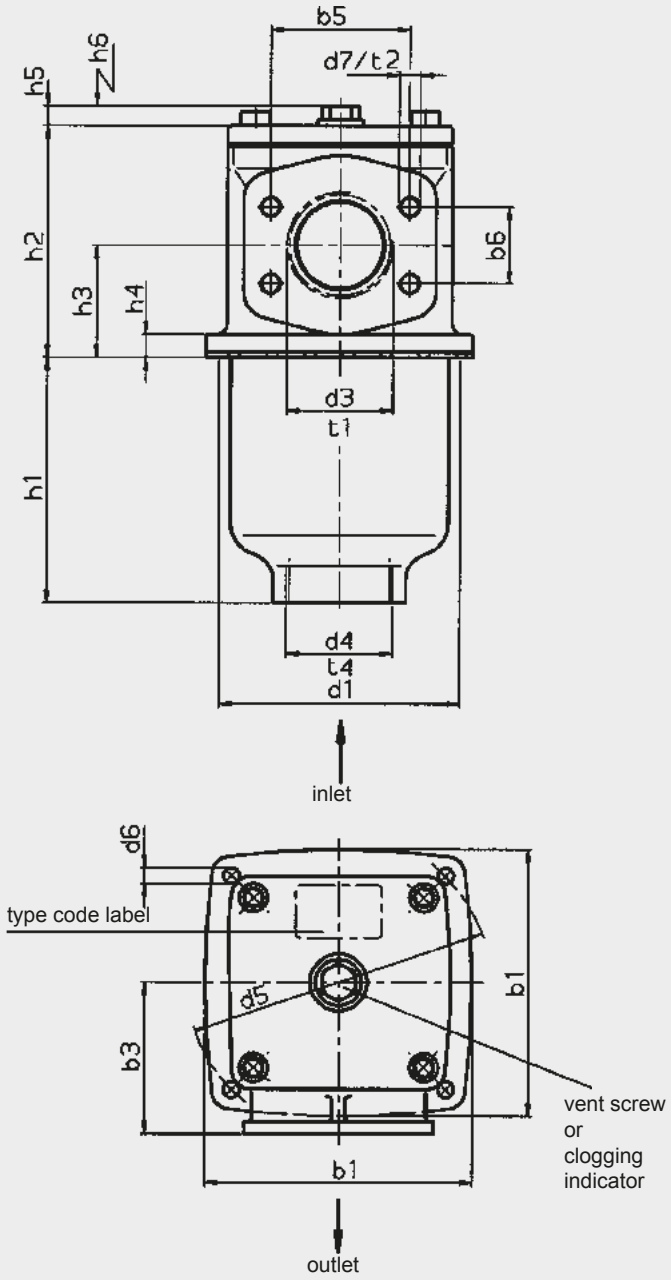


Designation	G	E	d	L1	L2	SW
0110 SHB 125 W	38.1	2½-12 UN 2 B	32	176	158	70
0070 SHB 125 W	32.0	1 7/8-12 UNF	25	176	158	55
0060 SHB 125 W	32.0	1 7/8-12 UNF	25	143	125	55
0070 SUI 125 W	1 1/16-12 UN	1 7/8-12 UNF	-	176	158	55
0060 SUI 125 W	1 1/16-12 UN	1 7/8-12 UNF	-	143	125	55
0110 SGF 125 W	G 1½	2½-12 UN 2 B	34	176	158	70
0070 SGD 125 W	G 1	1 7/8-12 UNF	25	176	158	55
0040 SGC 125 W	G ¾	1 7/8-12 UNF	20	143	125	55

SF 60 to 240

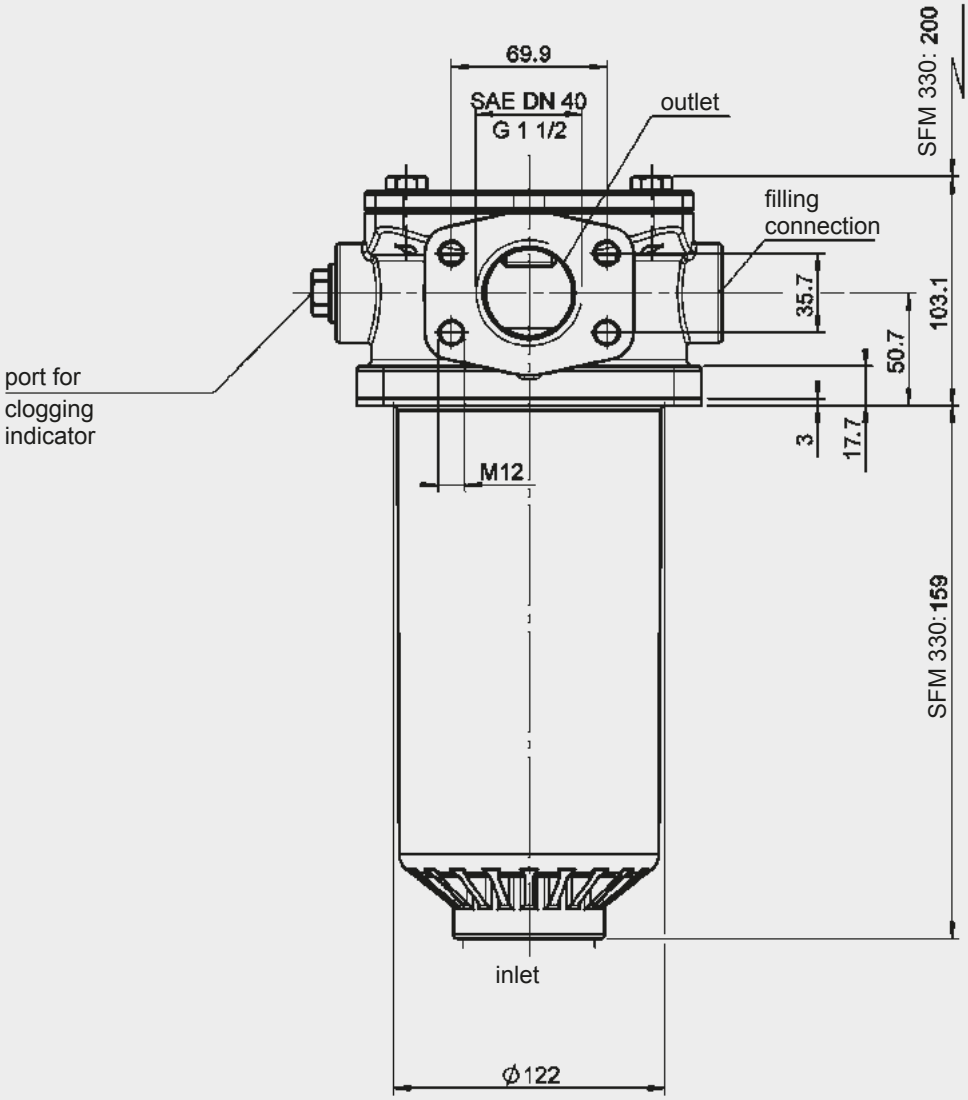


SF 330

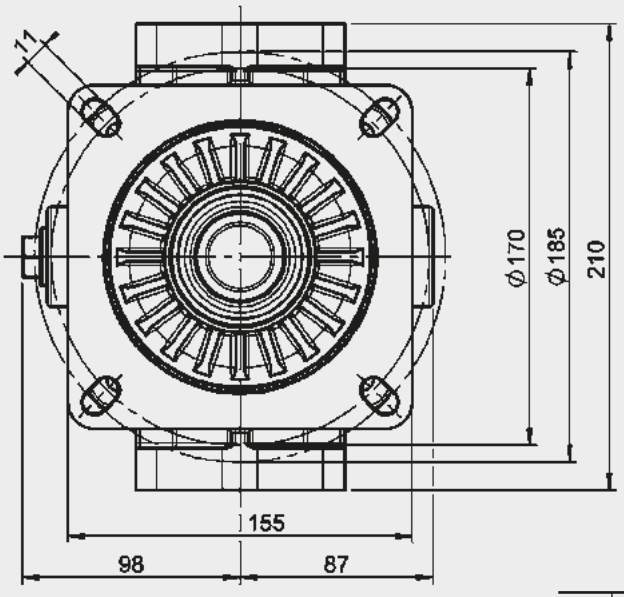


SF	b1	b3	b5	b6	d1	d3[1)]	d4	d5	d6[2)]	d7	h1	h2	h3	h4	h5	h6	t1	t2	t4	Weight incl. element [kg]	Volume of pressure chamber [l]
60	96	55	-	-	80	G ¾	-	100	M5	-	66	88	44	6	12	80	17	-	-	0.9	0.4
110	96	55	-	-	80	G ¾	-	100	M5	-	133	88	44	6	12	145	17	-	-	1.1	0.6
160	126	72	-	-	106	G 1¼	-	135	M6	-	89	108	54	6	12	120	20	-	-	1.8	1.0
240	126	72	-	-	106	G 1¼	-	135	M6	-	150	108	54	6	12	180	20	-	-	2.2	1.4
330	150	85	- 77.8	- 42.9	135	G2 SAE DN 50	G2	170	M8	- M12	138	130	63	13	12	180	27	- 23	27	4.1	2.0

[1)] Threaded port to ISO 228 / [2)] Mounting hole for screw

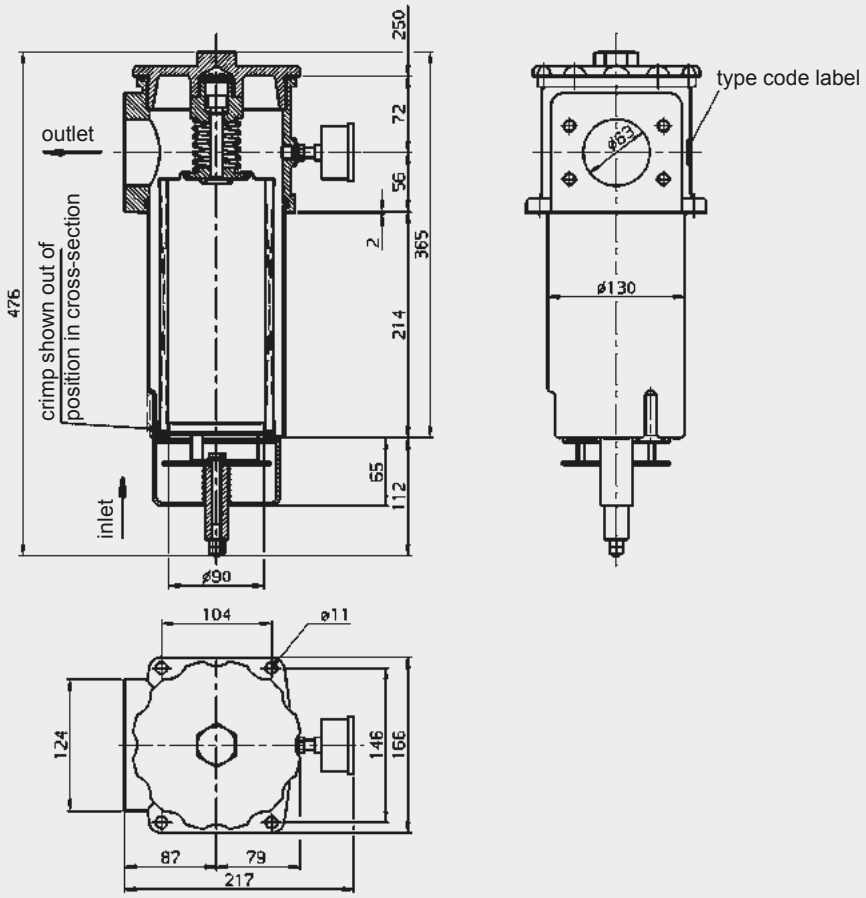


View from below

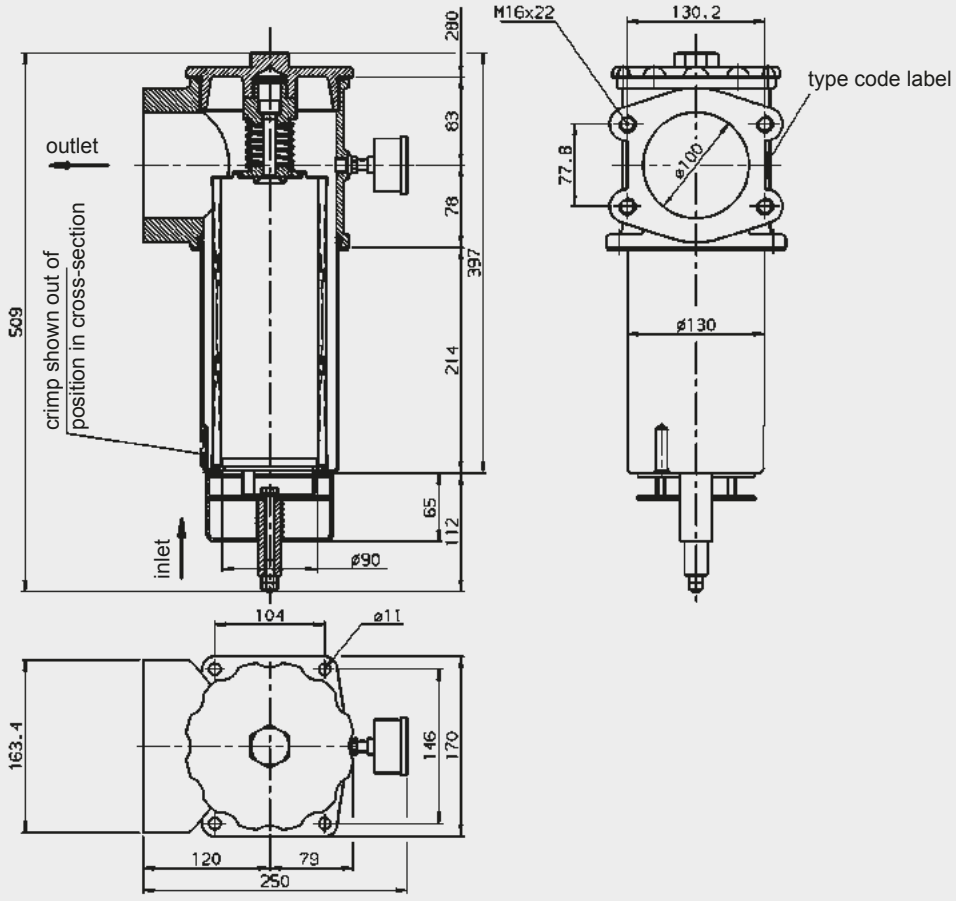


SFM	Weight incl. element [kg]	Volume of pressure chamber [l]
330	3.9	2.0

SFF 400



SFF 500



SFF	Volume of pressure chamber [l]
400	4.23
500	4.63

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

HYDAC Filtertechnik GmbH
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D-66280 Sulzbach/Saar
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

Suction Filter SFAR

Element flow direction from in to out up to 250 l/min

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a cover plate, filter head and housing tube. The element is top-removable.

These filters can be installed horizontally below the oil level.

Standard equipment:

- mounting holes on the filter head
- magnetic core built into cover plate
- foot valve
- connection for a clogging indicator in filter head

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Contamination retention capacities in g for 0.5 bar

	Polyester (PE)
SFAR	10 µm (nominal)
100	15.5
150	23.2
180	27.5
200	30.4
250	42.7

Filter elements are available with the following pressure stability values:

Polyester (PE): 6 bar
Wire mesh (WR): 6 bar

Other filtration ratings on request.

1.4 FILTER SPECIFICATIONS

Temperature range	-30 °C to +100 °C	
Material of housing tube	SFAR 100, 150, 180:	PA6 – GF30
	SFAR 200, 250:	Steel DIN EN 10130-FE P04 A
Material of filter head	SFAR 100, 150:	Die-cast EN AC 43300 - F
	SFAR 180, 200, 250:	Chill-cast EN AC 43300-F
Material of cover	PA6 – GF30	
Type of clogging indicator	VMFR – Connection thread G 1/8	
Pressure setting of the clogging indicator	-0.25 bar (others on request)	

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Tank-top filter

1.6 SPECIAL MODELS AND ACCESSORIES

- without port, no clogging indicator
- without magnetic core

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

Test certificate 2.2
Other approvals on request

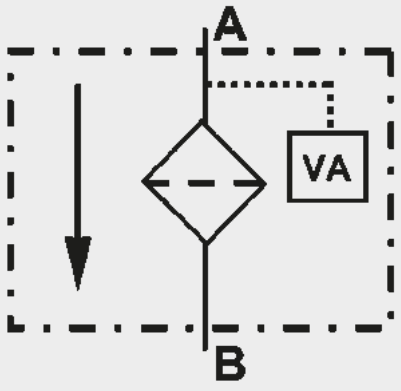
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



VA = clogging indicator

2. MODEL CODE (also order example)

SFAR PE 180 W Z F 10 W 1.0 /-V

2.1 COMPLETE FILTER

Filter type
SFAR

Filter material
PE Polyester
WR Wire mesh

Size of filter or element
SFAR: 100, 150, 180, 200, 250

Operating pressure
W suction operation

Additional connection options multiport head

Type	Connection	Filter size				
		100	150	180	200	250
Z	to customer spec.			●	●	●

Type and size of connection

Type	Connection	Filter size				
		100	150	180	200	250
E	G 1 1/4	●	●			
F	G 1 1/2			●	●	●

Filtration rating in µm
PE : 10
WR : 100

Type of clogging indicator
W without port, no clogging indicator
A steel blanking plug in indicator port
UE vacuum gauge] for other clogging indicators
UF vacuum switch] see brochure no. 7.050../..

Type code
0 without indicator port, no clogging indicator
1-4 see Point 2.5

Modification number
X the latest version is always supplied

Supplementary details
V FPM seals
OM without magnetic core
MPx Multiport head only for SFAR 180, 200, 250 (see Point 2.4)

2.2 REPLACEMENT ELEMENT

0180 RS 010 PE /-V

Size
0100, 0150, 0180, 0200, 0250

Type
RS

Filtration rating in µm
PE : 010
WR : 100

Filter material
PE, WR

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VMF 1 UE . X /-V

Type
VMF Thread G 1/8 (SFAR 100, 150)*

Pressure setting
1 1 bar (for type UE)
0.2 0.2 bar (for type UF)

Type of clogging indicator
(see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
V (for descriptions, see Point 2.1)

* for SFAR 180, 200 and 250 on request

2.4 PORT CONFIGURATION
SFAR 180, 200, 250

Since there are numerous options for machining the ports on the head of the SFAR 180-250, the code WZF is selected here as standard. In order to determine the position and size of the ports, an MPF, MPI or MPL code is added as a supplementary detail. These three connection options are preferred types, please contact us to discuss other options.

Example:

SFAR PE 200 WZF 10 W 0.0 /-MPI

MPF

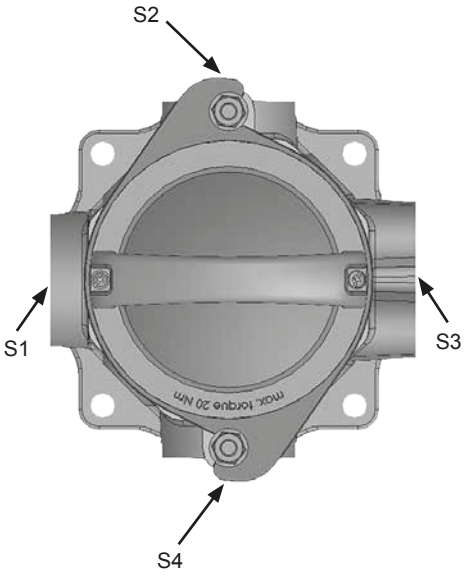
S1: Connection G1½
S2: Connection G1
S3: Connection G1½
S4: Connection G1

MPI

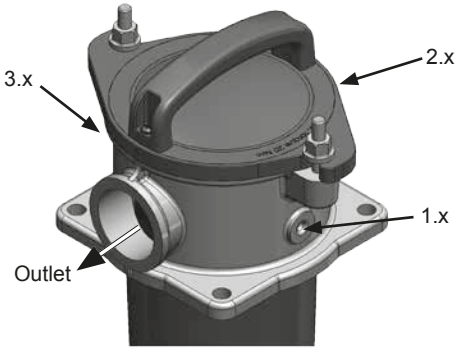
S1: Connection G1½
S2: Connection G1¼
S3: Connection G1½
S4: Connection G1¼

MPL

S1: Connection G1½
S2: Connection G1
S3: Connection SAE DN 50
S4: Connection G1

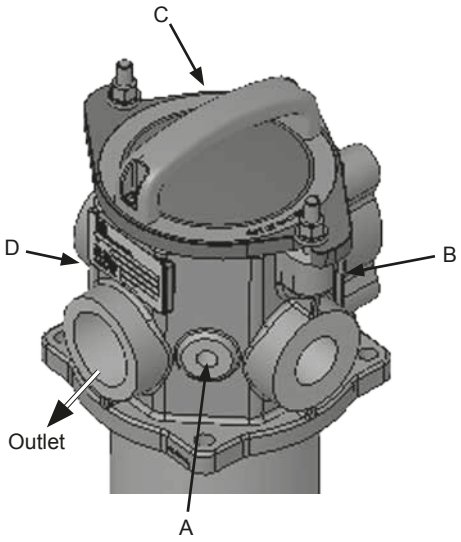


2.5 TYPE CODE
SFAR 100, 150



Type code	Mounting position of clogging indicator
0.x	Plain, undrilled
1.x	To right of filter outlet
2.x	Opposite filter outlet
3.x	To left of filter outlet
4.x	All positions with G 1/8 port and with blanking plug in ports

SFAR 180, 200, 250



Type code	Mounting position of clogging indicator
0.x	All undrilled
1.x*	A = G 1/4; B = G 3/8; C = G 3/8; D = G 3/8
2.x*	A = G 3/8; B = G 3/8; C = G 1/4; D = G 3/8
3.x	A = G 3/8; C = G 3/8; B and D undrilled
4.x	All positions with G 1/8 port and with blanking plug in ports

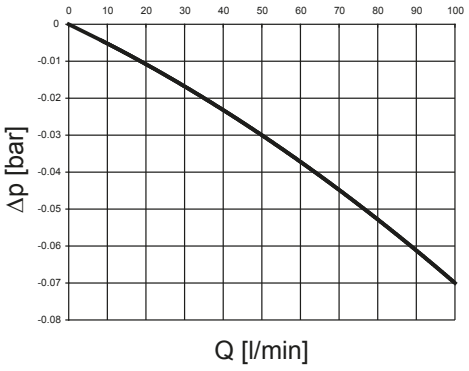
* Preferred range

3. FILTER CALCULATION / SIZING

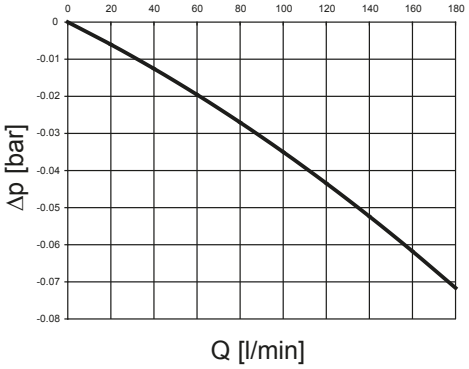
3.1 GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30mm²/s.

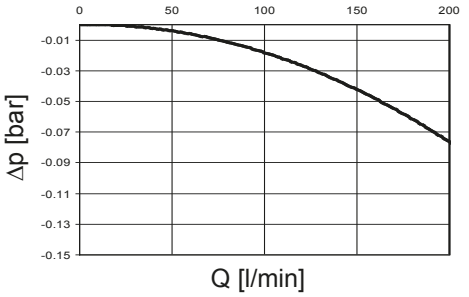
SFAR 100: PE



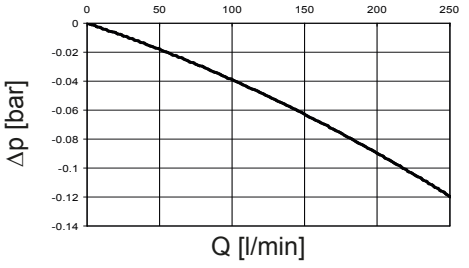
SFAR 150: PE



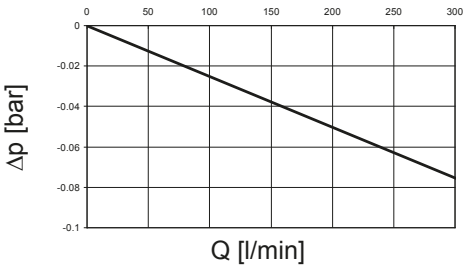
SFAR 180: PE



SFAR 200: PE

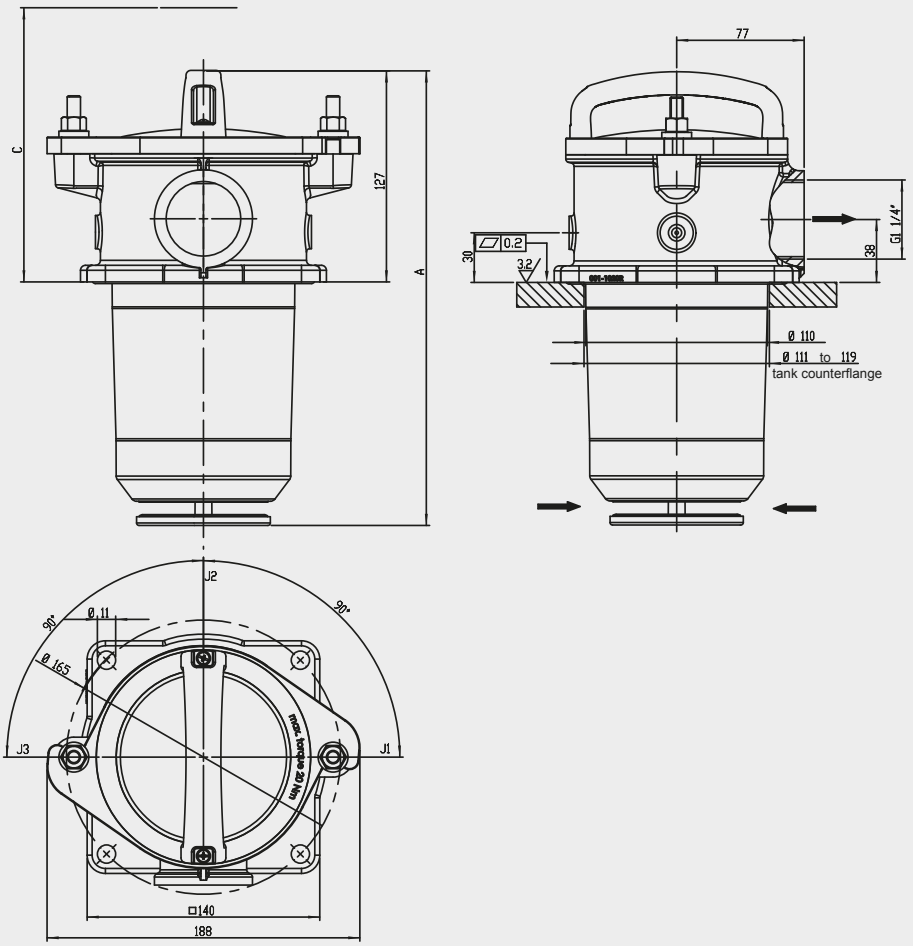


SFAR 250: PE



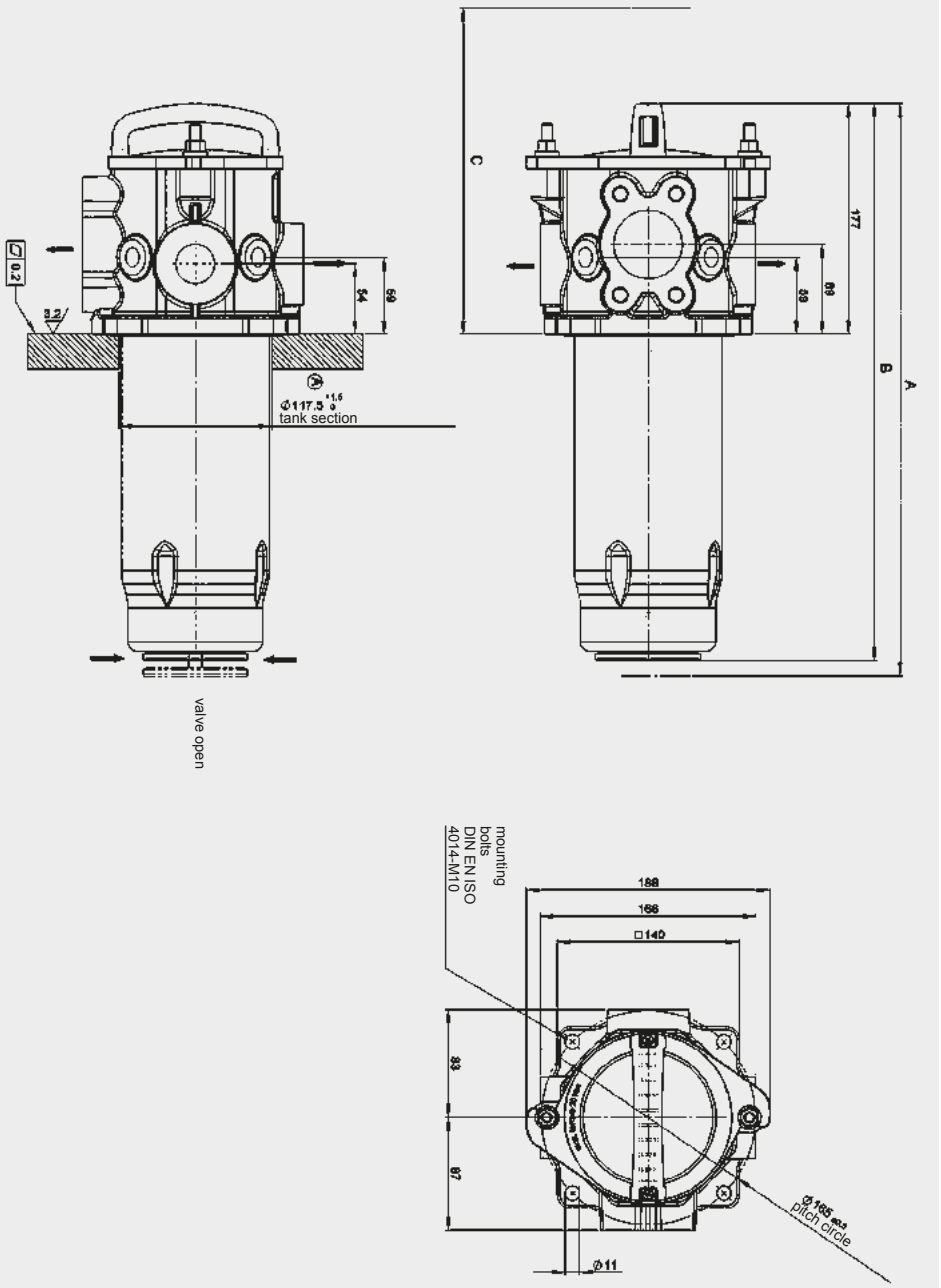
4. DIMENSIONS

SFAR 100 – 150



Type	A	C	Weight incl. element [kg]
SFAR 100	274	250	1.8
SFAR 150	354	330	2.1

SFAR 180 – 250



Type	a	B	C	Weight incl. element [kg]
SFAR 180	404	396	520	3.63
SFAR 200	441	429	580	4.68
SFAR 250	583	571	690	5.38

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Tel.: 0 68 97 / 509-01
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Tank-Top Return Line Filter RFN with Elements to DIN 24550

up to 490 l/min, up to 10 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head, filter bowl and a bolt-on cover plate.

Standard equipment:

- bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:
Betamicron® (BN4HC): 20 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	10 bar
Temperature range	-10 °C to +100 °C
Material of filter head	Aluminium
Material of filter bowl	Polyamide
Material of cover plate	Polyamide (RFN 40 to 100) Aluminium (RFN 160 to 630)
Type of clogging indicator	VR Connection thread G 1/2 VMF Connection thread G 1/8
Pressure setting of the clogging indicator	2.5 bar (others on request)
Bypass cracking pressure	3.5 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Tank-top filter

1.6 SPECIAL MODELS AND ACCESSORIES

On request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

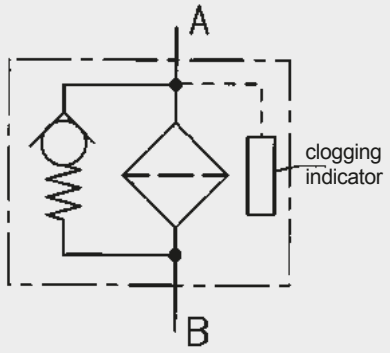
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



VA = clogging indicator

2. MODEL CODE (also order example)

RFN BN/HC 250 B F 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
RFN

Filter material
BN/HC Betamicron® (BN4HC)

Size of filter or element
RFN: 40, 63, 100, 160, 250, 400, 630

Operating pressure
B = 10 bar
V = 7 bar (for RFN with clogging indicator up to max. 7 bar operating pressure)

Type and size of port
to DIN 24550 (●), possible ports (X)

Type	Connection	Filter size						
		40	63	100	160	250	400	630
B	G ½	●	X	X				
C	G ¾	X	●	X				
D	G 1	X	X	●				
E	G1 ¼				●	X		
F	G1 ½				X	●		
M	DN 64						X	●

Filtration rating in µm
BN/HC: 3, 6, 10, 25

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
] only for clogging indicators type D
AV LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connection to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO specification)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz specification)
D4C LZ indicator with plug and connector to Daimler-Chrysler specification and cold start suppression 30°C
BO-LED as for BO, but with diode strip
GM LZ indicator with "no element" indicator
30C LZ indicator with temperature limiter (only in conjunction with type DB)
T with tank breather filter (only RFN 40, 63, 100)
BAN filling connection G¾ (from size RFN 160)
Vxxx outlet extension (xxx = corresponding length in mm)
V FPM seals

2.2 REPLACEMENT ELEMENT

0250 RN 010 BN4HC /-V

Size
0040, 0063, 0100, 0160, 0250, 0400, 0630

Type
RN

Filtration rating in µm
BN4HC: 003, 006, 010, 025

Filter material
BN4HC

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VR 2.5 D . X /-L24

Type of clogging indicator
VR connection thread G 1/2 (size 160 and above)
VMF connection thread G 1/8 (only size 40, 63, 100)

Pressure setting
2.5 standard 2.5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
V for all VR indicators
for all VMF indicators only for types B, LE, LZ and C /-EX2G
(all other VMF indicators have FPM seals as standard)
L..., LED, (for descriptions, see point 2.1.)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

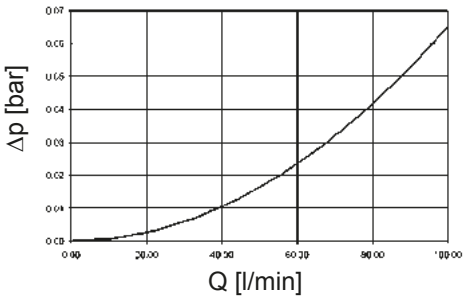
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

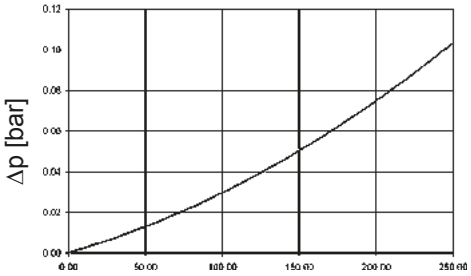
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

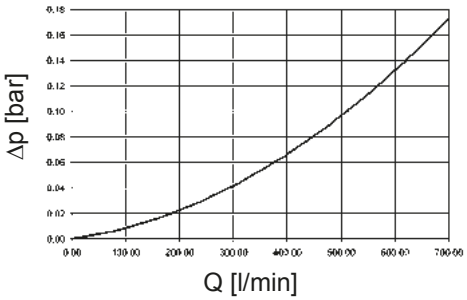
RFN 40/63/100



RFN 160/250



RFN 400/630



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

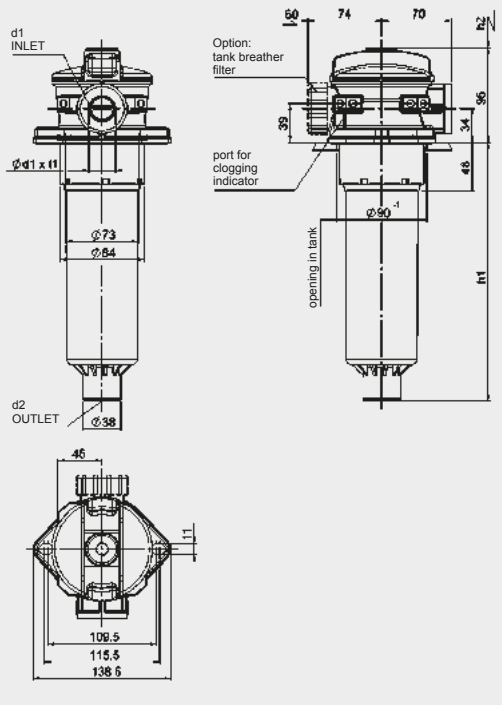
RFN	BN4HC			
	3 µm	6 µm	10 µm	25 µm
40	14.2	7.8	4.8	2.6
63	9.5	5.2	3.4	1.8
100	6.8	3.3	2.3	1.2
160	3.6	1.8	1.2	0.5
250	2.8	1.4	0.9	0.4
400	2.2	1.6	1.3	1.0
630	2.1	1.6	1.3	0.9

4. DIMENSIONS

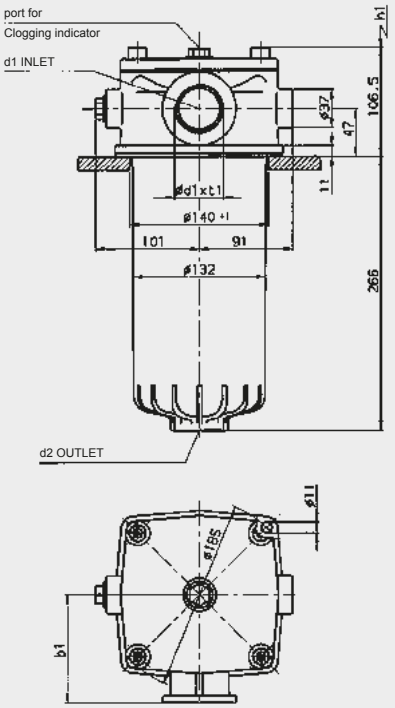
Tank requirements

1. In the filter contact area, the tank flange should have a maximum flatness of 0.3 mm and RA 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter. As an alternative, the tank flange can be continuously welded from the inside.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.
5. When using a dipstick through a mounting screw, threadlock the screw into the thread, using Loctite 243, for example, or a similar threadlocker.

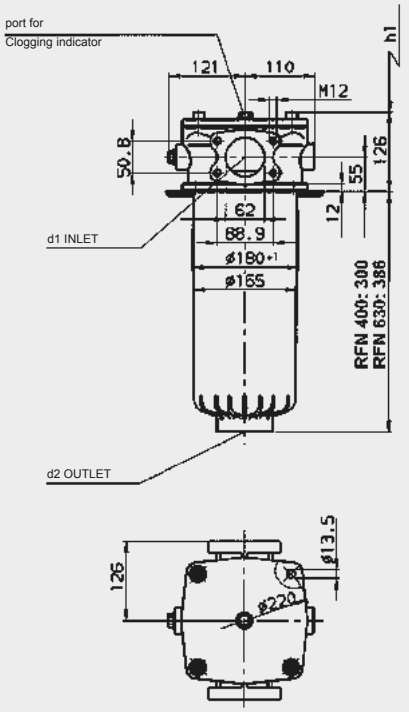
RFN 40, 63, 100



RFN 160, 250



RFN 400, 630



Flange interface / opening in tank to DIN 24550

RFN	d1 Inlet	d2 Outlet	b1	h1	h2	$t1^{+2}$	Weight including element [kg]	Volume of pressure chamber [l]
40	G ½	32	70	122	150	14	1.0	0.6
40	G ¾	32	70	122	150	16	1.0	0.6
40	G ¾	32	70	122	150	16	1.0	0.6
63	G ½	32	70	206	200	14	1.2	0.9
63	G ¾	32	70	206	200	16	1.2	0.9
63	G 1	32	70	206	200	18	1.2	0.9
100	G ½	32	70	260	290	14	1.3	1.0
100	G ¾	32	70	260	290	16	1.3	1.0
100	G 1	32	70	260	290	18	1.3	1.0
160	G 1¼	G 1½	142	210	-	20	4.6	3.5
160	G 1¼	G 1½	105	210	-	22	4.6	3.5
250	G 1¼	G 1½	142	300	-	20	6.0	3.5
250	G 1¼	G 1½	105	300	-	22	6.0	3.5
400	DN 64	G 2½	-	270	-	-	9.3	8.0
630	DN 64	G 2½	-	420	-	-	10.0	8.0

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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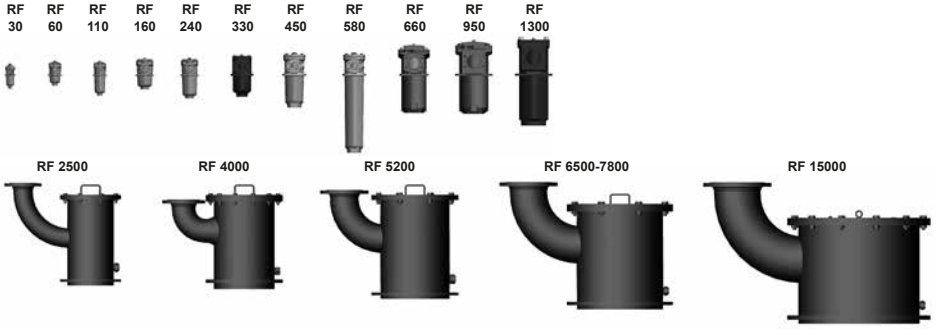
Return Line Filter RF
up to 15000 l/min, up to 25 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter housing and a threaded cover plate.

Standard equipment:

- bypass valve in the element. For RF 450/580 the bypass valve is built into the cover plate as standard.
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943 ISO 3724, ISO 3968, ISO 11170 ISO 16889

Number of filter elements

RF	Elements
30	1x0030R
60	1x0060R
110	1x0110R
160	1x0160R
240	1x0240R
330	1x0330R
450	1x0450R
580	1x0580R
660	1x0660R
950	1x0950R
1300	1x1300R
2500	3x0850R
4000	5x0850R
5200	4x1300R
6500	5x1300R
7800	6x1300R
15000	10x1300R

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Paper (P/HC):	10 bar
Stainl. st. wire mesh (W/HC):	20 bar
Stainless steel fibre (V):	210 bar
Betamicron®/Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	RF 30, 2500 to 15000: RF 450 and 580: RF 60 to 1300:	10 bar 16 bar 25 bar
Temperature range	-10 °C to +100 °C	
Material of filter housing and cover plate	RF 30: RF 60 to 580: RF 660 to 1300: RF 2500 to 15000:	PA 66 Aluminium EN-GJS-400-15 Welded steel
Type of clogging indicator	VR Connection thread G ½ (return line indicator up to 25 bar operating pressure) VM Differential pressure indicator only for RF 450 and 580	
Pressure setting of clogging indicator	2 bar (others on request)	
Bypass cracking pressure	3 bar (others on request)	

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Tank-top or inline filter.
RF 450 and 580 are also suitable for horizontal installation (with check valve).

1.6 SPECIAL MODELS AND ACCESSORIES

On request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

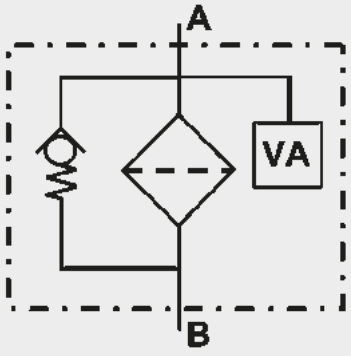
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.

Symbol for hydraulic systems



VA = clogging indicator

2. MODEL CODE (also order example)

RF ON 330 D L 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type

RF

Filter material

ON	Optimicron® (ON)	P/HC	Paper	AM	Aquamicron®
V	Stainless steel fibre	W/HC	Stainl. st. wire mesh	BN/AM	Betamicron®/Aquamicron®

Size of filter or element

RF: 30, 60, 110, 160, 240, 330, 450, 580, 660, 950, 1300, 2500, 4000, 5200, 6500, 7800, 15000

Operating pressure

B = 10 bar (RF 30, 2500 to 15000)
C = 16 bar (RF 450, 580)
D = 25 bar (RF 60 to 1300)
V = 7 bar (for RF with clogging indicator up to max. 7 bar operating pressure)

Type and size of connection

Type	Port	Filter size 30	60	110	160	240	330	450	580	660	950	1300	2500	4000	5200	6500	7800	15000
B	G ½	●																
C	G ¾		●	●														
E	G 1¼				●	●												
G	G 2						●											
L	SAE DN 50 (2")						●	●	●									
M	SAE DN 80 (3")									●								
N*	G 3									●								
O	SAE DN 90 (3½")										●							
P	SAE DN 100 (4")											●						
R	DIN DN 100												●					
U	DIN DN 125												●	●	●			
V	DIN DN 150													●	●	●		
W	DIN DN 200															●	●	
X	DIN DN 250																●	●
Y	DIN DN 300																	●

* This port G3 applies to filter outlet only (filter inlet = SAE DN 80)

Filtration rating in µm

ON:	1, 3, 5, 10, 15, 20	P/HC:	10, 20	BN/AM:	3, 10
V:	3, 5, 10, 20	W/HC:	25, 50, 100, 200	AM:	40

Type of clogging indicator

Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical

for other clogging indicators, see brochure no. 7.050../..

Type code

1 standard connection (only RF 30 to 1300)
2 RF 2500 to 15000: outlet for each filter element location spigot has threaded connection for pipe extension
3 RF 2500 to 15000: common elbow outlet

Modification number

X the latest version is always supplied

Supplementary details

B. cracking pressure of bypass (e.g. B6 = 6 bar, for RF 450/580: B7 = 7 bar)
DE differential pressure measurement across element (RF 660, 950, 1300)
DH cover plate lifting device (only RF 2500 to 15000)
GA mating weld connection flange in steel
KB without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt

only for clogging indicators type D

O O-ring groove on the DIN inlet flange (only RF 2500 to 15000)
T with tank breather filter (only RF 30)
V FPM seals

2.2 REPLACEMENT ELEMENT

0330 R 010 ON /-V

Size

0030, 0060, 0110, 0160, 0240, 0330, 0450, 0580, 0660, 0950, 1300

Type

R

Filtration rating in µm

ON:	001, 003, 005, 010, 015, 020	P/HC:	010, 020	BN4AM:	003, 010
V:	003, 005, 010, 020	W/HC:	025, 050, 100, 200	AM:	040

Filter material

ON, V, W/HC, P/HC, BN4AM, AM

Supplementary details

V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VR 2 D . X /-L24

Type of indicator

VR return line indicator up to 25 bar operating pressure (for RF 450/580: on request)
VM differential pressure indicator (only possible for RF 450/580)

Pressure setting

2 standard 2 bar, others on request

Type of clogging indicator (see Point 2.1)

Modification number

X the latest version is always supplied

Supplementary details

L..., LED, V (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

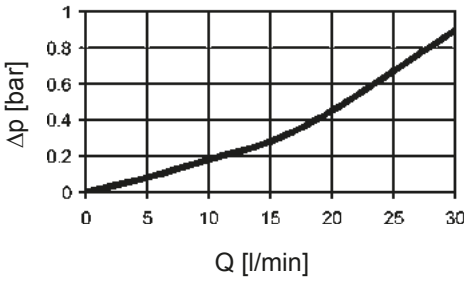
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

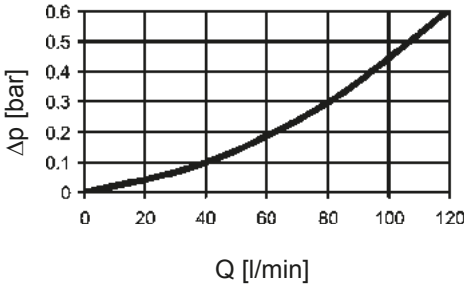
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

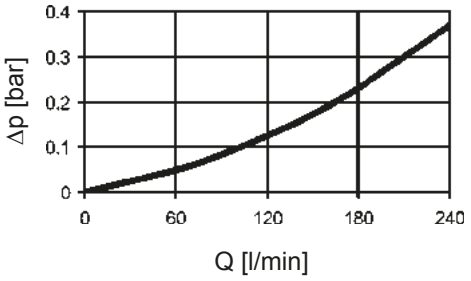
RF 30



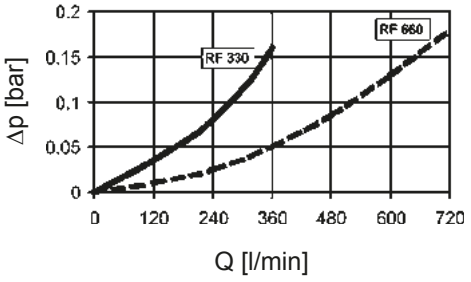
RF 60, 110



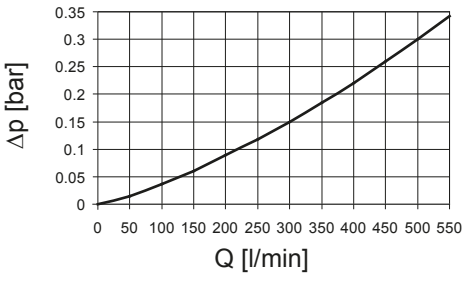
RF 160, 240



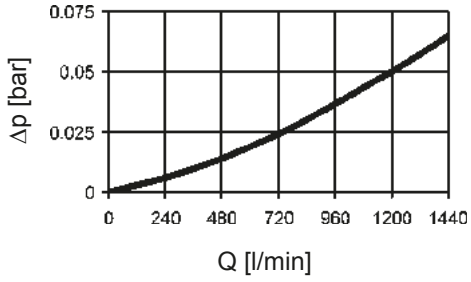
RF 330, 660



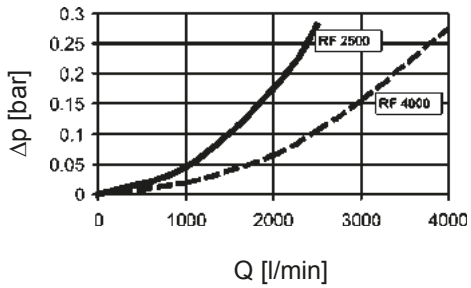
RF 450, 580



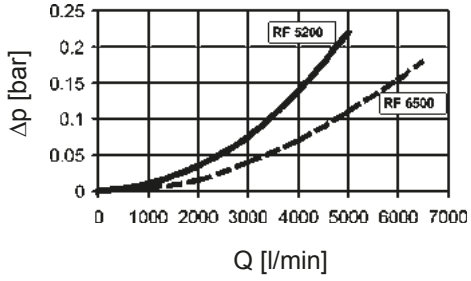
RF 950, 1300



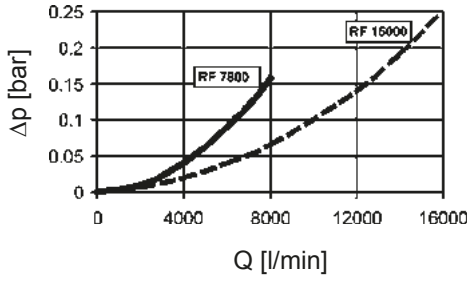
RF 2500, 4000



RF 5200, 6500



RF 7800, 15000



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

RF	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
30	89.8	68.4	43.9	26.8	16.8	14.7
60	47.2	23.6	17.2	9.82	9.01	6.85
110	22.3	13.1	8.87	5.40	4.26	3.24
160	16.0	8.00	5.68	3.22	2.69	2.32
240	10.4	5.18	3.66	2.27	1.84	1.41
330	8.09	3.72	2.73	1.48	1.28	1.02
450	6.33	3.17	2.30	1.40	1.00	0.85
580	2.49	1.23	0.90	0.53	0.40	0.34
660	3.57	1.69	1.21	0.67	0.57	0.45
950	2.39	1.03	0.79	0.48	0.38	0.31
1300	1.72	0.72	0.59	0.35	0.32	0.22

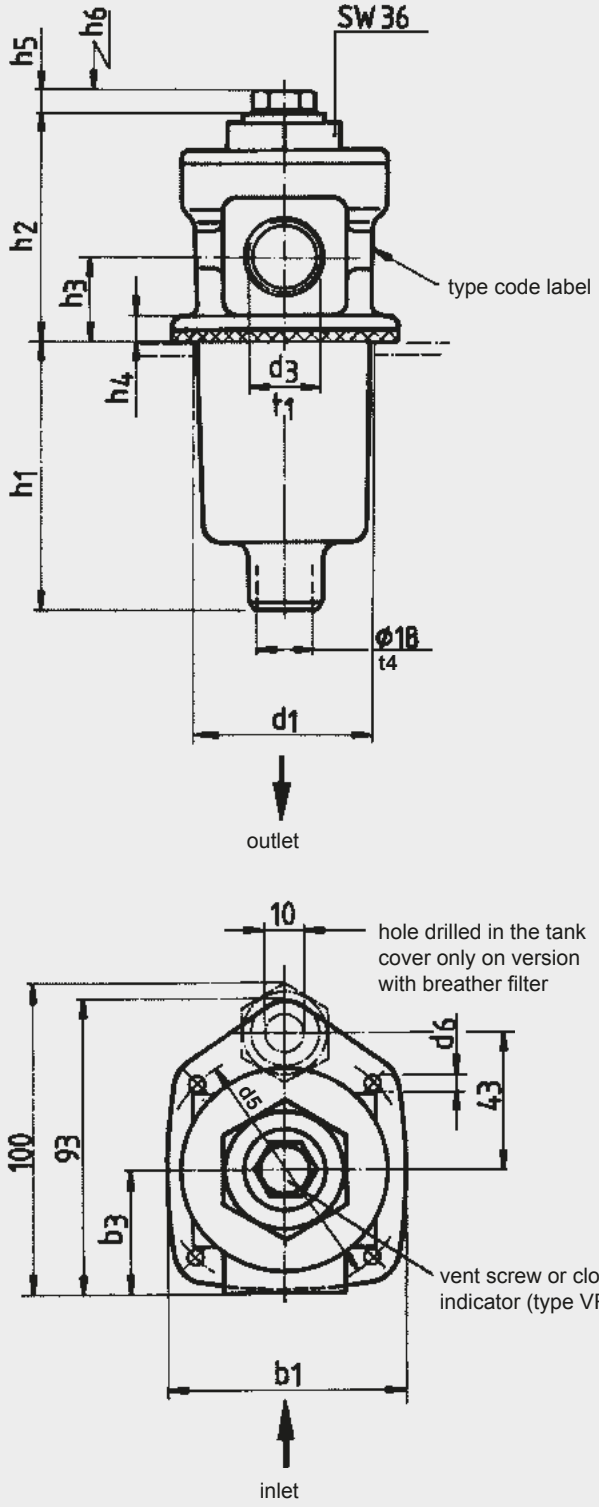
RF	V				W/HC
	3 µm	5 µm	10 µm	20 µm	–
30	19.4	14.2	7.9	3.8	–
60	15.9	9.3	5.4	3.3	0.611
110	7.6	5.1	3.0	2.0	0.30
160	4.9	3.5	2.4	1.5	0.193
240	3.2	2.6	1.7	1.2	0.123
330	2.1	1.7	1.1	0.8	0.195
450	1.7	1.3	0.9	0.6	0.165
580	0.7	0.5	0.3	0.3	0.065
660	1.0	0.8	0.6	0.4	0.067
950	0.7	0.6	0.4	0.2	0.048
1300	0.5	0.4	0.3	0.2	0.034

4. DIMENSIONS

Tank requirements

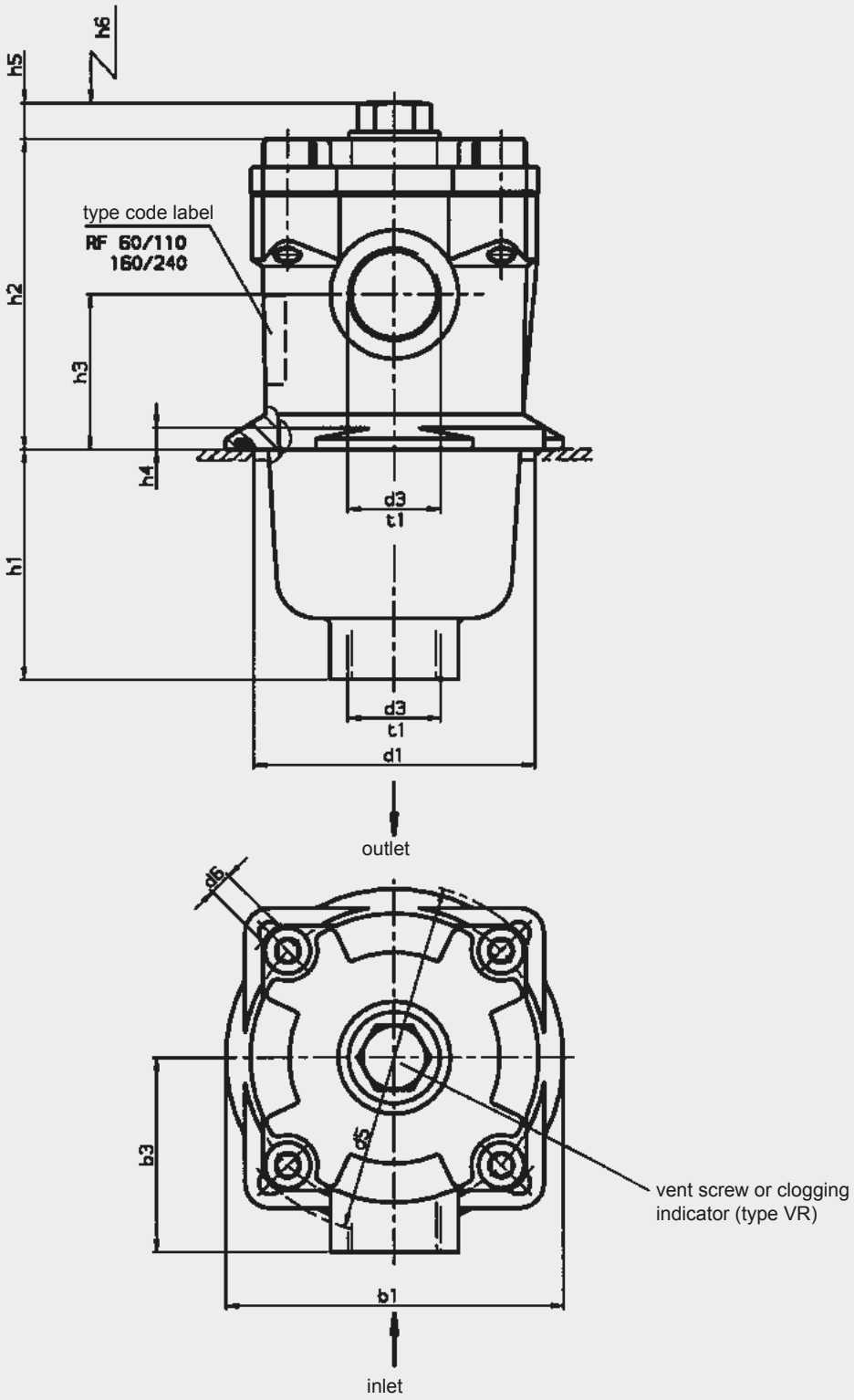
1. In the filter contact area, the tank flange should have a maximum flatness of 0.3 mm and Ra 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.

RF 30



RF	b1	b3	d1	d3[1)]	d5	d6[2)]	h1	h2	h3	h4	h5	h6	t1	t4	Weight including element [kg]	Volume of pressure chamber [l]
30	71	38	60	G ½	78	M4	86	70	27	8	11	90	14	14	0.4	0.18

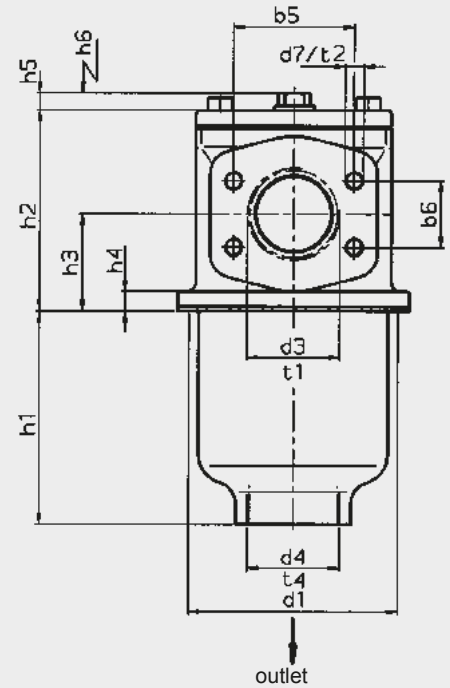
[1)] Threaded port to ISO 228 / [2)] Mounting hole for screw

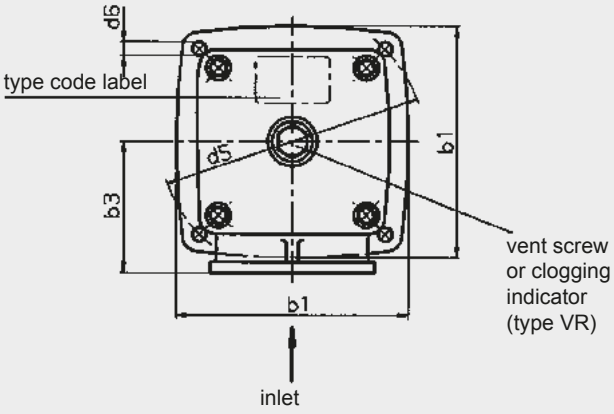


RF	b1	b3	d1	d3[1)]	d5	d6[2)]	h1	h2	h3	h4	h5	h6	t1	t4	Weight including element [kg]	Volume of pressure chamber [l]
60	96	55	80	G ¾	100	M5	66	88	44	6	12	80	17	-	0.9	0.40
110	96	55	80	G ¾	100	M5	133	88	44	6	12	145	17	-	1.1	0.60
160	126	72	106	G 1¼	135	M6	89	108	54	6	12	120	20	-	1.8	1.00
240	126	72	106	G 1¼	135	M6	150	108	54	6	12	180	20	-	2.2	1.40

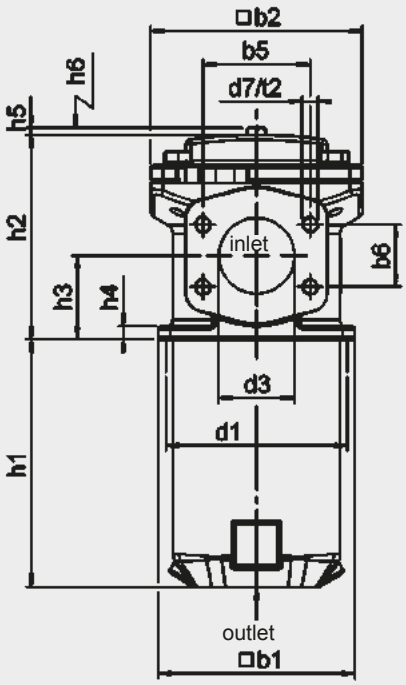
[1)] Threaded port to ISO 228 / [2)] Mounting hole for screw

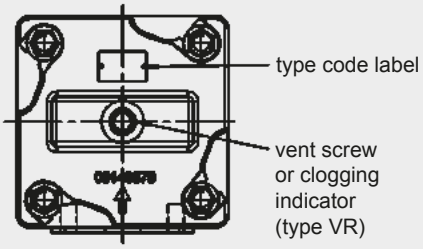
RF 330

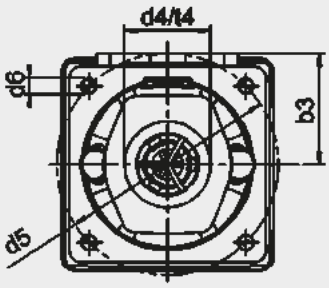




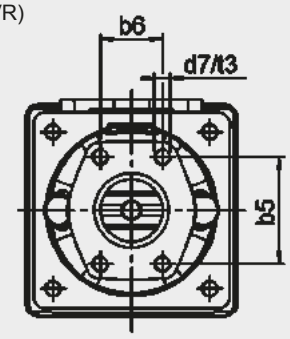
RF 660 - 1300







outlet: view
from below
RF 660 D N

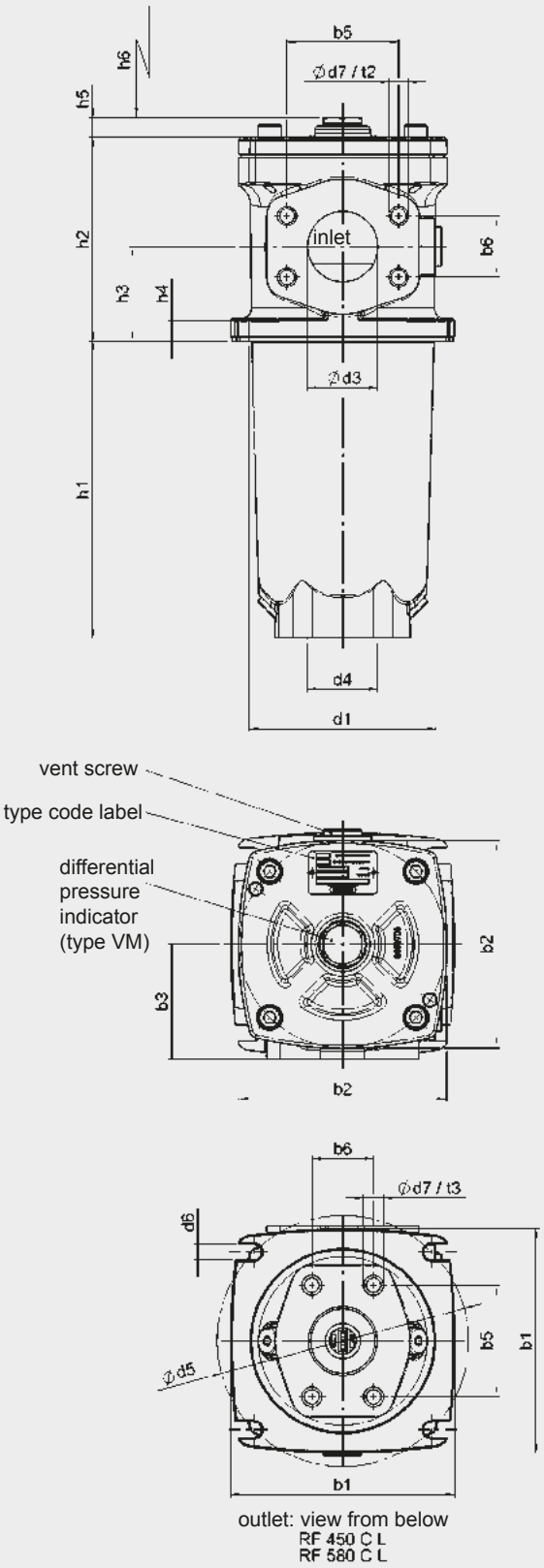


outlet: view
from below
RF 660 D M
RF 950 D O
RF 1300 D P

RF	b1	b2	b3	b5	b6	d1	d3	d4	d5	d6[1)]	d7	h1	h2	h3	h4	h5	h6	t1	t2	t3	t4	Weight including element [kg]	Volume of pressure chamber [l]
330	150	126	85	- 77.8	- 42.9	135	G2 SAE DN 50 (2")	G2	170	M8	- M12	139	130	63	13	12	180	27	- 23	-	27	4.1	2.0
660	195	210	110	106.4	61.9	180	SAE DN 80 (3")	G3 SAE DN 80 (3")	220	M12	M16	246	203	83	13	8	320	-	28	18	28	31.0	6.8
950	250	244	135	120.7	69.9	208	SAE DN 90 (3½")	SAE DN 90 (3½")	290	M16	M16	252.5	225	93	13	8	385	-	20	20	-	44.5	10.3
1300	250	244	145	130.2	77.8	208	SAE DN 100 (4")	SAE DN 100 (4")	290	M16	M16	330.5	269	121	13	8	485	-	20	20	-	52.5	13.5

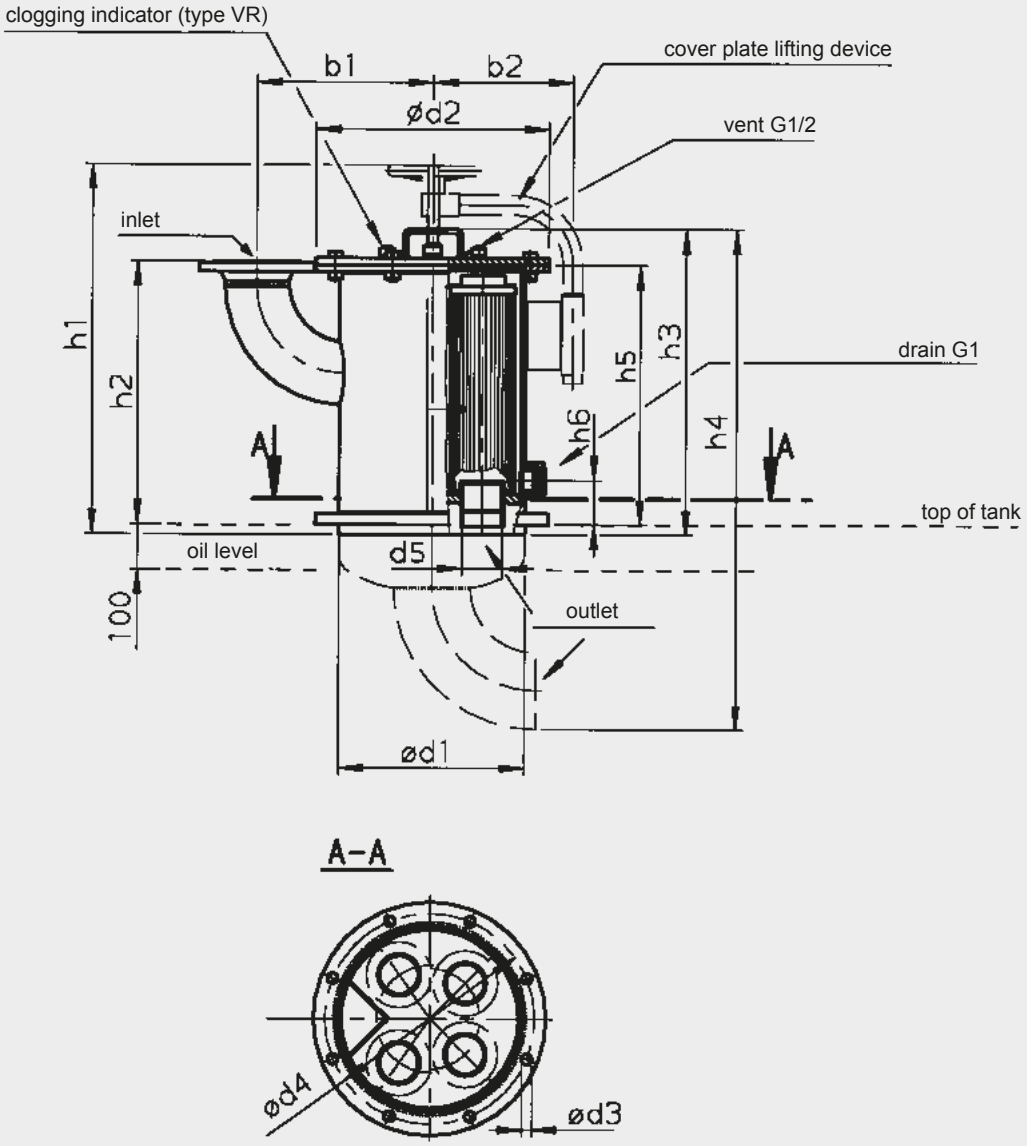
Filter connection for SAE flanges to SAE-J 518c / 3000 PSI / [1)] Mounting hole for screw

RF 450 / 580



RF	b1	b2	b3	b5	b6	d1	d3	d4	d5	d6 [1]	d7	h1	h2	h3	h4	h5	h6	t1	t2	t3	t4	Weight incl. element [kg]	Volume of pressure chamber [l]
450	156	144.5	80	77.8	42.9	130	SAE DN 50 (2")	SAE DN 50 (2")	175	M10	M12	207	142	66	14	14	345	-	22	22	-	6.6	2.7
580	156	144.5	80	77.8	42.9	130	SAE DN 50 (2")	SAE DN 50 (2")	175	M10	M12	507	142	66	14	14	645	-	22	22	-	9.4	4.7

Filter connection for SAE flanges to SAE-J 518c / 3000 PSI / [1] Mounting hole for screw



dimension h4 on request!

RF	Flange connection	h1	h2	h3	h5	h6	b1	b2	d1	d2	d3	d4	d5	No. of cover plate screws	Weight including element [kg]	Volume of pressure chamber [l]
2500	DIN DN 100 DIN DN 125	732	578 505	590	496	84	395 317	240	273	360	18	320	G2	8	55.3 58.3	26.0 29.0
4000	DIN DN 125 DIN DN 150	738	501 540	596	496	84	355 388	282	356	450	18	410	G2	12	97.3 101.3	44.0 48.0
5200	DIN DN 125 DIN DN 150	812	576 615	670	571	84	382 416	308	406	510	23	460	G3	8	119.1 126.1	64.0 68.0
6500	DIN DN 150 DIN DN 200	817	615 720	680	571	84	470 535	358	508	620	26	572	G3	8	175.1 186.1	98.0 108.0
7800	DIN DN 200 DIN DN 250	817	720 800	680	571	84	535 605	358	508	620	26	572	G3	8	187.1 202.1	108.0 126.0
15000	DIN DN 250 DIN DN 300	817	800 866	709	571	84	712 777	460	711	840	26	780	G3	12	329.1 382.1	224.0 247.0

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

HYDAC Filtertechnik GmbH
Industriegebiet
D-66280 Sulzbach/Saar
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

Tank-Top Return Line Filter RFND Change-Over Version

to DIN 24550
up to 480 l/min, up to 10 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head, filter bowl and a screw-on or bolt-on cover plate.

Standard equipment:

- bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:
Betamicron® (BN4HC): 20 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	10 bar
Temperature range	-10 °C to +100 °C
Material of filter head	Aluminium
Material of filter bowl	Polyamide
Material of cover plate	Polyamide (RFN 100) Aluminium (RFN 250 and 630)
Type of clogging indicator	VR Connection thread G 1/2 VMF Connection thread G 1/8
Pressure setting of the clogging indicator	2.5 bar (others on request)
Bypass cracking pressure	3.5 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Tank-top filter

1.6 SPECIAL MODELS AND ACCESSORIES

On request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

on request

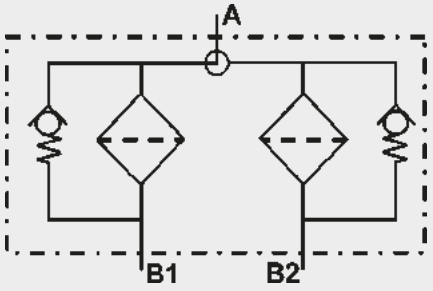
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 MAINTENANCE INSTRUCTIONS

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

RFND BN/HC 250 B A E 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
RFND

Filter material of element
BN/HC Betamicron® (BN4HC)

Size of filter or element
RFND: 100, 250, 630

Operating pressure
B = 10 bar
V = 7 bar (for RFND with clogging indicator up to max. 7 bar operating pressure)

Type of change-over
A = Ball

Type and size of connection

Type	Port	Filter size 100	250	630
C	G ¾	●		
E	G1 ¼		●	
L	SAE DN 50			●

Filtration rating in µm
BN/HC: 3, 6, 10, 25

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
L... light with appropriate voltage (24V, 48V, 110V, 220V)] only for clogging
LED 2 light emitting diodes up to 24 Volt] indicators type D
AV LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connection to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO specification)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz specification)
D4C LZ indicator with plug and connector to Daimler-Chrysler specification and cold start suppression 30°C
BO-LED as for BO, but with diode strip
GM LZ indicator with "no element" indicator
30C LZ indicator with temperature limiter (only in conjunction with type DB)
V FPM seals

2.2 REPLACEMENT ELEMENT

0250 RN 010 BN4HC /-V

Size
0100, 0250, 0630

Type
RN

Filtration rating in µm
BN4HC: 003, 006, 010, 025

Filter material
BN4HC

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VR 2.5 D . X /-L24

Type of clogging indicator
VR connection thread G 1/2
VMF connection thread G 1/8

Pressure setting
2.5 standard 2.5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
V for all VR indicators
for all VMF indicators only for types B, LE, LZ and C /-EX2G
(all other VMF indicators have FPM seals as standard)
L..., LED, (for descriptions, see point 2.1.)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

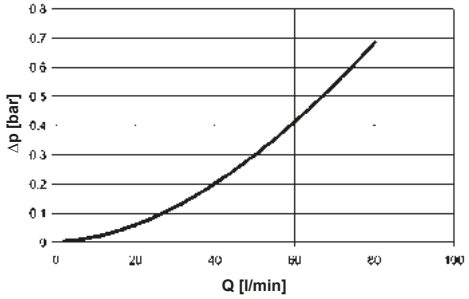
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

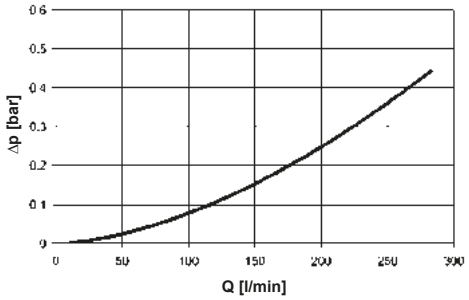
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

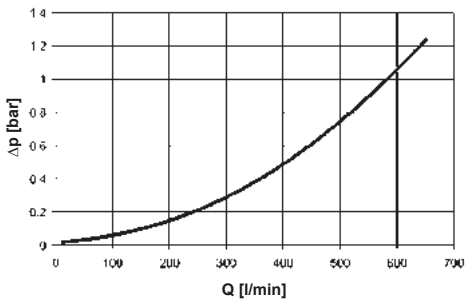
RFND 100



RFND 250



RFND 630



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

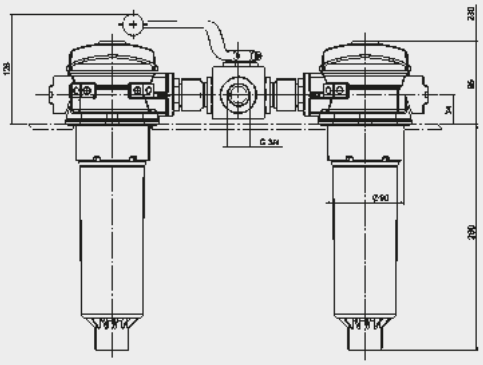
RFND	BN4HC			
	3 µm	6 µm	10 µm	25 µm
100	6.8	3.3	2.3	1.2
250	2.8	1.4	0.9	0.4
630	2.1	1.2	0.9	0.7

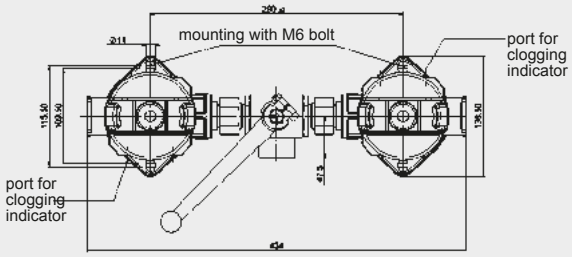
4. DIMENSIONS

Tank requirements

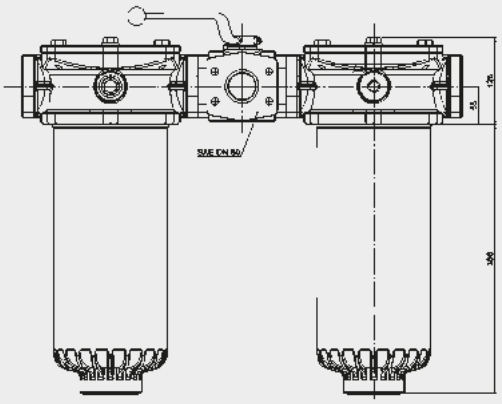
1. In the filter contact area, the tank flange should have a maximum flatness of 0.3 mm and RA 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter.
   As an alternative, the tank flange can be continuously welded from the inside.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.

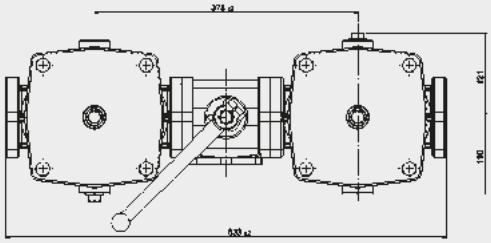
RFND 100





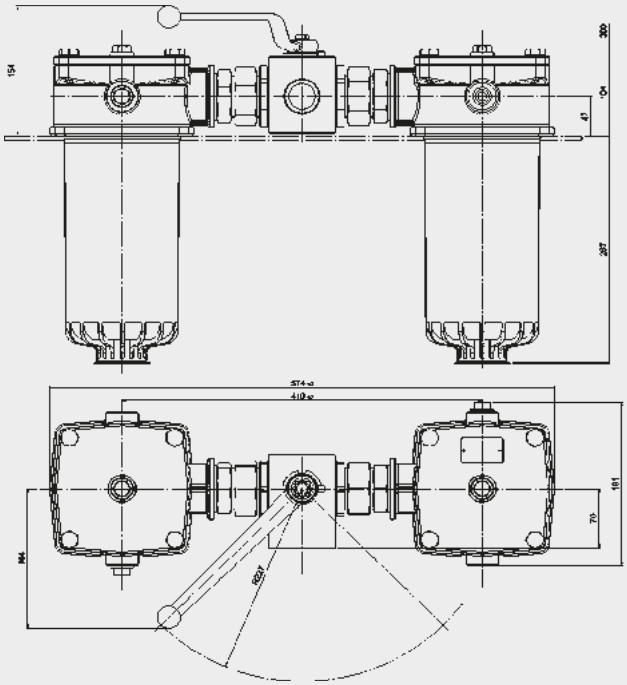
RFND 630





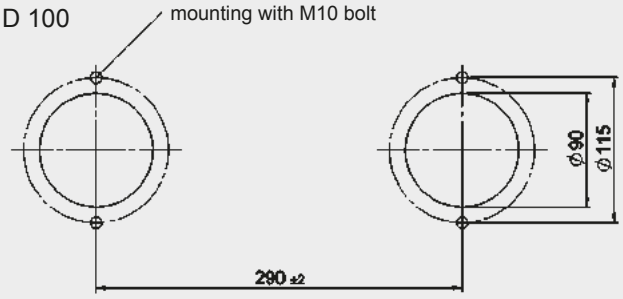
RFND	Weight incl. element [kg]	Vol. of pressure chamber [l]
100	5.4	2 x 1.00
250	13.0	2 x 3.50
630	23.0	2 x 8.00

RFND 250

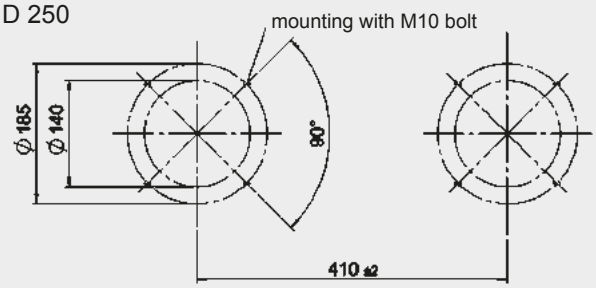


Flange interface / opening in tank to DIN 24550

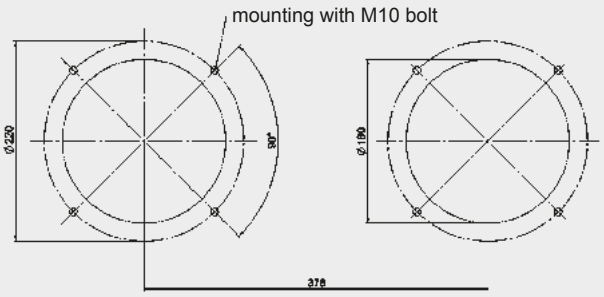
RFND 100



RFND 250



RFND 630



NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Change-Over Return Line Filter RFD

up to 1300 l/min, up to 25 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of one-piece housings with bolt-on cover plates. The two housings are connected by a ball change-over valve with negative overlap and single-lever operation.

Standard equipment:

- bypass valve
- connection for a clogging indicator (1 clogging indicator per filter side!)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Paper (P/HC):	10 bar
Stainl. st. wire mesh (W/HC):	20 bar
Stainless steel fibre (V):	210 bar
Betamicron®/Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	25 bar
Temperature range	-10 °C to +100 °C
Material of filter housing and cover plate	RFD 60 to 330: Aluminium RFD 660 to 1300: EN-GJS-400-15
Type of clogging indicator	VR Connection thread G ½ (return line indicator up to 25 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Tank-top filter

1.6 SPECIAL MODELS AND ACCESSORIES

On request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

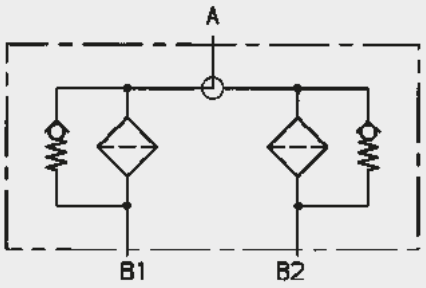
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) and CLP oils on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

RFD ON 330 D A L 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
RFD

Filter material

ON	Optimicron® (ON)	W/HC	Stainl. st. wire mesh
V	Stainless steel fibre	AM	Aquamicron®
P/HC	Paper	BN/AM	Betamicron®/Aquamicron® (BN4AM)

Size of filter or element
RFD: 60, 110, 160, 240, 330, 660, 950, 1300

Operating pressure
D = 25 bar
V = 7 bar (for RFD with clogging indicator up to max. 7 bar operating pressure)

Type of change-over
A Ball

Type and size of connection

Type	Connection	Filter size							
		60	110	160	240	330	660	950	1300
C	G ¾	●	●						
D	G 1			●	●				
G	G 2					●			
L	SAE DN 50 (2")					●			
M	SAE DN 80 (3")						●		
N*	G3						●		
P	SAE DN 100 (4")							●	●

* This port, G3, applies to filter outlet only

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20 P/HC: 10, 20 BN/AM: 3, 10
V: 3, 5, 10, 20 W/HC: 25, 50, 100, 200 AM: 40

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
B. special cracking pressure of bypass (e.g. B6 = 6 bar)
KB without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
] only for clogging indicators type D
SO136 filter housing of RFD 330 in EN-GJS-400-15
V FPM seals

2.2 REPLACEMENT ELEMENT

0330 R 010 ON /-V

Size
0060, 0110, 0160, 0240, 0330, 0660, 0950, 1300

Type
R

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020 P/HC: 010, 020 BN4AM: 003, 010
V: 003, 005, 010, 020 W/HC: 025, 050, 100, 200 AM: 040

Filter material
ON, V, W/HC, P/HC, BN4AM, AM

Supplementary details
V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VR 2 D . X /-L24

Type
VR return line indicator up to 25 bar operating pressure

Pressure setting
2 standard 2 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

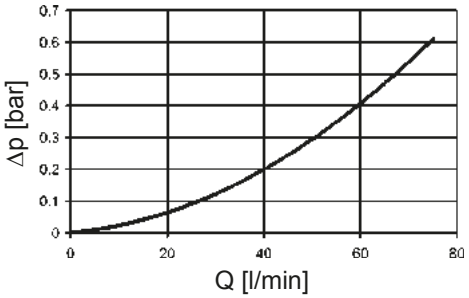
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

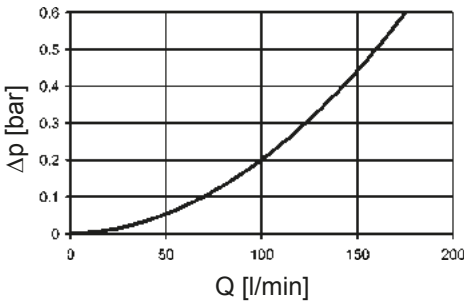
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

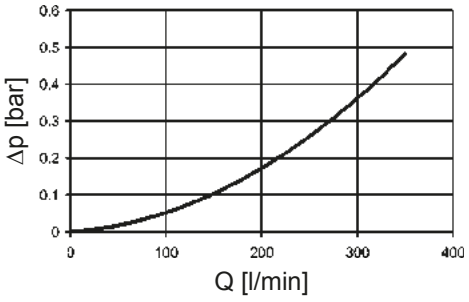
RFD 60, 110



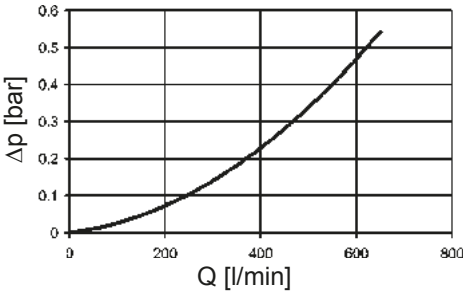
RFD 160, 240



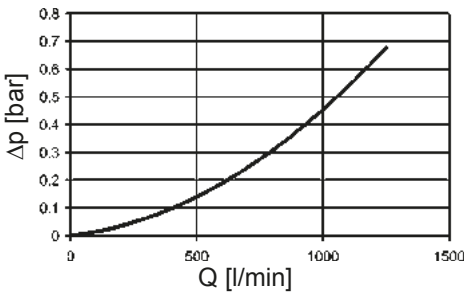
RFD 330



RFD 660, 950



RFD 1300



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

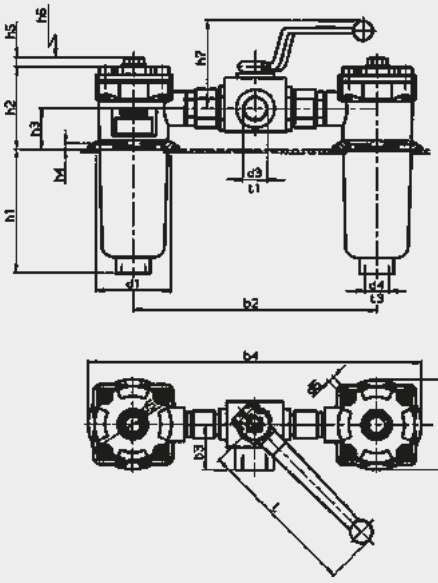
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

RFD	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
60	47.2	23.6	17.2	9.82	9.01	6.85
110	22.3	13.1	8.87	5.40	4.26	3.24
160	16.0	8.00	5.68	3.22	2.69	2.32
240	10.4	5.18	3.66	2.27	1.84	1.41
330	8.09	3.72	2.73	1.48	1.28	1.02
660	3.57	1.69	1.21	0.67	0.57	0.45
950	2.39	1.03	0.79	0.48	0.38	0.31
1300	1.72	0.72	0.59	0.35	0.32	0.22

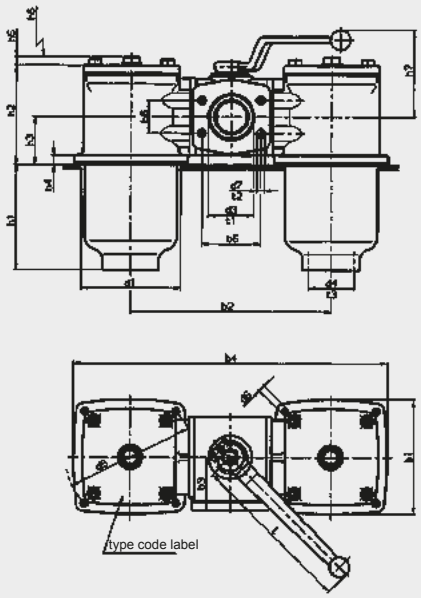
RFD	V				W/HC
	3 µm	5 µm	10 µm	20 µm	–
60	15.9	9.3	5.4	3.3	0.611
110	7.6	5.1	3.0	2.0	0.30
160	4.9	3.5	2.4	1.5	0.193
240	3.2	2.6	1.7	1.2	0.123
330	2.1	1.7	1.1	0.8	0.195
660	1.0	0.8	0.6	0.4	0.067
950	0.7	0.6	0.4	0.2	0.048
1300	0.5	0.4	0.3	0.2	0.034

4. DIMENSIONS

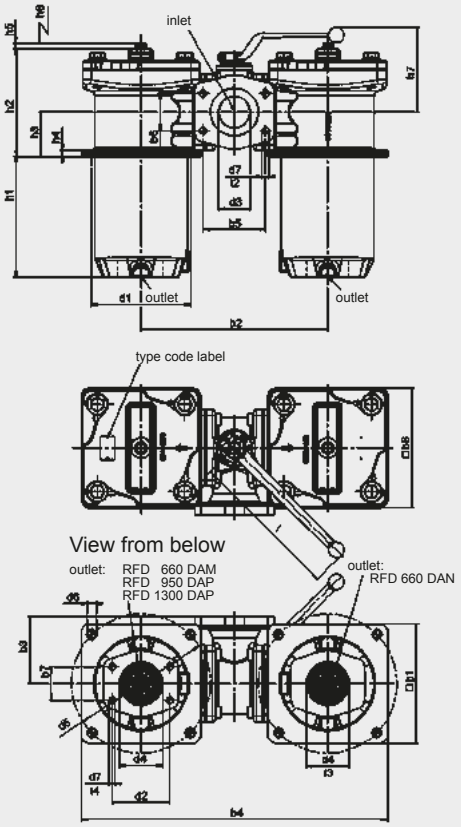
RFD 60-240



RFD 330



RFD 660-1300



Tank requirements

1. In the filter contact area, the tank flange should have a maximum flatness of 0.3 mm and Ra 3.2 µm maximum roughness.
2. In addition, the contact area should be free of damage and scratches.
3. The fixing holes of the tank flange must be blind, or stud bolts with threadlocker must be used to fix the filter.
   As an alternative, the tank flange can be continuously welded from the inside.
4. Both the tank sheet metal and/or the filter mounting flange must be sufficiently robust so that neither deform when the seal is compressed during tightening.

RFD	60	110	160	240	330	660	950	1300
b1	96	96	126	126	150	195	250	250
$b2_{\pm 1.5}$	260.5	260.5	335.5	335.5	254	330	390	410
b3	47.5	47.5	56.5	56.5	69	100	140	140
b4	357	357	461	461	404	540	640	660
b5	-	-	-	-	77.8	106.5	130.2	130.2
b6	-	-	-	-	42.9	61.9	77.8	77.8
b7	-	-	-	-	-	61.9	69.9	77.8
b8	-	-	-	-	-	210	244	244
d1	80	80	106	106	135	180	208	208
d2	-	-	-	-	-	106.4	120.7	130.2
d3	G ¾	G ¾	G 1	G 1	G 2 / SAE DN 50 (2")	SAE DN 80 (3")	SAE DN 100 (4")	SAE DN 100 (4")
d4	G ¾	G ¾	G 1¼	G 1¼	G 2	G 3 or SAE DN 80 (3")	SAE DN 90 (3½ ")	SAE DN 100 (4")
d5	100	100	135	135	170	220	290	290
d6[1)]	Ø8 (M5)	Ø8 (M5)	Ø9.5 (M6)	Ø9.5 (M6)	Ø16 (M8)	Ø14 (M12)	Ø18 (M16)	Ø16 (M16)
d7[2)]	-	-	-	-	- / M12	M16	M16	M16
h1	66	133	89	150	139	246	252.5	330.5
h2	88	88	108	108	130	203	225	269
h3	44	44	54	54	63	83	93	121
h4	6	6	6	6	13	13	13	13
h5	11	11	11	11	11	8	8	8
h6	80	145	120	180	180	320	385	485
h7	92	92	95	95	110	114	170	170
l	173	173	173	173	229	229	318	318
t1[2)]	16	16	24	24	24 / -	-	-	-
t2[2)]	-	-	-	-	- / 17	20	25	25
t3	17	17	20	20	27	28	-	-
t4	-	-	-	-	-	18	20	20
Weight incl. element [kg]	3.2	3.7	7.0	7.8	13.4	72.0	105.0	118.0
Volume of pressure chamber [l]	2x 0.30	2x 0.60	2x 1.00	2x 1.40	2x 2.00	2x 6.80	2x 10.30	2x 13.50

[1)] Mounting hole for bolt
[2)] Refers to the appropriate port (d3)

NOTE

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Subject to technical modifications.

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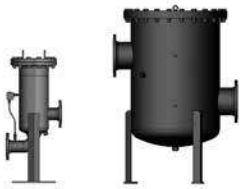
Inline Filter RFL Welded Version

up to 15000 l/min, up to 16 bar

RFL 1300 C K to RFL 15020 C Y



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a two-piece filter housing with a bolt-on cover plate.

Standard equipment:

- stand
- with bypass valve
- inlet and outlet are positioned at different heights on opposite sides
- connections for venting and draining
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943 ISO 3724, ISO 3968, ISO 11170 ISO 16889

Number of filter elements

RFL	Elements
130x	1x1300 R
132x	1x2600 R
250x	3x0850 R
252x	3x1700 R
400x	5x0850 R
402x	5x1700 R
520x	4x1300 R
522x	4x2600 R
650x	5x1300 R
652x	5x2600 R
780x	6x1300 R
782x	6x2600 R
1500x	10x1300 R
1502x	10x2600 R

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Optimicron® Power (ON/PO):	10 bar
Paper (P/HC):	10 bar
Stainl. st. wire mesh (W/HC):	20 bar
Stainless steel fibre (V):	30 bar
Betamicron®/Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	16 bar
Temperature range	-10 °C to +100 °C
Material of filter housing and cover plate	RFL 1300 to 15020: Welded steel RFL 1303 to 15023: Stainl. st. 1.4571
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Without bypass valve
- Drain and vent ports with ball valves or other shut-off valves
- Inlet and outlet positioned one above the other
- Counter flanges available for all sizes
- Venting line with sight gauges
- Cover plate lifting device

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

Material code (final digit of filter size) - 1:

These filters can be supplied with manufacturer's test certificates O and M to DIN 55350, Part 18. Test certificates 3.1 to DIN EN 10204.

Material code (final digit of filter size) - 3:

Filters for use in separation technology with low viscosity, high viscosity and aggressive fluids as well as gaseous media.*

* *These filters are available from HYDAC Process Technology division.*

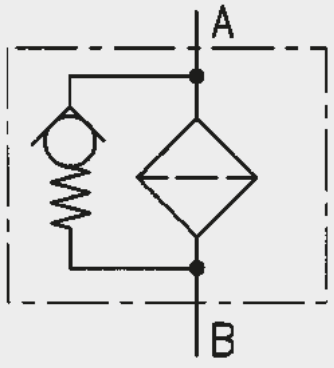
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

RFL ON 1300 C K 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type

RFL

Filter material

ON	Optimicron®	P/HC	Paper	AM	Aquamicron®
ON/PO	Optimicron® Power*	W/HC	Stainl. st. wire mesh	BN/AM	Betamicron®/Aquamicron®
V	Stainless steel fibre				

Size of filter or element

RFL: 1300, 1303, 1320, 1323, 2500, 2503, 2520, 2523, 4000, 4003, 4020, 4023, 5200, 5203, 5220, 5223, 6500, 6503, 6520, 6523, 7800, 7803, 7820, 7823, 15000, 15003, 15020, 15023

Operating pressure

C = 16 bar

Type and size of connection

Type	Port	Filter size							
		1300	1320	2500	4000	5200	6500	7800	15000
		1303	1323	2503	4003	5203	6503	7803	15003
				2520	4020	5220	6520	7820	15020
				2523	4023	5223	6523	7823	15023
K	DIN DN 40	●	●						
L	DIN DN 50	●	●	●					
M	DIN DN 65	●	●	●					
Q	DIN DN 80	●	●	●	●	●			
R	DIN DN 100	●	●	●	●	●	●	●	
U	DIN DN 125		●	●	●	●	●	●	
V	DIN DN 150			●	●	●	●	●	
W	DIN DN 200				●	●	●	●	●
X	DIN DN 250					●	●	●	●
Y	DIN DN 300								●

Filtration rating in µm

ON:	1, 3, 5, 10, 15, 20	P/HC:	10, 20	BN/AM:	3, 10
ON/PO*, V:	3, 5, 10, 20	W/HC:	25, 50, 100, 200	AM:	40

Type of clogging indicator

Y plastic blanking plug in indicator port
A stainless steel blanking plug in indicator port
B visual
C electrical
D visual and electrical

] for other clogging indicators, see brochure no. 7.050../..

Type code

1

Modification number

X the latest version is always supplied

Supplementary details

B. special cracking pressure of bypass (e.g. B1 = 1 bar)
DH cover plate lifting device
KB without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt

] only for clogging indicators type "D"

OR O-ring groove on the DIN flange (inlet and outlet) to Rexroth standard AB 22-04
RE sealing strip E on the flange (inlet and outlet): surface finish 3.6 µm
V FPM seals
33 inlet and outlet positioned one above the other

2.2 REPLACEMENT ELEMENT

1300 R 010 ON /-V

Size

0850, 1300, 1700, 2600

Type

R

Filtration rating in µm

ON:	001, 003, 005, 010, 015, 020	W/HC:	025, 050, 100, 200	BN4AM:	003, 010
ON/PO*, V:	003, 005, 010, 020	P/HC:	010, 020	AM:	040

Filter material

ON, ON/PO*, V, W/HC, P/HC, BN4AM, AM

Supplementary details

V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 2 D . X /-L24

Type

VM differential pressure indicator up to 210 bar operating pressure

Pressure setting

2 standard 2 bar, others on request

Type of clogging indicator (see Point 2.1)

Modification number

X the latest version is always supplied

Supplementary details

L..., LED, V (for descriptions, see point 2.1)

* Optimicron® Power only in filtration ratings 5, 10 and 20 µm

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

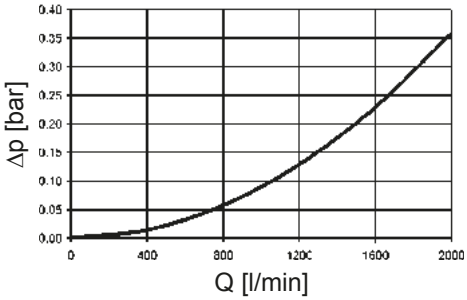
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

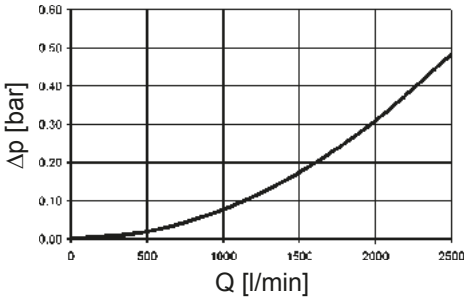
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

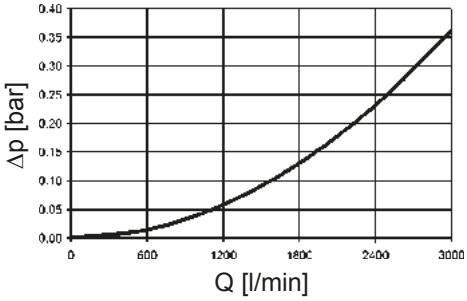
RFL 1300, 1303



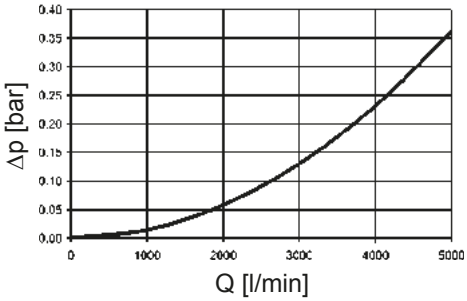
RFL 1320, 1323



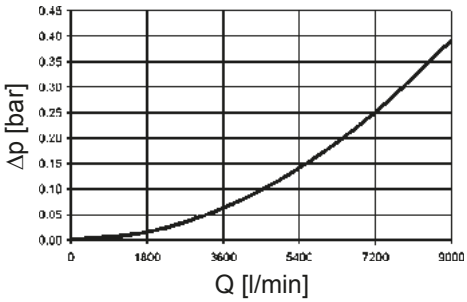
RFL 2500, 2503, 2520, 2523



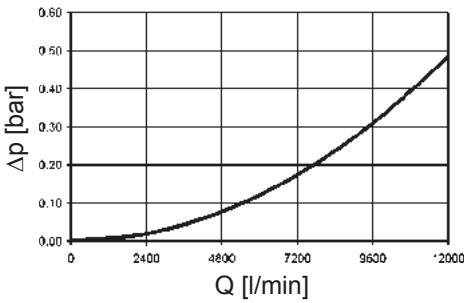
RFL 4000, 4003, 4020, 4023



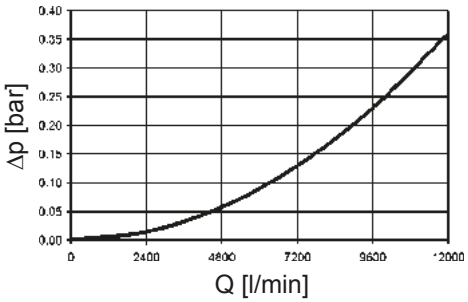
RFL 5200, 5203, 5220, 5223



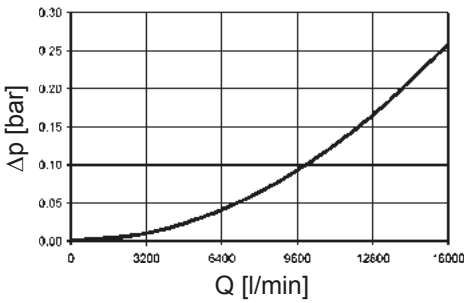
RFL 6500, 6503, 6520, 6523



RFL 7800, 7803, 7820, 7823



RFL 15000, 15003, 15020, 15023



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

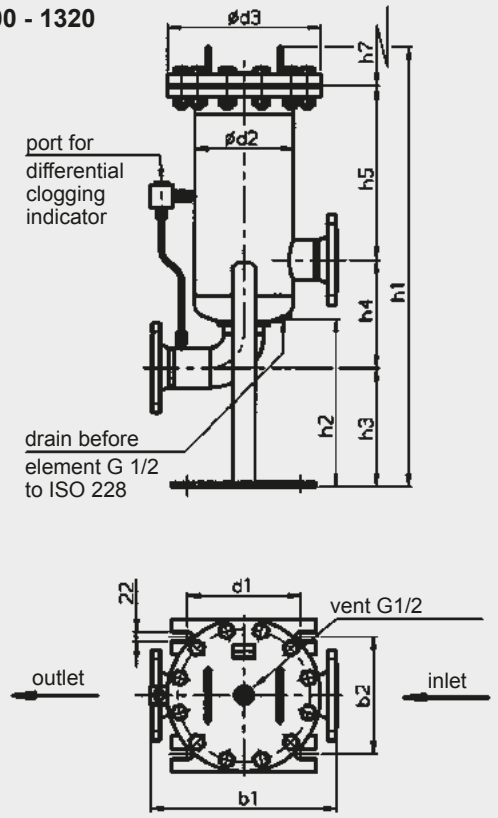
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

RFL	ON						ON/PO		
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	5 µm	10 µm	20 µm
850	2.77	1.31	1.00	0.58	0.44	0.36	0.28	0.24	0.16
1300	1.72	0.72	0.59	0.35	0.32	0.22	0.18	0.15	0.10
1700	1.35	0.64	0.53	0.28	0.25	0.18	0.13	0.11	0.07
2600	0.84	0.36	0.29	0.18	0.16	0.11	0.08	0.07	0.05

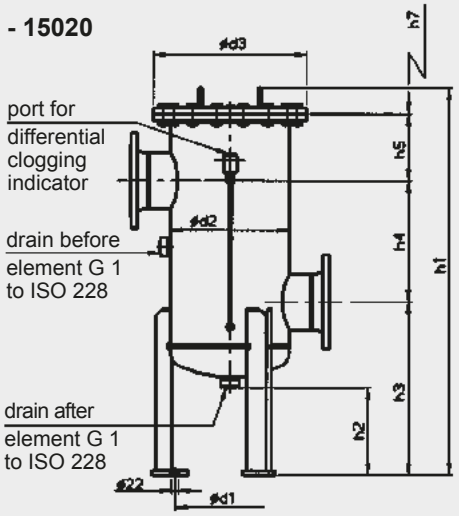
RFL	V				W/HC
	3 µm	5 µm	10 µm	20 µm	–
850	0.8	0.6	0.4	0.3	0.052
1300	0.5	0.4	0.3	0.2	0.048
1700	0.4	0.3	0.2	0.1	0.025
2600	0.3	0.2	0.1	0.1	0.017

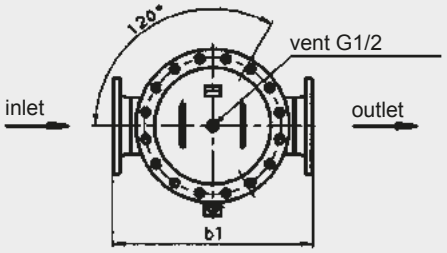
4. DIMENSIONS

RFL 1300 - 1320



RFL 2500 - 15020





RFL	Flange port	b1	b2	d1	d2	d3	h1	h2	h3	h4	h5	h7 including	Weight pressure element [kg]	Volume of chamber [l]
130x/132x	DIN DN 40 DIN DN 50 DIN DN 65 DIN DN 80 DIN DN 100	412	260	250	219.1	340	972/1416	370	294 266 279 266 253	212 240 227 240 275	384/824 384/824 384/824 384/824 362/802	500/940	64.1/78.1 64,1/78,1 65.1/79.1 67.1/81.1 69.1/83.1	18/33 18/33 18/33 19/34 19/34
132x	DIN DN 125	480	260	250	219.1	340	/1416	370	215	291	/824	/940	87.1	/36
250x/252x	DIN DN 50 DIN DN 65 DIN DN 80 DIN DN 100 DIN DN 125 DIN DN 150	466	312	250	273	360	942/1332 990/1380 990/1380 1050/1440 1050/1440 1050/1440	220	378 408 388 438 438 438	270 350 410 304 380 365	222/612 160/550 120/510 236/626 160/550 175/565	420/810 420/810 420/810 420/810 420/810 420/810	73,9/82,4 70.9/85.4 72.9/87.4 75.9/90.4 79.9/94.4 83.9/98.4	34/54 36/56 36/56 40/60 40/60 45/65
400x/402x	DIN DN 80 DIN DN 100 DIN DN 125 DIN DN 150 DIN DN 200	600	-	330	355.6	460	1079/1469 1079/1469 1169/1459 1169/1559 1204/1594	266	475 475 525 525 525	410 304 380 365 365	115/505 221/661 185/575 200/590 235/625	420/810 420/810 420/810 420/810 420/810	119.5/145.0 121.5/147.0 127.5/153.0 133.5/159.0 140.5/166.0	64/99 65/100 75/110 75/110 83/118
520x/522x	DIN DN 80 DIN DN 100 DIN DN 125 DIN DN 150 DIN DN 200 DIN DN 250	600 600 600 600 640 660	-	380	406.4	510	1144/1584 1144/1584 1256/1696 1256/1696 1256/1696 1324/1764	244	465 465 525 525 525 560	410 304 380 365 365 450	191/631 297/737 271/711 286/726 286/726 236/676	500/940	158.4/202.4 160.4/204.4 170.4/214.4 175.4/219.4 179.4/223.4 194.4/238.4	89/142 90/143 104/157 106/159 110/162 125/178
400x/402x	DIN DN 80 DIN DN 100 DIN DN 125 DIN DN 150 DIN DN 200	600	-	330	355.6	460	1079/1469 1079/1469 1169/1459 1169/1559 1204/1594	266	475 475 525 525 525	410 304 380 365 365	115/505 221/661 185/575 200/590 235/625	420/810 420/810 420/810 420/810 420/810	119.5/145.0 121.5/147.0 127.5/153.0 133.5/159.0 140.5/166.0	64/99 65/100 75/110 75/110 83/118
780x/782x	DIN DN 100 DIN DN 125 DIN DN 150 DIN DN 200 DIN DN 250	740 740 740 740 780	-	480	508	620	1260/1700 1260/1700 1260/1700 1380/1820 1380/1820	255	540 540 540 600 600	304 380 365 460 450	336/776 260/700 275/715 240/680 250/690	500/940	225.6/282.6 229.6/286.6 234.6/291.6 249.6/306.6 259.6/316.6	161/246 162/247 163/248 190/275 194/279
1500x/ 1502x	DIN DN 200 DIN DN 250 DIN DN 300	1000	-	690	711	830	1425/1865 1425/1865 1495/1935	263	655 655 670	365 450 515	330/770 245/685 235/675	500/940	476.0/570.0 488.0/582.0 513.0/607.0	391/558 397/564 426/593

DIN flange connection to DIN EN ISO 1092-1, PN 16 (with sealing strip, flange shape B1)

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

HYDAC Filtertechnik GmbH
Industriegebiet
D-66280 Sulzbach/Saar
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

Inline filters NF
up to 3500 l/min, up to 25 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter housing and a threaded cover plate.

Standard equipment:

- bypass valve
- port for clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Number of filter elements

NF	Elements
160	1x0160 R
240	1x0240 R
280	1x0280 R
330	1x0330 R
500	1x0500 R
750	1x0750 R
950	1x0950 R
13xx	1x1300 R
26xx	1x2600 R
5240	2x2600 R
7840	3x2600 R
10440	4x2600 R

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Optimicron® Pulp & Paper (ON/PP):	10 bar
Stainl. st. wire mesh (W/HC):	20 bar
Stainless steel fibre (V):	30 bar
Ecomicron® (ECON2)	10 bar
Paper (P/HC)	10 bar
Betamicron®/Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM)	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	25 bar
Max. operating pressure	30 bar at max. 10^6 cycles
Temperature range	-10 °C to +100 °C
Material of filter head	Aluminium
Material of tube (housing)	Steel up to NF 750 Aluminium for NF 950 and above
Material of cover plate	Aluminium
Type of clogging indicator	VM (differential pressure measurement)
Pressure setting of clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 MOUNTING

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Mounting bracket for NF 1310, 1340, 2610, 2640
- Mounting flange for NF 1340/2640
- Filling connection for NF 330, 500, 750, 950, 1350, 2650 on the contaminated side
- Foot bracket option for NF 160-750, 950, 1350, 2650
- Quick release coupling on the filling connection for NF 160, 240, 280
- Check valve on the clean side for NF 160, 240, 280
- For applications up to 40 bar, please make separate request! (only for NF 950, 1350, 2650)
- NF filter as tank-top return line filter (type code 1.x) and as inline filter (horizontal inlet flange at top, outlet vertical;(type code 3.x) on request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

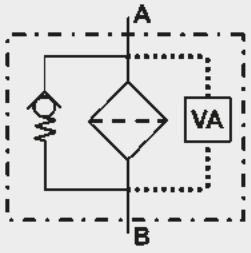
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using visual clogging indicators, the BM version (visual with manual reset) only should be used.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



VA = clogging indicator

2. MODEL CODE (also order example)

NF ON 2640 D P 10 D 2 . X /-L24

2.1 COMPLETE FILTER

Filter type

NF

Filter material

ON	Optimicron®	P/HC	Paper	BN/AM	Betamicron®/Aquamicron®
ON/PP*	Optimicron® Puls & Paper	W/HC	Stainl. st. wire mesh	AM	Aquamicron®
V	Stainless steel fibre	ECO/N	Ecomircron® (ECON2)		

Size of filter or element

NF: 160, 240, 280, 330, 500, 750, 950, 1310, 1340, 1350, 2610, 2640, 2650, 5240, 7840, 10440

Operating pressure

D = 25 bar

Type and size of connection

Type	Port	Filter size														
		160	240	280	330	500	750	950	1310	1340	1350	2610	2640	2650	5240	7840	10440
E	G 1 1/4	●	●	●													
F	G 1 1/2				●	●	●										
K	SAE DN 40 (1½")				●	●	●										
L	SAE DN 50 (2")							●			●			●			
M	SAE DN 65 (2½")							●			●			●			
N	SAE DN 80 (3")							●			●			●			
P	SAE DN 100 (4")							●	○	●	●	○	●	●	●	●	●

○ = Discontinued model

Filtration rating in µm

ON:	1, 3, 5, 10, 15, 20	ECO/N, V:	3, 5, 10, 20	P/HC:	10, 20	AM:	40
ON/PP*:	5	W/HC:	25, 50, 100, 200	BN/AM:	3, 10		

Type of clogging indicator

A with steel blanking plug in indicator port
BM visual
C electrical
D visual and electrical

for other clogging indicators see brochure no. 7.050../..

Type code (TKZ)

2

Modification number

X the latest version is always supplied

Supplementary details

B. special cracking pressure of bypass (e. g. B6 = 6 bar); no details = standard 3 bar
EM manual vent with shut-off valve
EP permanent vent via Minimess hose
FF mounting flange for NF 1340/2640
KB without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light emitting diodes up to 24 Volt
SB4 filling line with Ø 4 mm
V FPM seals

only for clogging indicators type "D"

2.2 REPLACEMENT ELEMENT

2600 R 010 ON /-V

Size

0160, 0240, 0280, 0330, 0500, 0750, 0950, 1300, 2600

Type

R

Filtration rating in µm

ON:	001, 003, 005, 010, 015, 020	ECON2, V:	003, 005, 010, 020	P/HC:	010, 020	AM:	040
ON/PP*:	005	W/HC:	025, 050, 100, 200	BN4AM:	003, 010		

Filter material

ON, ON/PP*, ECON2, V, W/HC, P/HC, BN4AM, AM

Supplementary details

V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

(IMPORTANT: the clogging indicator must not be screwed into the cover plate)

Type

VM Differential pressure indicator

Pressure setting

2 2 bar (5 = 5 bar), others on request

Type of clogging indicator (see point 2.1)

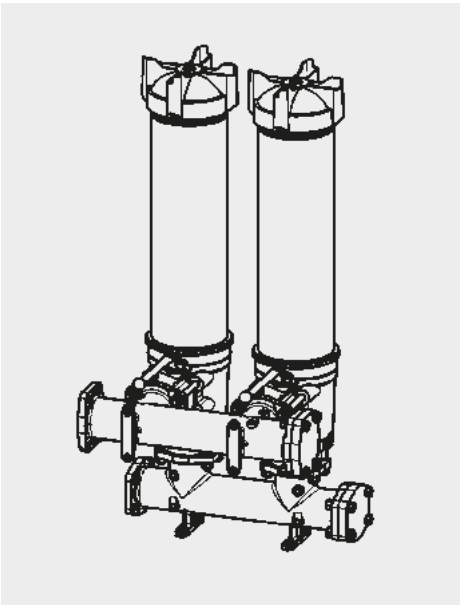
Modification number

X the latest version is always supplied

Supplementary details

L..., LED, V (for descriptions, see point 2.1)

* for BG 1340 filters and above



TECHNICAL DESCRIPTION

The NF n+1 filter series has been developed in line with the classic NF filters. It features a ball change-over valve from HYDAC Filtertechnik GmbH and offers a cost-efficient and space saving alternative to the classic, fully duplex version of the NF series. In comparison to the previous butterfly change-over valve with 16 bar operating pressure, the new HYDAC ball change-over valve is rated to the higher operating pressure of 25 bar. Since each filter tower can be shut off individually using the ball change-over valve, the filters can be changed while the system is running, guaranteeing 24 hour operation.

Flow rate: 500–4000 l/min
Nom. pressure: up to 25 bar
Size: 5240, 7840, 10440 (others on request)

MODEL CODE

NF ON 5240 D P 10 D 4 . X /-L24

Filter type
NF

Filter material (see point 2.1)

Size of filter or element
NF: 5240, 7840, 10440

Operating pressure
D = 25 bar

Type and size of connection

Type	Port	Filter size		
		5240	7840	10440
P	SAE DN 100 (4")	●	●	●

Filtration rating in µm (see point 2.1)

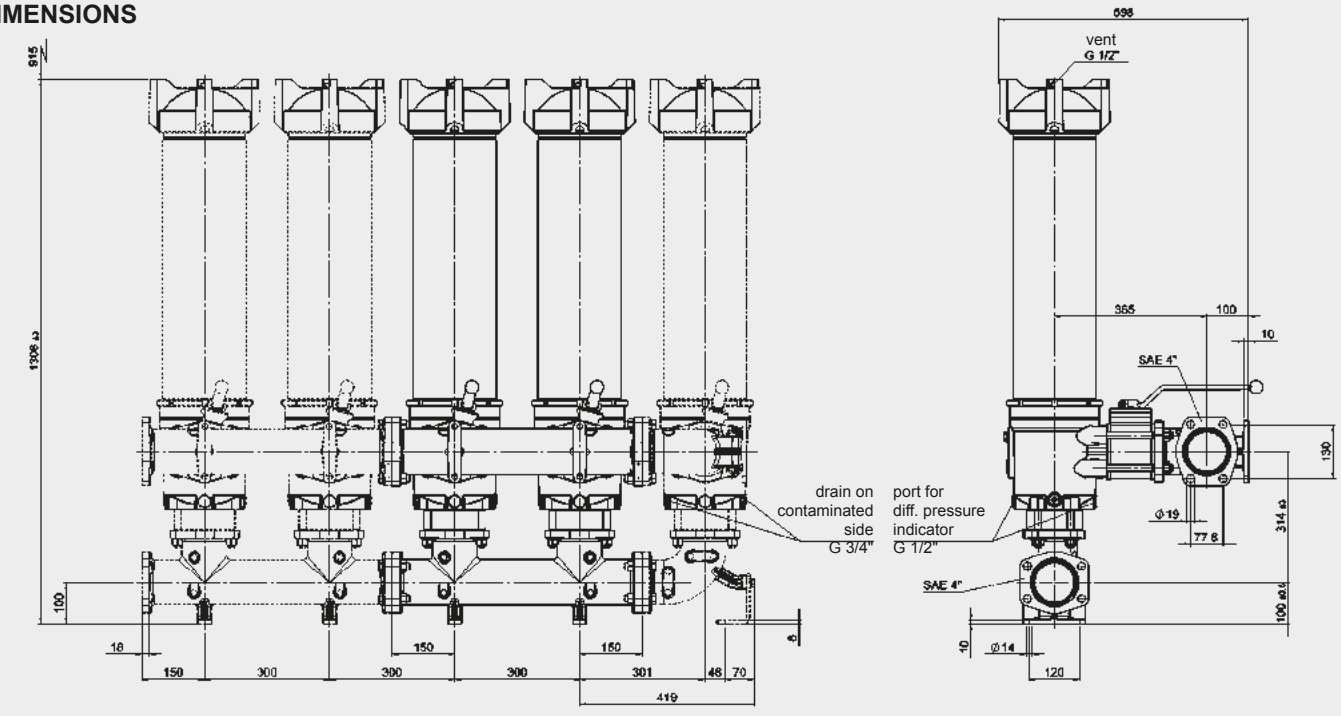
Type of clogging indicator (see point 2.1)

Type code
4 individual shut-off capability

Modification number
X the latest version is always supplied

Supplementary detail (see point 2.1)

DIMENSIONS



3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

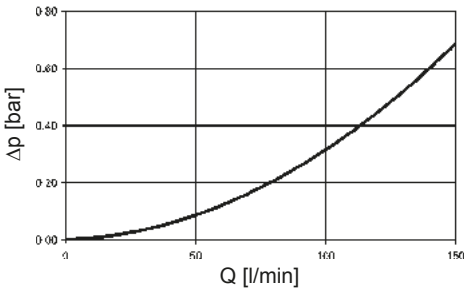
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

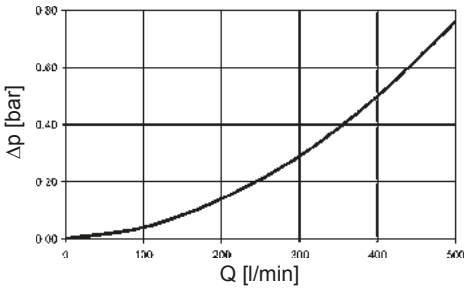
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

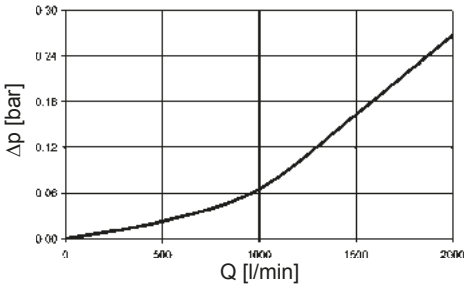
NF 160, 240, 280



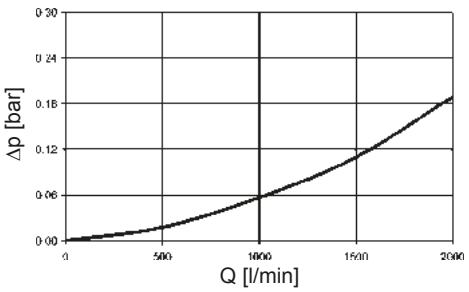
NF 330, 500, 750



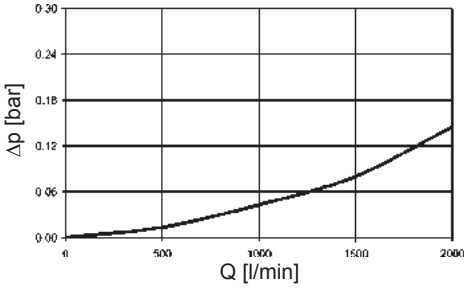
NF 1310, 2610
NF 1340, 2640
NF 950, 1350, 2650



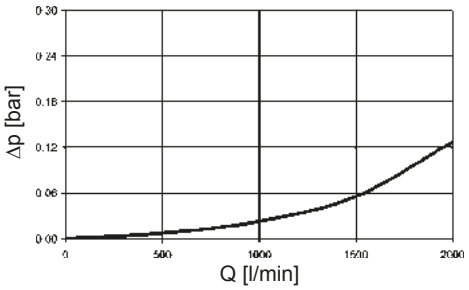
NF 5240



NF 7840



NF 10440



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

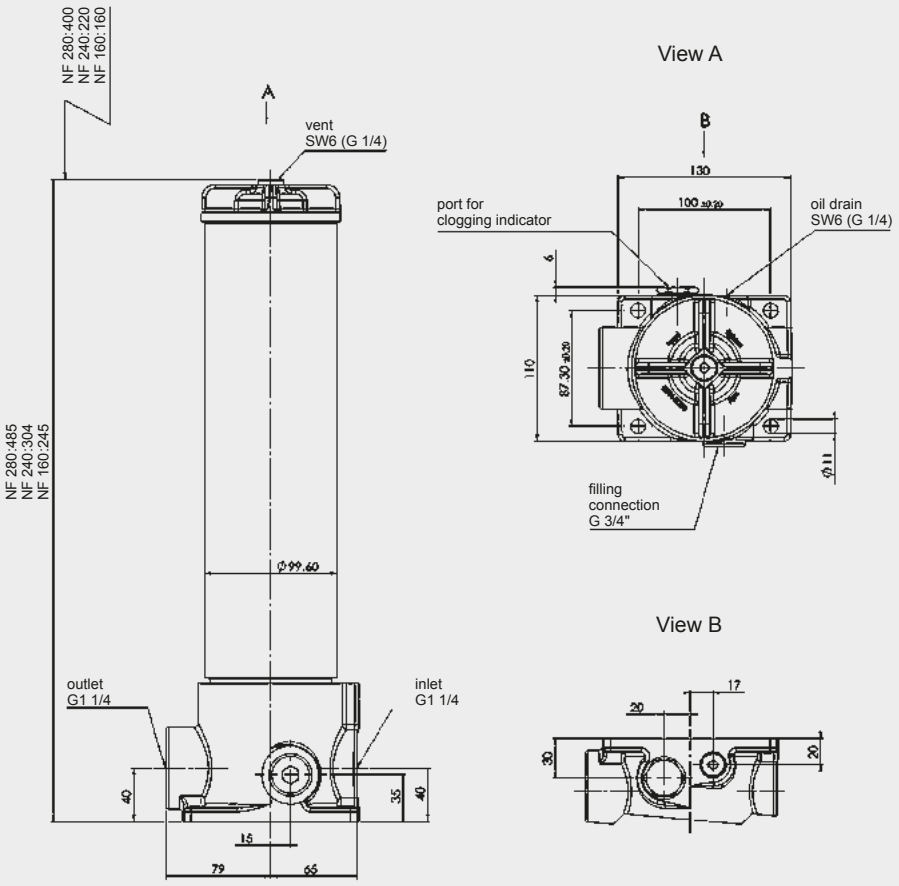
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

NF	ON						ON/PP
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	5 µm
160	16.0	8.00	5.68	3.22	2.69	2.32	–
240	10.4	5.18	3.66	2.27	1.84	1.41	–
280	5.10	2.57	2.08	1.43	1.06	0.80	–
330	8.09	3.72	2.73	1.48	1.28	1.02	–
500	5.27	2.60	1.90	1.09	0.84	0.69	–
750	2.11	1.12	0.92	0.53	0.34	0.32	–
950	2.39	1.03	0.79	0.48	0.38	0.31	–
1300	1.72	0.72	0.59	0.35	0.32	0.22	1.00
2600	0.84	0.36	0.29	0.18	0.16	0.11	0.45

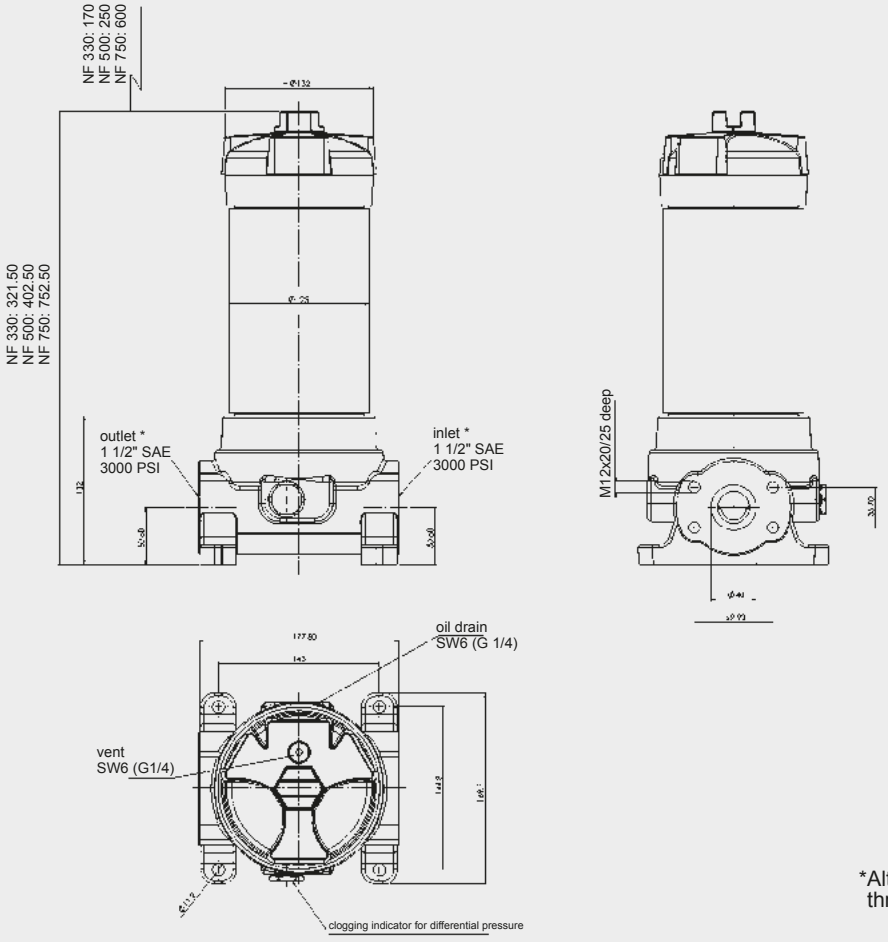
NF	V				W/HC	ECON2			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	5 µm	10 µm	20 µm
160	4.9	3.5	2.4	1.5	0.193	9.5	5.9	3.8	2.9
240	3.2	2.6	1.7	1.2	0.123	6.2	3.8	2.6	1.8
280	1.4	1.1	0.7	0.5	0.017	3.1	2.2	1.6	1.0
330	2.1	1.7	1.1	0.8	0.195	4.2	2.7	1.7	1.2
500	1.5	1.2	0.8	0.5	0.128	3.0	1.9	1.3	0.8
750	0.6	0.5	0.3	0.2	0.049	1.3	0.9	0.6	0.4
950	0.7	0.6	0.4	0.2	0.048	1.2	0.8	0.5	0.4
1300	0.5	0.4	0.3	0.2	0.034	0.8	0.6	0.4	0.3
2600	0.3	0.2	0.1	0.1	0.017	0.4	0.3	0.2	0.1

4. DIMENSIONS

NF 160-280



NF 330-750

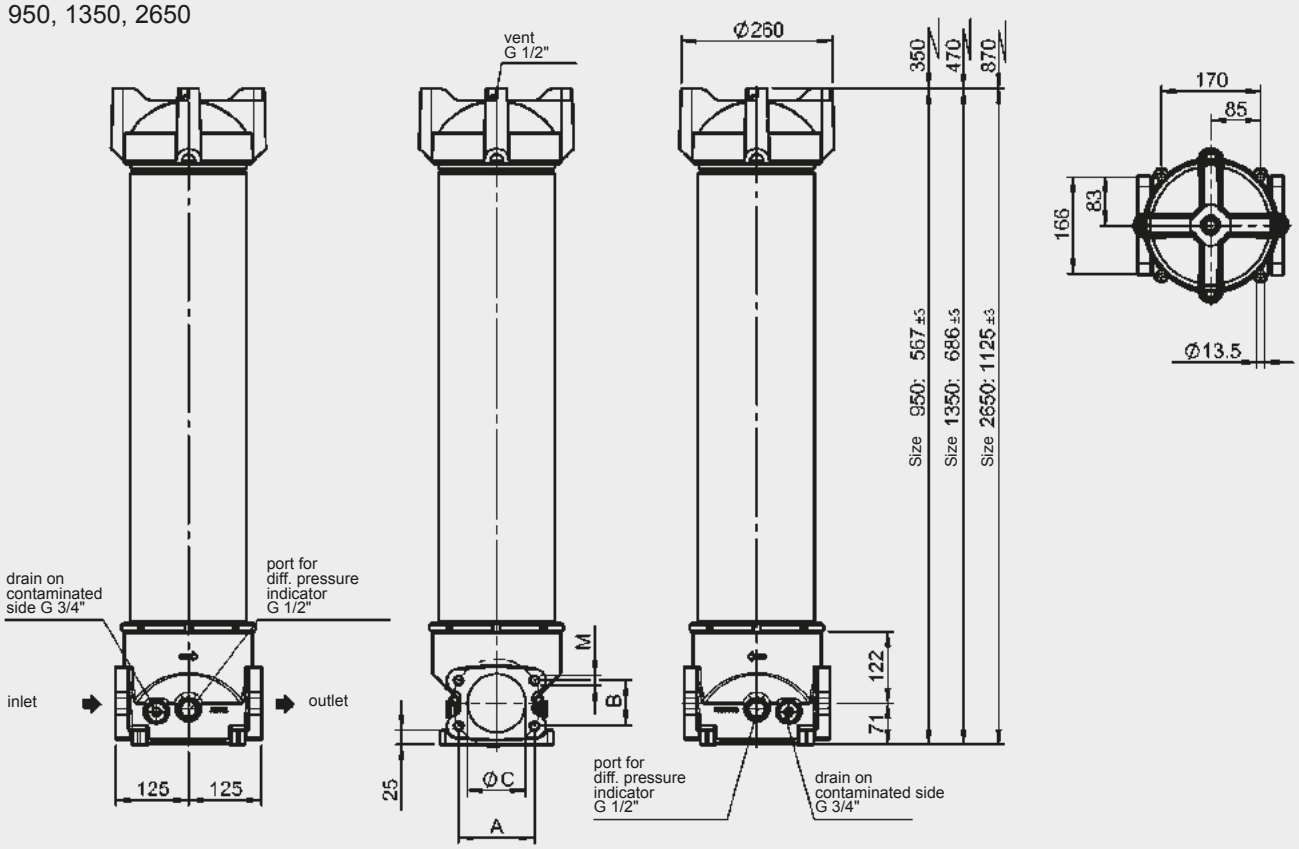


*Alternatively:
threaded connection G 1 1/2

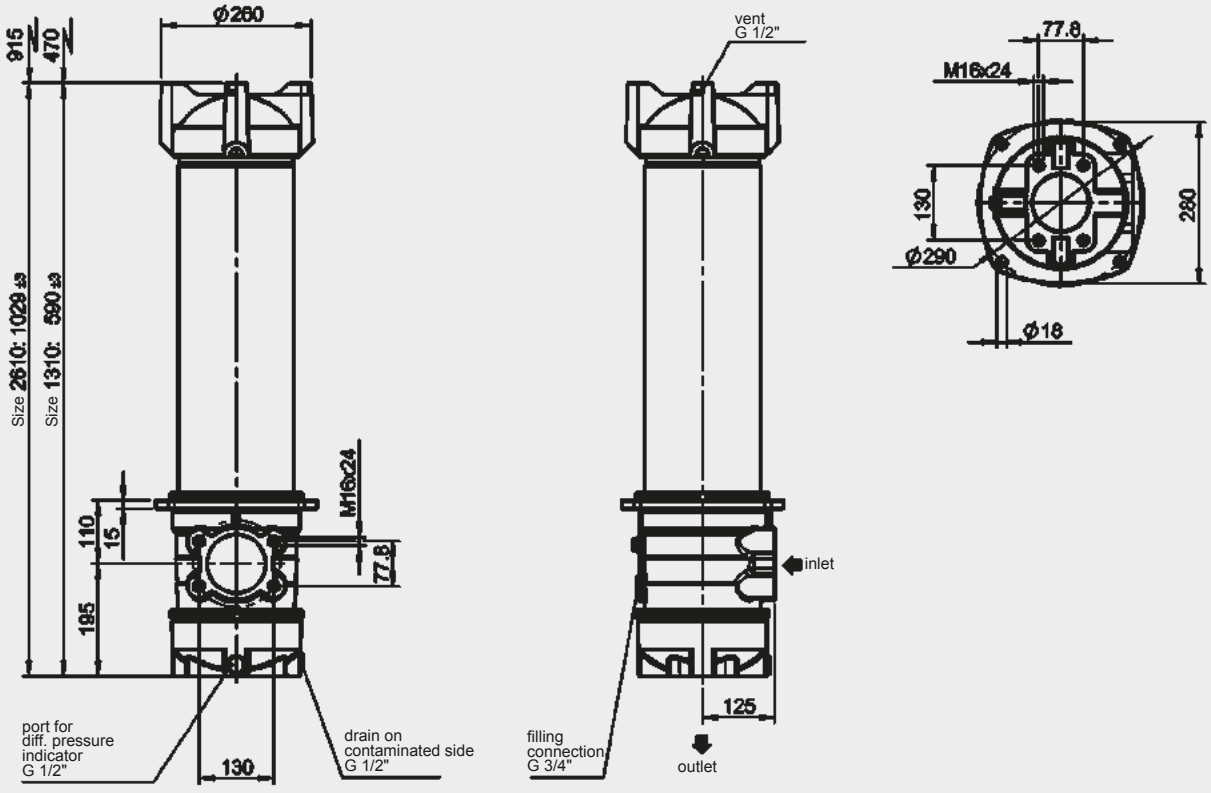
NF	No. of elements	Weight incl. element [kg]	Vol. of pressure chamber [l]
160	1x0160 R...	4.5	0.8
240	1x0240 R...	5.6	1.1
280	1x0280 R...	9.1	2.1

NF	No. of elements	Weight incl. element [kg]	Vol. of pressure chamber [l]
330	1x0330 R...	7.8	2.05
500	1x0500 R...	9.0	2.80
750	1x0750 R...	14.1	6.08

NF 950, 1350, 2650



NF 1310/2610 ... 2.X (on request)



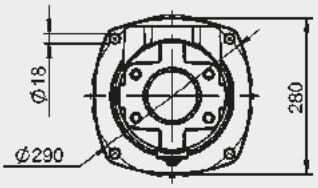
Port	A	B	ØC	M
SAE DN 50 (2")	77.8	42.9	50	M12x15
SAE DN 65 (2½")	88.9	50.8	65	M12x15
SAE DN 80 (3")	106.4	62.9	75	M16x24
SAE DN 100 (4")	130.2	77.8	100	M16

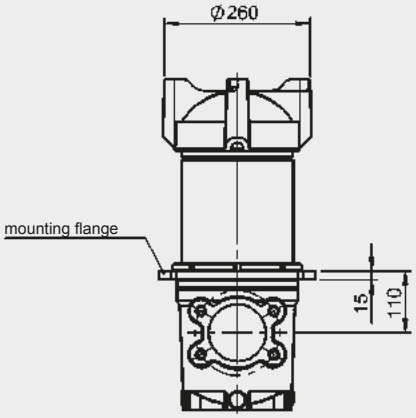
NF	No. of elements	Weight incl. element [kg]	Vol. of pressure chamber [l]
950	1x0950 R...	16	10
1350	1x1300 R...	18	13
2650	1x2600 R...	25	25

NF	No. of elements	Weight incl. element [kg]	Vol. of pressure chamber [l]
1310...2.X	1x1300 R...	17	14

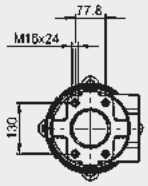
NF	No. of elements	Weight incl. element [kg]	Vol. of pressure chamber [l]
2610...2.X	1x2600 R...	23	25

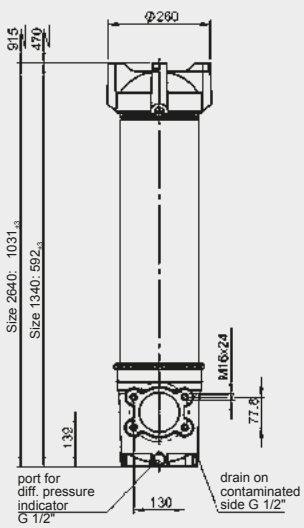
NF 1340/2640 ... 2.X/-FF

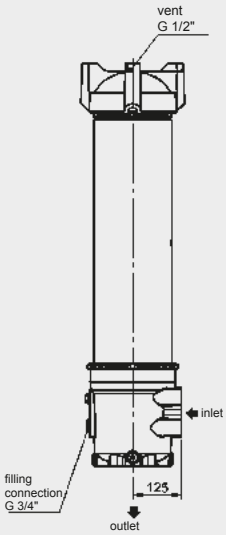




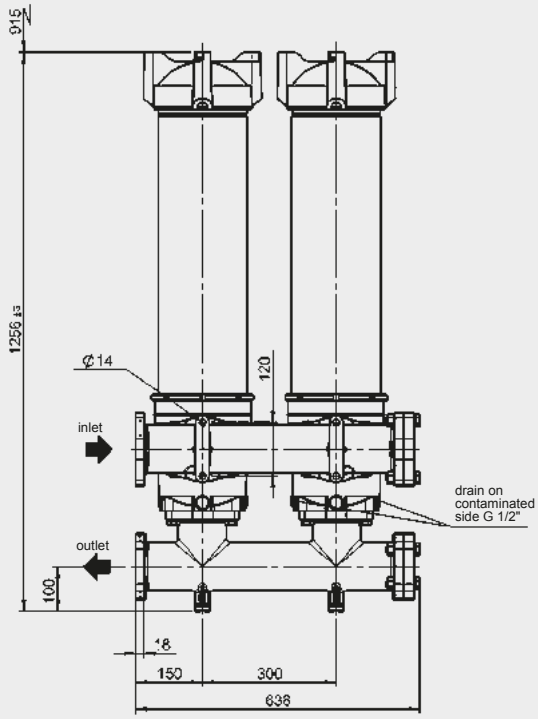
NF 1340/2640 ... 2.X

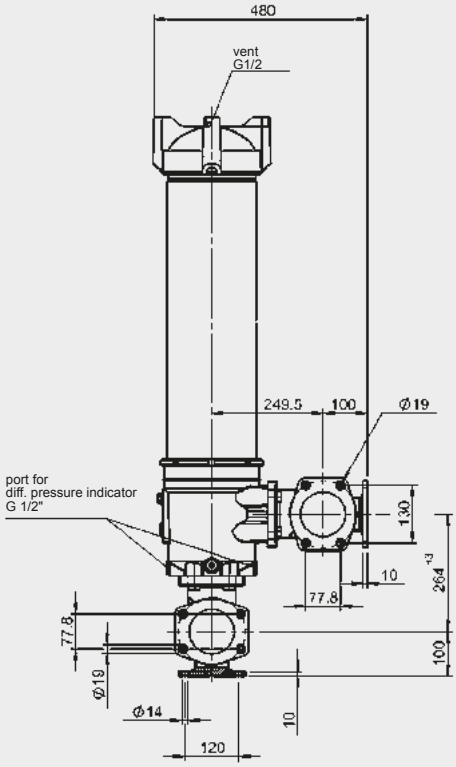






NF 5240 ... 2.X



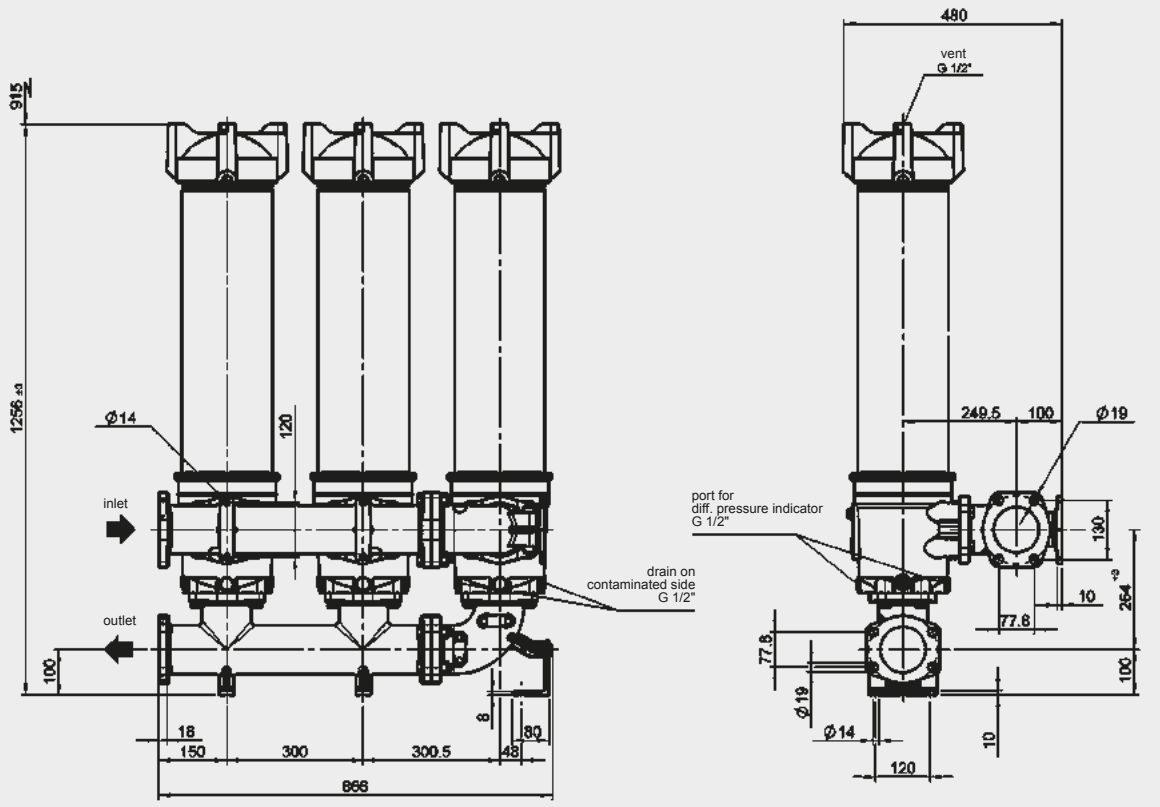


NF	No. of elements	Weight incl. element [kg]	Vol. of pressure chamber [l]
1340...2.X	1x1300 R...	17	14

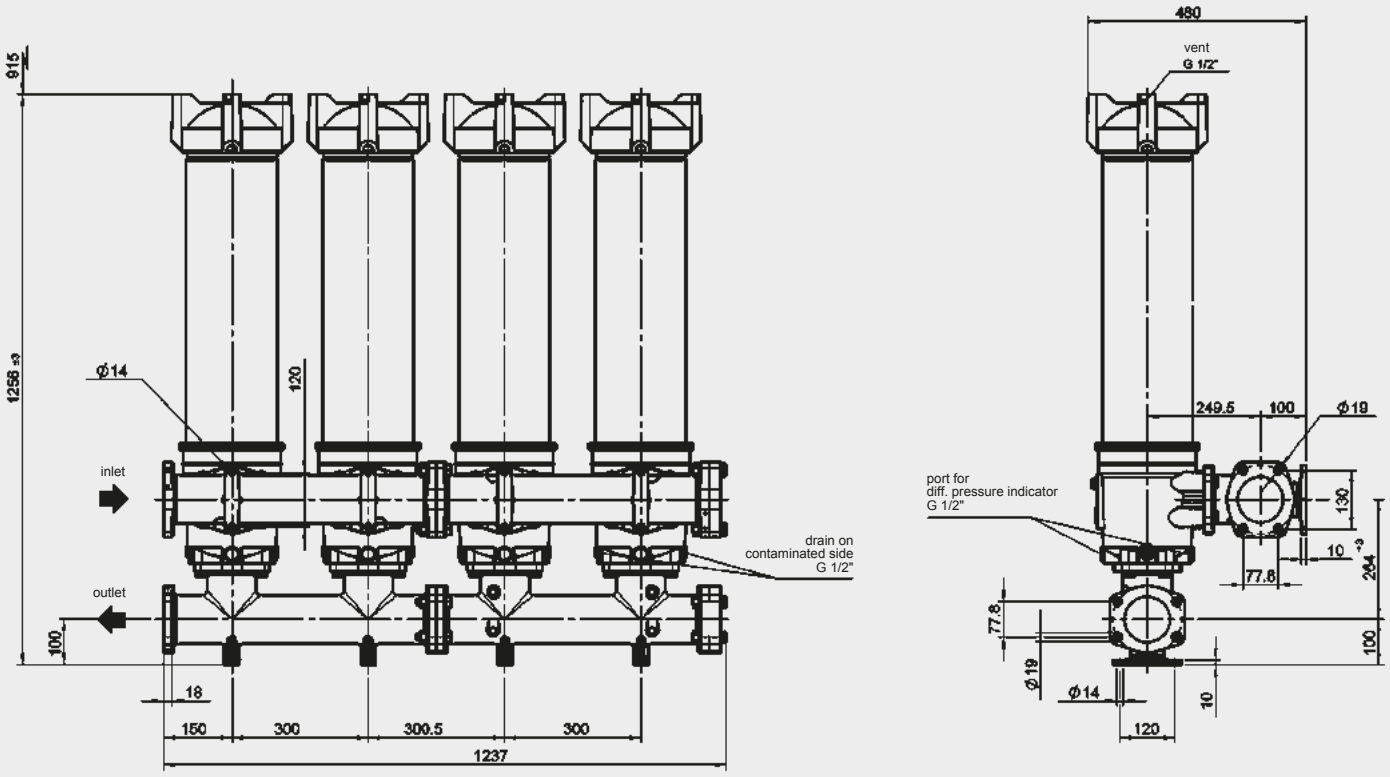
NF	No. of elements	Weight incl. element [kg]	Vol. of pressure chamber [l]
2640...2.X	1x2600 R...	23	25

NF	No. of elements	Weight incl. element [kg]	Vol. of pressure chamber [l]
5240...2.X	2x2600 R...	90	60

NF 7840 2.x



NF 10440 2.x



NF	No. of elements	Weight incl. element [kg]	Vol. of pressure chamber [l]
7840	3x2600 R...	125	88

NF	No. of elements	Weight incl. element [kg]	Vol. of pressure chamber [l]
10440	4x2600 R...	180	120

NOTES

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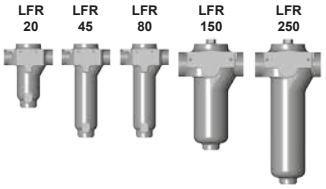
Inline Filter LFR
up to 250 l/min, up to 120 bar



ELEMENT FLOW DIRECTION FROM IN TO OUT

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter housing and a screw-on cover plate. The element is top-removable.

Standard equipment:

- installation holes in the housing
- magnetic core built into cover plate
- without bypass valve
- oil drain plug

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943 ISO 3968, ISO 11170, ISO 16889

Contamination retention capacities in g

	Glass fibre (ULP)		
	5 µm	10 µm	25 µm
20	1.45	2.61	2.9
45	3.35	6.03	6.7
80	4.18	7.51	8.35
150	5.25	9.45	10.5
250	8.5	15.3	17

	Glass fibre with pre-filter (UHC)		
	5 µm	10 µm	20 µm
20	4.64	6.96	7.83
45	10.72	16.08	18.09
80	13.36	20.04	22.55
150	16.8	25.2	28.35
250	27.2	40.8	45.9

Filter elements are available with the following pressure stability values:

Glass fibre (ULP): 6 bar
Glass fibre with pre-filter (UHC): 6 bar
Wire mesh (WR): 6 bar
Other filtration ratings on request

1.3 SEALS

NBR (=Perbunan)

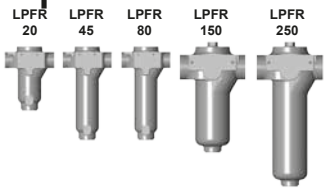
1.4 SPECIAL MODELS

- Port for clogging indicator in filter housing
- Without magnetic core
- Bypass valve built into the head
- Seals in FPM, EPDM

FILTER SPECIFICATIONS

Nominal pressure	120 bar
Temperature range	-10 °C to +120 °C
Material of filter housing	EN-GJS
Material of cover plate	EN-GJS: LFR 20 to 80 9SMn28k: LFR 150 to 250
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure (optional)	2.5 bar (others on request)

Inline Filter LPFR
up to 250 l/min, up to 25 bar

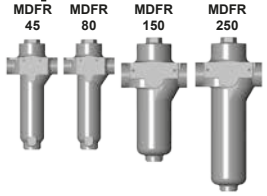


ELEMENT FLOW DIRECTION FROM IN TO OUT

FILTER SPECIFICATIONS

Nominal pressure	25 bar
Temperature range	-10 °C to +120 °C
Material of filter housing	EN-GJS: LPFR 20 to 250
Material of cover plate	EN-GJS: LPFR 20 to 80 EN-GJL: LPFR 150 to 250
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure (optional)	2.5 bar (others on request)

Inline Filter MDFR
up to 250 l/min, up to 250 bar



ELEMENT FLOW DIRECTION FROM IN TO OUT

FILTER SPECIFICATIONS

Nominal pressure	250 bar
Temperature range	-10 °C to +120 °C
Material of filter housing	EN-GJS
Material of cover plate	S355JR: MDFR 45 to 80 EN-GJS: MDFR 150 to 250
Type of clogging indicator	VD (differential pressure measurement up to 400 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure (optional)	2.5 bar (others on request)

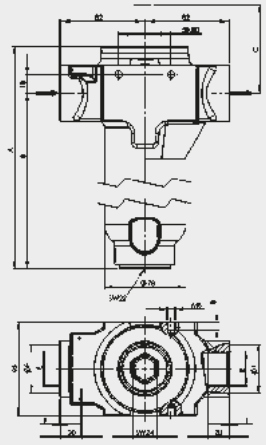
2. MODEL CODE
2.1 COMPLETE FILTER

Type	Filter material of element	Size	Operating pressure	Port	Filtration rating	Clogging indicator (VA)	Type code	Modification number	Supplementary details
LFR **LPFR** **MDFR**	**ULP**=Glass fibre **UHC**=Glass fibre with pre-filter **WR**=Wire mesh	20* 45 80 150 250	**D**=25 bar (only LPFR) **I**=120 bar (only LFR) **M**=250 bar (only MDFR)	**B**=G 1/2 **C**=G 3/4 **D**=G1 **F**=G1 1/2	5 10 20(UHC) 25(ULP)	**W**=no port for indicator **B**=visual **C**=electrical **D**=visual / electrical	**1**=indic. on right in flow direction **2**=indic. on left in flow direction **3**=no indic.	**.x=** the latest version is always supplied	**-V**=FPM direction (Viton) **-B**=special bypass cracking pressure **-OM**=without magnetic core

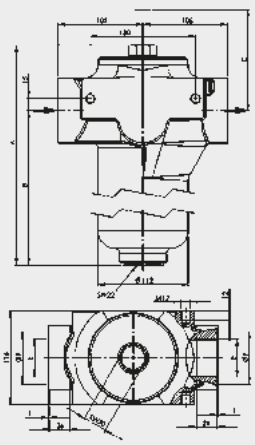
* Size 20 only possible for LPFR and LFR!

3. DIMENSIONS

LFR 20 - 80

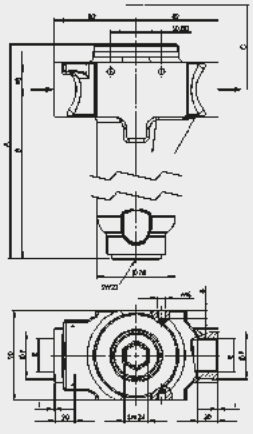


LFR 150 - 250

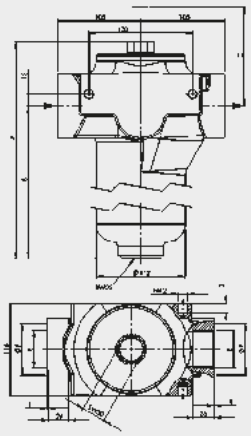


LFR	A	B	C	E	F Ø	Weight incl. element [kg]
20	212	167	180	G ½	34	5.3
45	312	267	250	G ¾	42	5.8
80	312	267	280	G 1	47	6.6
150	354	273	335	G 1½	68	14.2
250	454	373	435	G 1½	65	15.0

LPFR 20 - 80

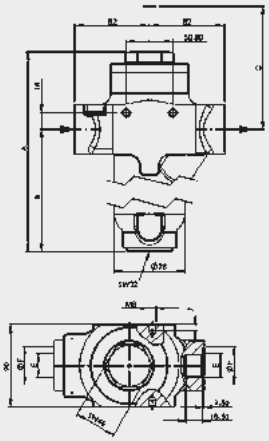


LPFR 150 - 250

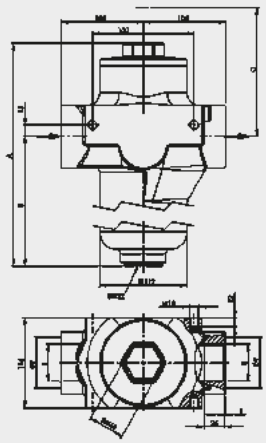


LPFR	A	B	E	F Ø	Weight incl. element [kg]
20	212	167	G ½	34	5.3
45	312	267	G ¾	42	5.8
80	312	267	G 1	47	6.6
150	354	273	G 1½	68	14.2
250	454	373	G 1½	65	15.0

MDFR 40 - 80



MDFR 150 - 250



MDFR	A	B	C	E	F Ø	Weight incl. element [kg]
45	360	274	275	G ¾	42	7.9
80	360	274	305	G 1	47	8.6
150	405	282	365	G 1 ½	65	18.4
250	505	382	465	G 1½	68	19.0

NOTE

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Inline Filter FLN to DIN 24550

up to 400 l/min, up to 25 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- without bypass valve
- oil drain plug
- port for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Betamicron® (BN4HC):	20 bar
Wire mesh (W/HC):	20 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	25 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-30 °C to +100 °C
Material of filter head	Aluminium
Material of filter bowl	Aluminium
Type of indicator	VM (Diff. pressure indicator up to 210 bar operating pressure) VD (Diff. pressure indicator up to 420 bar operating pressure - only for types LE and LZ)
Pressure setting of the clogging indicator	2.5 and 5 bar (others on request)
Bypass cracking pressure (optional)	3.5 bar or 7 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

With bypass valve

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

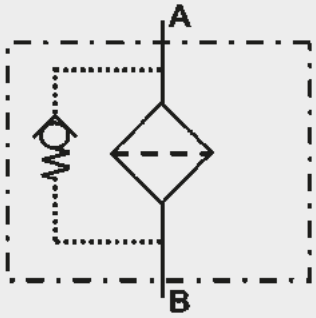
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

1.10 MAINTENANCE INSTRUCTIONS

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

FLN BN/HC 250 D F 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
FLN

Filter material of element
BN/HC Betamicron® (BN4HC)
W/HC Stainless steel wire mesh

Size of filter or element
FLN: 160, 250, 400

Operating pressure
D = 25 bar

Type and size of port
to DIN 24550 (●), possible ports (X)

Type	Port	Filter size		
		160	250	400
E	G 1¼	●	X	X
F	G 1½	X	●	X
K	DN 38*	X	X	●

*Flange SAE 1½", 3000 PSI

Filtration rating in µm
BN/HC: 3, 6, 10, 25
W/HC: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
A. pressure setting (e.g. A2.5 = 2.5 bar)
B. bypass cracking pressure (e.g.: B3.5 = 3.5 bar; B7 = 7 bar); no details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light-emitting diodes 24 Volt
] only for clogging indicators Type "D"
AV LZ indicator with plug to AUDI and VW specifications
BO LZ indicator with plug and pin connections to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO specification)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz specification)
D4C LZ indicator with plug and connector to Daimler-Chrysler specification and cold start suppression 30 °C
BO-LED as for BO, but with diode strip
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0250 DN 010 BN4HC /-V

Size
0160, 0250, 0400

Type
DN

Filtration rating in µm
BN4HC : 003, 006, 010, 025
W/HC : 025, 050, 100, 200

Filter material
BN4HC, W/HC

Supplementary details
V, W (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

Type of indicator
VM Differential pressure indicator up to 210 bar operating pressure
VD Differential pressure indicator up to 420 bar operating pressure (only for types LE and LZ)

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

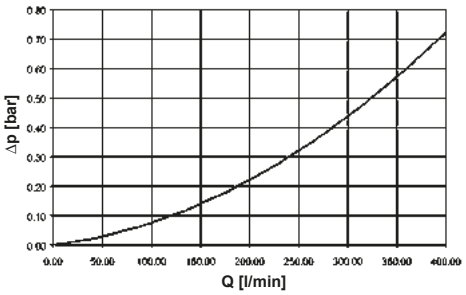
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

FLN 160, 250, 400

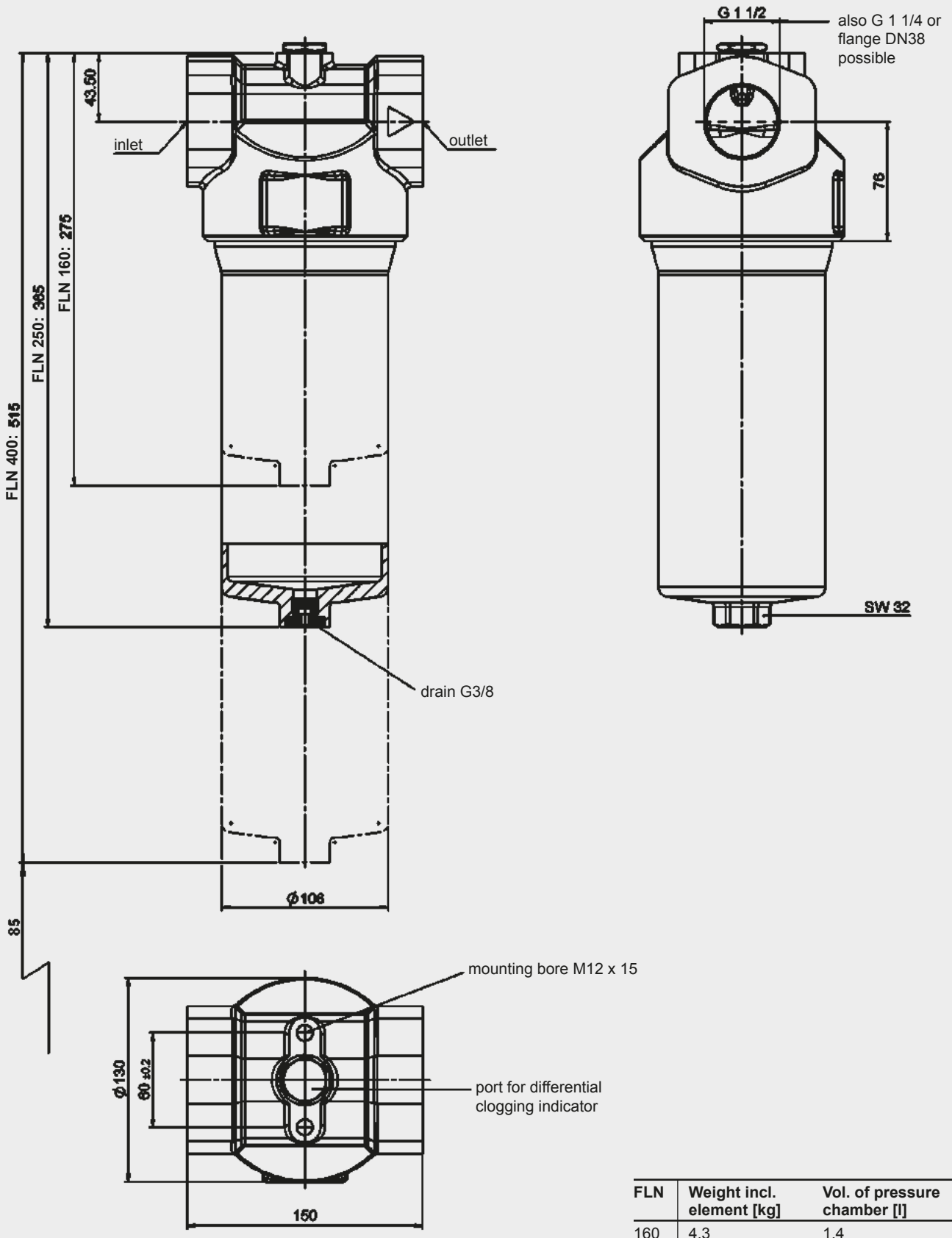


3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

FLN	BN4HC				W/HC
	3 µm	6 µm	10 µm	25 µm	–
160	7.9	5.1	3.4	2.6	0.169
250	5.1	3.2	2.1	1.7	0.102
400	3.2	2.0	1.3	1.0	0.061

4. DIMENSIONS



FLN	Weight incl. element [kg]	Vol. of pressure chamber [l]
160	4.3	1.4
250	4.9	2.0
400	5.9	3.1

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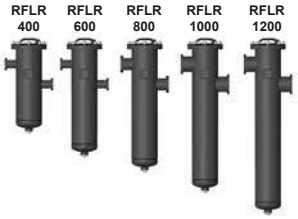
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

HYDAC Filtertechnik GmbH
Industriegebiet
D-66280 Sulzbach/Saar
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

Inline Filter RFLR

Flow direction from in to out up to 1200 l/min, up to 25 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter housing and cover plate. The element is top-removable.

Standard equipment:

- mounting holes in the housing
- oil drain plug
- magnetic core built into cover plate
- with bypass valve
- port for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3968
- ISO 11170
- ISO 16889

Contamination retention capacities in g

	Glass fibre (UHC)		
RFLR	5 µm	10 µm	20 µm
400	192	288	324
600	272	408	459
800	368	552	621
1000	438	658	739
1200	544	816	918

Filter elements are available with the following pressure stability values:

Glass fibre (UHC) for biodegradable oils: 6 bar

Wire mesh (WR): 6 bar

Other filtration ratings on request.

1.3 FILTER SPECIFICATIONS

Nominal pressure	25 bar
Temperature range	-30 °C to +120 °C
Material of filter housing	Steel
Material of cover plate	Spheroidal graphite iron
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- No port for clogging indicator on filter housing
- without magnetic core
- Seals in FPM

1.7 SPARE PARTS

See Original Spare Parts List

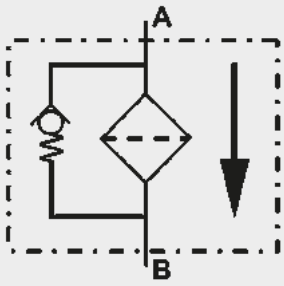
1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG

1.9 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

RFLR UHC 800 D M 10 W 1.0 /-V

2.1 COMPLETE FILTER

Filter type
RFLR

Filter material
UHC Glass fibre for biodegradable operating fluids
WR Wire mesh

Size of filter or element
RFLR: 400, 600, 800, 1000, 1200

Operating pressure
D = 25 bar

Type and size of connection

Type	Connection	Filter size				
		400	600	800	1000	1200
L	SAE DN 50	●	●			
N	SAE DN 80			●		
P	SAE DN 100				●	●

Filtration rating in µm
UHC 5, 10, 20
WR 40, 60, 80
Others on request

Type of clogging indicator
W without port (no clogging indicator)
B visual
C electrical
D visual and electrical

for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
V FPM seals
OM without magnetic core

2.2 REPLACEMENT ELEMENT

0800 R 010 UHC /-V

Size
0400, 0600, 0800, 1000, 1200

Type
R

Filtration rating in µm
UHC: 005, 010, 020
WR: 040, 060, 080
Others on request

Filter material
UHC Glass fibre for biodegradable operating fluids
WR Wire mesh

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 2 C . X /-V

Type of indicator
VM differential pressure indicator

Pressure setting
2 standard (others on request)

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

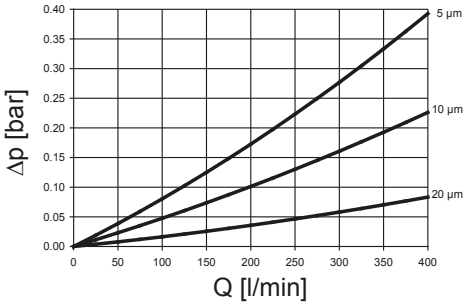
Supplementary details
V (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

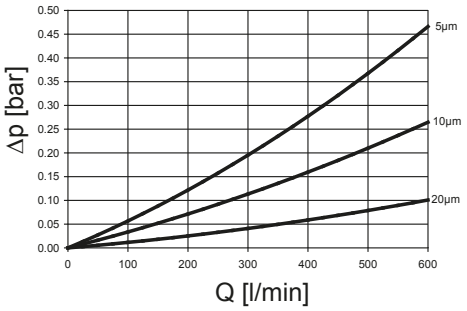
3.1 GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30mm²/s.

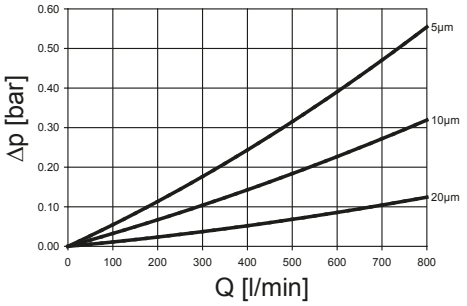
RFLR 400: UHC



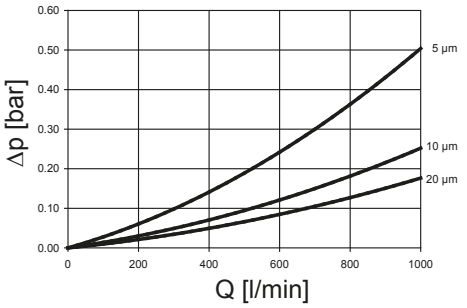
RFLR 600: UHC



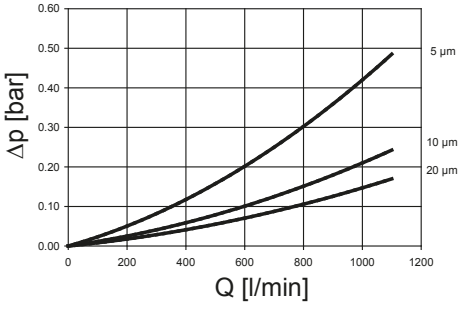
RFLR 800: UHC



RFLR 1000: UHC

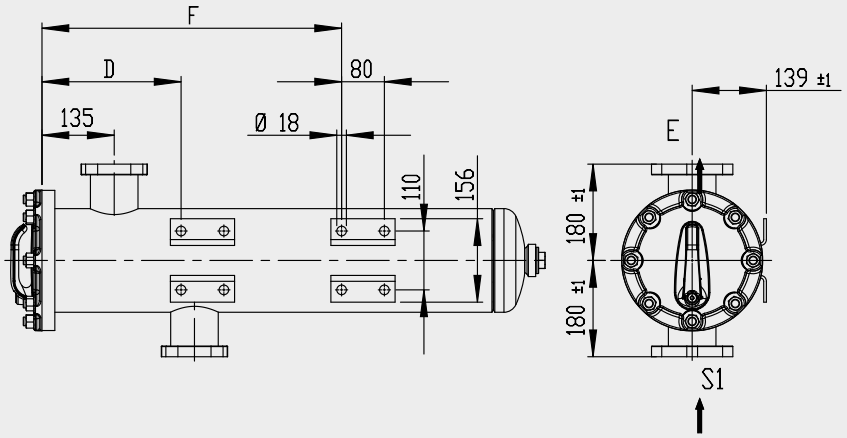


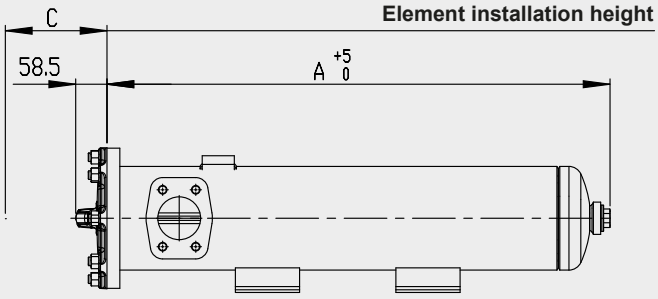
RFLR 1200: UHC



Other curves on request

4. DIMENSIONS





Type	Connection E + S	A	C	D	F	Weight incl. element [kg]
RFLR 400	SAE DN 50 (2")	650	400	120	–	33.5
RFLR 600	SAE DN 50 (2")	828	580	220	520	37.8
RFLR 800	SAE DN 80 (3")	940	700	260	560	42.8
RFLR 1000	SAE DN 100 (4")	1094	850	260	560	47.9
RFLR 1200	SAE DN 100 (4")	1260	1010	260	560	52.3

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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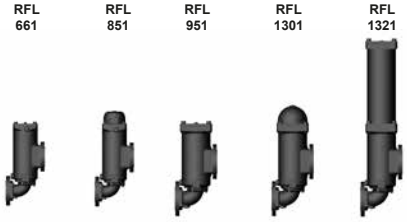
Inline Filter RFL Cast Version

up to 1300 l/min, up to 40 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a two-piece filter housing with a bolt-on cover plate.

Standard equipment:

- with bypass valve
- connections for venting and draining
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Optimicron® Power (ON/PO):	10 bar
Paper (P/HC):	10 bar
Stainl. st. wire mesh (W/HC):	20 bar
Stainl. st. fibre (V):	30 bar
Betamicron®/Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	25 bar 40 bar (RFL 662 to 1322 to AD)
Temperature range	-10 °C to +100 °C
Material of filter housing and cover plate	EN-GJS-400-15 : RFL 661 to 1321 GP 240 GH+N : RFL 662 to 1322 On RFL 1321 and 1322 the extension is in steel!
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- without bypass valve
- Inlet and outlet positioned one above the other
- Counter flanges as welding or blank flanges

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

These filters can be supplied with manufacturer's test certificates O and M to DIN 55350, Part 18.
Test certificates 3.1 to DIN EN 10204 and approval certificates (Type Approval) for different approval authorities. Areas of application, amongst others: lubrication.

Filter to API 614 (ANSI flange) on request!

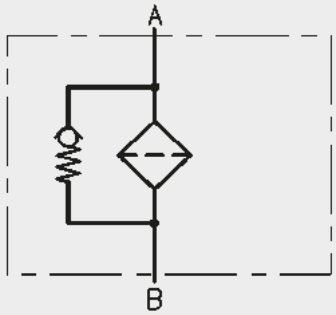
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.
- When used with W/HC and P/HC elements, please follow the sizing recommendation under point 3.3!

Symbol for hydraulic systems



2. MODEL CODE (also order example)

RFL ON 851 D N 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type

RFL

Filter material

ON	Optimicron®	P/HC	Paper	AM	Aquamicron®
ON/PO	Optimicron® Power*	W/HC	Stainl. st. wire mesh	BN/AM	Betamicron®/Aquamicron®
V	Stainless steel fibre				

Size of filter or element

RFL: 661, 662, 851, 951, 952, 1301, 1302, 1321, 1322

Operating pressure

D = 25 bar
E = 40 bar (RFL 662-1322 according to AD)

Type and size of connection

Type	Connection	Filter size				
		661 662	851	951 952	1301 1302	1321 1322
N	SAE DN 80 (3")	●	●			
P	SAE DN 100 (4")			●	●	●
Q	DIN DN 80	●	●			
R	DIN DN 100			●	●	●

Other nominal bores on request

Filtration rating in µm

ON:	1, 3, 5, 10, 15, 20	P/HC:	10, 20	BN/AM:	3, 10
ON/PO*, V:	3, 5, 10, 20	W/HC:	25, 50, 100, 200	AM:	40

Type of clogging indicator

Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical

for other clogging indicators, see brochure no. 7.050../..

Type code

1

Modification number

X the latest version is always supplied

Supplementary details

B. special cracking pressure of bypass (e.g. B1 = 1 bar)
GA counter flange as welding flange
GB counter flange as blank flange
KB without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt

only for clogging indicators type "D"

OR O-ring groove on the DIN flange (inlet and outlet) to Rexroth standard AB 22-04
V FPM seals
33 inlet and outlet positioned one above the other
SAK contamination retainer

2.2 REPLACEMENT ELEMENT

0850 R 010 ON /-V

Size

0660, 0850, 0950, 1300, 2600

Type

R

Filtration rating in µm

ON:	001, 003, 005, 010, 015, 020	W/HC:	025, 050, 100, 200	BN4AM:	003, 010
ON/PO*, V:	003, 005, 010, 020	P/HC:	010, 020	AM:	040

Filter material

ON, ON/PO*, V, W/HC, P/HC, BN4AM, AM

Supplementary details

V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 2 D . X /-L24

Type

VM differential pressure measurement up to 210 bar operating pressure

Pressure setting

2 standard 2 bar, others on request

Type of clogging indicator (see Point 2.1)

Modification number

X the latest version is always supplied

Supplementary details

L..., LED, V (for descriptions, see point 2.1)

* Optimicron® Power only in filtration rating 5, 10 and 20 µm

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

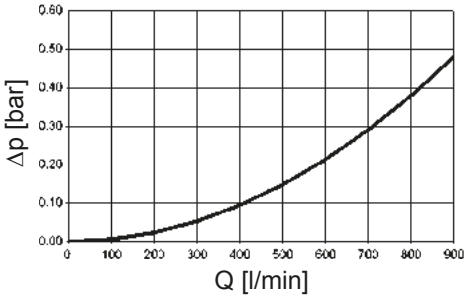
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

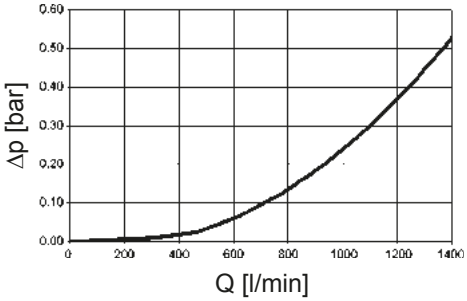
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

RFL 661, 662, 851



RFL 951, 952, 1301, 1302, 1321, 1322



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

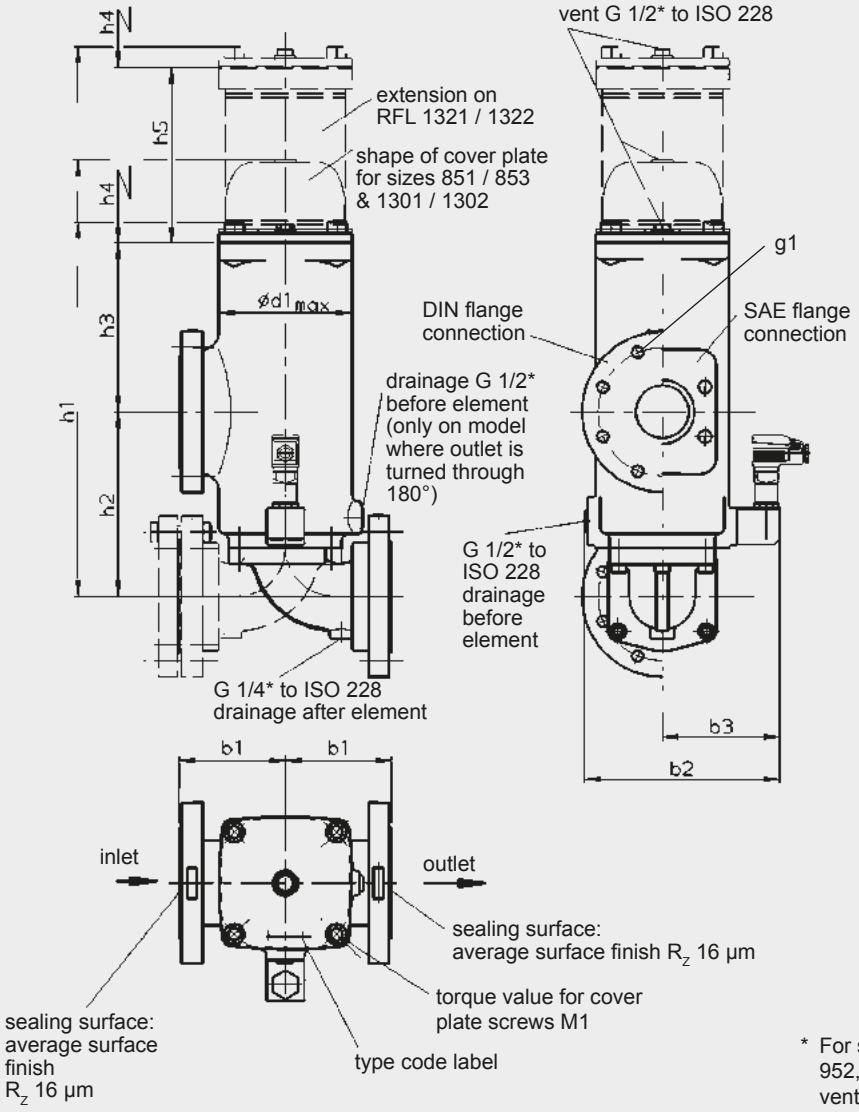
RFL	ON						ON/PO		
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	5 µm	10 µm	20 µm
660	3.57	1.69	1.21	0.67	0.57	0.45	0.35	0.30	0.19
850	2.77	1.31	1.00	0.58	0.44	0.36	0.28	0.24	0.16
950	2.39	1.03	0.79	0.48	0.38	0.31	0.25	0.21	0.14
1300	1.72	0.72	0.59	0.35	0.32	0.22	0.18	0.15	0.10
2600	0.84	0.36	0.29	0.18	0.16	0.11	0.08	0.07	0.05

RFL	V				W/HC
	3 µm	5 µm	10 µm	20 µm	–
660	1.0	0.8	0.6	0.4	0.067
850	0.8	0.6	0.4	0.3	0.052
950	0.7	0.6	0.4	0.2	0.048
1300	0.5	0.4	0.3	0.2	0.034
2600	0.3	0.2	0.1	0.1	0.017

3.3 SIZING RECOMMENDATION

Filter type	Connection	Q_{max} when using W/HC and P/HC elements
RFL 661/662	DIN DN 80 SAE DN 80	480 l/min 480 l/min
RFL 851	DIN DN 80 SAE DN 80	480 l/min 480 l/min
RFL 951/952	DIN DN 100 SAE DN 100	900 l/min 900 l/min
RFL 1301/1302/1321/1322	DIN DN 100 SAE DN 100	900 l/min 900 l/min

4. DIMENSIONS



RFL	Flange connection 1)	b1	b2	b3	d1	h1	h2	h3	h4	h5	M1	g1 (Nm)	Weight	Volume of including element [kg]	pressure chamber [l]
661	SAE DN 80 DIN DN 80		133	243	147	166	465	230	210	350	-	150	M16 M16	36	8.2
662	SAE DN 80 DIN DN 80		133	238	144	177	465	230	210	350	-	150	M16 M16	42	8.2
851	SAE DN 80 DIN DN 80		133	243	147	166	552	230	210	420	-	150	M16 M16	38.5	9.5
951	SAE DN 100 DIN DN 100		143	271	161	194	523	250	238	380	-	250	M16 M20	54	13
952	SAE DN 100 DIN DN 100		143	264	157	200	523	250	238	380	-	250	M16 M20	67.5	13
1301	SAE DN 100 DIN DN 100		143	271	161	194	630	250	238	500	-	250	M16 M20	55.5	16
1302	SAE DN 100 DIN DN 100		143	264	157	200	630	250	238	500	-	250	M16 M20	75.5	16
1321	SAE DN 100 DIN DN 100		143	271	161	194	1084	250	238	940	561	250	M16 M20	82	31
1322	SAE DN 100 DIN DN 100		143	264	157	200	1084	250	238	940	561	250	M16 M20	96	31

1) Flange connection to SAE J 518 C (standard pressure series 3000 psi);
DIN flange connection to DIN EN ISO 1092, PN 25/40 to DN 100 (with sealing strip, flange shape B)

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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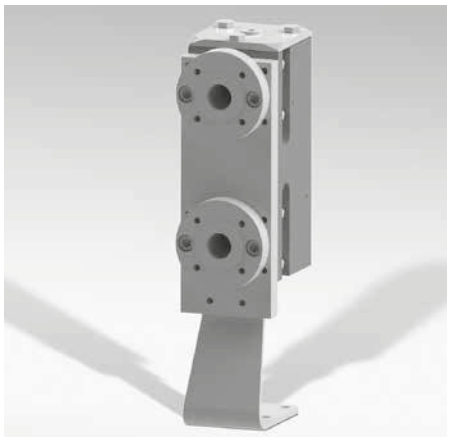
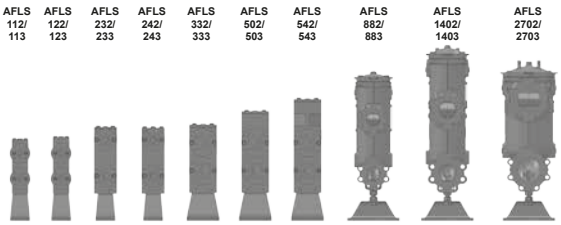


Inline Filter AFLS to API 614

up to 1700 l/min, up to 40 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filters are designed in accordance with the API 614 (approval according to ASME Sec. VIII, Div.1). They consist of a filter housing and a screw-on cover plate.

Standard equipment:

- without bypass valve
- without port for clogging indicator
- inlet and outlet ASME flange
- side vent and drain, ¾" ASME flange connection (300 lbs)
- with stand
- test certificates (acceptance test certificate 3.1 to DIN EN 10204; Manufacturer's Test Certificate M of final inspection and pressure testing)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® Power (ON/PO): 10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	16 bar (at 150 lbs) 25 bar (at 300 lbs) 40 bar (at 300 lbs)
Temperature range	-10 °C to +100 °C
Material of filter housing and cover	Forged version: SA-266 Gr.4/1.0565: 112, 122, 232, 242, 332, 502, 542 SA-182 F316L/1.4404: 113, 123, 233, 243, 333, 503, 543 Cast version: SA-216 WCB/1.0619: 882, 1402, 2702 SA-351 CF8M/1.4408: 883, 1403, 2703

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Higher operating pressure on request
- Others on request!

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

- With U-Stamp at extra charge
- Classification societies and other approvals on request

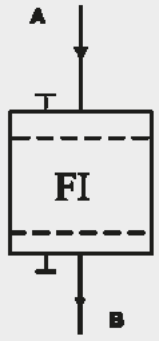
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) and CLP oils on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.

Symbol for lubrication systems



2. MODEL CODE (also order example)

AFLS ON/PO 882 E 4 10 W 1.X /-Z-300

2.1 COMPLETE FILTER

Filter type
AFLS

Filter material of element
ON/PO Optimicron® Power

Size

Carbon steel (1.0565/SA-266 Gr.4):	112, 122, 232, 242, 332, 502, 542
Stainless steel (1.4404/SA-182 F316L):	113, 123, 233, 243, 333, 503, 543
Cast steel CS (1.0619/SA-216 WCB):	882, 1402, 2702
Cast stainless steel (1.4408/SA-351 CF8M):	883, 1403, 2703

Operating pressure

Pressure range		Filter size									
		Forged							Cast		
		112/ 113	122/ 123	232/ 233	242/ 243	332/ 333	502/ 503	542/ 543	882/ 883	1402/ 1403	2702/ 2703
C	150 lbs; 16 bar	●	●	●	●	●	●	●	●	●	●
D	300 lbs; 25 bar	●	●	●	●	●	●	●	●	●	
E	300 lbs; 40 bar	●	●	●	●	●	●	●	●	●	

Preferred models
Other pressure ranges on request!

Type and size of connection

Type	Connection to ASME B16.5	Filter size									
		Forged							Cast		
		112/ 113	122/ 123	232/ 233	242/ 243	332/ 333	502/ 503	542/ 543	882/ 883	1402/ 1403	2702/ 2703
1	1"	●	●								
2	1½"			●	●						
3	2"					●	●	●			
4	3"								●		
5	4"									●	
7	6"										●

Preferred models
Other connections on request!

Filtration rating in µm
ON/PO: 10

Type of clogging indicator
W without port, no clogging indicator

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
Z Manufacturer's Test Certificate M to DIN 55350 Part 18
Acceptance test certificate 3.1 to EN 10204 (material certificate)
300 Indicates flange pressure range (150 lbs, 300 lbs)

Further optional supplementary details
SBx filling line in compression fitting with orifice size (SB2 = orifice 2 mm)
SS steel parts of element in stainless steel
V FPM seals, filters suitable for biodegradable oils and phosphate ester fluid (HFD-R)
ZU U-Stamp (approval to ASME Sec. VIII, Div. 1)

2.2 REPLACEMENT ELEMENT

0880 A 010 ON/PO

Size
0110, 0120, 0230, 0240, 0330, 0500, 0540, 0880, 1400, 2700

Type
A API version

Filtration rating in µm
ON/PO: 010

Filter material of element
ON/PO Optimicron® Power

Supplementary details
SS Steel parts of element in stainless steel

2.3 CLOGGING INDICATOR (OPTIONAL)

VM 2 D . X /-L24

Type
VM Differential pressure measurement

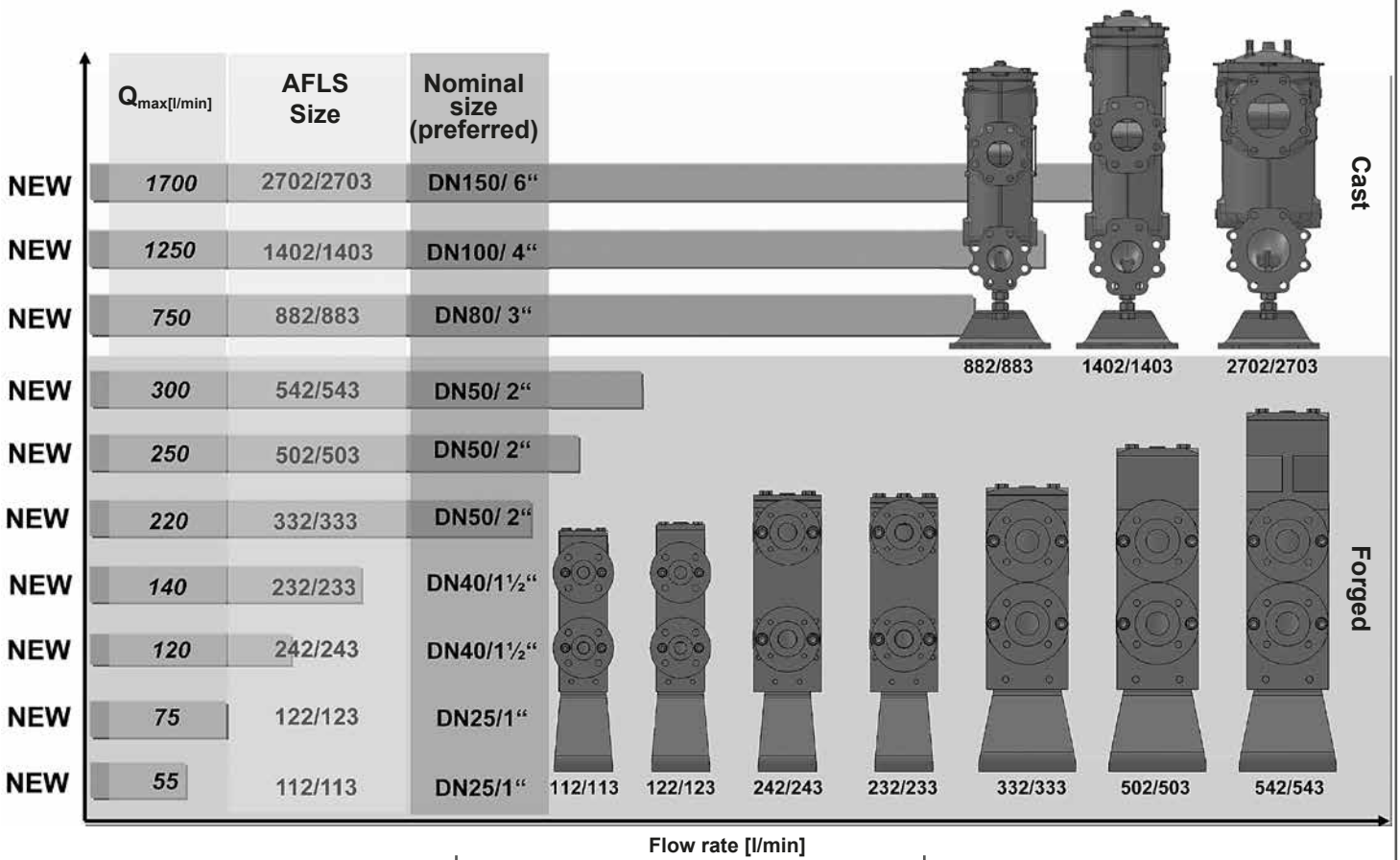
Pressure setting
2 standard 2 bar, others on request

Type
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual/electrical

Modification number
X the latest version is always supplied

Supplementary details
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light-emitting diodes up to 24 Volt
V FPM seals

2.4 QUICK SELECTION



3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

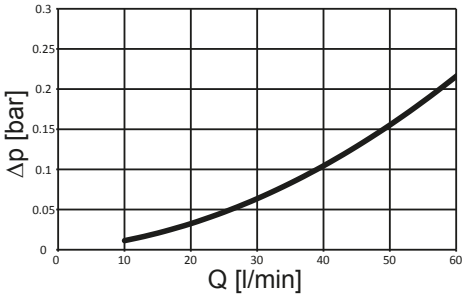
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

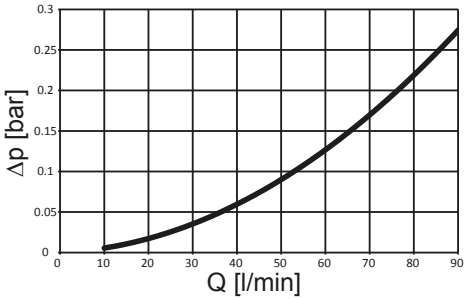
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

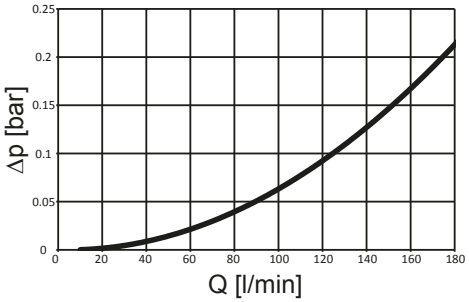
AFLS 112/113



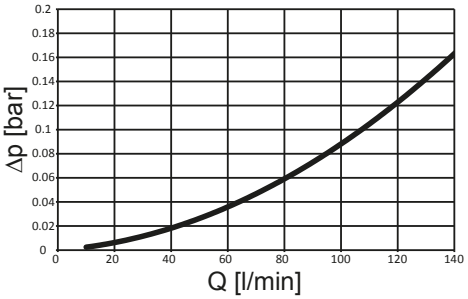
AFLS 122/123



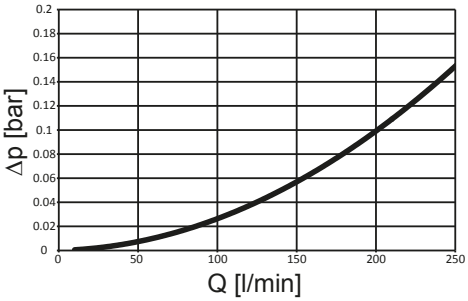
AFLS 232/233



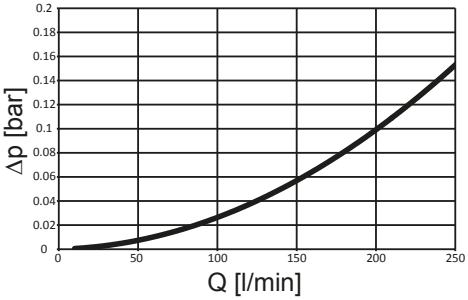
AFLS 242/243



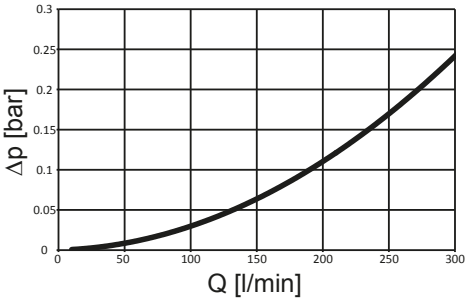
AFLS 332/333



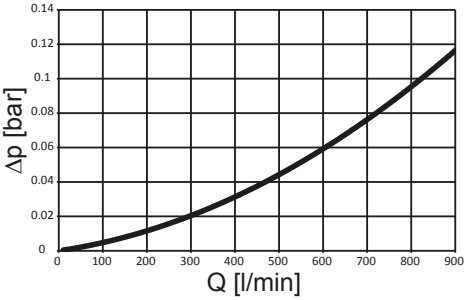
AFLS 502/503



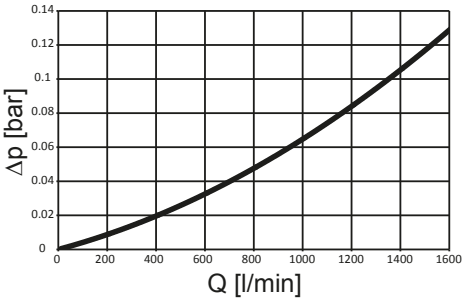
AFLS 542/543



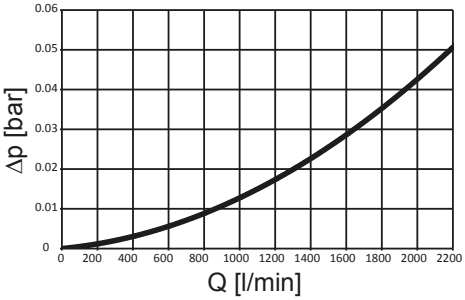
AFLS 882/883



AFLS 1402/1403



AFLS 2702/2703



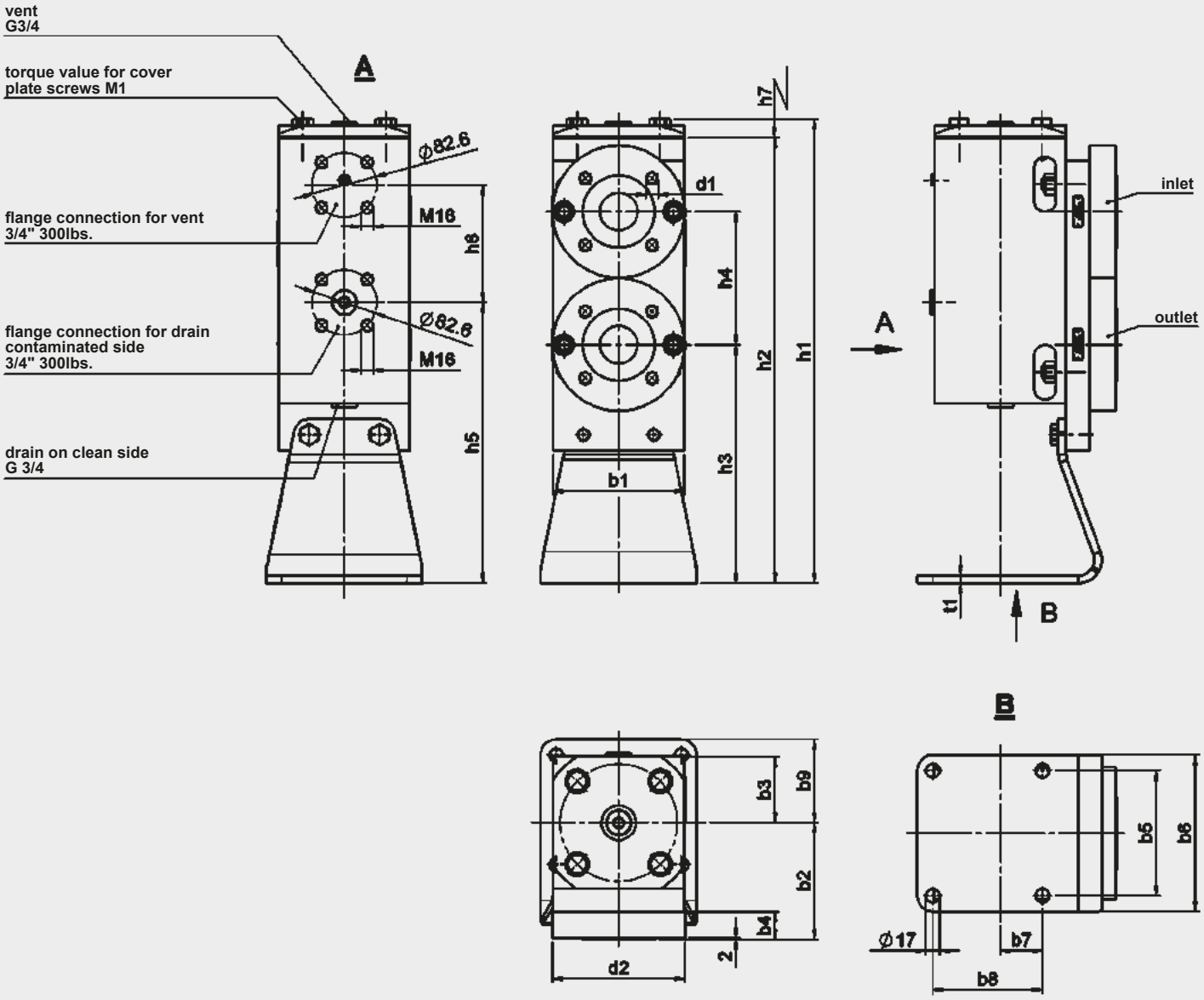
3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

AFLS	ON/PO 10 µm
112/113	3.08
122/123	1.37
232/233	0.68
242/243	1.12
332/333	0.69
502/503	0.45
542/543	0.33
882/883	0.14
1402/1403	0.09
2702/2703	0.07

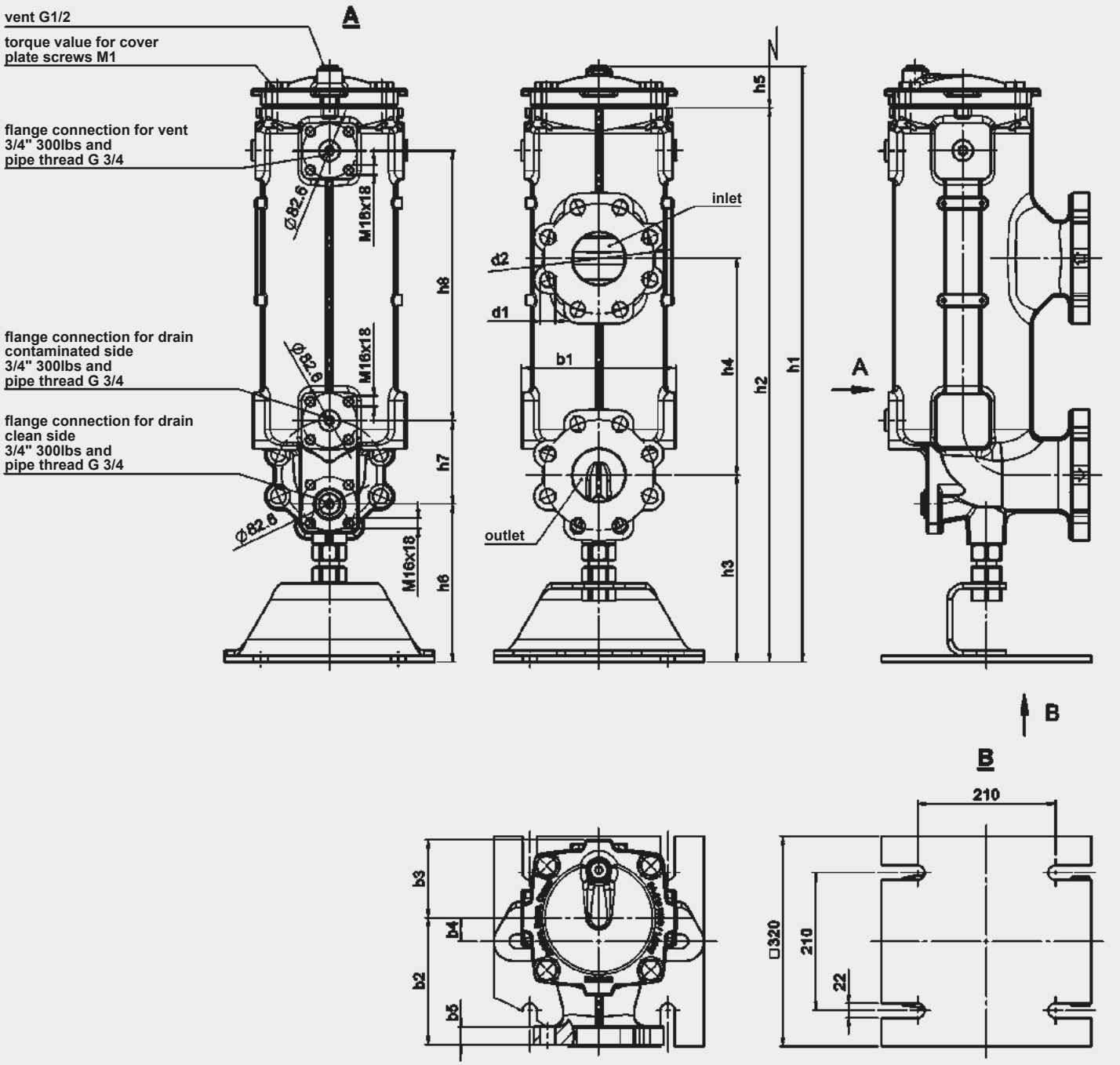
4. DIMENSIONS

AFLS 112-543 (FORGED)



AFLS	Connection to ASME B16.5			b1	b2	b3	b4	b5	b6	b7	b8	b9	d1	d2	h1	h2	h3	h4	h5	h6	h7	t1	M1 [Nm]	Weight incl. element [kg]	Volume of pressure chamber [l]
	Nominal size	Pressure range	Form																						
112/113	1"	150 lbs.	raised face	100	90	50	25	80	120	19	80	81	4 x M12	Ø110	503	485	255	155	292	133	180	8	80/60	28	0.60
		300 lbs.											4 x M16	Ø125											
122/123	1"	150 lbs.		100	88	52	25	80	120	17	80	83	4 x M12	Ø110	516	498	255	155	284	154	195	8	80/60	28.5	0.75
		300 lbs.											4 x M16	Ø125											
232/233	1 1/2"	150 lbs.		140	131	64	30	80	120	45	80	55	4 x M12	Ø135	579	558	273	220	323	170	205	8	190/150	58.5	2.00
		300 lbs.											4 x M20	Ø155											
242/243	1 1/2"	150 lbs.		140	131	64	30	80	120	45	80	55	4 x M12	Ø135	574	553	273	220	323	170	205	8	190/150	60.5	1.50
		300 lbs.											4 x M20	Ø155											
332/333	2"	150 lbs.		168	149	84	35	160	200	54	140	106	4 x M16	Ø169	594	569	305	170	359	150	205	10	190/150	90	2.20
		300 lbs.											8 x M16	Ø169											
502/503	2"	150 lbs.		168	149	84	35	160	200	54	140	106	4 x M16	Ø169	675	650	305	170	359	231	300	10	190/150	101	3.10
		300 lbs.											8 x M16	Ø169											
542/543	2"	150 lbs.		168	149	84	35	160	200	54	140	106	4 x M16	Ø169	748	724	305	170	349	315	370	10	190/150	106	4.30
		300 lbs.											8 x M16	Ø169											

AFLS 882 - 2703 (CAST)



AFLS	Connection to ASME B16.5			b1	b2	b3	b4	b5	d1	d2	h1	h2	h3	h4	h5	h6	h7	h8	M1 [Nm]	Weight incl. element [kg]	Volume of pressure chamber [l]
	Nominal size	Pressure range	Form																		
882/883	3"	300 lbs.	flat face	235	193	119	36	27	8 x Ø23	Ø168.3	908	844	285	330	515	241	127	411	110	81	16
1402/1403	4"	300 lbs.		268	224	133	53	31	8 x Ø23	Ø200	1067	982	290	385	650	226	160	532	170	110	24
2702/2703	6"	150 lbs.		325	239	175	5	21	8 x Ø23	Ø240	975	873	310	425	500	249	177	383	110	125	37

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Industriegebiet
D-66280 Sulzbach/Saar
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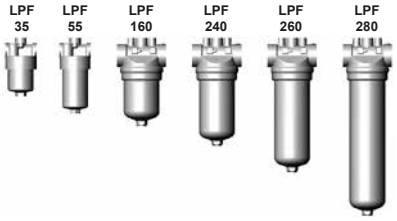
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

Low Pressure Filter LPF
up to 280 l/min, up to 50 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- without bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BH4HC):	210 bar
Wire mesh (W/HC)*:	30 bar

*only for LPF 160, 240, 260, 280

NOTICE:
Only filter elements with Optimicron® and .../HC material can be used in LPF filters!

1.3 FILTER SPECIFICATIONS

Nominal pressure	LPF 35, 55: 40 bar LPF 160, 240, 260, 280: 50 bar
Fatigue strength	at nominal pressure 10^6 load cycles from 0 to nominal pressure LPF 35 and 55: 10^7 load cycles at 40 bar
Temperature range	-30 °C to +100 °C
Material of filter head	Aluminium
Material of filter bowl	Aluminium
Type of indicator	VM (Diff. pressure indicator up to 210 bar operating pressure) VL (Diff. pressure indicator up to 40 bar operating pressure - only BF indicator)
Pressure setting of clogging indicator	5 bar (others on request)
Bypass cracking pressure (optional)	6 bar (LPF 160 - 280) 7 bar (LPF 35 - 55) others on request

1.4 SEALS

Perbunan (=NBR)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in FPM, EPDM
- With bypass valve (1, 3, 6 or 7 bar)
- Without port for clogging indicator (LPF 160, 240, 260, 280)

1.7 SPARE PARTS

See Original Spare Parts List

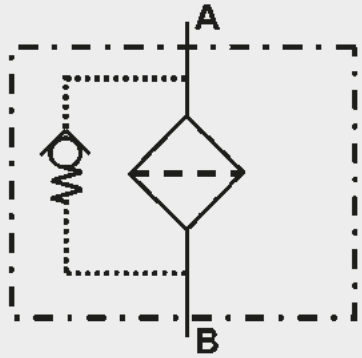
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)

LPF ON 160 G E 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
LPF

Filter material
ON Optimicron®
BH/HC Betamicron® (BH4HC)
W/HC wire mesh (only LPF160, 240, 260, 280)

Size of filter or element
LPF: 35, 55, 160, 240, 260, 280

Operating pressure
E = 40 bar (LPF 35, 55)
G = 50 bar (LPF 160, 240, 260, 280)

Type and size of connection

Type	Port	Filter size					
		35	55	160	260	240	280
A	M18 x 1.5	●	●				
B	G ½	●	●				
E	G 1¼			●	●	●	●

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20 BH/HC: 3, 5, 10, 20
W/HC: 25, 50, 100, 200 (only LPF 160, 240, 260, 280)

Type of clogging indicator
W without port (no clogging indicator)
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..
BF visual mobile indicator (only LPF 160, 240, 260, 280)
Return line indicator possible on request!

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
B. cracking pressure of bypass valve (e.g. B6 = 6 bar); no details = without bypass valve
BFL BF clogging indicator on left in direction of flow
BFR BF clogging indicator on right in direction of flow
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light-emitting diodes up to 24 Volt
] only for clogging indicators type "D"
SO184 pressure release/oil drain screw
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0160 D 010 ON /-V

Size
0035, 0055, 0160, 0240, 0260, 0280

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020 BH4HC: 003, 005, 010, 020
W/HC: 025, 050, 100, 200 (only LPF 160, 240, 260, 280)

Filter material
ON, BH4HC, W/HC

Supplementary details
V, W (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

Type of indicator
VM Diff. pressure indicator up to 210 bar operating pressure
VL Diff. pressure indicator up to 50 bar operating pressure (only in conjunction with the "BF" indicator)

Pressure setting
5 standard 5 bar, others on request (standard 2 bar on "BF" indicator)

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see Point 3.2)

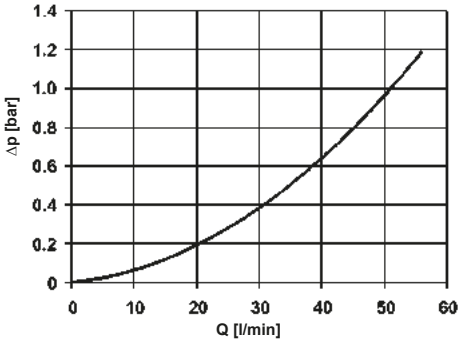
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

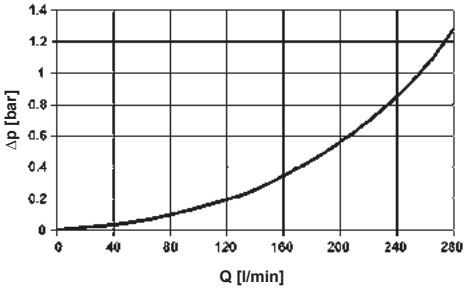
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

LPF 35, 55



LPF 160, 240, 260, 280



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

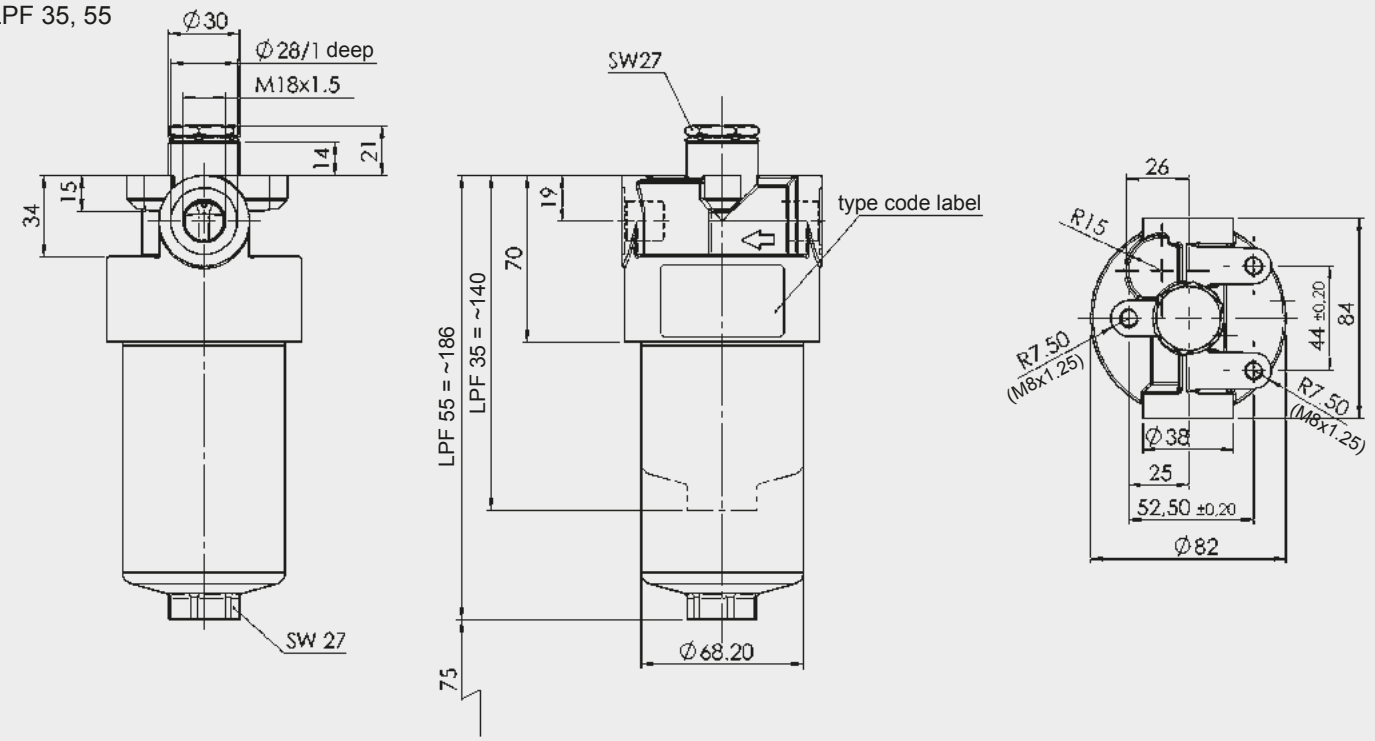
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

LPF	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
35	50.2	21.3	17.1	13.7	10.0	7.44
55	26.0	12.3	9.90	7.90	5.17	3.84
160	18.5	11.0	7.70	4.10	3.71	3.18
240	11.5	6.90	5.34	3.19	2.44	2.10
260	8.18	4.96	3.87	2.31	1.83	1.44
280	5.54	3.37	2.74	1.49	1.36	1.17

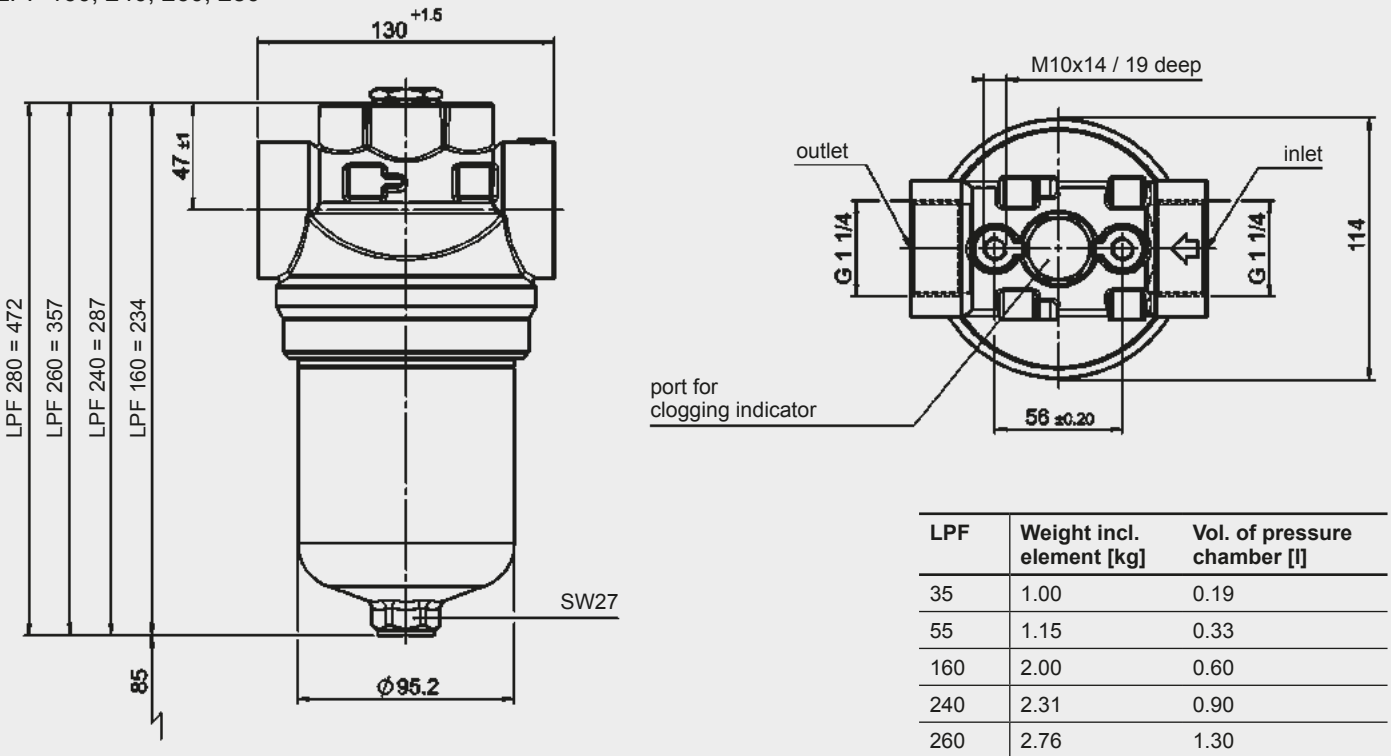
LPF	BH4HC				W/HC
	3 µm	5 µm	10 µm	20 µm	–
35	47.8	28.1	16.8	10.5	–
55	24.2	14.2	8.5	5.3	–
160	16.8	10.4	5.9	4.4	0.284
240	10.6	6.8	3.9	2.9	0.189
260	8.1	4.8	3.3	1.9	0.131
280	5.7	3.4	1.8	1.6	0.089

4. DIMENSIONS

LPF 35, 55



LPF 160, 240, 260, 280



LPF	Weight incl. element [kg]	Vol. of pressure chamber [l]
35	1.00	0.19
55	1.15	0.33
160	2.00	0.60
240	2.31	0.90
260	2.76	1.30
280	3.28	1.70

NOTE

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Subject to technical modifications.

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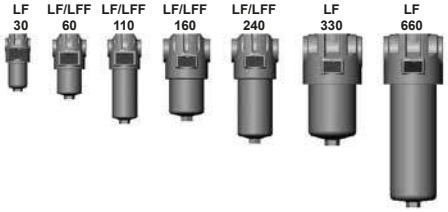
Inline Filter LF
Inline Filter LFF
for Reversible Oil Flow

up to 500 l/min, up to 100 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl. LFF filters are suitable for flow in both directions.

Standard equipment:

- connection for a clogging indicator in filter head
- mounting holes in the filter head
- drain screw with pressure relief (LF 330 and above)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BH4HC):	210 bar
Optimicron® Pulse (ON/PS):	20 bar
Optimicron® Pulse (OH/PS):	210 bar
Wire mesh (W):	20 bar
Stainless steel fibre (V):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	100 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure (For other pressures, see Point 1.8)
Temperature range	-30 °C to +100 °C
Material of filter head	Aluminium
Material of filter bowl	Aluminium
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Bypass cracking pressure (optional)	6 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter with or without reversible oil flow

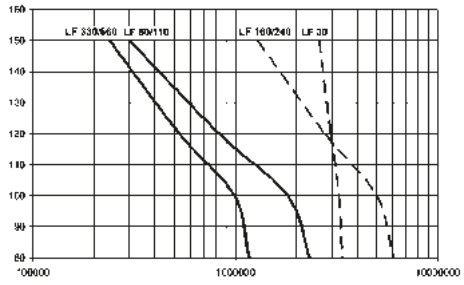
1.6 SPECIAL MODELS AND ACCESSORIES

- Bypass valve built into the head, separate from the main flow
- Oil drain screw up to LF/LFF 240
- Seals in FPM, EPDM
- Test and approval certificates

1.7 SPARE PARTS

See Original Spare Parts List

1.8 FATIGUE STRENGTH



1.9 CERTIFICATES AND APPROVALS

On request

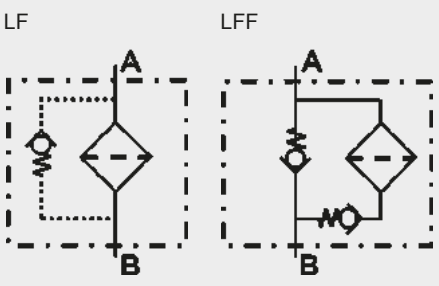
1.10 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.11 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

LF ON 60 I C 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
LF or LFF

Filter material

ON	Optimicron®	ON/PS	Optimicron® Pulse
BH/HC	Betamicron® (BH4HC)	OH/PS	Optimicron® Pulse
W	Stainl. st. wire mesh		
V	Stainless steel fibre		

Size of filter or element
LF: 30, 60, 110, 160, 240, 330, 660
LFF: 60, 110, 160, 240

Operating pressure
I = 100 bar

Type and size of connection

Type	Port	Filter size						
		30	60	110	160	240	330	660
B	G ½	●						
C	G ¾		●	●				
E	G1 ¼				●	●		
F	G1 ½						●	●

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20 BH/HC, ON/PS, OH/PS, V: 3, 5, 10, 20
W: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A stainless steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
B. bypass cracking pressure (e.g. B6 = 6 bar); without details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)] only for clogging indicators
LED 2 light emitting diodes up to 24 Volt] type "D"
SO184 pressure release/oil drain screw (standard for LF 330 and above)
V FPM seals
W suitable for HFA, HFC oil-water emulsions
(only necessary when using a clogging indicator or V or W elements)

2.2 REPLACEMENT ELEMENT

0060 D 010 ON /-V

Size
0030, 0060, 0110, 0160, 0240, 0330, 0660

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020 BH4HC, ON/PS, OH/PS, V: 003, 005, 010, 020
W: 025, 050, 100, 200

Filter material
ON, BH4HC, ON/PS, OH/PS, V, W

Supplementary details
V, W (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

Type of indicator
VM Differential pressure indicator up to 210 bar operating pressure

Pressure setting
5 standard for LF filters 5 bar
8 standard for LFF filters 8 bar
] others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

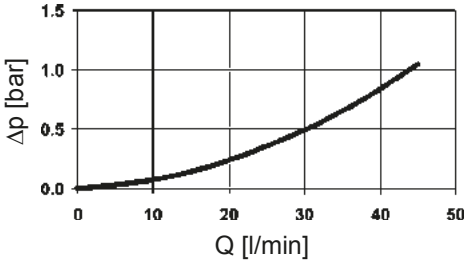
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

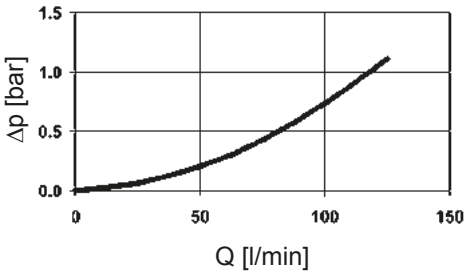
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

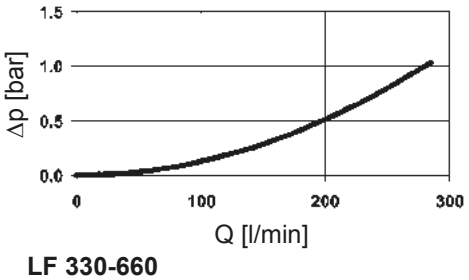
LF 30



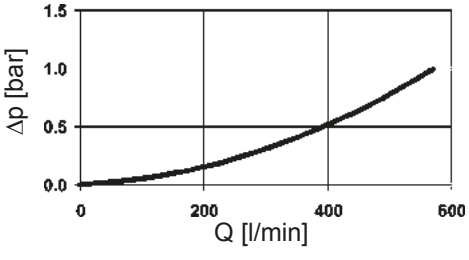
LF 60-110



LF 160-240



LF 330-660



LFF Δp-Q housing curves on request!

3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

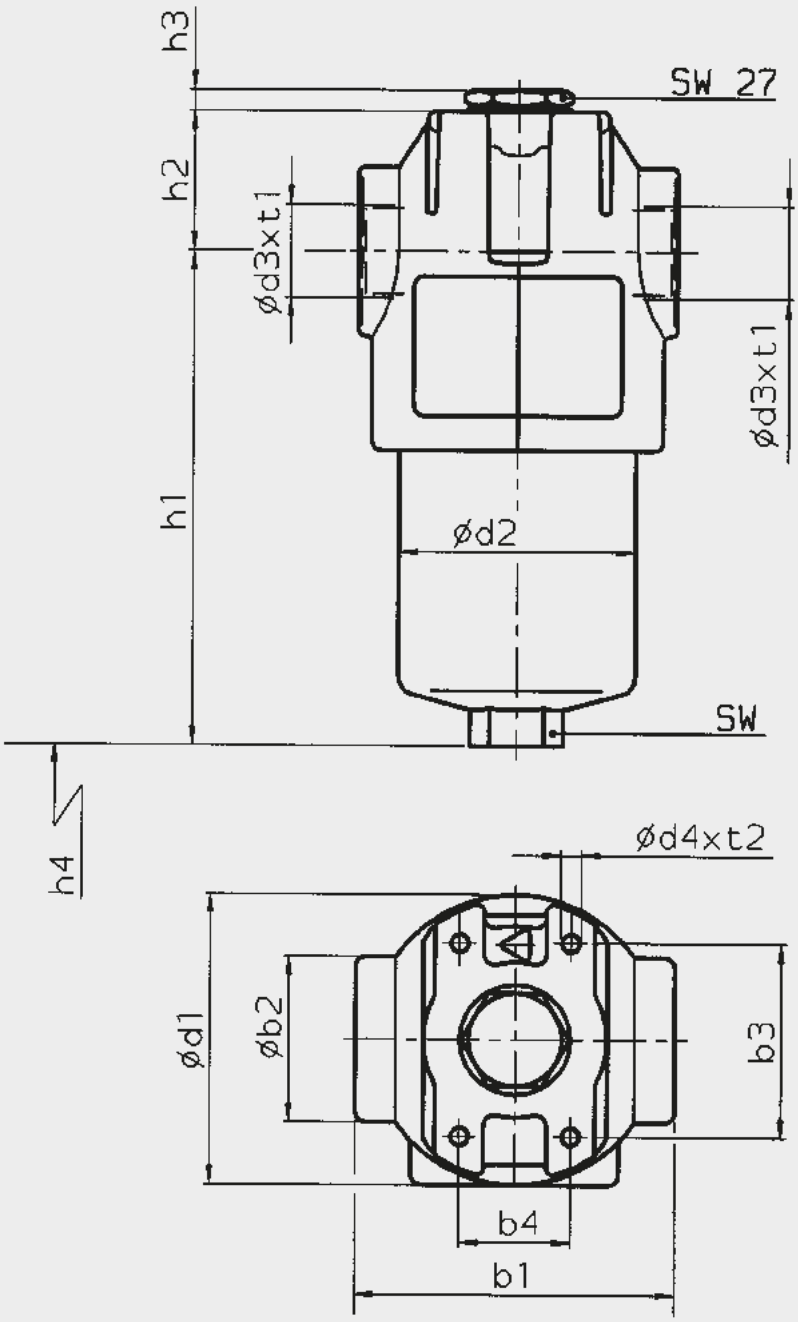
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

LF/ LFF	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
30	77.8	63.9	43.3	22.8	14.0	11.3
60	53.5	26.0	18.3	12.1	9.78	6.32
110	25.8	13.4	9.61	6.06	4.63	2.99
160	18.5	11.0	7.70	4.10	3.71	3.18
240	11.5	6.90	5.34	3.19	2.44	2.10
330	8.23	4.19	3.37	2.46	1.55	1.22
660	3.78	1.93	1.56	0.93	0.71	0.56

LF/ LFF	ON/PS				OH/PS			
	3 µm	5 µm	10 µm	20 µm	3 µm	5 µm	10 µm	20 µm
30	63.90	43.30	25.08	11.30	87.54	59.32	34.36	15.48
60	28.90	20.40	14.52	7.90	39.59	27.95	19.89	10.82
110	14.90	10.70	7.26	3.70	20.41	14.66	9.95	5.07
160	13.10	8.80	5.52	3.50	17.95	12.06	7.56	4.80
240	8.20	6.10	4.32	2.30	11.23	8.36	5.92	3.15
330	4.86	3.90	3.00	1.70	6.66	5.34	4.11	2.33
660	2.25	1.80	1.10	0.80	3.08	2.47	1.51	1.10

LF/ LFF	V				W	BH4HC			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	5 µm	10 µm	20 µm
30	18.4	13.5	7.5	3.6	3.030	91.2	50.7	36.3	19.0
60	16.0	9.3	5.4	3.3	0.757	58.6	32.6	18.1	12.2
110	8.2	5.6	3.3	2.2	0.413	25.4	14.9	8.9	5.6
160	4.6	3.2	2.3	1.4	0.284	16.8	10.4	5.9	4.4
240	3.1	2.5	1.7	1.1	0.189	10.6	6.8	3.9	2.9
330	2.2	1.8	1.2	0.8	0.138	7.7	4.5	2.8	2.0
660	1.1	0.9	0.6	0.4	0.069	3.3	1.9	1.0	0.9

4. DIMENSIONS



LF / LFF	b1	b2	b3	b4	d1	d2	d3	d4	h1	h2	h3	h4	SW	t1	t2	Weight including element [kg]	Volume of pressure chamber [l]
30	69	36	45	30	67	52	G½	M5	125.5	31	7	75	24	15	8	0.8	0.13
60	90	48	56	32	84	68	G¾	M6	137.5	39	6	75	27	17	9	1.5	0.24
110	90	48	56	32	84	68	G¾	M6	207.0	39	6	75	27	17	9	1.8	0.42
160	125	65	85	35	116	95	G1¼	M10	190.5	46	6	95	32	21	14	3.7	0.60
240	125	65	85	35	116	95	G1¼	M10	250.5	46	6	95	32	21	14	4.3	0.80
330	159	85	115	60	160	130	G1½	M12	252.5	50	6	105	36	23	17	8.0	1.50
660	159	85	115	60	160	130	G1½	M12	423.5	50	6	105	36	23	17	11.0	3.00

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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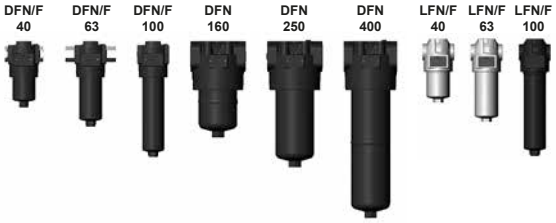
Inline Filter DFN/DFNF/LFN/LFNF to DIN 24550

up to 350 l/min, up to 400 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl. DFNF and LFNF filters are suitable for flow in both directions.

Standard equipment:

- without bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Betamicron® (BN4HC):	20 bar
Betamicron® (BH4HC):	210 bar
Wire mesh (W/HC):	20 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	100 bar 210 bar 400 bar	: all LFN and LFNF : DFN 160, 400 : DFN 40, 63, 100, 250 DFNF 40, 63, 100
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure	
Temperature range	-30 °C to +100 °C (-30 °C to -10 °C = 200 bar - only DFN/F)	
Material of filter head (and cover plate)	EN-GJS-400-15: DFN/F Aluminium	: LFN/F
Material of filter bowl (tube)	Steel Aluminium Steel	: DFN/F : LFN/F 40, 63 : LFN/F 100
Type of indicator	VM (Diff. pressure ind. up to 210 bar oper. pressure - not for type LZ) VD (Diff. pressure ind. up to 420 bar oper. pressure)	
Pressure setting of the clogging indicator	5 bar (others on request)	
Bypass cracking pressure (optional)	7 bar (others on request)	

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- With bypass valve
- FPM seals

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

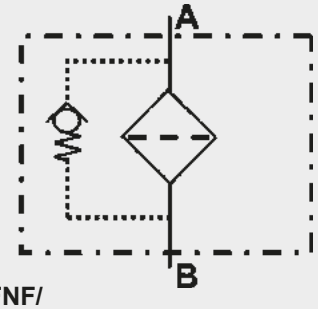
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

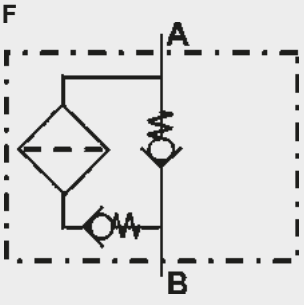
1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems DFN / LFN



DFNF/ LFNF



2. MODEL CODE (also order example)

DFN BN/HC 250 S F 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
DFN, LFN, LFNF, DFNF

Filter material of element
BN/HC Betamicron® (BN4HC) BH/HC Betamicron® (BH4HC)
W/HC Wire mesh

Size of filter or element
DFN: 40, 63, 100, 160*, 250, 400 (*on request)
DFNF: 40, 63, 100
LFN/F: 40, 63, 100

Operating pressure
I = 100 bar (LFN and LFNF)
L = 210 bar (DFN 160, 400)
S = 400 bar (DFN 40, 63, 100, 250; DFNF 40, 63, 100)

Type and size of connection

Type	Connection	Filter size 40	63	100	160	250	400
B	G ½	●	x	x			
C	G ¾	x	●	x			
D	G 1	x	x	●			
E	G 1¼				●	x	x
F	G 1½				x	●	x
K	DN 40*				x	x	●

to DIN 24550 (●); possible ports (x)

*Flange SAE, 6000 PSI

Filtration rating in µm
BN/HC, BH/HC: 3, 6, 10, 25 W/HC: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
for other clogging indicators, see brochure no. 7.050../..

Type code
1 DFN / DFNF
2 LFN / LFNF

Modification number
X the latest version is always supplied

Supplementary details
B. bypass cracking pressure (e.g. B7 = 7 bar); without details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V) — only for clogging indicators type D
LED 2 light emitting diodes up to 24 volts — only for clogging indicators type D
AV LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connections to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO specification)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz specification)
D4C LZ with plug and connector to Daimler-Chrysler specification and cold start suppression 30°C
BO-LED as for BO, but with diode strip
SO368 inlet and outlet G ½ (without RI connection; only for DFN/F 40, 63, 100)
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0250 DN 010 BN4HC /-V

Size
0040, 0063, 0100, 0160, 0250, 0400

Type
DN

Filtration rating in µm
BN4HC, BH4HC: 003, 006, 010, 025 W/HC: 025, 050, 100, 200

Filter material
BN4HC, BH4HC, W/HC

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

Type of indicator
VM differential pressure indicator up to 210 bar operating pressure (not for type LZ)
VD differential pressure indicator 420 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing} =$ (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

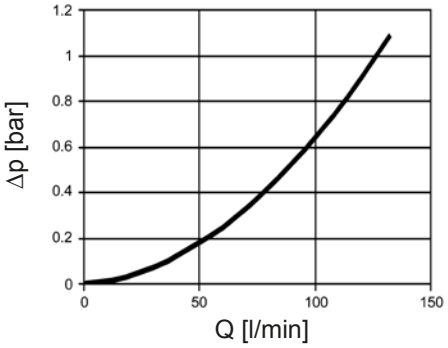
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

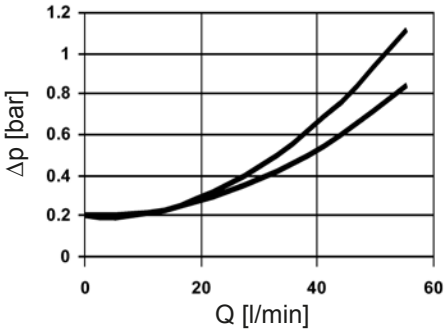
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

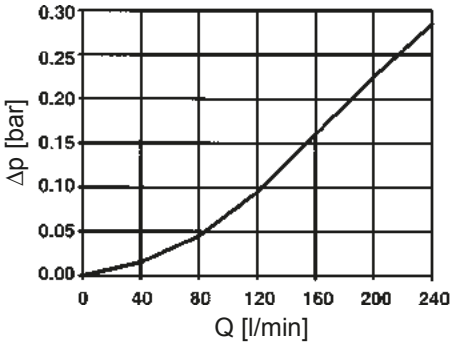
DFN 40, 63, 100
LFN 40, 63, 100



DFNF / LFNF 40, 63, 100



DFN 160, 250, 400



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

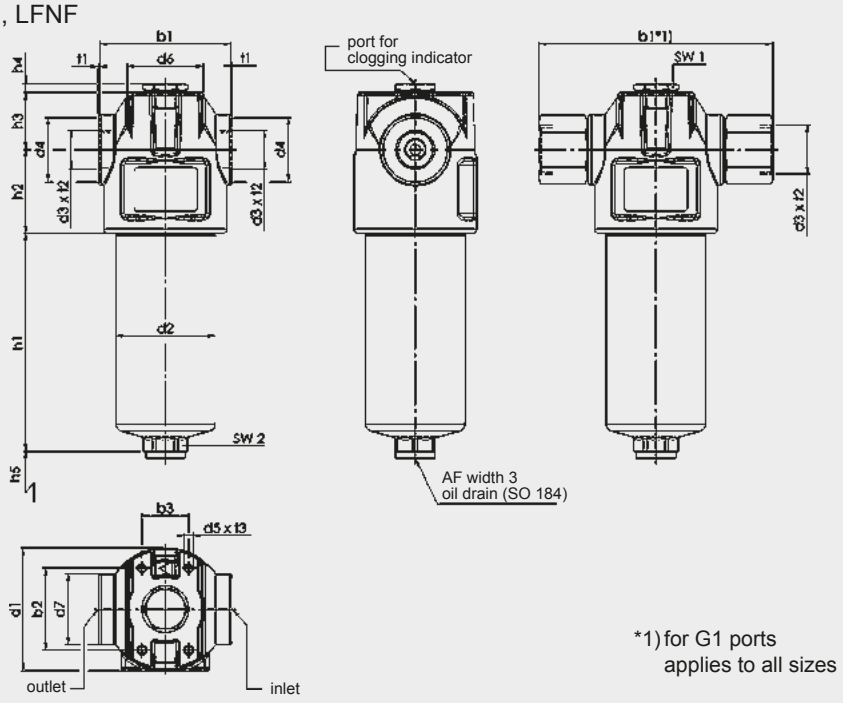
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

LFN/F DFN/F	BN4HC			
	3 µm	6 µm	10 µm	25 µm
40	40.4	24.8	16.4	10.9
63	29.0	18.2	11.7	7.6
100	19.0	11.7	7.7	5.3
160	8.0	5.1	3.8	2.5
250	5.4	3.4	2.8	1.9
400	3.4	2.1	1.7	1.1

LFN/F DFN/F	BH4HC				W/HC
	3 µm	6 µm	10 µm	25 µm	–
40	40.4	24.8	16.4	10.9	0.966
63	29.0	18.2	11.7	7.6	0.540
100	19.0	11.7	7.7	5.3	0.325
160	8.0	5.1	3.8	2.5	0.168
250	5.4	3.4	2.8	1.9	0.101
400	3.4	2.1	1.7	1.1	0.061

4. DIMENSIONS

LFN, LFNF

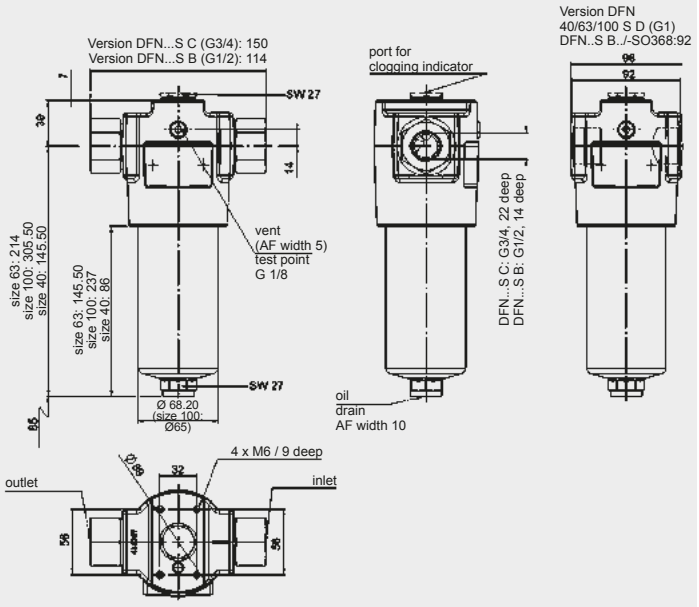


*1) for G1 ports
applies to all sizes

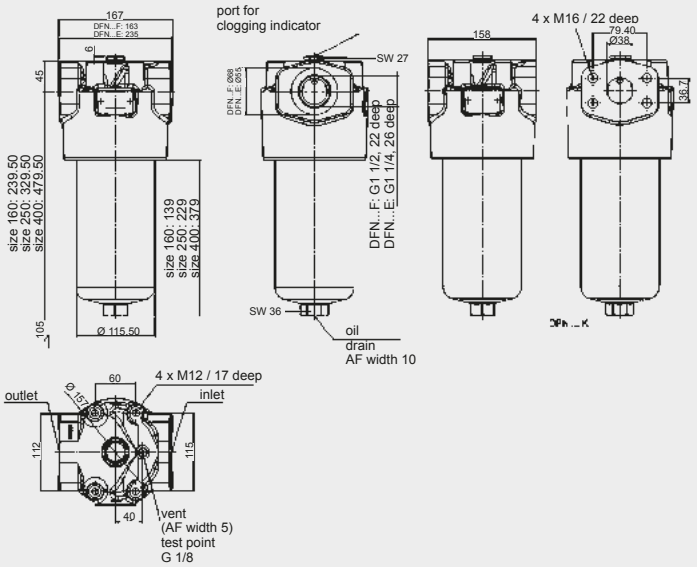
Type	Weight incl. element [kg]	Volume of pressure chamber [l]
LFN 40	1.45	0.26
LFN 63	1.8	0.40
LFN 100	4.3	0.50
LFNF 40	1.45	0.26
LFNF 63	1.8	0.40
LFNF 100	4.3	0.50
DFN 40	5.0	0.22
DFN 63	6.0	0.33
DFN 100	6.25	0.50
DFN 160	20.0	1.10
DFN 250	22.0	1.70
DFN 400	26.5	2.70
DFNF 40	5.0	0.22
DFNF 63	6.0	0.33
DFNF 100	6.25	0.50

Type	b1	b2	b3	d1	d2	d3	d4	d5	d6	d7	h1	h2	h3	h4	h5	SW1	SW2	t1	t2	t3
LFN 40	90	56	32	84	68	G ½	34	M6	52	48	90	57	39	6	75	27	27	1	14	9
LFN 63	90	56	32	84	68	G ¾	44	M6	52	48	150	57	39	6	75	27	27	1	17	9
LFN 100	160*1)	56	32	84	65	G 1	-	M6	52	48	245.5	57	39	6	75	27	27	-	24.5	9
LFNF 40	90	56	32	84	68.2	G ½	34	M6	52	48	90	57	39	6	75	27	27	1	14	9
LFNF 63	90	56	32	84	68.2	G ¾	44	M6	52	48	150	57	39	6	75	27	27	1	17	9
LFNF 100	160*1)	56	32	84	65	G 1	-	M6	52	48	245.5	57	39	6	75	27	27	-	24.5	9

DFN / DFNF 40 - 100



DFN 160 - 400



NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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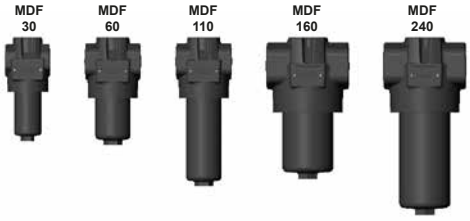
Pressure Filter MDF
up to 280 l/min, up to 280 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- without bypass valve
- connection for a clogging indicator in filter head
- installation holes in the filter head

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BH4HC):	210 bar
Wire mesh (W):	20 bar
Stainless steel fibre (V):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	210 bar or 280 bar
Fatigue strength	min. 5 million cycles at 1.2 times nominal pressure (for other pressures, see Point 1.8)
Temperature range	-30 °C to +100 °C (-30 °C to -10 °C: p_{max}= 140 bar)
Material of filter head	EN-GJS-400-15
Material of filter bowl	Steel
Type of indicator	VM (Diff. pressure indicator up to 210 bar operating pressure) VD (Diff. pressure indicator up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Bypass cracking pressure (optional)	6 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

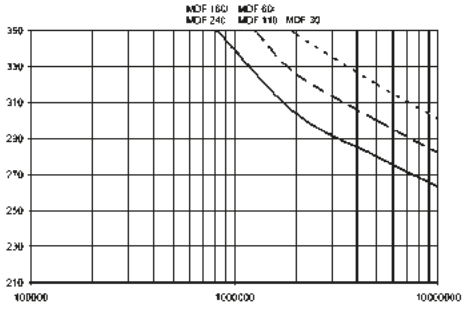
1.6 SPECIAL MODELS AND ACCESSORIES

- Bypass valve built into the head, separate from the main flow
- Oil drain plug
- Seals in FPM, EPDM
- Test and approval certificates

1.7 SPARE PARTS

See Original Spare Parts List

1.8 FATIGUE STRENGTH



1.9 CERTIFICATES AND APPROVALS

- Test certificate 2.2
- Manufacturer's certificate O and M to DIN 55350, part 18
  Other certificates on request

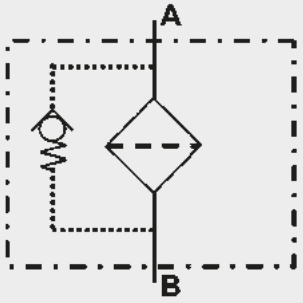
1.10 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.11 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

MDF ON 60 O C 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
MDF

Filter material

ON	Optimicron®	W	Stainl. st. wire mesh
BH/HC	Betamicron® (BH4HC)	V	Stainless steel fibre

Size of filter or element
MDF: 30, 60, 110, 160, 240

Operating pressure
Threaded port: L = 210 bar (VM clogging indicator)
O = 280 bar (standard; VD clogging indicator)
Flange connection: L = 210 bar (3000 PSI flange) → VM clogging indicator

Type and size of connection

Type	Connection	Filter size 30	60	110	160	240
B	G ½	×				
C	G¾	●	×	×		
D	G1		●	●		
E	G1¼				×	×
F	G1½				●	●
H	SAE DN 13	●				
I	SAE DN 20		●	●		
J	SAE DN 32				●	●

× Preferred models

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20 BH/HC, V: 3, 5, 10, 20
W: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A stainless steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
B. bypass cracking pressure (e.g. B6 = 6 bar); without details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V) — only for clogging indicators type "D"
LED 2 light emitting diodes up to 24 Volt
SO184 pressure release/oil drain screw
V FPM seals
W suitable for HFA, HFC oil-water emulsions (only necessary when using a clogging indicator or V or W elements)

2.2 Replacement element

0060 D 010 ON /-V

Size
0030, 0060, 0110, 0160, 0240

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020 BH4HC, V: 003, 005, 010, 020
W: 025, 050, 100, 200

Filter material
ON, BH4HC, V, W

Supplementary details
V, W (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

Type of indicator
VM Diff. pressure indicator up to 210 bar oper. pressure
VD Diff. pressure indicator 420 bar oper. pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing} =$ (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

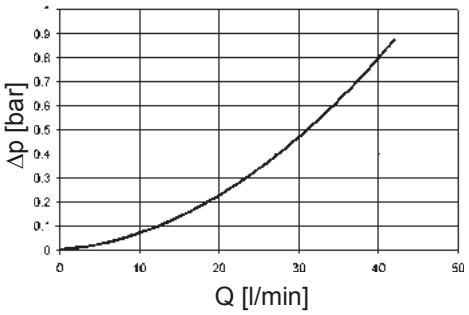
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

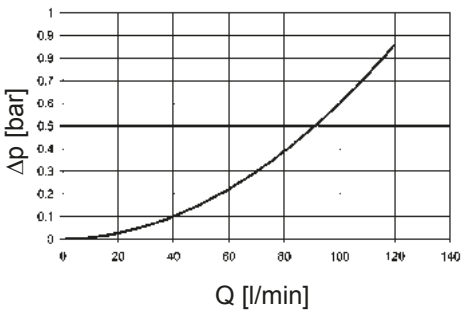
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

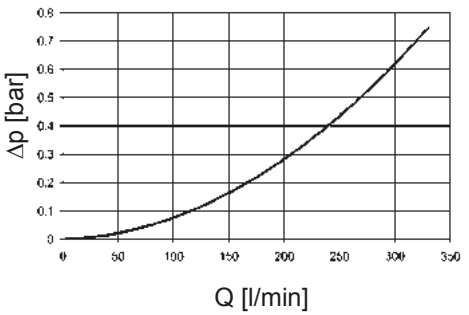
MDF 30



MDF 60-110



MDF 160-240



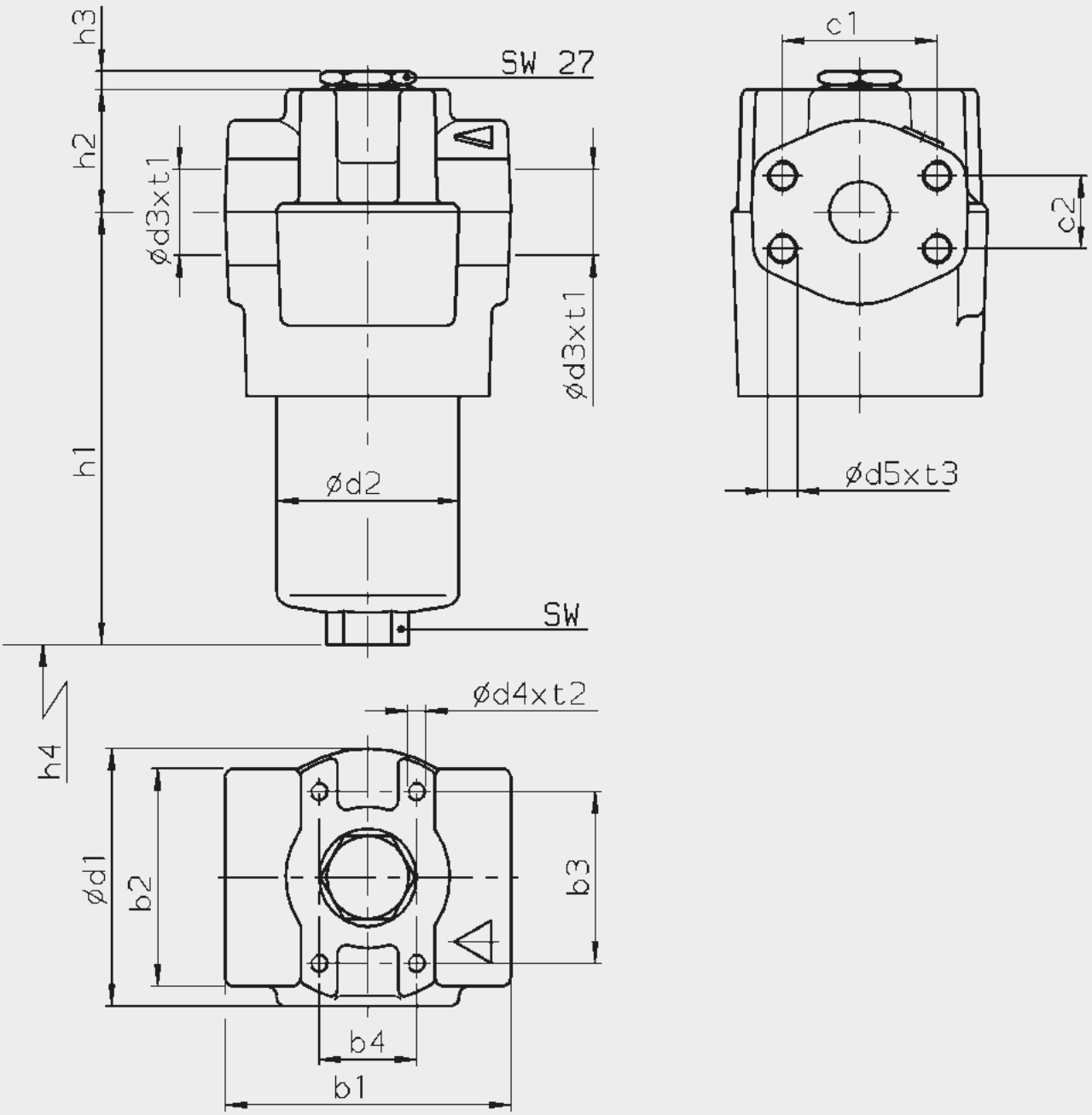
3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

MDF	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
30	77.8	63.9	43.3	22.8	14.0	11.3
60	53.5	26.0	18.3	12.1	9.78	6.32
110	25.8	13.4	9.61	6.06	4.63	2.99
160	18.5	11.0	7.70	4.10	3.71	3.18
240	11.5	6.90	5.34	3.19	2.44	2.10

MDF	V				W	BH4HC			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	5 µm	10 µm	20 µm
30	18.4	13.5	7.5	3.6	3.030	91.2	50.7	36.3	19.0
60	16.0	9.3	5.4	3.3	0.757	58.6	32.6	18.1	12.2
110	8.2	5.6	3.3	2.2	0.413	25.4	14.9	8.9	5.6
160	4.6	3.2	2.3	1.4	0.284	16.8	10.4	5.9	4.4
240	3.1	2.5	1.7	1.1	0.189	10.6	6.8	3.9	2.9

4. DIMENSIONS



MDF	b1	b2	b3	b4	C1	C2	d1	d2	d3	d4	d5	h1	h2	h3	h4	SW	t1	t2	t3	Weight incl. element [kg]	Volume of pressure chamber [l]
30 (B/C)	71	55	45	30	-	-	69	45	G½–G¾	M5	-	133	38	6	75	19	14–17	6	-	2.3	0.1
30 (H)	70	55	45	30	38.1	17.5	69	45	SAE DN 13	M5	M8	133	38	6	75	19	-	6	12	2.3	0.1
60 (C/D)	90	71	56	32	-	-	86	59	G¾–G1	M6	-	138	40	6	85	27	17–19	9	-	4.1	0.18
60 (I)	89	71	56	32	47.6	22.2	86	59	SAE DN 20	M6	M10	138	40	6	85	27	-	9	15	4.1	0.18
110 (C/D)	90	71	56	32	-	-	86	59	G¾–G1	M6	-	206	40	6	85	27	17–19	9	-	4.6	0.32
110 (I)	89	71	56	32	47.6	22.2	86	59	SAE DN 20	M6	M10	206	40	6	85	27	-	9	15	4.6	0.32
160 (E/F)	133	95	85	35	-	-	119	84	G1¼–G1½	M10	-	187	47	6	105	32	21–23	14	-	9.6	0.55
160 (J)	133	95	85	35	58.7	30.2	119	84	SAE DN 32	M10	M10	187	47	6	105	32	-	14	15	9.6	0.55
240 (E/F)	133	95	85	35	-	-	119	84	G1¼–G1½	M10	-	246	47	6	105	32	21–23	14	-	10.5	0.79
240 (J)	133	95	85	35	58.7	30.2	119	84	SAE DN 32	M10	M10	246	47	6	105	32	-	14	15	10.5	0.79

(.) = connection size (see Point 2.1: Type and size of connection)

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Inline Filter HDF
Inline Filter for Reversible Flow HDFF
up to 380 l/min, up to 280 (420) bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl. HDFF filters (on request) are suitable for flow in both directions.

Standard equipment:

- port in L-configuration
- without bypass valve
- port for a clogging indicator in filter head

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BH4HC):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	280 (420) bar
Fatigue strength	0 to 280 bar (min. 10^6 cycles) 0 to 420 bar (min. 250,000 cycles)
Temperature range	-30 °C to +100 °C (-30 °C to -10 °C: p_{max} = 140 bar)
Material of filter head	EN-GJS 400-15
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure indication up to 420 bar operating pressure)
Pressure setting of clogging indicator	5 bar for HDF (others on request) 8 bar for HDFF (others on request)
Cracking pressure of bypass only for HDF filters (optional)	6 bar (others on request)

1.4 SEALS

NBR (= Perbunan)

1.5 INSTALLATION

Inline filter with or without reversible oil flow

1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in FPM, EPDM
- With bypass valve (only HDF filter) *1
- With No-Element valve (only HDF filter in L-configuration) *1
- With oil drain plug

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

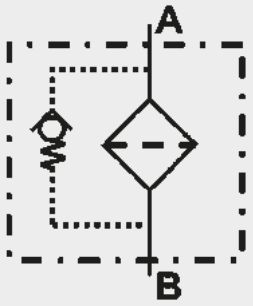
*1 Bypass valve and No-Element valve cannot be combined!

1.10 IMPORTANT INFORMATION

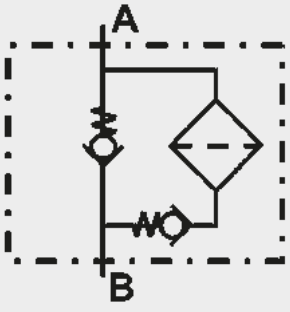
- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems

HDF



HDFF



E 7.581.2/11.16

2. MODEL CODE (also order example)

HDF ON 450 O L E 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
HDF or HDFF (HDFF on request)

Filter material
ON Optimicron®
BH/HC Betamicron® (BH4HC)

Size of filter or element
HDF/HDFF: 300, 450, 650, 900

Operating pressure
O 280 bar

Head type
L Flow path in L-configuration (standard version)

Type and size of connection

Type	Connection	300	450	650	900
D	G 1	●	●	●	●
E	G1 ¼	●	●	●	●
F	G1 ½	●	●	●	●

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20
BH/HC: 3, 5, 10, 20

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
BM visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
B. bypass cracking pressure (e.g. B6 = 6 bar); without details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt)] only for clogging indicators type "D"
LED 2 light-emitting diodes up to 24 Volt
NEV No-Element valve (only for HDF filters in L-configuration
SO184 pressure release/oil drain screw
V FPM seals

2.2 REPLACEMENT ELEMENT

0450 D 010 ON /-V

Size
0300, 0450, 0650, 0900

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020
BH4HC: 003, 005, 010, 020

Filter material
ON, BH4HC

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
5 standard 5 bar (for HDF filters)
8 standard 8 bar (for HDFF filters)
] others on request

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
V (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

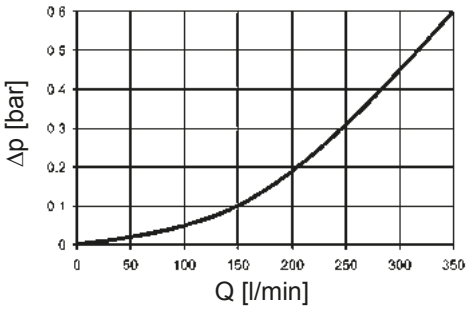
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

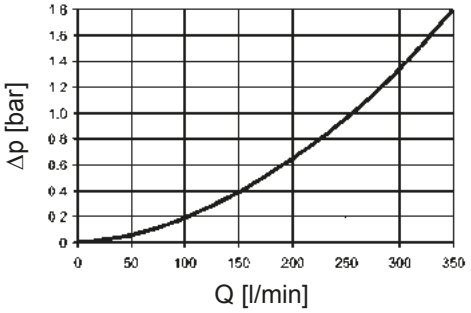
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

HDF



HDF with NEV



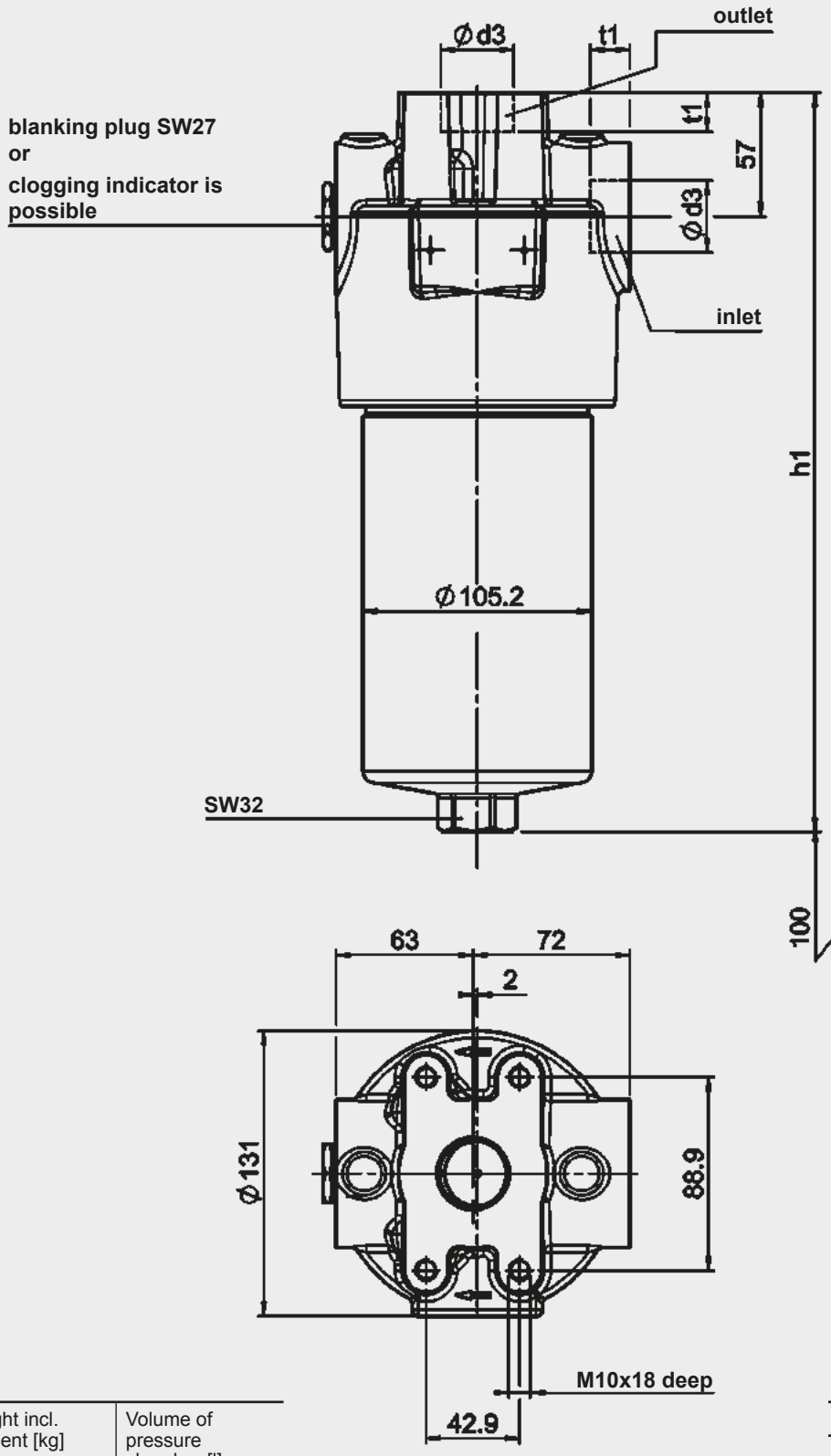
3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

HDF /	ON					
HDFF	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
300	14.6	8.90	7.13	4.88	2.80	2.61
450	7.30	4.45	3.52	2.39	1.40	1.26
650	4.46	2.69	2.20	1.47	0.86	0.81
900	3.37	2.10	1.67	1.10	0.65	0.63

HDF /	BH4HC			
HDFF	3 µm	5 µm	10 µm	20 µm
300	16.0	8.9	7.1	3.3
450	7.8	4.3	3.4	1.6
650	4.7	2.6	2.1	1.0
900	3.5	2.0	1.6	0.7

4. DIMENSIONS



HDF/ HDFF	h1	Weight incl. element [kg]	Volume of pressure chamber [l]
300	246	11.2	0.8
450	339	13.1	1.4
650	460	16.2	2.1
900	558	21.5	2.7

Ød3	t1
G1	18
G1 1/4	20
G1 1/2	22

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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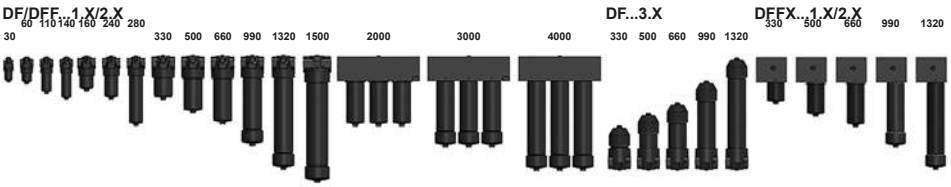
Pressure Filter DF
Pressure filter for Reversible Oil Flow DFF/DFFX
up to 1800 l/min, up to 420 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl. DFF filters are suitable for flow in both directions. The ∆p optimized filters DFFX are also suitable for flow in both directions and the filter ports are in L configuration.

Standard equipment:

- connection for a clogging indicator in filter head
- without bypass valve
- drain screw with pressure relief (for size DF/DFF/DFFX 330 and above)
- 1 or 2-piece filter bowl available as an option for DF/DFF 280-660, DFFX 330-660 and DF 2000
- 2-piece filter bowl standard for size DF/DFF/DFFX 990 and above

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Number of filter elements

DF/DFF/DFFX	Elements
30	1x0030 D
60	1x0060 D
110	1x0110 D
140	1x0140 D
160	1x0160 D
240	1x0240 D
280	1x0280 D
330	1x0330 D
500	1x0500 D
660	1x0660 D
990	1x0990 D
1320	1x1320 D
1500	1x1500 D
2000	3x0660 D
3000	3x0990 D
4000	3x1320 D

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BH4HC):	210 bar
Optimicron® Pulse (ON/PS):	20 bar
Optimicron® Pulse (OH/PS):	210 bar
Stainl. st. wire mesh (W)*:	20 bar
Stainless steel fibre (V)*:	210 bar

* not in 2-piece filter bowl

1.3 FILTER SPECIFICATIONS

Nominal pressure	420 bar
Fatigue strength	at nominal pressure $2x10^6$ cycles from 0 to nominal pressure (size 30 to 1320) $3x10^5$ cycles at 420 bar (size 1500) $3x10^6$ cycles at 280 bar (size 1500) 10^6 cycles at 315 bar (size 2000–4000)
Temperature range	-30 °C to +100 °C (-30 °C to -10 °C: p_{max} = 210 bar)
Material of filter head	EN-GJS 400-15, ADI (size 330–1500)
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure indication up to 420 bar operating pressure)
Pressure setting of clogging indicator	DF: 5 bar DFF/DFFX: 8 bar (others on request)
Bypass cracking pressure (optional)	6 bar (others on request)

1.4 SEALS

NBR (= Perbunan)

1.5 INSTALLATION

Inline filter with or without reversible oil flow

1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in FPM, EPDM
- with bypass valve (except for DFF 1500)
- Oil drain screw, up to DF/DFF 280
- In ADI material
  - for high duty cycle (DF/DFF 330-1500)
- Element top-removable - TKZ 3.X (only DF filters 330 - 1500)
- ∆P-optimized filter (only DFFX filter 330-1320)

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

on request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

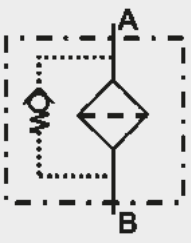
- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

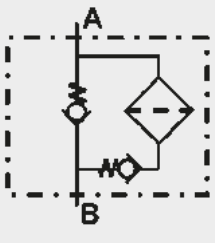
- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems

DF



DFF/DFFX



2. MODEL CODE (also order example)

DF ON 1500 T L L 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
DF, DFF, DFFX

Filter material

ON	Optimicron®	ON/PS	Optimicron® Pulse	W	Wire mesh*
BH/HC	Betamicron® (BH4HC)	OH/PS	Optimicron® Pulse	V	Metal fibre*

Size of filter or element
DF: 30, 60, 110, 140, 160, 240, 280, 330, 500, 660, 990, 1320, 1500, 2000, 3000, 4000
DFF: 60, 110, 140, 160, 240, 280, 330, 500, 660, 990, 1320, 1500
DFFX: 330, 500, 660, 990, 1320

Operating pressure
T 420 bar

Head design
no details inline filter ports (not possible for DFFX filters)
L filter ports in L configuration (only DF/DFF 1500 and for all DFFX filters)

Type and size of connection

Type	Connection type	Filter size 30	60	110	140	160	240	280	330	500	660	990	1320	1500	2000	3000	4000
B	G ½	●															
C	G ¾		●	●	●												
E	G1 ¼					●	●	●									
F	G1 ½								●	●	●	●	●				
G	G2													●			
I	SAE DN 20		●	●	●												
J	SAE DN 32					●	●	●									
L	SAE DN 50								●	●	●	●	●	●	●	●	●
N	SAE DN 80														●	●	●

Preferred models

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20 BH/HC, ON/PS, OH/PS, V*: 3, 5, 10, 20 W*: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A stainless steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1 one-piece filter bowl (up to DF/DFF/DFFX 660; DF 2000)
2 two-piece filter bowl (size DF/DFF/DFFX 280 and above)
3 element top-removable (only DF 330 - 1500)

Modification number
X the latest version is always supplied

Supplementary details
ADI ADI material - for high duty cycle (only DF/DFF 330 - 1500)
B. bypass cracking pressure (e.g. B6 = 6 bar); without details = without bypass valve (bypass not possible for DFF 1500!)
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 volts
] only for clogging indicators version "D"
SO184 pressure release screw/oil drain plug (DF/DFF 330 series and above)
V FPM seals
W suitable for HFA, HFC oil-water emulsions (only necessary when using a clogging indicator or V or W elements)

2.2 REPLACEMENT ELEMENT

1500 D 010 ON /-V

Size
0030, 0060, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320, 1500

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020 BH4HC, ON/PS, OH/PS, V: 003, 005, 010, 020
W*: 025, 050, 100, 200

Filter material
ON, BH4HC, W*, ON/PS, OH/PS, V*

Supplementary details
V, W (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
5 standard for DF filter: 5 bar
8 standard for DFF/DFFX filters: 8 bar
] others on request

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see point 2.1)

* not in 2-piece filter bowl

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

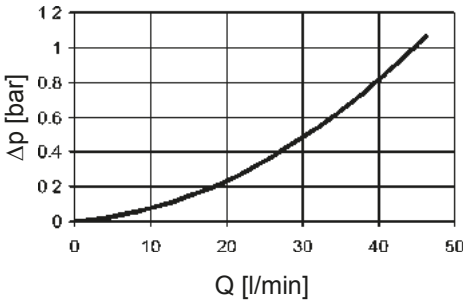
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

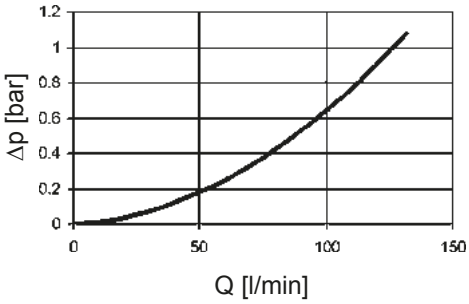
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

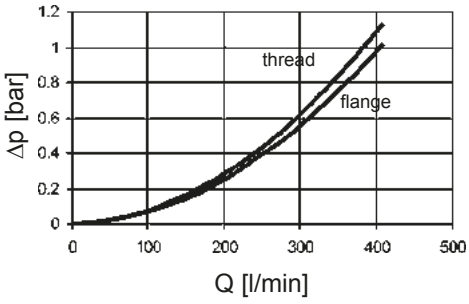
DF 30



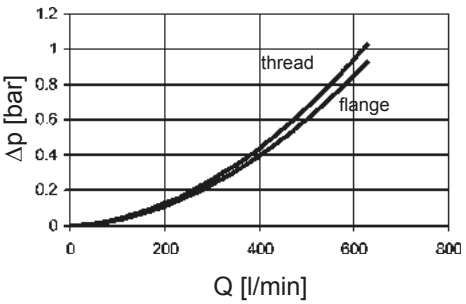
DF 60, 110, 140



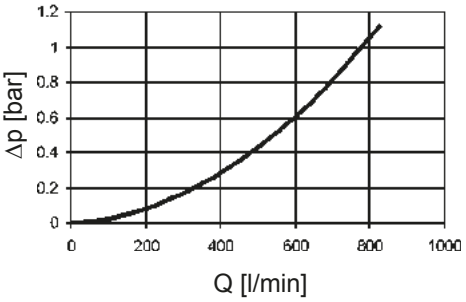
DF 160, 240, 280



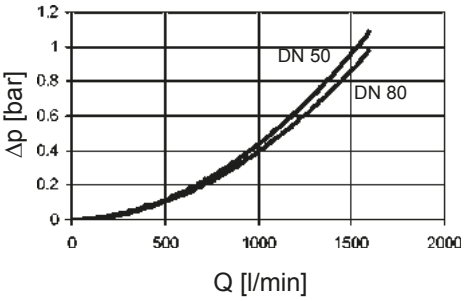
DF 330, 500, 660, 990, 1320



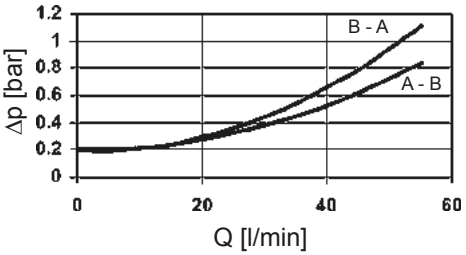
DF 1500



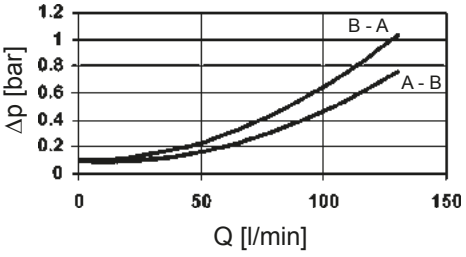
DF 2000, 3000, 4000



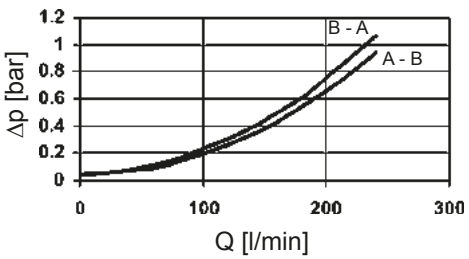
DFF 60, 110, 140



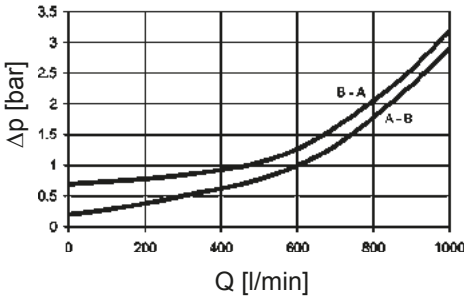
DFF 160, 240, 280



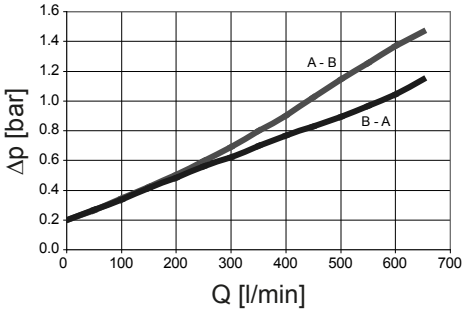
DFF 330, 500, 660, 990, 1320



DFF 1500



Δp optimized
DFFX 330, 500, 660, 990, 1320



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

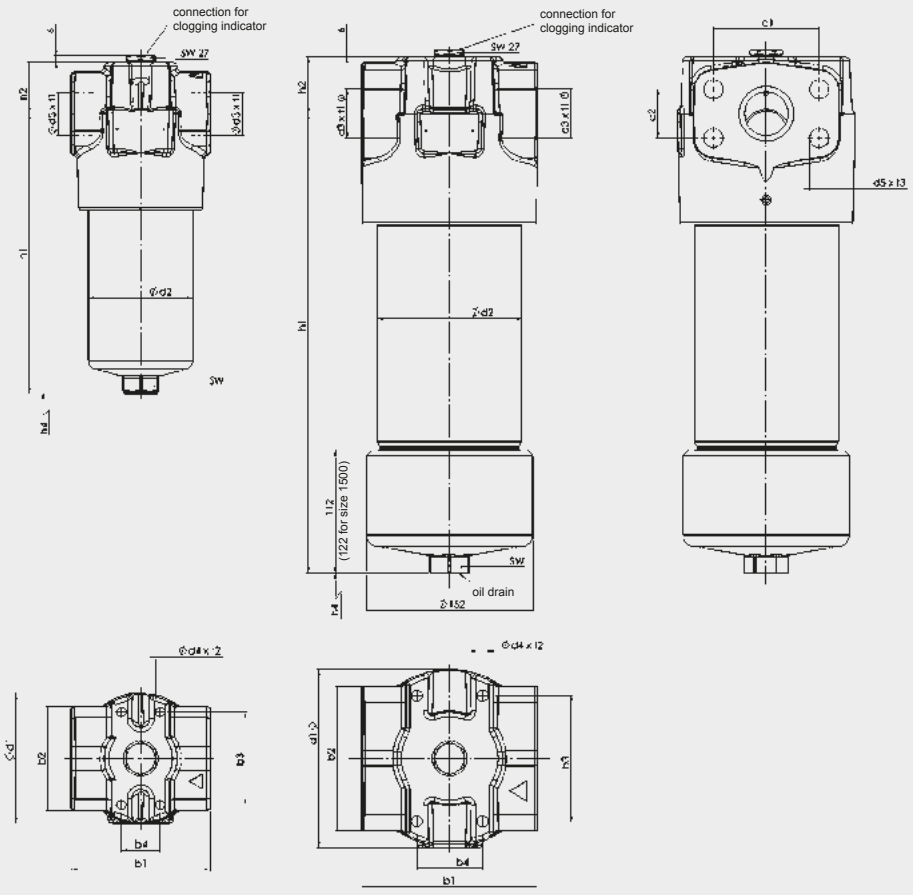
DF/ DFF DFFX	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
30	77.8	63.9	43.3	22.8	14.0	11.3
60	53.5	26.0	18.3	12.1	9.78	6.32
110	25.8	13.4	9.61	6.06	4.63	2.99
140	19.9	11.5	7.39	4.38	3.54	2.29
160	18.5	11.0	7.70	4.10	3.71	3.18
240	11.5	6.90	5.34	3.19	2.44	2.10
280	5.54	3.37	2.74	1.49	1.36	1.17
330	8.23	4.19	3.37	2.46	1.55	1.22
500	5.05	2.57	2.07	1.23	0.95	0.75
660	3.78	1.93	1.56	0.93	0.71	0.56
990	2.51	1.28	1.03	0.61	0.47	0.37
1320	1.85	0.97	0.76	0.45	0.35	0.27
1500	1.64	0.97	0.70	0.48	0.36	0.28

DF/ DFF DFFX	ON/PS				OH/PS			
	3 µm	5 µm	10 µm	20 µm	3 µm	5 µm	10 µm	20 µm
30	63.90	43.30	25.08	11.30	87.54	59.32	34.36	15.48
60	28.90	20.40	14.52	7.90	39.59	27.95	19.89	10.82
110	14.90	10.70	7.26	3.70	20.41	14.66	9.95	5.07
140	12.80	8.20	5.28	2.90	17.54	11.23	7.23	3.97
160	13.10	8.80	5.52	3.50	17.95	12.06	7.56	4.80
240	8.20	6.10	4.32	2.30	11.23	8.36	5.92	3.15
280	4.00	3.10	2.04	1.30	5.48	4.25	2.79	1.78
330	4.86	3.90	3.00	1.70	6.66	5.34	4.11	2.33
500	2.97	2.40	1.50	1.10	4.07	3.29	2.06	1.51
660	2.25	1.80	1.10	0.80	3.08	2.47	1.51	1.10
990	1.44	1.20	0.70	0.50	1.97	1.64	0.96	0.69
1320	1.10	0.90	0.50	0.40	1.51	1.23	0.69	0.55
1500	1.10	0.90	0.50	0.40	1.51	1.23	0.69	0.55

DF/ DFF DFFX	V				W/HC	BH4HC			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	5 µm	10 µm	20 µm
30	18.4	13.5	7.5	3.6	3.030	91.2	50.7	36.3	19.0
60	16.0	9.3	5.4	3.3	0.757	58.6	32.6	18.1	12.2
110	8.2	5.6	3.3	2.2	0.413	25.4	14.9	8.9	5.6
140	5.8	4.8	3.1	2.3	0.324	19.9	11.3	8.1	4.3
160	4.6	3.2	2.3	1.4	0.284	16.8	10.4	5.9	4.4
240	3.1	2.5	1.7	1.1	0.189	10.6	6.8	3.9	2.9
280	2.3	1.7	1.2	0.8	0.162	5.7	3.4	1.8	1.6
330	2.2	1.8	1.2	0.8	0.138	7.7	4.5	2.8	2.0
500	1.5	1.2	0.8	0.5	0.091	4.2	2.6	1.5	1.2
660	1.1	0.9	0.6	0.4	0.069	3.3	1.9	1.0	0.9
990	0.8	0.6	0.4	0.3	0.046	2.2	1.3	0.8	0.6
1320	0.6	0.5	0.3	0.2	0.035	1.6	1.0	0.6	0.4
1500	0.3	0.2	0.2	0.1	0.020	1.4	0.8	0.6	0.5

4. DIMENSIONS

DF 30, DF/DFF 60 to 1500 (inline filter ports)

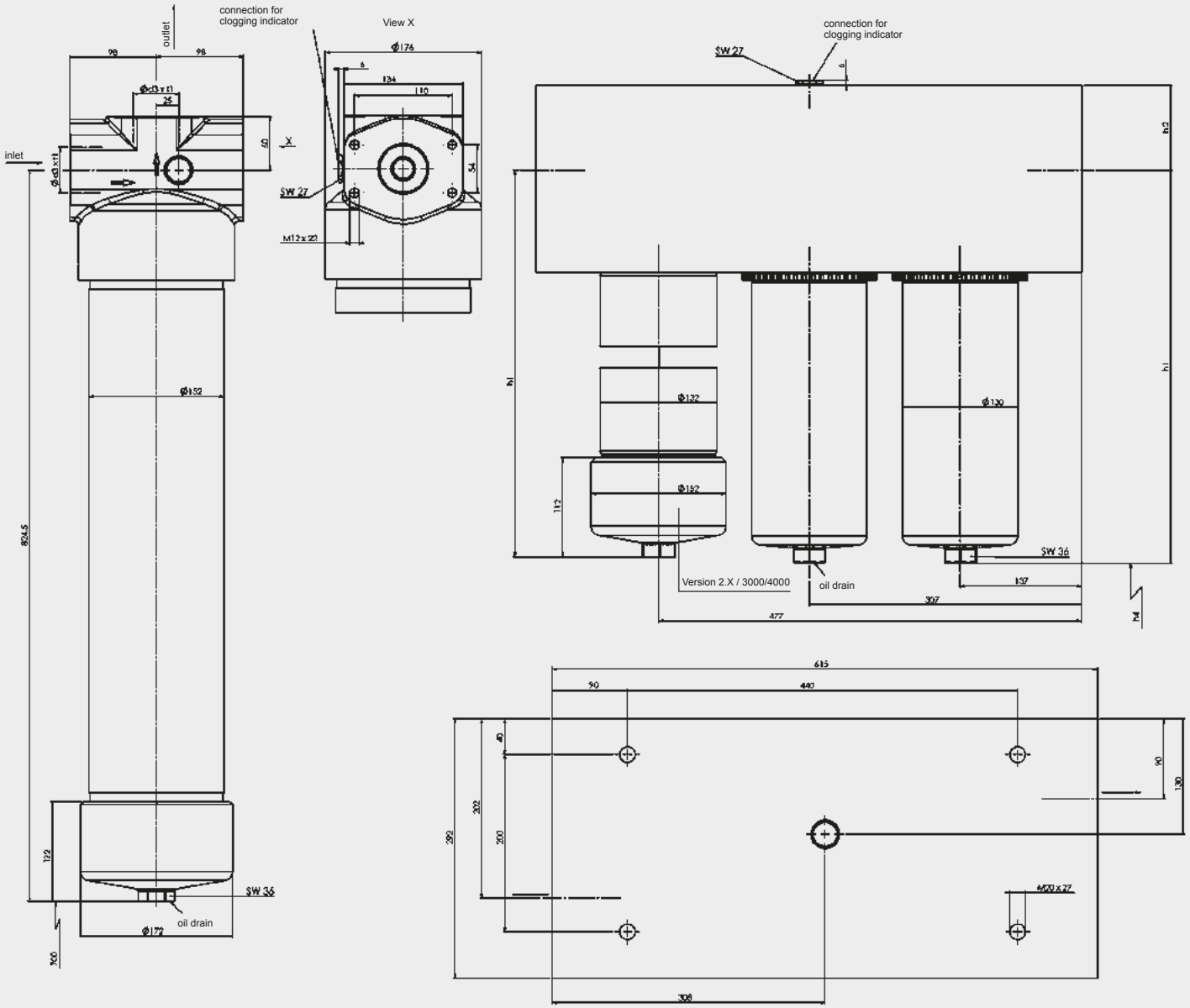


Type	b1	b2	b3	b4	c1	c2	d1	d2	d3	d4	d5	h1	h2	h4	SW	t1	t2	t3	Weight incl. element [kg]	Vol. of pressure chamber [l]
30... B...1.X	68	38	45	30	-	-	69	52	G ½	M5	-	131.5	38	75	24	14	6	-	2.3	0.13
60... C...1.X	90	71	56	32	-	-	86	68	G ¾	M6	-	140	40	85	27	16	9	-	4.5	0.20
60... I...1.X	89	71	56	32	50.8	23.8	86	68	SAE DN 20	M6	M10	140	40	85	27	-	9	15	4.5	0.20
110... C...1.X	90	71	56	32	-	-	86	68	G ¾	M6	-	209.5	40	85	27	16	9	-	5.4	0.33
110... I...1.X	89	71	56	32	50.8	23.8	86	68	SAE DN 20	M6	M10	209.5	40	85	27	-	9	15	5.4	0.33
140... C...1.X	89	71	56	32	-	-	86	68	G ¾	M6	-	250.5	40	85	27	16	9	-	6.0	0.40
140... I...1.X	89	71	56	32	50.8	23.8	86	68	SAE DN 20	M6	M10	250.5	40	85	27	-	9	15	6.0	0.40
160... E...1.X	125	95	85	35	-	-	119	95	G1¼	M10	-	196.5	47	105	32	20	14	-	10.3	0.60
160... J...1.X	125	95	85	35	66.7	31.8	119	95	SAE DN 32	M10	M14	196.5	47	105	32	-	14	19	10.3	0.60
240... E...1.X	125	95	85	35	-	-	119	95	G1¼	M10	-	256	47	105	32	20	14	-	11.8	0.80
240... J...1.X	125	95	85	35	66.7	31.8	119	95	SAE DN 32	M10	M14	256	47	105	32	-	14	19	11.8	0.80
280... E...1.X	125	95	85	35	-	-	119	95	G1¼	M10	-	438	47	105	32	20	14	-	16.3	1.60
280... J...1.X	125	95	85	35	66.7	31.8	119	95	SAE DN 32	M10	M14	438	47	105	32	-	14	19	16.3	1.60
330... F...1.X	160	133	115	60	-	-	163	130	G1½	M12	-	257.5	52	115	36	22	17	-	24.5	1.50
330... L...1.X	160	133	115	60	96.8	44.5	163	130	SAE DN 50	M12	M20	257.5	52	115	36	-	17	25	24.5	1.50
500... F...1.X	160	133	115	60	-	-	163	130	G1½	M12	-	350.5	52	115	36	22	17	-	28.6	2.30
500... L...1.X	160	133	115	60	96.8	44.5	163	130	SAE DN 50	M12	M20	350.5	52	115	36	-	17	25	28.6	2.30
660... F...1.X	160	133	115	60	-	-	163	130	G1½	M12	-	428	52	115	36	22	17	-	31.6	3.00
660... L...1.X	160	133	115	60	96.8	44.5	163	130	SAE DN 50	M12	M20	428	52	115	36	-	17	25	31.6	3.00
330... F...2.X	160	133	115	60	-	-	163	132	G1½	M12	-	254	52	180	36	22	17	-	27.4	1.50
330... L...2.X	160	133	115	60	96.8	44.5	163	132	SAE DN 50	M12	M20	254	52	180	36	-	17	25	27.4	1.50
500... F...2.X	160	133	115	60	-	-	163	132	G1½	M12	-	343	52	270	36	22	17	-	31.5	2.30
500... L...2.X	160	133	115	60	96.8	44.5	163	132	SAE DN 50	M12	M20	343	52	270	36	-	17	25	31.5	2.30
660... F...2.X	160	133	115	60	-	-	163	132	G1½	M12	-	420	52	350	36	22	17	-	34.4	3.00
660... L...2.X	160	133	115	60	96.8	44.5	163	132	SAE DN 50	M12	M20	420	52	350	36	-	17	25	34.4	3.00
990... F...2.X	160	133	115	60	-	-	163	132	G1½	M12	-	576	52	500	36	22	17	-	43.4	4.20
990... L...2.X	160	133	115	60	96.8	44.5	163	132	SAE DN 50	M12	M20	576	52	500	36	-	17	25	43.4	4.20
1320.. F...2.X	160	133	115	60	-	-	163	132	G1½	M12	-	742	52	670	36	22	17	-	51.1	5.60
1320.. L...2.X	160	133	115	60	96.8	44.5	163	132	SAE DN 50	M12	M20	742	52	670	36	-	17	25	51.1	5.60
1500.. G...2.X	196	134	110	54	-	-	176	152	G2	M12	-	824.5	60	700	36	29	22	-	69.3	8.20
1500.. L...2.X	196	134	110	54	96.8	44.5	176	152	SAE DN 50	M12	M20	824.5	60	700	36	-	22	25	69.3	8.20

B, C, E, F, G = threaded connection
I, J, L = flange connection to DIN ISO 6162, 6000 psi with metric thread

DF/DFF 1500 (filter ports in L configuration)

DF 2000, 3000, 4000

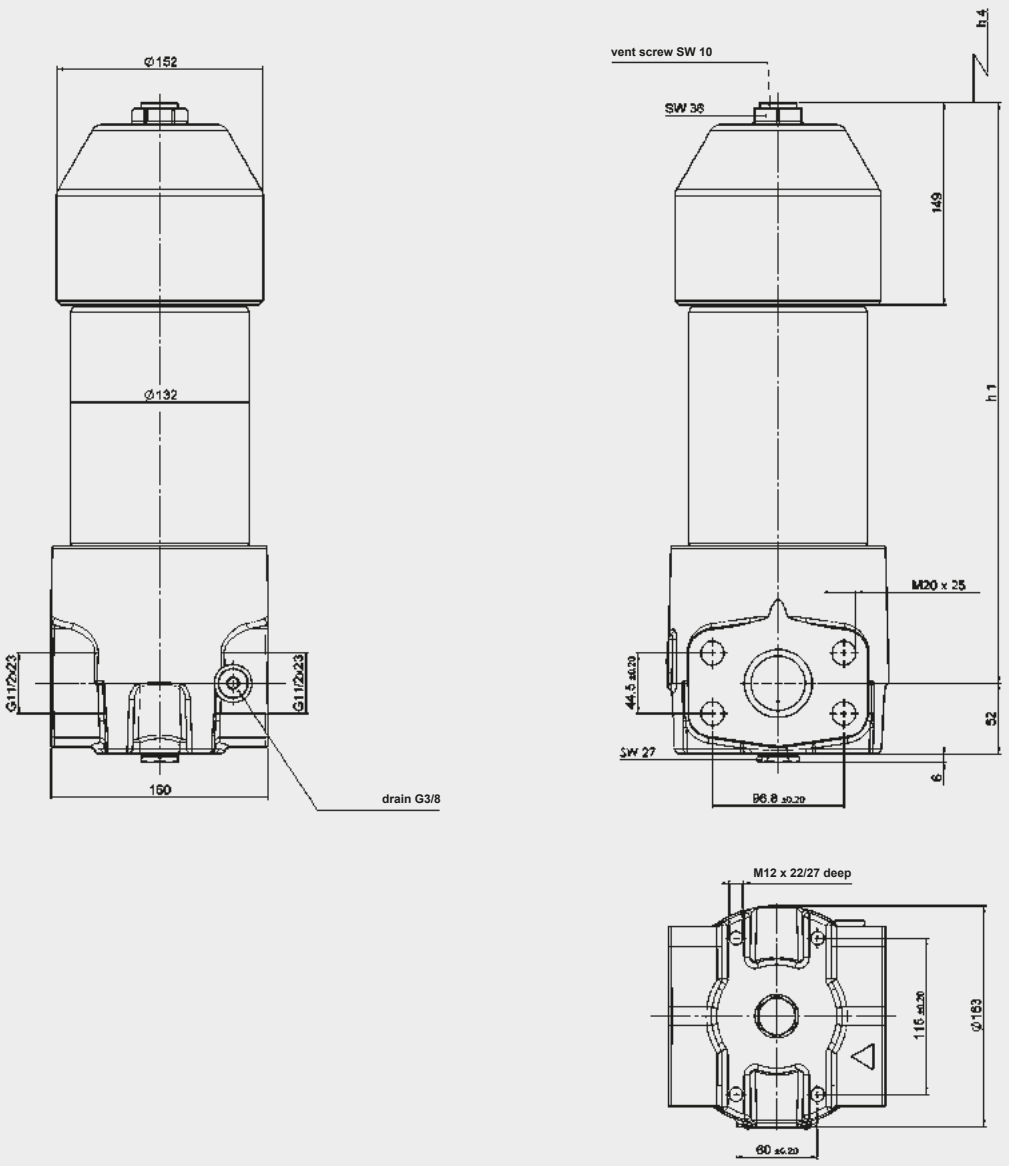


Type	d3	h1	h2	h4	t1	Weight incl. element [kg]	Volume of pressure chamber [l]
1500…TLG…2.X	G2	-		700	30	69.3	8.20
1500…TLL…2.X	SAE DN 50	-		700	-	69.3	8.20
2000…T L…1.X	SAE DN 50	433	70	95	-	180.0	11.00
2000…T L…2.X	SAE DN 50	425.5	70	350	-	180.0	11.00
2000…T N…1.X	SAE DN 80	447	95	95	-	265.0	14.00
2000…T N…2.X	SAE DN 80	440	95	350	-	274.0	14.00
3000…T L…2.X	SAE DN 50	582	70	500	-	206.0	17.00
3000…T N…2.X	SAE DN 80	596	95	500	-	302.0	17.00
4000…T L…2.X	SAE DN 50	783	70	670	-	229.0	21.80
4000…T N…2.X	SAE DN 80	762	95	670	-	326.0	21.80

G = threaded connection

L, N = flanged connection to DIN ISO 6162, 6000 psi with metric thread

DF 330 to 1320...3.X (element top-removable)

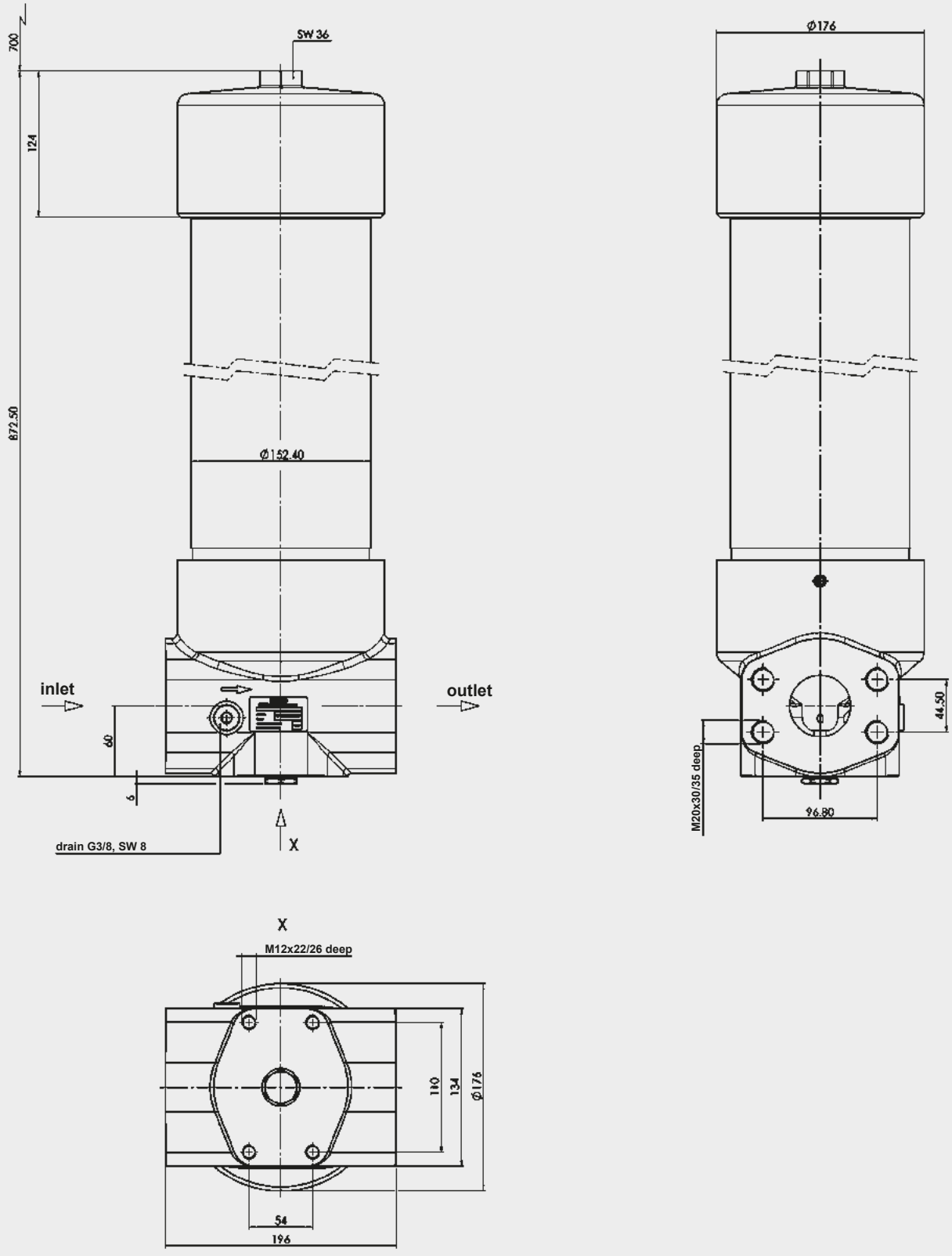


Type	h1	h4	Weight incl. element [kg]	Volume of pressure chamber [l]
330...F..3.X	263	80	27.9	1.50
330...L..3.X	263	80	27.9	1.50
500...F..3.X	351	170	31.8	2.30
500...L..3.X	351	170	31.8	2.30
660...F..3.X	428	250	33.9	3.00
660...L..3.X	428	250	33.9	3.00
990...F..3.X	583	400	43.1	4.20
990...L..3.X	583	400	43.1	4.20
1320...F..3.X	749	570	50.8	5.60
1320...L..3.X	749	570	50.8	5.60

F = threaded connection

L = flanged connection to DIN ISO 6162, 6000 psi with metric thread

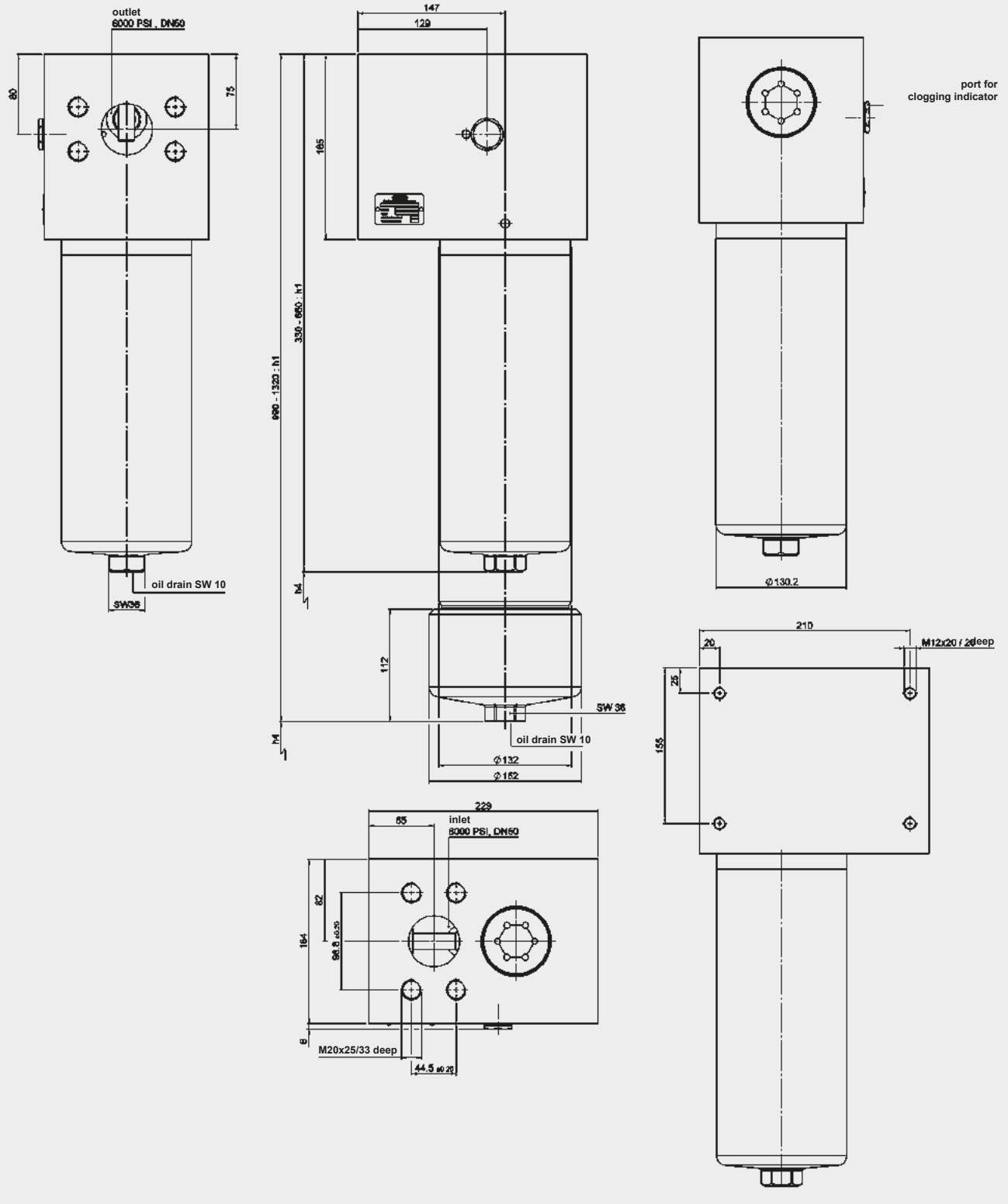
DF 1500...3.X (element top-removable)



Type	Weight incl. element [kg]	Volume of pressure chamber [l]
1500...L..3.X	65.0	8.20

L = flanged connection to DIN ISO 6162, 6000 psi with metric thread

DFFX 330 to 1320 (Δp-optimized; filter ports in L configuration)



Type	h1	h4	Weight incl. element [kg]	Volume of pressure chamber [l]
330...L..1.X	346.5	115	49.5	1.50
500...L..1.X	439.5	115	53.6	2.30
660...L..1.X	517	115	56.6	3.00
990...L..2.X	665	500	68.4	4.20
1320..L..2.X	831	670	76.1	5.60

L = flange connection to DIN ISO 6162, 6000 psi with metric thread

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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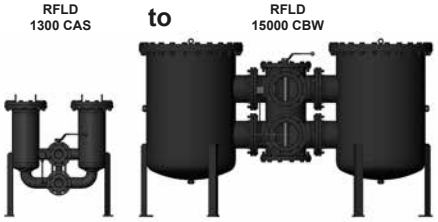
Change-Over Inline Filter RFLD Welded Version

up to 15000 l/min, up to 16 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. The two sections of the filter housing (each with bolt-on cover plates) are connected by means of a ball change-over valve with negative overlap and single lever operation (ball, segment) or hand-wheel (butterfly).

Standard equipment:

- connections for venting and draining
- connection for a clogging indicator
- pressure equalisation line
- bypass valve

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170 ISO 16889

Number of filter elements

RFLD	Elements per side
130x	1x1300 R
132x	1x2600 R
250x	3x0850 R
252x	3x1700 R
400x	5x0850 R
402x	5x1700 R
520x	4x1300 R
522x	4x2600 R
650x	5x1300 R
652x	5x2600 R
780x	6x1300 R
782x	6x2600 R
1500x	10x1300 R
1502x	10x2600 R

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Optimicron® Power (ON/PO):	10 bar
Paper (P/HC):	10 bar
Stainl. st. wire mesh (W/HC):	20 bar
Stainless steel fibre (V):	30 bar
Betamicron®/Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	16 bar (or 10 bar: depending on size and nominal bore)
Temperature range	-10 °C to +100 °C
Material of housing and cover plate	Welded steel: final digit of filter size 0 Stainl. steel 1.4571: final digit of filter size 3
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 MOUNTING

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Orifice in the pressure equalisation line
- Drain and vent ports with ball valves or other shut-off valves
- Counter flanges available for all sizes
- Change-over valve lockable
- Venting line with sight gauges
- Flanges to DIN 2501 with O-ring seal
- Cover plate lifting device for sizes RFLD 4000

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

Material code (final digit of filter size): 0:

These filters can be supplied with manufacturer's test certificates O and M to DIN 55350, Part 18.
Test certificates 3.1 to DIN EN 10204 and approval certificates (Type Approval) for different approval authorities.
Areas of application, amongst others: lubrication

Material code (final digit of filter size): 3:

Filters for use in separation technology with low viscosity, high viscosity and aggressive fluids as well as gaseous media.*

* *These filters are available from HYDAC Process Technology division.*

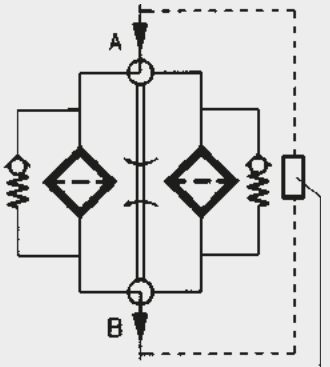
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) and CLP oils on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.

Symbol for hydraulic systems



Differential pressure indicator

2. MODEL CODE (also order example)

RFLD ON/PO 1300 C A K 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type

RFLD

Filter material

ON	Optimicron®	P/HC	Paper	AM	Aquamicron®
ON/PO	Optimicron® Power	W/HC	Stainl. st. wire mesh	BN/AM	Betamicron®/Aquamicron®
V	Stainless steel fibre				

Size of filter or element

Welded steel: 1300, 1320, 2500, 2520, 4000, 4020, 5200, 5220, 6500, 6520, 7800, 7820, 15000, 15020
Stainl. st. 1.4571: 1303, 1323, 2503, 2523, 4003, 4023, 5203, 5223, 6503, 6523, 7803, 7823, 15003, 15023

Operating pressure

C = 16 bar (other operating pressures on request)

Type of change-over

A	One-part, ball	All nominal bores except DN 200, 250, 300
B	Segment	Nominal bores DN 200, 250
C	Butterfly	Nominal bores DN 150, 200, 250, 300
E	Two-part, ball	Nominal bore DN 200

Type and size of port

Steel, welded (●) - for lubrication applications; 1.4571 (★) - for emulsion applications (please contact Hydac Process Technology division)

Type	Port	Filter size 1300 1303	1320 1323	2500 2503 2520 2523	4000 4003 4020 4023	5200 5203 5220 5223	6500 6503 6520 6523	7800 7803 7820 7823	15000 15003 15020 15023
K	SAE DN 40	●★	●★						
L	SAE DN 50	●★	●★	●★					
M	SAE DN 65	●★	●★	●★					
S	SAE/DIN DN 80	●★	●★	●★	●★	●★	●★		
T	SAE/DIN DN 100	●★	●★	●★	●★	●★	●★	●★	
U	DIN DN 125	●★	●★	●★	●★	●★	●★	●★	
V	DIN DN 150			●★	●★	●★	●★	●★	
W	DIN DN 200				●★	●★	●★	●★	●★
X	DIN DN 250					●★	●★	●★	●★
Y	DIN DN 300								●★

Other nominal bores on request

Filtration rating in µm

ON:	1, 3, 5, 10, 15, 20	P/HC:	10, 20	AM:	40
ON/PO *, V:	3, 5, 10, 20	W/HC:	25, 50, 100, 200	BN/AM:	3, 10

Type of clogging indicator

Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical

for other clogging indicators, see brochure no. 7.050../..

Type code

1

Modification number

X the latest version is always supplied

Supplementary details

B. special cracking pressure (e.g. B1 = 1 bar)
DE differential pressure measurement across element
DH cover plate lifting device
KB without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt

only for clogging indicators type "D"

OR O-ring groove on the DIN flange (inlet, outlet) to Rexroth standard AB22-04
RE sealing strip E on the flange (inlet, outlet): surface finish 3,6 µm
- ball change-over, up to 150 nominal bore
- segment change-over, nominal bores CBV, CBW, CBX
- butterfly change-over all nominal bores

SB pressure equalisation line (SB2 = with 2mm orifice)
V FPM seals

2.2 REPLACEMENT ELEMENT

0850 R 010 ON/PO /-V

Size

0850, 1300, 1700, 2600

Type

R

Filtration rating in µm

ON:	001, 003, 005, 010, 015, 020	P/HC:	010, 020	AM:	040
ON/PO *, V:	003, 005, 010, 020	W/HC:	025, 050, 100, 200	BN4AM:	003, 010

Filter material

ON, ON/PO, V, W/HC, P/HC, BN4AM, AM

Supplementary details

V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 2 D . X /-L24

Type

VM differential pressure measurement up to 210 bar operating pressure

Pressure setting

2 standard 2 bar, others on request

Type of clogging indicator (see Point 2.1)

Modification number

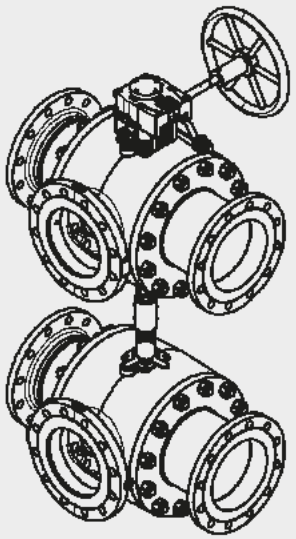
X the latest version is always supplied

Supplementary details

L..., LED, V (for descriptions, see point 2.1)

* Optimicron® Power (ON/PO) not available in 3 µm!

2.4 TWO-PART BALL CHANGE-OVER VALVE KUA



Independently of RFLD filters, the valve can also be used separately as a connector piece for double plate heat exchangers as well as for double tube bundle coolers.

It consists of SG iron and is available with a DIN DN 200 flange and a pressure equalisation line with integrated ball valve (DN 15).

Can be installed in filters RFLD 4000, 4020, 5200, 5220, 6500, 6520, 7800, 15000 and 15020 welded of steel.

Preferred distance from ball centre to ball centre is 500 mm[1)].

Others on request!

When supplied, control spindle is disconnected!

Technical features

- Two-part change-over valve
- Ports: DIN DN 200 (other ports on request)
- Materials
  - SG iron EN GJS-400-15 to DIN EN 1563
- Full bore
- Supplied with cooler connecting flange

MODEL CODE

KUA 01 C E W /-Axxxx

Filter type
KUA Ball change-over valve

Material
01 SG iron

Operating pressure
C 16 bar

Change-over valve
E Ball change-over

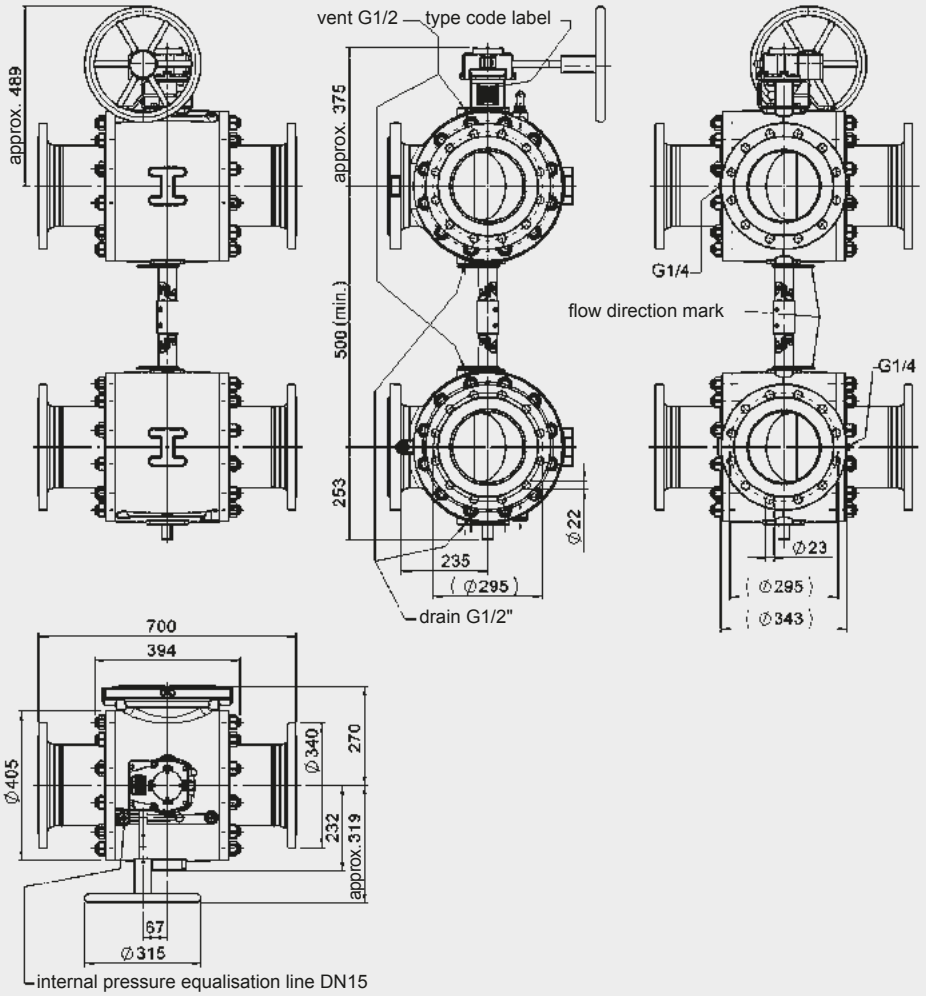
Type and size of connection

Type	Port	Material 01
W	DIN DN 200	●

Other nominal bores on request!

Supplementary details
Axxxx Distance from ball centre to ball centre (e.g. A500 = Preferred clearance 500 mm)

DIMENSIONS



1) When used on, for example, a cooler, there is a joint between the two parts of the KUA. In this case, the min. centre-to-centre distance is 710.

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing} =$ (see Point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

For ease of calculation, our Filter Sizing Program is available on request free of charge.

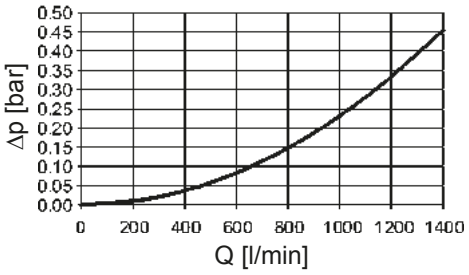
NEW: Sizing online at www.hydac.com

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

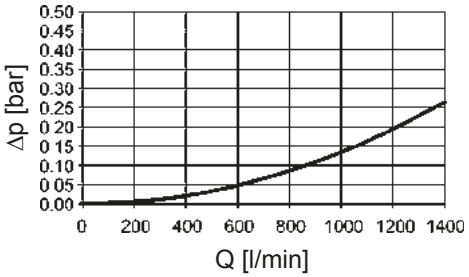
The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

——— with change-over valve

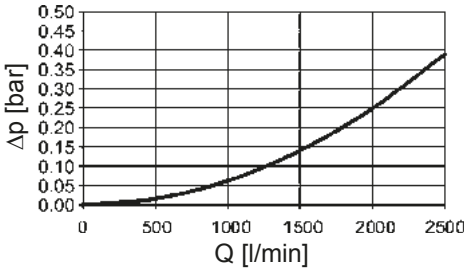
RFLD 1300, 1303



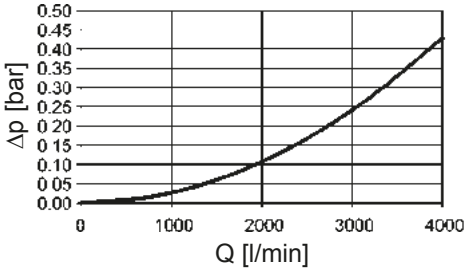
RFLD 1320, 1323



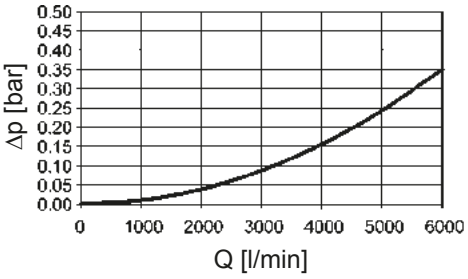
RFLD 2500, 2503, 2520, 2523



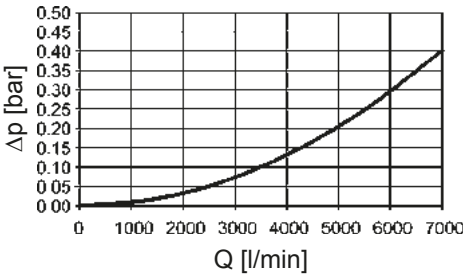
RFLD 4000, 4003, 4020, 4023



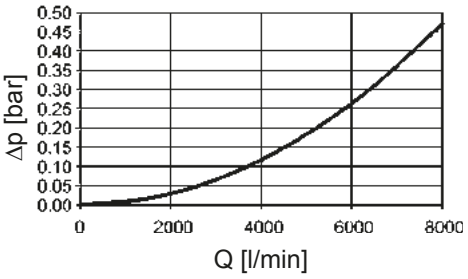
RFLD 5200, 5203, 5220, 5223



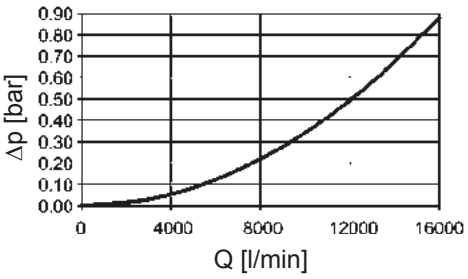
RFLD 6500, 6503, 6520, 6523



RFLD 7800, 7803, 7820, 7823



RFLD 15000, 15003, 15020, 15023



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

RFLD	ON						ON/PO		
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	5 µm	10 µm	20 µm
850	2.77	1.31	1.00	0.58	0.44	0.36	0.28	0.24	0.16
1300	1.72	0.72	0.59	0.35	0.32	0.22	0.18	0.15	0.10
1700	1.35	0.64	0.53	0.28	0.25	0.18	0.13	0.11	0.07
2600	0.84	0.36	0.29	0.18	0.16	0.11	0.08	0.07	0.05

RFLD	V				W/HC
	3 µm	5 µm	10 µm	20 µm	–
850	0.8	0.6	0.4	0.3	0.063
1300	0.5	0.4	0.3	0.2	0.045
1700	0.4	0.3	0.2	0.1	0.032
2600	0.3	0.2	0.1	0.1	0.018

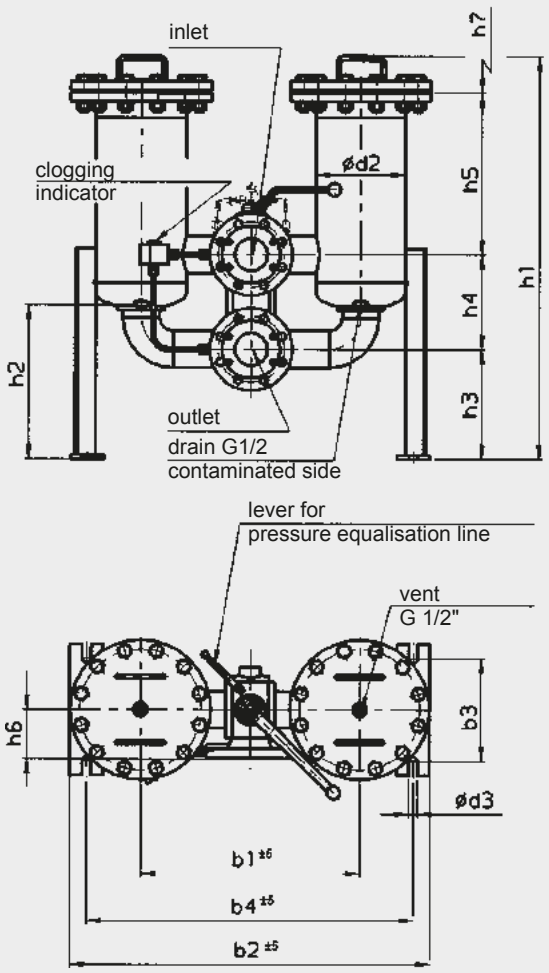
3.3 FILTER SPECIFICATIONS (TYPE OF CHANGE-OVER: A = BALL; B = SEGMENT; C = BUTTERFLY)

Filter type	Connection	Change-over	Volume of pressure chamber [l]	Weight [kg] including change-over valve and elements		
				A + E (ball)	B (segment)	C (butterfly)
1300, 1303	SAE DN 40	ball	2 x 22.0	105		
	SAE DN 50	ball	2 x 22.0	110		
	SAE DN 65	ball	2 x 22.0	115		
	SAE/DIN DN 80	ball	2 x 19.0	136		
	SAE/DIN DN 100	ball	2 x 19.0	150		
1320, 1323	SAE DN 40	ball	2 x 37.0	138		
	SAE DN 50	ball	2 x 37.0	143		
	SAE DN 65	ball	2 x 37.0	148		
	SAE/DIN DN 80	ball	2 x 34.0	169		
	SAE/DIN DN 100	ball	2 x 34.0	183		
	DIN DN 125	ball	2 x 45.0	209		
2500, 2503/ 2520, 2523	SAE DN 50	ball	2 x 34.0 / 2 x 54.0	144/174		
	SAE DN 65	ball	2 x 34.0 / 2 x 54.0	149/179		
	SAE/DIN DN 80	ball	2 x 37.0 / 2 x 57.0	170/200		
	SAE/DIN DN 100	ball	2 x 39.0 / 2 x 59.0	184/214		
	DIN DN 125	ball,	2 x 40.0 / 2 x 60.0	208/238		
	DIN DN 150	ball, butterfly	2 x 45.0 / 2 x 65.0	262/292		287/327
4000, 4003/ 4020, 4023	SAE/DIN DN 80	ball	2 x 63.0 / 2 x 96.0	210/270		
	SAE/DIN DN 100	ball	2 x 63.0 / 2 x 96.0	222/283		
	DIN DN 125	ball	2 x 74.0 / 2 x 109.0	246/307		
	DIN DN 150	ball, butterfly	2 x 75.0 / 2 x 110.0	292/352		313/373
	DIN DN 200	ball, segment, butterfly	2 x 83.0 / 2 x 118.0	507/567	262/504	393/453
5200, 5203/ 5220, 5223	SAE/DIN DN 80	ball	2 x 89.0 / 2 x 142.0	384/494		
	SAE/DIN DN 100	ball	2 x 90.0 / 2 x 143.0	398/507		
	DIN DN 125	ball	2 x 104.0 / 2 x 157.0	422/532		
	DIN DN 150	ball, butterfly	2 x 106.0 / 2 x 159.0	476/586		503/614
	DIN DN 200	ball, segment, butterfly	2 x 110.0 / 2 x 162.0	691/801	646/756	596/706
	DIN DN 250	segment, butterfly	2 x 128.0 / 2 x 180.0		890/1000	956/1118
6500, 6503/ 6520, 6523	SAE/DIN DN 100	ball	2 x 161.0 / 2 x 246.0	628/782		
	DIN DN 125	ball	2 x 162.0 / 2 x 247.0	652/806		
	DIN DN 150	ball, butterfly	2 x 163.0 / 2 x 248.0	706/868		738/901
	DIN DN 200	ball, segment, butterfly	2 x 190.0 / 2 x 275.0	921/1083	877/1039	826/988
	DIN DN 250	segment, butterfly	2 x 194.0 / 2 x 279.0		1121/1282	956/1118
7800, 7803/ 7820, 7823	SAE/DIN DN 100	ball	2 x 161.0 / 2 x 246.0	636/798		
	DIN DN 125	ball	2 x 162.0 / 2 x 247.0	660/822		
	DIN DN 150	ball, butterfly	2 x 163.0 / 2 x 248.0	714/884		746/917
	DIN DN 200	ball, segment, butterfly	2 x 190.0 / 2 x 275.0	929/1099	885/1055	834/1004
	DIN DN 250	segment, butterfly	2 x 194.0 / 2 x 279.0		1129/1298	964/1134
15000, 15003/ 15020, 15023	DIN DN 200	ball, segment, butterfly	2 x 391.0 / 2 x 558.0		1210/1380	1143/1250
	DIN DN 250	segment, butterfly	2 x 397.0 / 2 x 564.0		1454/1623	1271/1379
	DIN DN 300	butterfly	2 x 433.0 / 2 x 600.0			1487/1547

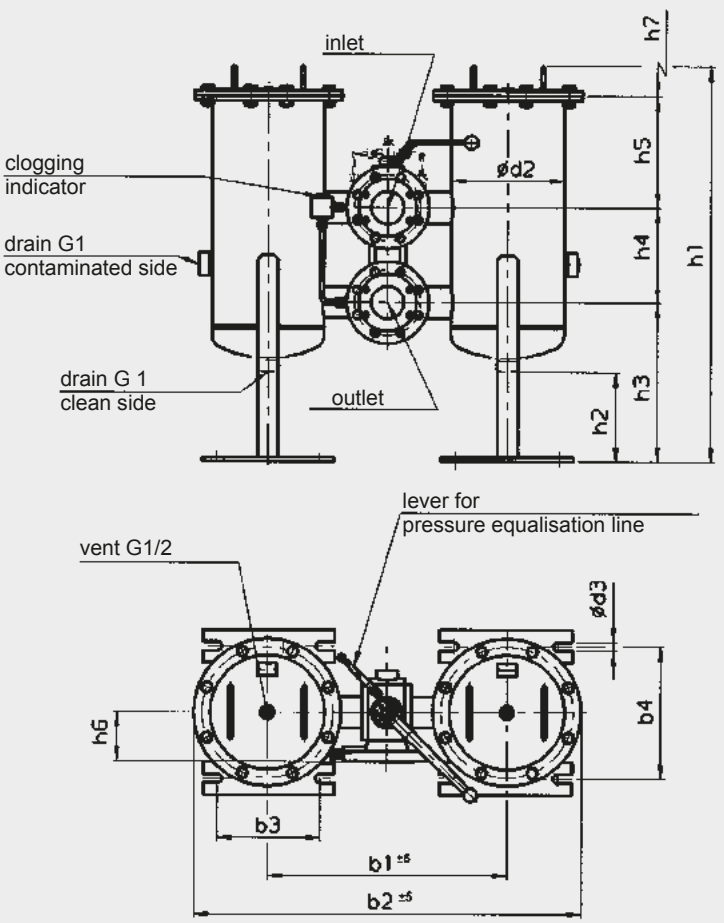
4. DIMENSIONS

4.1. WELDED FILTER SERIES - BALL VERSION RFLD 130x - 252x (CHANGE-OVER TYPE A)

RFLD 1300/1320



RFLD 2500/2520

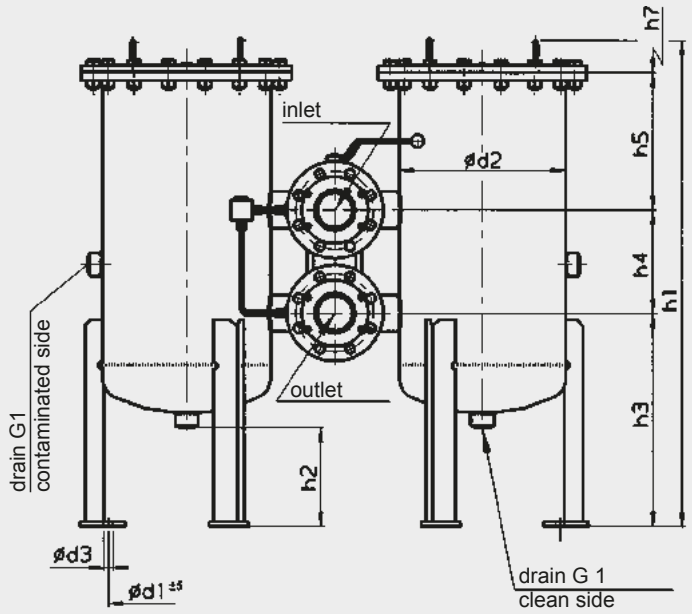


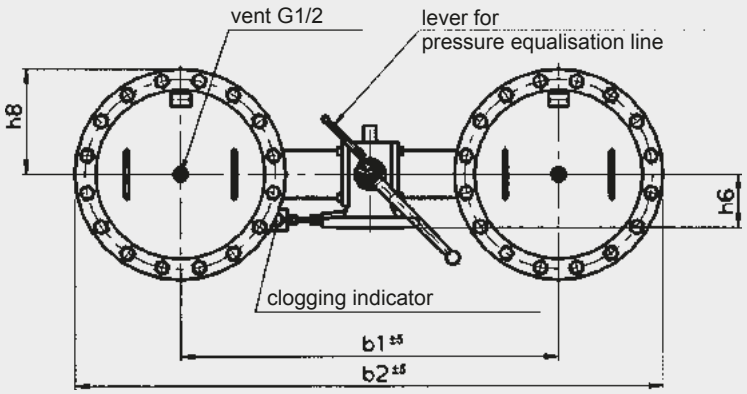
Dimensions in mm

Type	Flange connection [1]	b_1	b_2	b_3	b_4	d_2	d_3	h_1	h_2	h_3	h_4	h_5	h_6	h_7
RFLD	SAE DN 40	495	835	250	755	220	22	970/1410	205	335	95	460/900	92	500/940
1300/1320	SAE DN 50	506	846	250	766	220	22	970/1410	210	328	110	452/892	102	500/940
	SAE DN 65	506	846	250	766	220	22	970/1410	210	328	110	452/892	167	500/940
	SAE/DIN DN 80	530	870	250	790	220	22	970/1410	370	260	230	400/840	120	500/940
	SAE/DIN DN 100	588	926	250	846	220	22	970/1410	375	266	250	374/814	130	500/940
RFLD 1320	DIN DN 125	603	943	250	863	220	22	1536	190	385	300	765	188	940
RFLD	SAE DN 50	548	908	250	312	273	22	940/1330	220	383	110	378/768	102	420/810
2500/2520	SAE DN 65	548	908	250	312	273	22	940/1330	220	383	110	378/768	167	420/810
	SAE/DIN DN 80	572	932	250	312	273	22	990/1380	220	408	230	280/670	120	420/810
	SAE/DIN DN 100	588	948	250	312	273	22	990/1380	220	408	250	260/650	130	420/810
	DIN DN 125	589	949	250	312	273	22	1050/1440	220	438	300	240/630	188	420/810
	DIN DN 150	641	1001	250	312	273	22	1050/1440	220	438	300	240/630	190	420/810

[1] Flange connection to SAE J 518 C (standard pressure series 3000 psi)
DIN flange connection to DIN EN ISO 1092, PN25/40 up to DN100 and
PN 16 from DN125 (with sealing strip, flange shape B)

4.2. WELDED FILTER SERIES - BALL VERSION RFLD 400x - 1502x (CHANGE-OVER TYPE A + E)



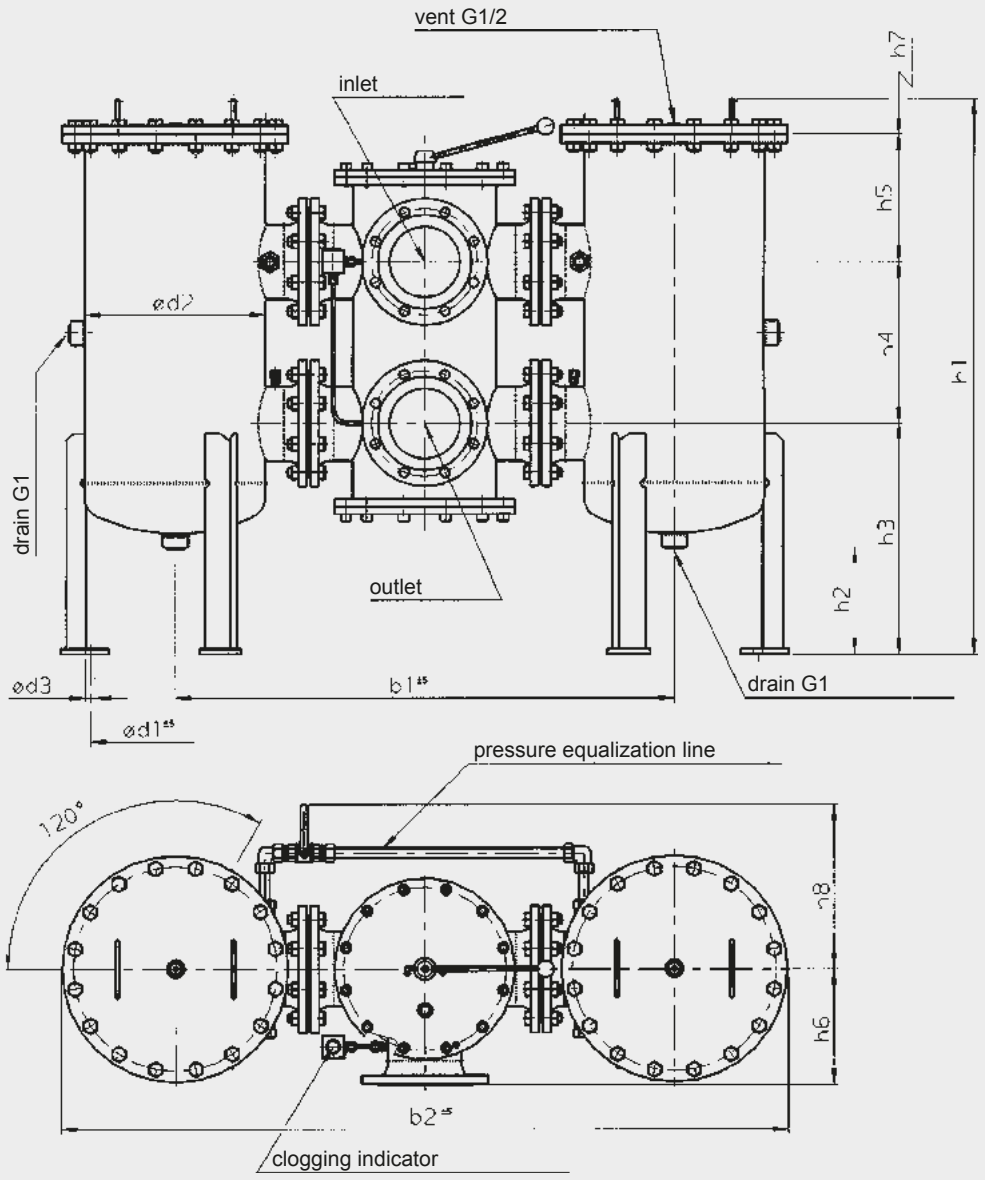


Dimensions in mm

Type	Flange connection [1]	b_1	b_2	d_1	d_2	d_3	h_1	h_2	h_3	h_4	h_5	h_6	h_7	h_8
RFLD 4000/4020	SAE/DIN DN 80	688	1152	330	356	22	1080/1470	260	475	230	295/685	120	420/810	230
	SAE/DIN DN 100	704	1164	330	356	22	1080/1470	260	475	250	275/665	130	420/810	230
	DIN DN 125	723	1183	330	356	22	1170/1560	260	525	300	265/645	188	420/810	230
	DIN DN 150	775	1240	330	356	22	1170/1560	260	525	300	265/645	190	420/810	230
	DIN DN 200	884	1349	330	356	22	1205/1585	260	525	500	215/480	270	420/810	230
RFLD 5200/5220	SAE/DIN DN 80	728	1244	380	406	22	1144/1584	250	465	230	371/811	120	500/940	255
	SAE/DIN DN 100	744	1260	380	406	22	1144/1584	250	465	250	351/791	130	500/940	255
	DIN DN 125	763	1275	380	406	22	1256/1696	250	525	300	351/791	188	500/940	255
	DIN DN 150	815	1330	380	406	22	1256/1696	250	525	300	351/791	190	500/940	255
	DIN DN 200	924	1439	380	406	22	1365/1696	250	525	500	260/591	270	500/940	255
RFLD 6500/6520	SAE/DIN DN 100	1024	1644	480	508	22	1260/1700	260	540	250	390/830	130	500/940	310
	DIN DN 125	863	1483	480	508	22	1260/1700	260	540	300	340/780	188	500/940	310
	DIN DN 150	915	1535	480	508	22	1260/1700	260	540	300	340/780	190	500/940	310
	DIN DN 200	1024	1644	480	508	22	1440/1830	265	600	500	260/640	270	500/940	310
RFLD 7800/7820	SAE/DIN DN 100	1024	1644	480	508	22	1260/1700	260	540	250	390/830	130	500/940	310
	DIN DN 125	863	1483	480	508	22	1260/1700	260	540	300	340/780	188	500/940	310
	DIN DN 150	915	1535	480	508	22	1260/1700	260	540	300	340/780	190	500/940	310
	DIN DN 200	1024	1644	480	508	22	1440/1830	265	600	500	260/640	270	500/940	310
RFLD 15000/15020	DIN DN 200	1284	2114	690	711	22	1505/1895	260	655	500	260/700	270	500/940	415

[1] DIN flange connection to DIN EN ISO 1092, PN25/40 up to DN100 and PN 16 from DN125 (with sealing strip, flange shape B)

4.3 WELDED FILTER SERIES - SEGMENT VERSION RFLD 400x - 1502x (CHANGE-OVER TYPE B)

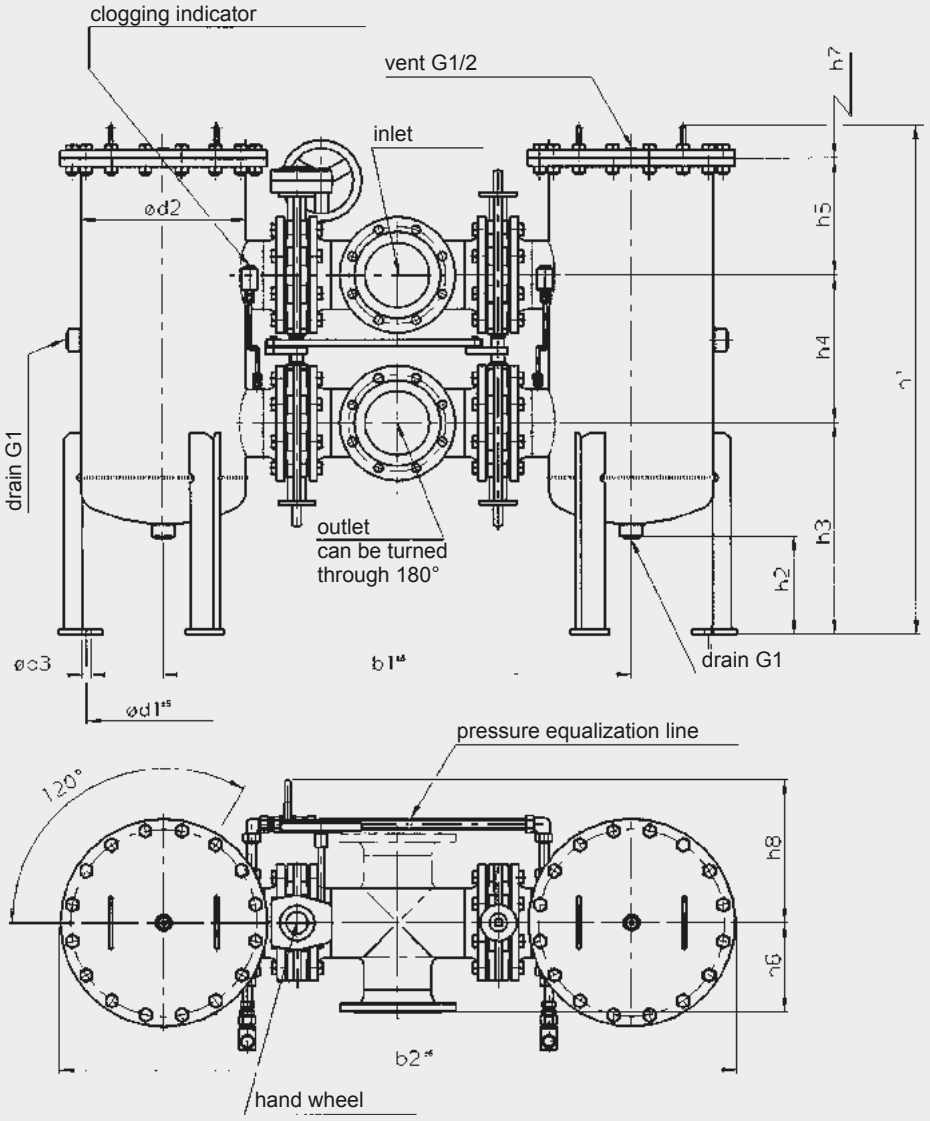


Dimensions in mm

Type	Flange connection [1]	b_1	b_2	d_1	d_2	d_3	h_1	h_2	h_3	h_4	h_5	h_6	h_7	h_8
RFLD 4000/4020	DN 200	1124	1590	330	356	22	1250/1595	260	525	365	235/625	261	420/810	370
RFLD 5200/5220	DN 200	1166	1680	380	406	22	1265/1705	250	525	365	286/726	261	500/940	370
	DN 250	1312	1825	380	406	22	1324/1764	250	560	450	236/676	322	500/940	400
RFLD 6500/6520	DN 200	1266	1886	480	508	22	1380/1820	260	600	365	335/775	261	500/940	370
	DN 250	1402	2022	480	508	22	1380/1820	260	600	450	250/690	322	500/940	400
RFLD 7800/7820	DN 200	1266	1886	480	508	22	1380/1820	260	600	365	335/775	261	500/940	370
	DN 250	1402	2022	480	508	22	1380/1820	260	600	450	250/690	322	500/940	400
RFLD 15000/15020	DN 200	1506	2336	690	711	22	1425/1865	263	655	365	330/770	261	500/940	415
	DN 250	1628	2458	690	711	22	1425/1865	263	640	450	260/700	322	500/940	415

[1] DIN flange connection to DIN EN ISO 1092-1, PN 16 (with sealing strip, flange shape B)

4.4 WELDED FILTER SERIES - BUTTERFLY VERSION RFLD 250x - 1502x (CHANGE-OVER TYPE C)



Dimensions in mm

Type	Flange connection [1]	b_1	b_2	d_1	d_2	d_3	h_1	h_2	h_3	h_4	h_5	h_6	h_7	h_8
RFLD 2500/2520	DN 150	1018	1378		273	22	1108/1498	220	460	365	211/601	220	420/810	330
RFLD 4000/4020	DN 150	1152	1616	330	356	22	1170/1560	260	525	365	200/590	220	420/810	350
	DN 200	1240	1724	330	356	22	1205/1595	260	525	365	235/625	260	420/810	370
RFLD 5200/5220	DN 150	1152	1666	380	406	22	1256/1696	250	525	365	286/726	220	500/940	350
	DN 200	1280	1794	380	406	22	1256/1696	250	525	365	286/726	260	500/940	370
	DN 250	1496	2010	380	406	22	1326/1766	250	560	450	236/676	350	500/940	400
RFLD 6500/6520	DN 150	1292	1916	480	508	22	1260/1700	260	540	365	275/715	220	500/940	350
	DN 200	1380	2004	480	508	22	1380/1820	260	600	365	335/775	260	500/940	370
	DN 250	1586	2210	480	508	22	1380/1820	260	600	450	250/690	350	500/940	400
RFLD 7800/7820	DN 150	1292	1916	480	508	22	1260/1700	260	540	365	275/715	220	500/940	350
	DN 200	1380	2004	480	508	22	1380/1820	260	600	365	335/775	260	500/940	370
	DN 250	1586	2210	480	508	22	1380/1820	260	600	450	250/690	350	500/940	400
RFLD 15000/15020	DN 200	1620	2450	690	711	22	1425/1865	260	655	365	330/770	260	500/940	370
	DN 250	1816	2646	690	711	22	1425/1865	260	655	450	250/690	350	500/940	400
	DN 300	1956	2786	690	711	22	1500/1940	260	670	515	235/675	400	500/940	430

[1] DIN flange connection to DIN EN ISO 1092, PN 16 (with sealing strip, flange shape B)

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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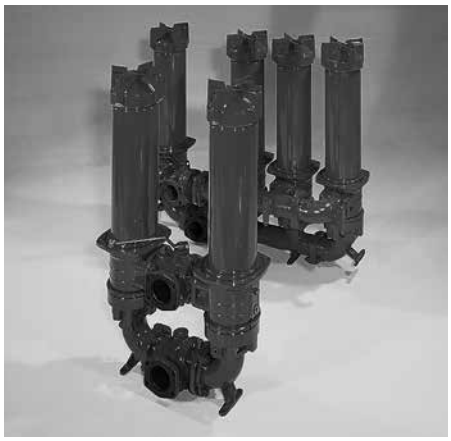


Change-Over Filter NFD

up to 1600 l/min, up to 25 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter housing and a threaded cover plate. The housings are connected by a ball change-over valve.

Standard equipment:

- connection for a clogging indicator in filter head
- with bypass valve

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Number of filter elements

NFD	Elements per side
1340	1x1300 R
2640	1x2600 R
5240	2x2600 R
7840	3x2600 R
10440	4x2600 R

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Optimicron® Pulp & Paper (ON/PP):	10 bar
Ecomicron® (ECON2):	10 bar
Stainl. st. wire mesh (W/HC):	20 bar
Stainless steel fibre (V):	210 bar
Paper (P/HC):	10 bar
Betamicron®/Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	25 bar
Max. operating pressure	30 bar at max. 10^6 cycles
Temperature range	-10 °C to +100 °C
Material of filter head, tube and cover plate	Aluminium
Material of change-over valve, elbow and connection piece	EN-GJS-400-15
Type of clogging indicator	VM (differential pressure measurement)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in FPM
- NFD filter as tank-top return line filter (type code 1.x) on request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

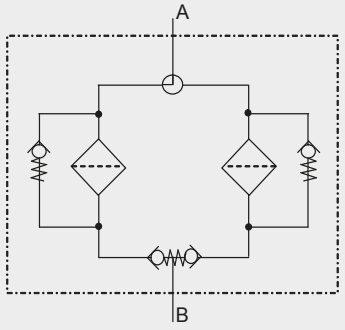
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using visual clogging indicators, the BM version (visual with manual reset) only should be used.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

NFD ON 2640 D A P 10 D 2 . X /-L24

2.1. COMPLETE FILTER

Filter type
NFD

Filtermaterial

ON	Optimicron®	P/HC	Paper
ON/PP	Optimicron® Pulp & Paper	W/HC	Stainl. st. wire mesh
V	Stainless steel fibre	ECO/N	ECOMircron® (ECON2)
BN/AM	Betamicron®/Aquamicron®	AM	Aquamicron®

Size of filter or element
NFD: 1340, 2640, 5240, 7840, 10440

Operating pressure
D = 25 bar

Type of change-over
A = Ball

Type and size of port

Type	Port	Filter size				
		1340	2640	5240	7840	10440
P	SAE DN 100	●	●	●	●	●

Other types and sizes of port on request!
For examples, see point 3.3

Filtration rating in µm

ON:	1, 3, 5, 10, 15, 20	ECO/N, V:	3, 5, 10, 20	P/HC:	10, 20	AM:	40
ON/PP:	5	W/HC:	25, 50, 100, 200	BN/AM:	3, 10		

Type of clogging indicator

Y	plastic blanking plug in indicator port
A	steel blanking plug in indicator port
B	visual
C	electrical
D	visual and electrical

for other clogging indicators see brochure no. 7.050../..

Type code (TKZ)
2

Modification number
X the latest version is always supplied

Supplementary details

B.	special cracking pressure of bypass (e. g.: B6 = 6 bar)
EM	manual vent with shut-off valve
EP	permanent vent via Minimess hose
KB	without bypass valve
L...	light with appropriate voltage (24, 48, 110, 220 Volt)
LED	2 light emitting diodes up to 24 Volt
SB4	filling line with Ø4 mm orifice
V	FPM seals
VKD	drain fitted with ball shut-off valve
39	connection alternative (see point 2.4)

only for clogging indicators type "D"

2.2 REPLACEMENT ELEMENT

2600 R 010 ON /-V

Size
1300, 2600

Type

Filtration rating in µm

ON:	001, 003, 005, 010, 015, 020	ECON2, V:	003, 005, 010, 020	P/HC:	010, 020	AM:	040
ON/PP:	005	W/HC:	025, 050, 100, 200	BN4AM:	003, 010		

Filter material
ON, ON/PP, ECON2, V, W/HC, P/HC, BN4AM, AM

Supplementary details
V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 2 D . X /-L24

Type
VM differential pressure measurement up to 210 bar operating pressure

Pressure setting
2 standard 2 bar, others on request

Type of clogging indicator (see point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V (for descriptions, see point 2.1)

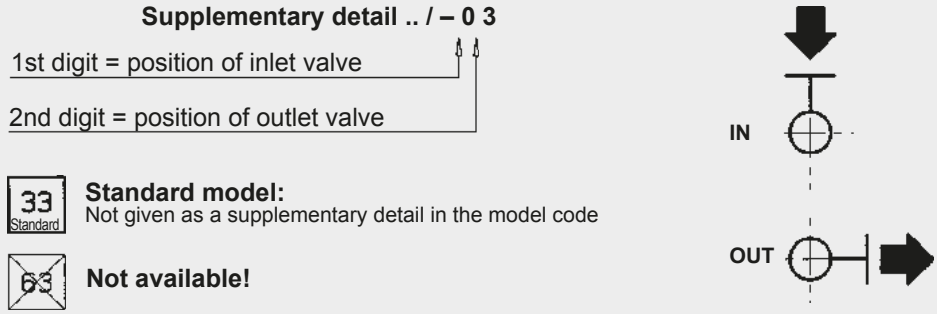
2.4 CONNECTION ALTERNATIVES

(also order example)

Supplementary detail .. / – 0 3

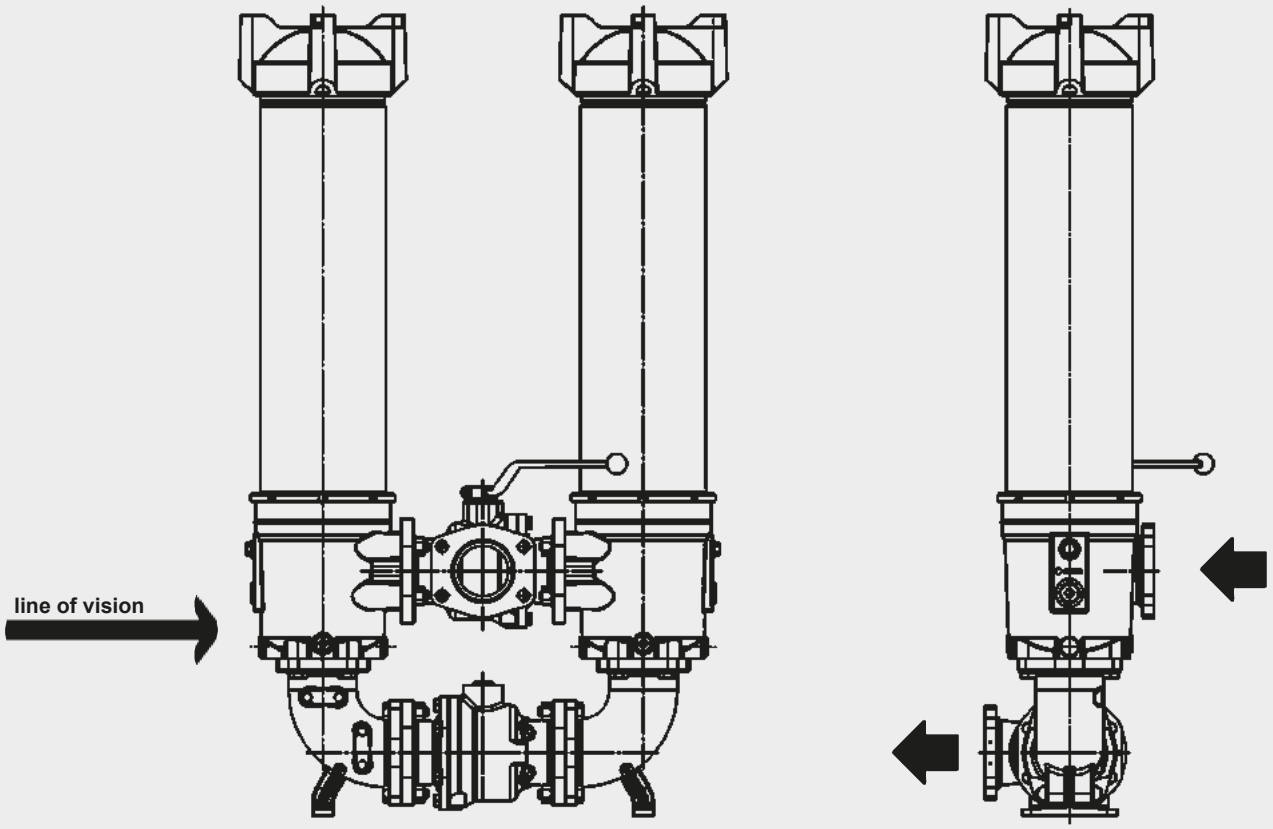
1st digit = position of inlet valve

2nd digit = position of outlet valve



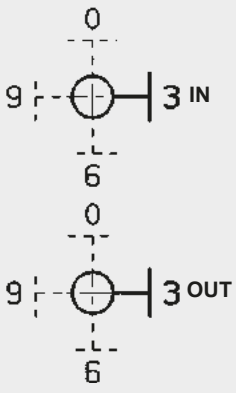
33 Standard **Standard model:**
Not given as a supplementary detail in the model code

63 **Not available!**



Line of vision
Type code .. / –39

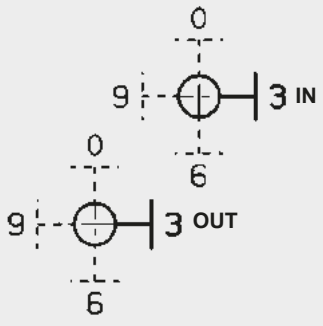
NFD 2640 .. A 2.0 / –XX
(possible supplementary detail)



00	03	06	09 1)
30	**33** Standard	36	39
60	63	66	69
90	93 2)	96	99 3)

1) corresponds to type 03
2) corresponds to type 39
3) corresponds to type 33

NFD 5240 .. A 2.0 / –XX
(possible supplementary detail)



00	03	06	09
30	**33** Standard	36	39
60	63	66	69
90	93	96	99

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = given in diagrams (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see Point 3.2)

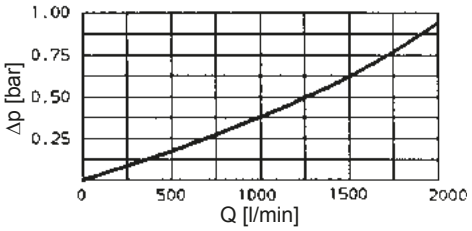
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

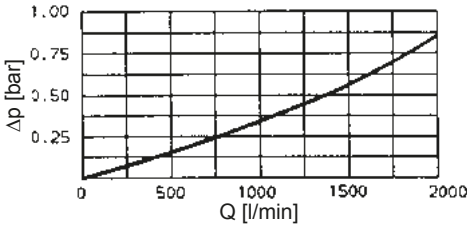
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

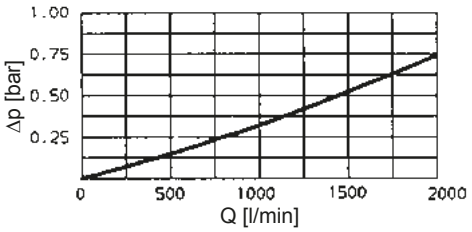
NFD 1340 / 2640



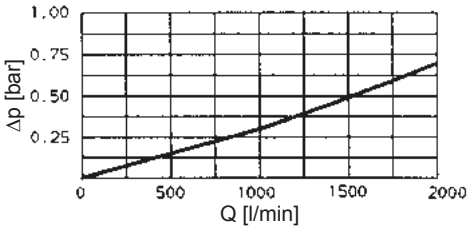
NFD 5240



NFD 7840



NFD 10440



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

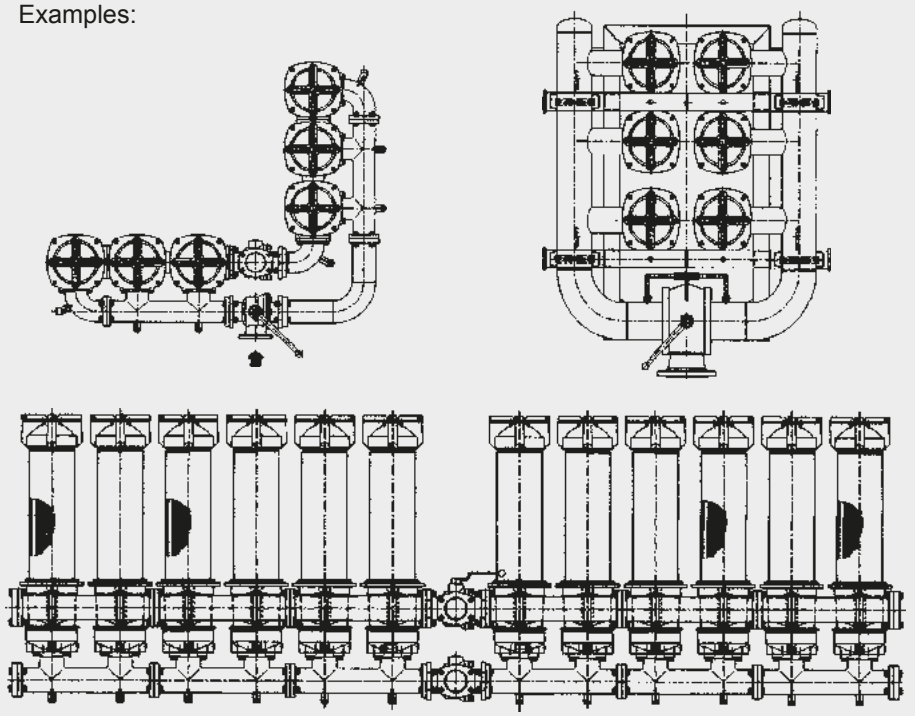
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

NFD	ON						ON/PP
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	5 µm
1300	1.72	0.72	0.59	0.35	0.32	0.22	1.00
2600	0.84	0.36	0.29	0.18	0.16	0.11	0.45

NFD	V				W/HC	ECON2			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	5 µm	10 µm	20 µm
1300	0.5	0.4	0.3	0.2	0.034	0.8	0.6	0.4	0.3
2600	0.3	0.2	0.1	0.1	0.017	0.4	0.3	0.2	0.1

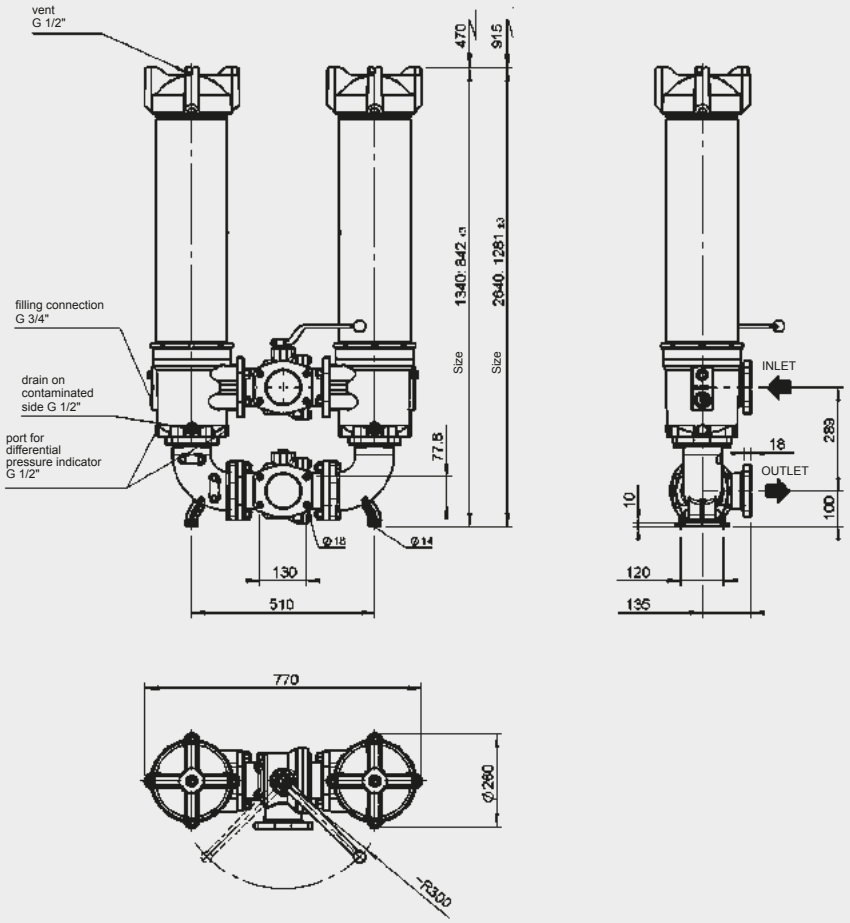
3.3 OTHER CONNECTION SIZES AND TYPES ON REQUEST!

Examples:



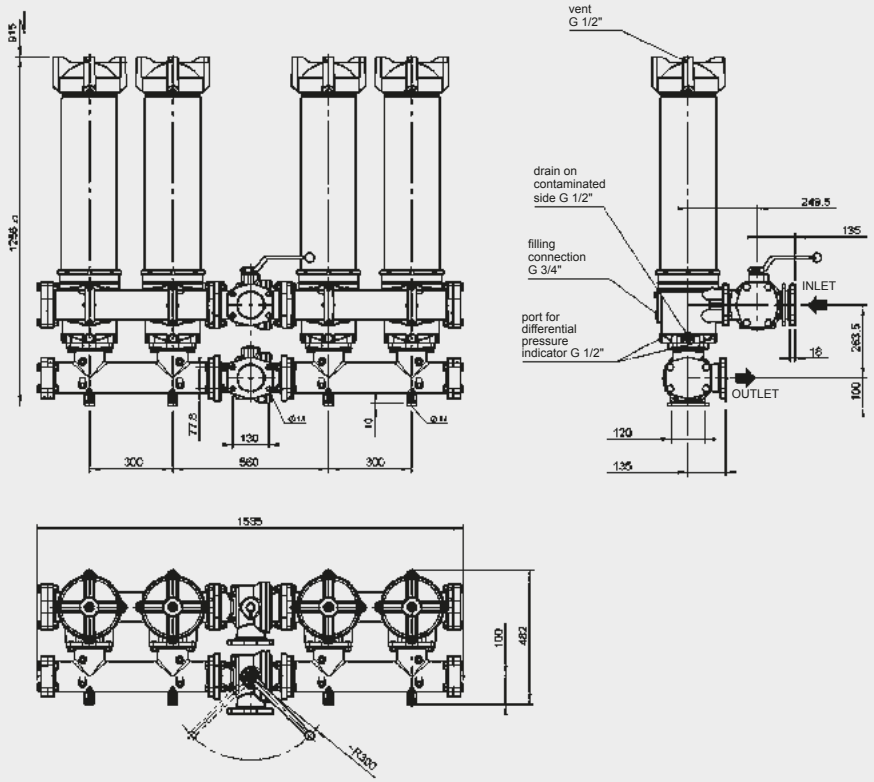
4. DIMENSIONS

NFD 1340/2640

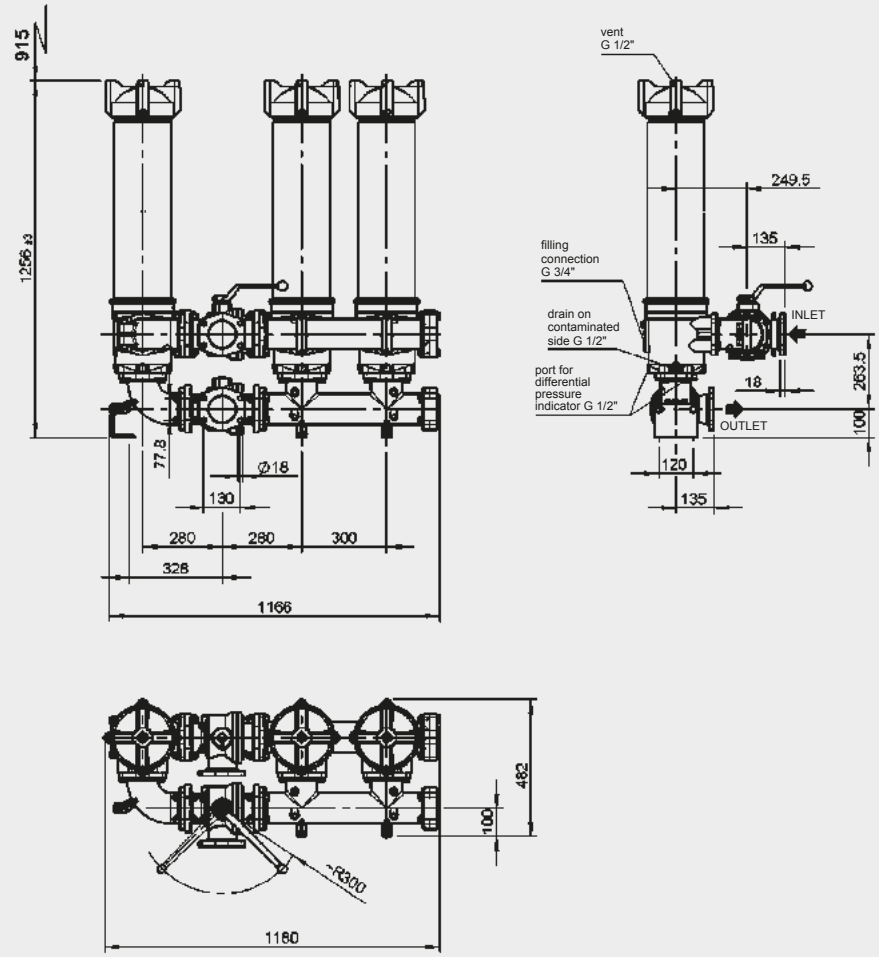


NFD	No. of elements per side	Weight incl. element [kg]	Vol. of pressure chamber [l]
1340...2.X	1x 1300 R...	122.7	35.8
2640...2.X	1x 2600 R...	140.0	58.1

NFD 5240

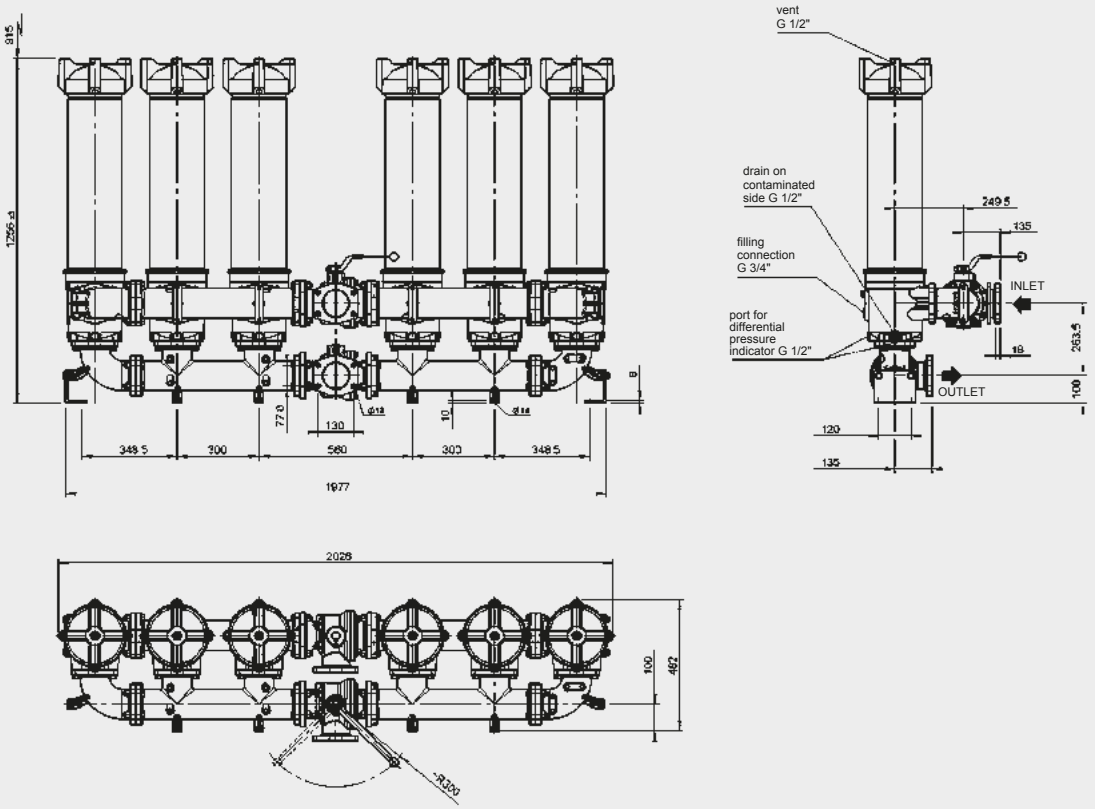


NFD 5240...2.X /-1+2

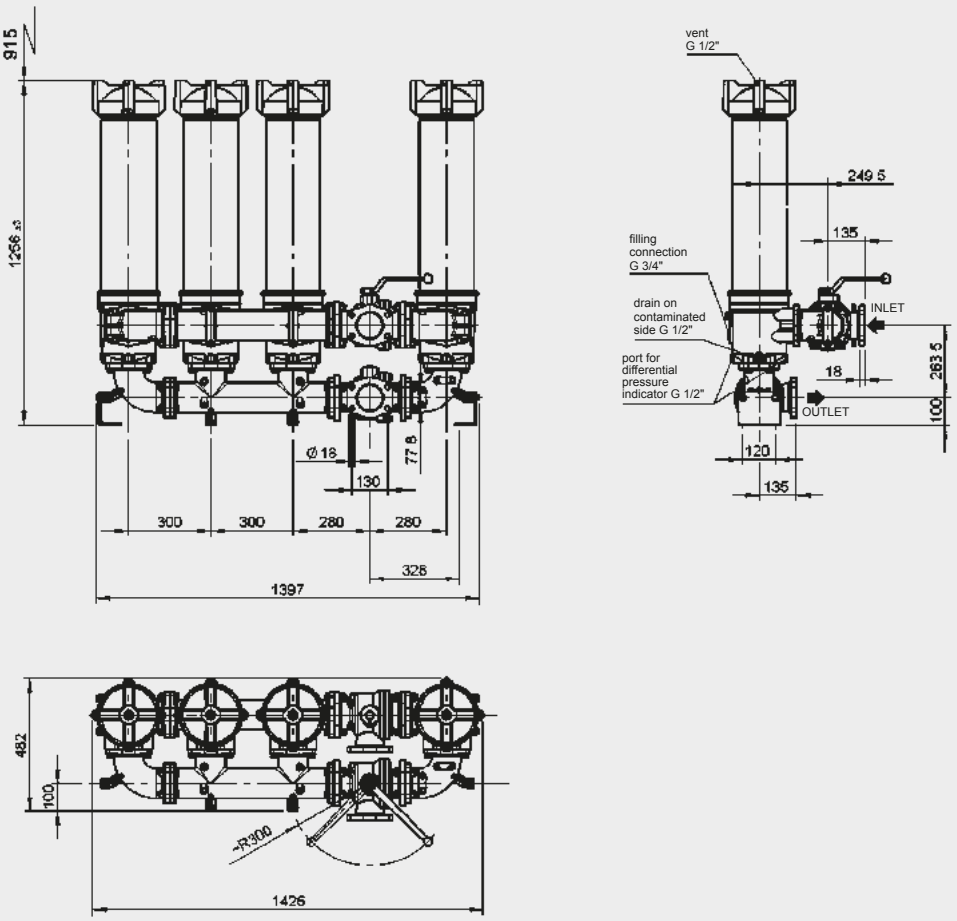


NFD	No. of elements per side	Weight incl. element [kg]		Vol. of pressure chamber [l]
5240...2.X	2x 2600 R...	276.8	126.4	
5240../-1+2...2.X	1x 2600 R... and 2x 2600 R...	217.4		94.3

NFD 7840

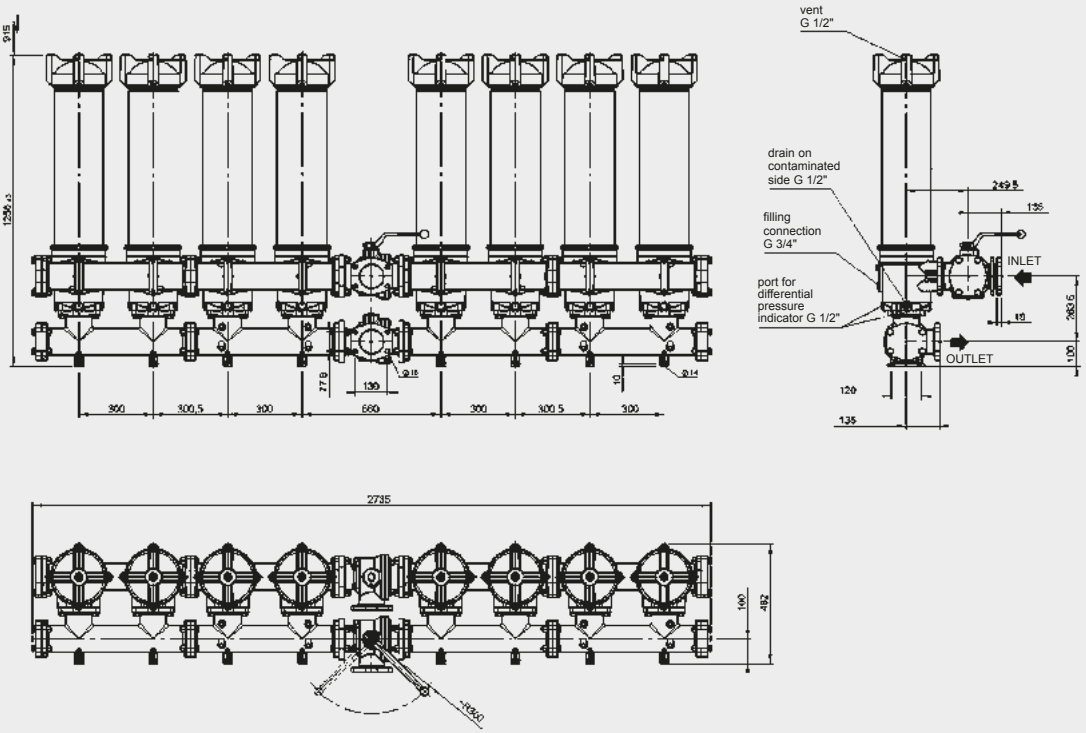


NFD 7840...2.X /-3+1

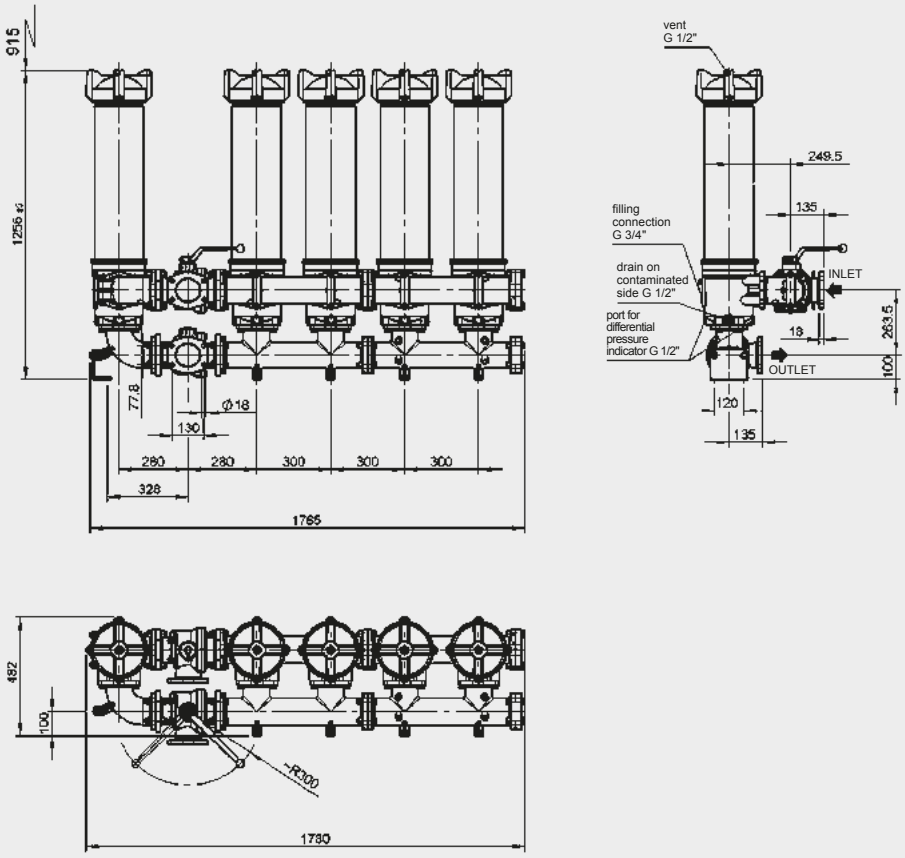


NFD	No. of elements per side	Weight incl. element [kg]		Vol. of pressure chamber [l]
7840	3x 2600 R...	391.6	182.8	
7840../-3+1	3x 2600 R... and 1x 2600 R...	286.6		122.2

NFD 10440



NFD 10440...2.X /-1+4



NFD	No. of elements per side	Weight incl. element [kg]		Vol. of pressure chamber [l]
10440	4x 2600 R...	510.4	251.0	
10440../-1+4	1x 2600 R... and 4x 2600 R...	328.3		154.0

NOTE

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Subject to technical modifications.

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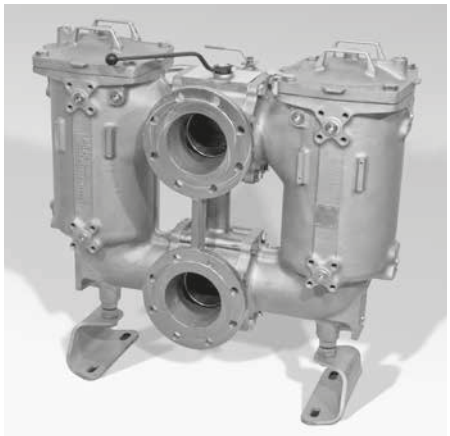
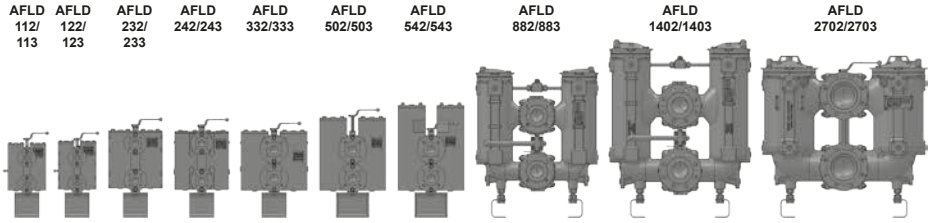


Change-Over Inline Filter AFLD to API 614

up to 1700 l/min, up to 40 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filters are designed in accordance with the API 614 (approval according to ASME Sec. VIII, Div.1). The two sections of the filter housing (each with a bolt-on cover plate) are connected by means of a ball change-over valve with negative overlap and single lever operation.

Standard equipment:

- without bypass valve
- without clogging indicator
- inlet and outlet ASME flange
- ball change-over valve with internal parts made of stainless steel
- pressure equalization line with 4 mm orifice
- side vent and drain, ¾“ ASME flange connection (300 lbs)
- with stand
- test certificates (acceptance test certificate 3.1 to DIN EN 10204; Manufacturer's Test Certificate M of final inspection and pressure testing)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® Power (ON/PO): 10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	16 bar (at 150 lbs) 25 bar (at 300 lbs) 40 bar (at 300 lbs)
Temperature range	-10 °C to +100 °C
Material of filter housing and cover	Forged version: SA-266 Gr.4/1.0565: 112, 122, 232, 242, 332, 502, 542 SA-182 F316L/1.4404: 113, 123, 233, 243, 333, 503, 543 Cast version: SA-216 WCB/1.0619: 882, 1402, 2702 SA-351 CF8M/1.4408: 883, 1403, 2703

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Ball, spindle (internal parts) not made of stainless steel
- Pressure compensating line with different orifice size and/or flared fitting
- Differential pressure measurement across complete filter (clogging indicator)
- Higher operating pressure on request
- Others on request!

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

- With U-Stamp at extra charge
- Classification societies and other approvals on request

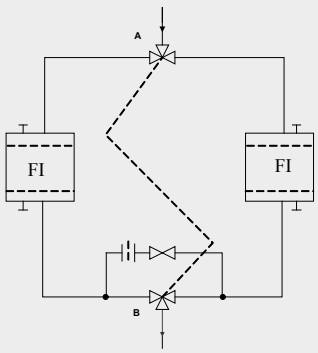
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) and CLP oils on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.

Symbol for lubrication systems



2. MODEL CODE (also order example)

AFLD ON/PO 882 E A 4 10 W 1.X /-Z-300

2.1 COMPLETE FILTER

Filter type
AFLD

Filter material of element
ON/PO Optimicron® Power

Size

Carbon steel(1.0565/SA-266 Gr.4):	112, 122, 232, 242, 332, 502, 542
Stainless steel (1.4404/SA-182 F316L):	113, 123, 233, 243, 333, 503, 543
Cast steel CS (1.0619/SA-216 WCB):	882, 1402, 2702
Cast stainless steel (1.4408/SA-351 CF8M):	883, 1403, 2703

Operating pressure

Pressure range		Filter size									
		Forged							Cast		
		112/ 113	122/ 123	232/ 233	242/ 243	332/ 333	502/ 503	542/ 543	882/ 883	1402/ 1403	2702/ 2703
C	150 lbs; 16 bar	●	●	●	●	●	●	●	●	●	●
D	300 lbs; 25 bar	●	●	●	●	●	●	●	●	●	
E	300 lbs; 40 bar	●	●	●	●	●	●	●	●	●	

Preferred models
Other pressure ranges on request!

Type of change-over
A Ball (all nominal sizes)

Type and size of connection

Type	Connection to ASME B16.5	Filter size									
		Forged							Cast		
		112/ 113	122/ 123	232/ 233	242/ 243	332/ 333	502/ 503	542/ 543	882/ 883	1402/ 1403	2702/ 2703
1	1"	●	●								
2	1½"			●	●						
3	2"					●	●	●			
4	3"								●		
5	4"									●	
7	6"										●

Preferred models
Other connections on request!

Filtration rating in µm
ON/PO: 10

Type of clogging indicator
W Without port (no clogging indicator)
others see Point 2.3 or on request

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
Z Manufacturer's Test Certificate M to DIN 55350 Part 18
Acceptance test certificate 3.1 to EN 10204 (material certificate)
300 Indicate flange pressure range (150 lbs, 300 lbs)

Further optional supplementary details
BBx flared fitting with orifice size (BB2 = aperture 2 mm)
KISS internal parts not in stainless steel (ball, spindle)
SBx filling line in compression fitting with orifice size (SB2 = orifice 2 mm)
SS steel parts of element in stainless steel
V FPM seals, filters suitable for biodegradable oils and phosphate ester fluid (HFD-R)
ZU U-Stamp (approval to ASME Sec. VIII, Div. 1)

2.2 REPLACEMENT ELEMENT

0880 A 010 ON/PO

Size
0110, 0120, 0230, 0240, 0330, 0500, 0540, 0880, 1400, 2700

Type
A API version

Filtration rating in µm
ON/PO: 010

Filter material of element
ON/PO Optimicron® Power

Supplementary details
SS Steel parts of element in stainless steel

2.3 CLOGGING INDICATOR (OPTIONAL)

VM 2 D . X /-L24

Type
VM Differential pressure indicator

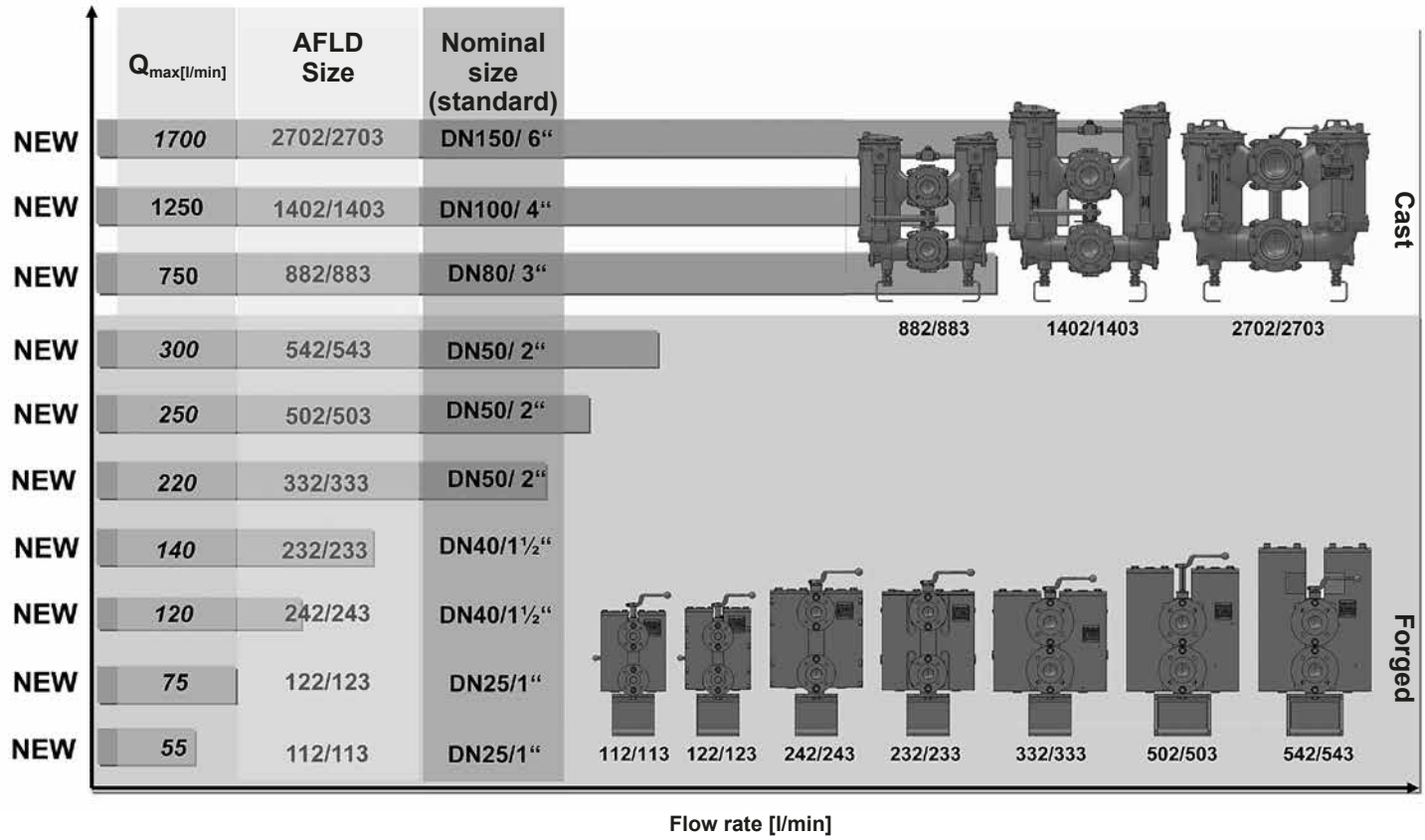
Pressure setting
2 standard 2 bar, others on request

Type
B visual
C electrical
D visual/electrical

Modification number
X the latest version is always supplied

Supplementary details
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
V FPM seals

2.4 QUICK SELECTION



2.5 TWO-PART BALL CHANGE-OVER VALVE (KUA)

The new two-part ball change-over valve was originally developed for use in filters of the AFLD series according to API directives.

Independently of AFLD filters, the valve can also be used separately as a connector piece in double plate heat exchangers as well as for double tube bundle coolers.

It is made of either steel or stainless steel and has ASME flanges as standard. It is available in the sizes ASME 3“ and 4“ – both in 150 or 300 lbs.

When supplied: control spindle is disconnected!

Technical features

- Two-part change-over valve
- Connections: DN 80 (3“) and DN 100 (4“) (other connections on request)
- Materials
  - Steel: SA-216-WCB / 1.0619-DIN EN 10213 (GP-240GH)
  - Stainless steel: SA-351 CF8M / 1.4408-DIN EN 10213
- Full bore
- Supplied with flange for cooler

MODEL CODE

KUA 02 C E 5 /-150-Axxxx-8SB

Type
KUA Ball change-over valve

Material
02 Steel (SA-216-WCB/1.0619)
03 Stainless steel (SA-351 CF8M/1.4408)

Operating pressure
C 16 bar
D 25 bar
E 40 bar

Change-over valve
E 2-parts ball valve

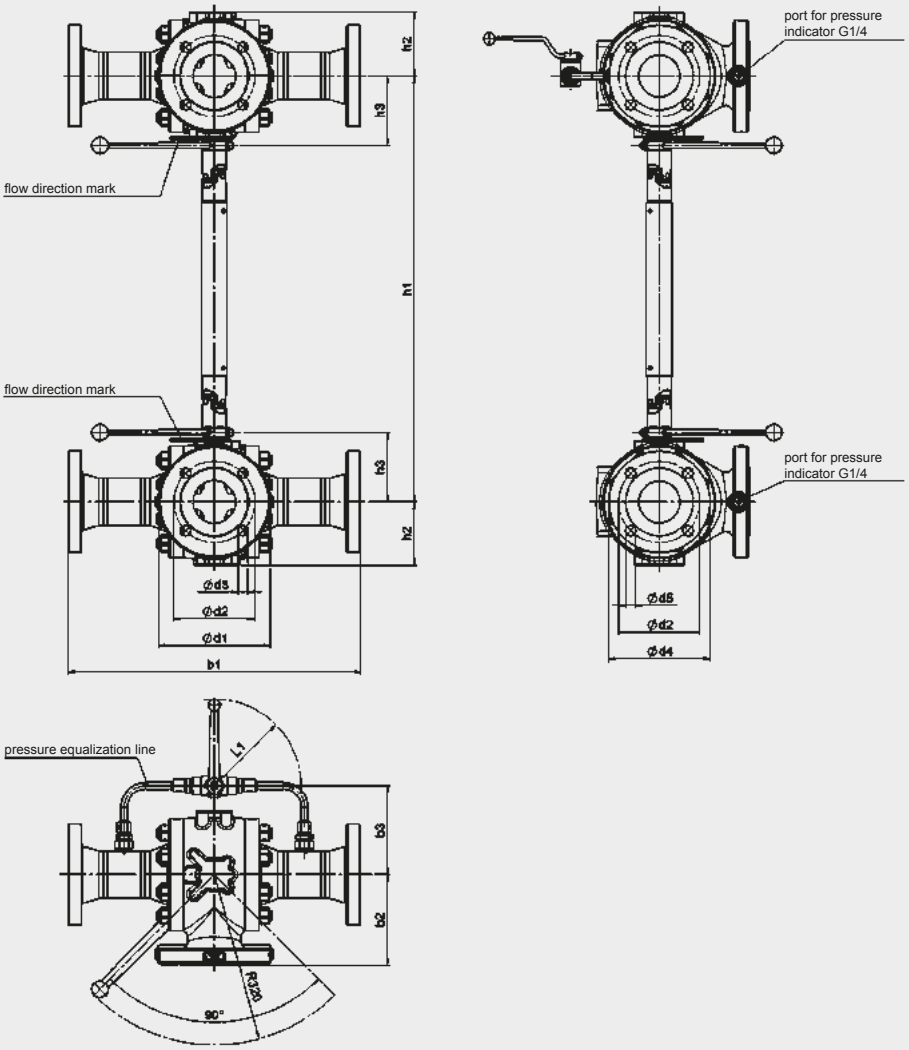
Type and size of connection

Type	Connection to ASME B16.5	Material 02, 03
4	3"	●
5	4"	●

other nominal sizes on request!

Supplementary details
150 Indicate pressure load (150 lbs, 300 lbs)
Axxxx Centre-to-centre distance
(e.g. A1365 = centre-to-centre distance 1365 mm)
8SB Pressure equalization line (8SB = DN8, compression fitting)

DIMENSIONS



KUA	Connection to ASME B16.5		b1	b2	b3	d1	d2	d3	d4	d5	h1	h2	h3	L1
	Nominal size	Pressure range												
02/03	3"	150 lbs.	554	170	144	210	152.4	4x19	190	19.1	Axxx min. 330	120	132	95
		300 lbs.					168.3	8x23	210	22.2				
02/03	4"	150 lbs.	600	210	167	255	190.5	8x19	230	19.1	Axxx min. 385	147	159	95
		300 lbs.					200	8x23	255	22.2				

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

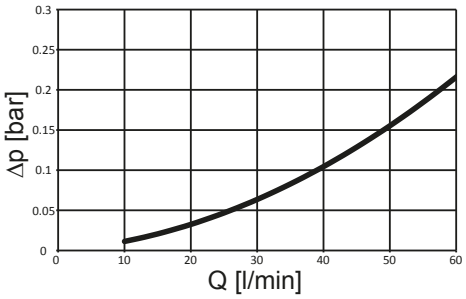
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

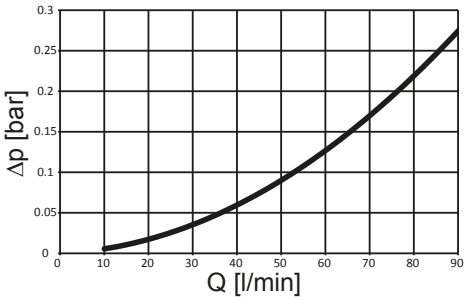
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

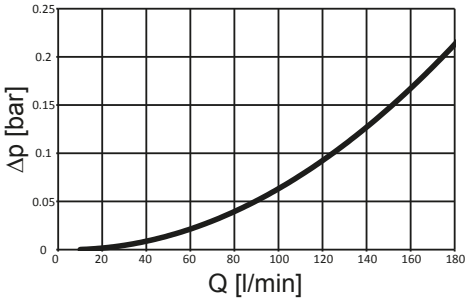
AFLD 112/113



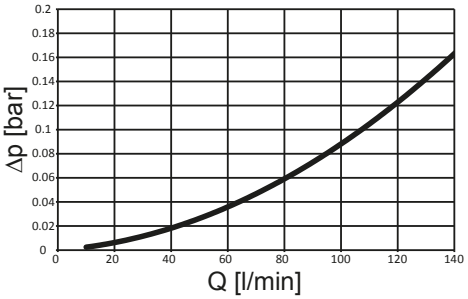
AFLD 122/123



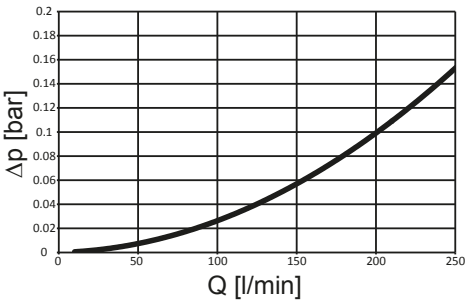
AFLD 232/233



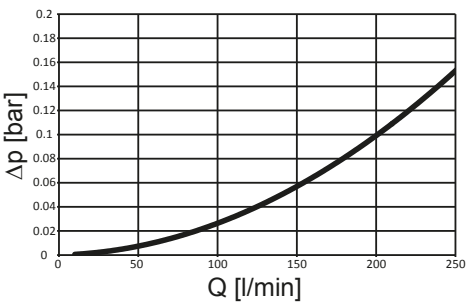
AFLD 242/243



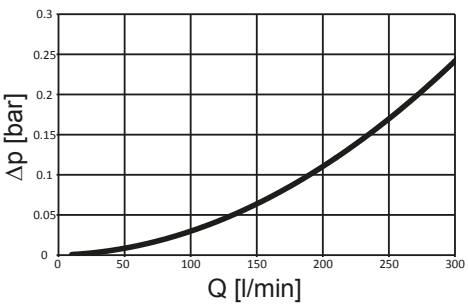
AFLD 332/333



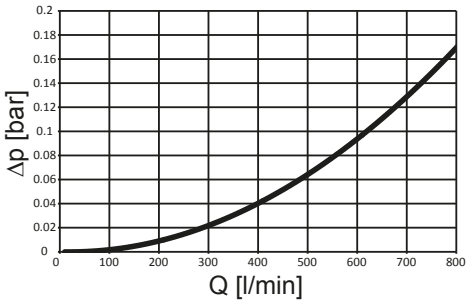
AFLD 502/503



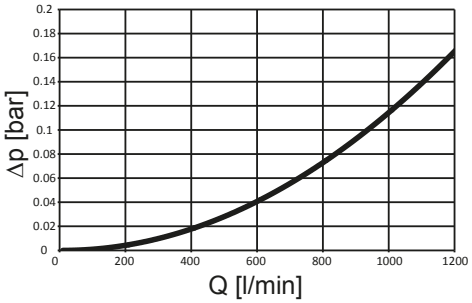
AFLD 542/543



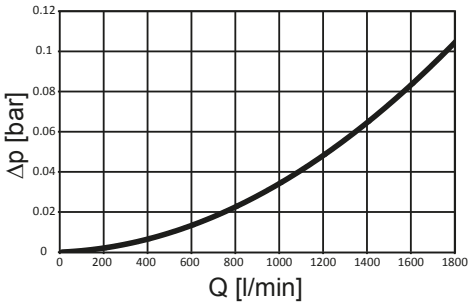
AFLD 882/883



AFLD 1402/1403



AFLD 2702/2703



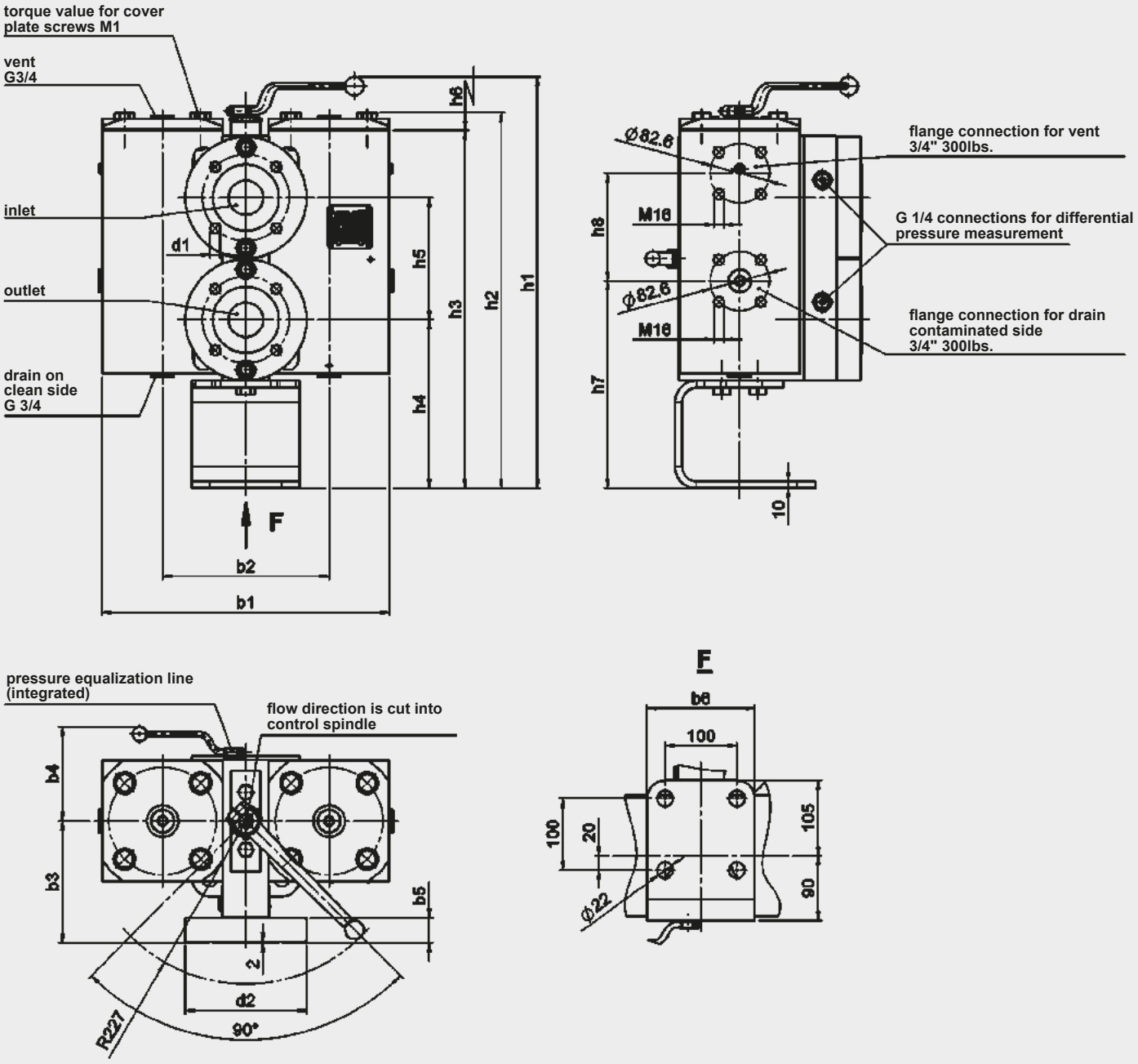
3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

AFLD	ON/PO 10 µm
112/113	3.08
122/123	1.37
232/233	0.68
242/243	1.12
332/333	0.69
502/503	0.45
542/543	0.33
882/883	0.14
1402/1403	0.09
2702/2703	0.07

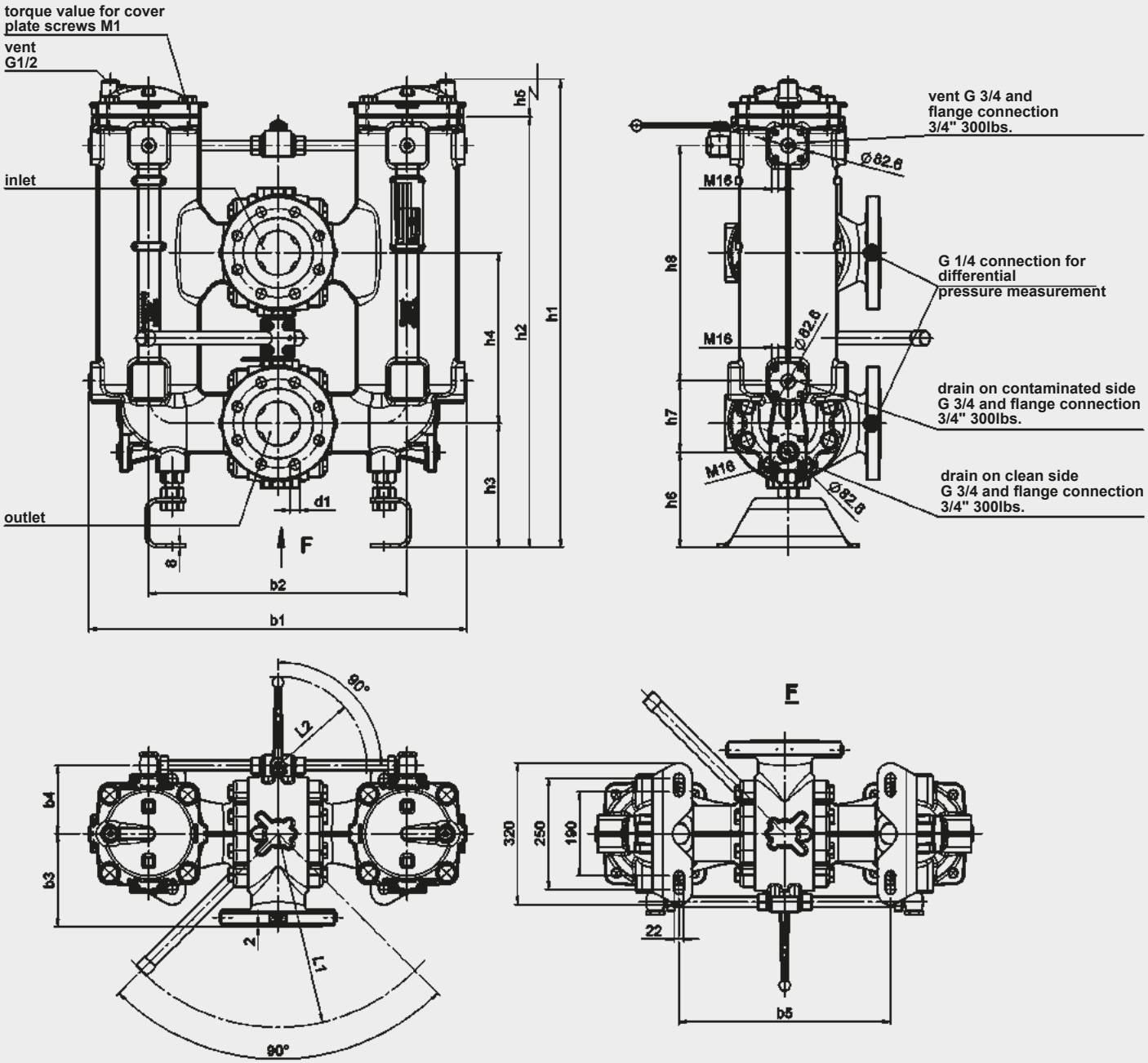
4. DIMENSIONS

AFLD 112-543 (FORGED)



AFLD	Connection to ASME B16.5		b1	b2	b3	b4	b5	b6	d1	d2	h1	h2	h3	h4	h5	h6	h7	h8	M1 [Nm]	Weight incl. element [kg]	Volume of pressure vessel [l]
	Nominal size	Pressure range																			
112/113	1"	150 lbs.	231	131	108	96	25	150	4 x M12	Ø 110	514	448	430	200	155	180	237	133	80/60	55	2 x 0.6
		300 lbs.							4 x M16	Ø 125											
122/123	1"	150 lbs.	231	127	108	96	25	150	4 x M12	Ø 110	514	460	443	200	155	195	229	154	80/60	55	2 x 0.75
		300 lbs.							4 x M16	Ø 125											
232/233	1 1/2"	150 lbs.	327	179	145	122	30	150	4 x M12	Ø135	597	527	507	222	220	205	272	170	190/150	125	2 x 2.0
		300 lbs.							4 x M20	Ø155											
242/243	1 1/2"	150 lbs.	327	199	145	122	30	150	4 x M12	Ø135	595	522	507	222	220	205	272	170	190/150	121	2 x 1.5
		300 lbs.							4 x M20	Ø155											
332/333	2"	150 lbs.	400	232	170	131	35	150	4 x M16	Ø169	573	523	499	235	170	205	289	150	190/150	200	2 x 2.2
		300 lbs.							8 x M16	Ø169											
502/503	2"	150 lbs.	400	232	170	131	35	200	4 x M16	Ø169	653	604	580	235	170	300	289	231	190/150	225	2 x 3.1
		300 lbs.							8 x M16	Ø169											
542/543	2"	150 lbs.	400	232	170	131	35	200	4 x M16	Ø169	573	678	653	235	170	370	279	315	190/150	250	2 x 4.3
		300 lbs.							8 x M16	Ø169											

AFLD 882 - 2703 (CAST)



AFLD	Connection to ASME B16.5		b1	b2	b3	b4	b5	d1	h1	h2	h3	h4	h5	h6	h7	h8	L1	L2	M1 [Nm]	Weight incl. element [kg]	Volume of pressure vessel [l]
	Nominal size	Pressure range																			
882/883	3"	150 lbs.	738	502	170	137/231	430	4 x Ø19	898	834	275	330	515	231	127	411	438	200/132	110	200	2 x 16
		300 lbs.						8 x Ø23													
1402/1403	4"	150 lbs.	854	584	210	155/266	478	8 x Ø19	1057	972	280	385	650	216	160	532	438	200/132	170	290	2 x 24
		300 lbs.						8 x Ø23													
2702/2703	6"	150 lbs.	980	653	190	184/249	645	8 x Ø23	964	863	300	425	500	239	177	383	317	200/132	110	360	2 x 37

NOTE

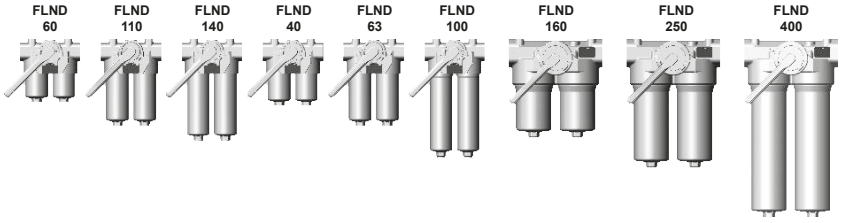
The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

HYDAC Filtertechnik GmbH
Industriegebiet
D-66280 Sulzbach/Saar
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com

Change-Over Inline Filter FLND

to DIN 24550*, up to 400 l/min, up to 63 bar

*Filters and filter elements also available in HYDAC dimensions



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head with built-in change-over valve and screw-in filter bowls.

Standard equipment:

- without bypass valve
- connection for a clogging indicator
- oil drain plug (FLND 160 to 400)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON)[1)]:	20 bar
Betamicron® (BN4HC) [2)]:	20 bar
Betamicron® (BH4HC):	210 bar
Wire mesh (W/HC, W) [3)]:	20 bar

[1)] only for FLND 60, 110, 140
[2)] only for FLND 40, 63, 100, 160, 250, 400
[3)] only for FLND 40–140

1.3 FILTER SPECIFICATIONS

Nominal pressure	25 bar (FLND 160 to 400) 63 bar (FLND 40 to 140)
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-10 °C to +100 °C
Material of filter head	Aluminium
Material of filter bowl	Aluminium (FLND 100 and 140: Steel)
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2.5 bar or 5 bar (others on request)
Bypass cracking pressure (optional)	3.5 bar or 7 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- With bypass valve
- With oil drain plug for FLND 40 to 140 (SO184)
- Seals in FPM, EPDM
- Reverse flow "RL" for FLND 160 and above on request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

These filters can be supplied with manufacturer's test certificates O and M to DIN 55350, Part 18.
Test certificates 3.1 to DIN EN 10204 and approval certificates (Type Approval) for different approval authorities.

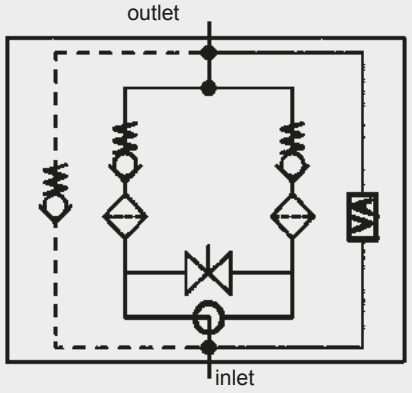
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters with switching valve are designed to have a permissible leakage depending on the operating medium.

Symbol for hydraulic systems



VA = clogging indicator

2. MODEL CODE (also order example)

FLND BN/HC 250 D D F 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
FLND

Filter material

ON	Optimicron® (BG 60, 110, 140 only)	BN/HC	Betamicron® (BN4HC) (BG 40, 63, 100, 160, 250, 400 only)
BH/HC	Betamicron® (BH4HC)	W/HC, W*	Wire mesh

Size of filter or element
FLND: 40, 60, 63, 100, 110, 140, 160, 250, 400

Operating pressure
D = 25 bar (FLND 160 to 400)
F = 63 bar (FLND 40 to 140)

Type of change-over
D single switching valve and check valve

Type and size of port
to DIN 24550 (●), possible ports (X)

Type	Port	Filter size ... not to DIN 24550			... to DIN 24550					
		60	110	140	40	63	100	160	250	400
B	G ½	X	X	X	●	X	X			
C	G ¾	X	X	X	X	●	X			
D	G 1	X	X	X	X	X	●			
E	G 1¼							●	X	X
F	G 1½							X	●	X
I	DN 25**	X	X	X	X	X	X			
K	DN 38**							X	X	●

** Flange SAE, 3000 PSI

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20
BN/HC, BH/HC to DIN 24550: 3, 6, 10, 25
BH/HC: 3, 5, 10, 20
W/HC, W*: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
B. bypass cracking pressure (e.g. B3.5 = 3.5 bar); without details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
] only for clogging indicators type D
AV LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connections to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO specification)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz specification)
D4C LZ with plug and connector to Daimler-Chrysler specification and cold start suppression 30°C
BO-LED as for BO, but with diode strip
SO184 oil drain plug (FLND 40 to 140)
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0250 DN 010 BN4HC /-V

Size
0040, 0060, 0063, 0100, 0110, 0140, 0160, 0250, 0400

Type
D 0060, 0110, 0140
DN to DIN 24550: 0040, 0063, 0100, 0160, 0250, 0400

Filtration rating in µm
ON 001, 003, 005, 010, 015, 020
BN4HC, BH4HC to DIN 24550: 003, 006, 010, 025
BH4HC: 003, 005, 010, 020
W/HC, W*: 025, 050, 100, 200

Filter material
ON, BN4HC, BH4HC, W/HC, W*

Supplementary details
V, W (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

Type
VM differential pressure measurement up to 210 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W, AV, BO, CN, DB, D4C, BO-LED (for descriptions see Point 2.1)
* only for FLND 40 - 140

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

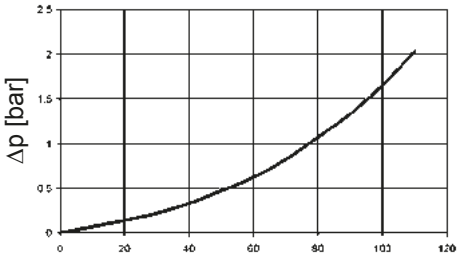
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

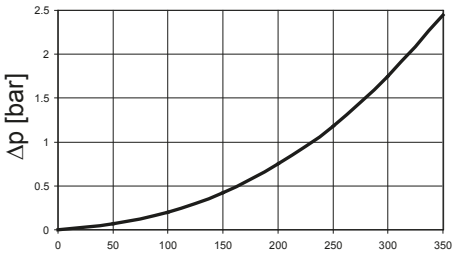
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

FLND 40, 60, 63, 100, 110, 140



FLND 160, 250, 400



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

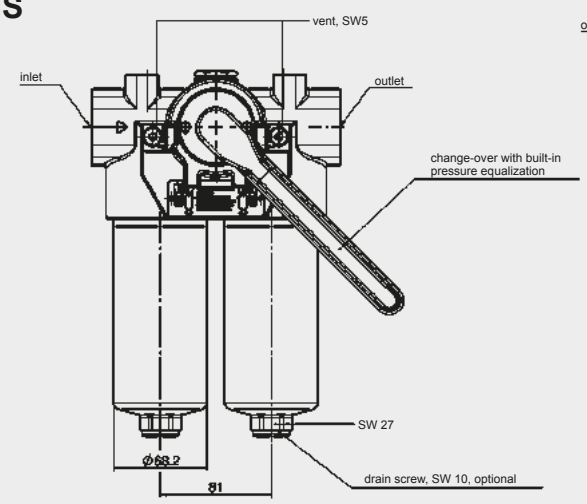
FLND	... D ... ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
60	53.5	26.0	18.3	12.1	9.78	6.32
110	25.8	13.4	9.61	6.06	4.63	2.99
140	19.9	11.5	7.39	4.38	3.54	2.29

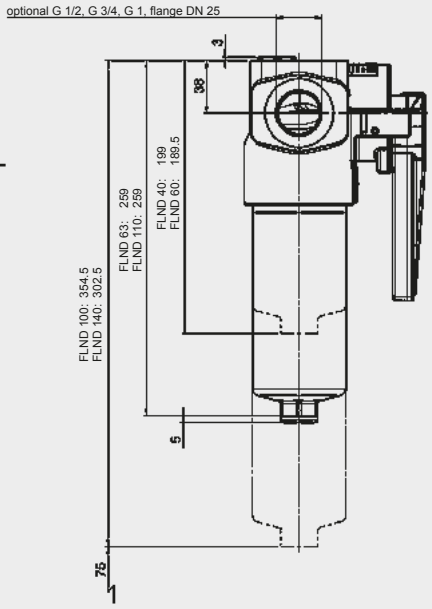
FLND	... DN ... BN4HC			
	3 µm	6 µm	10 µm	25 µm
40	40.4	24.8	16.4	10.9
63	29.0	18.2	11.7	7.6
100	19.0	11.7	7.7	5.3
160	8.0	5.1	3.8	2.5
250	5.4	3.4	2.8	1.9
400	3.4	2.1	1.7	1.1

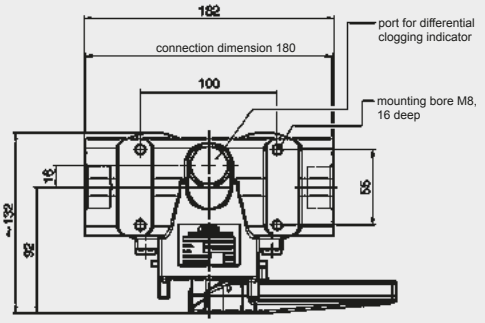
FLND	... D ... BH4HC				W/HC-W	... DN ... BH4HC			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	6 µm	10 µm	25 µm
60	58.6	32.6	18.1	12.2	0.757	-	-	-	-
110	25.4	14.9	8.9	5.6	0.413	-	-	-	-
140	19.9	11.3	8.1	4.3	0.324	-	-	-	-
40	-	-	-	-	0.966	40.4	24.8	16.4	10.9
63	-	-	-	-	0.540	29.0	18.2	11.7	7.6
100	-	-	-	-	0.325	19.0	11.7	7.7	5.3
160	-	-	-	-	0.168	8.0	5.1	3.8	2.5
250	-	-	-	-	0.101	5.4	3.4	2.8	1.9
400	-	-	-	-	0.068	3.4	2.1	1.7	1.1

4. DIMENSIONS

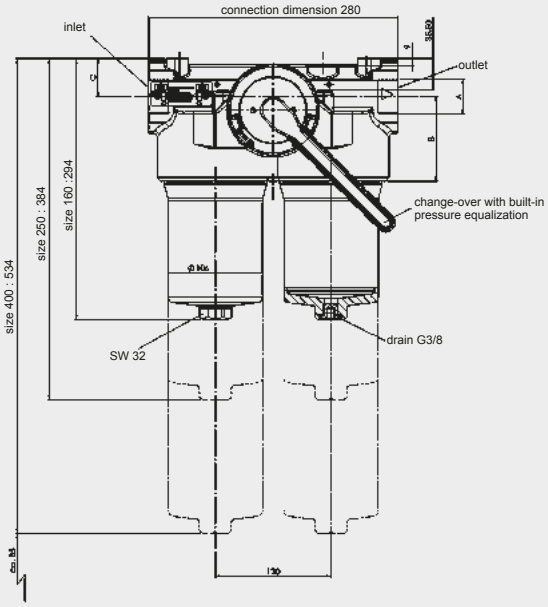
FLND 40 - 140

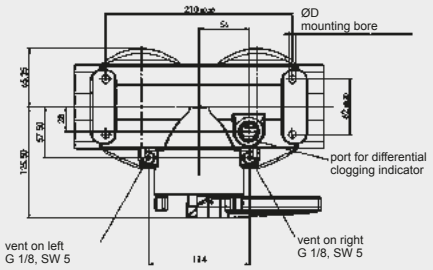






FLND 160 - 400





A	B	C	D
G 1 1/4	95	43	M10 x 19/22 deep
G 1 1/2	98	40	M10 x 19/22 deep
DN 38	95	43	M10 x 19/22 deep

FLND	Weight incl. element [kg]	Vol. of pressure chamber [l]
40	6.73	2x 0.26
60	6.83	2x 0.25
63	7.10	2x 0.40
100	11.33	2x 0.50
110	7.32	2x 0.40
140	11.78	2x 0.40
160	9.1	2x 1.40
250	9.6	2x 2.00
400	12.0	2x 3.10

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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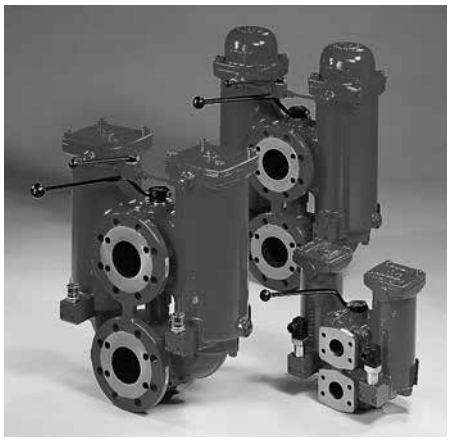
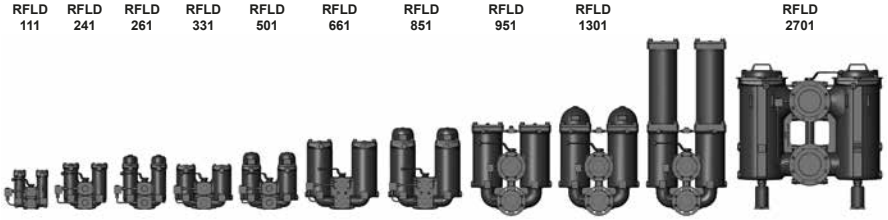


Change-Over Inline Filter RFLD Cast Version

up to 2500 l/min, up to 64 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. The two sections of the filter housing, each of which has a bolt-on cover plate, are connected by means of a ball change-over valve.

Standard equipment:

- connections for venting and draining
- connection for a clogging indicator
- for size DN 80 and above, the filters are fitted with a pressure equalisation line and a ball shut-off valve
- with bypass valve

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Optimicron® Power (ON/PO):	10 bar
Paper (P/HC)*:	10 bar
Stainl. st. wire mesh (W/HC):	20 bar
Stainless steel fibre (V)*:	30 bar
Betamicron®/Aquamicron® (BN4AM)*:	10 bar
Aquamicron® (AM)*:	10 bar

* for RFLD 2701 on request

1.3 FILTER SPECIFICATIONS

Nominal pressure	16 bar (RFLD 2701) 25 bar (RFLD 331-1321) 40 bar (RFLD 111-261, 662-1322) 64 bar (RFLD 332-502)
Temperature range	-10 °C to +100 °C
Material of filter housing and cover plate Material code (final digit of filter size)	EN-GJS-400-15: = 1 EN-GJS-400-18LT: = only RFLD 2701 GP 240 GH+N: = 2
Type of clogging indicator	VM (differential pressure measurement up to 210 bar operating pressure)
Pressure setting of the clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 MOUNTING

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Orifice in the pressure equalisation line
- Stand
- Drain and vent ports with ball valves or other shut-off valves
- Counter flanges available for all sizes
- Change-over valve lockable
- Venting line with sight gauges
- RFLD filter with nominal bore 100 at max. 50 bar operating pressure on request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

These filters can be supplied with manufacturer's test certificates O and M to DIN 55350, Part 18.
Test certificates 3.1 to DIN EN 10204 and approval certificates (Type Approval) for different approval authorities. Areas of application, amongst others lubrication.

Filter to API 614 (ANSI flange) on request!

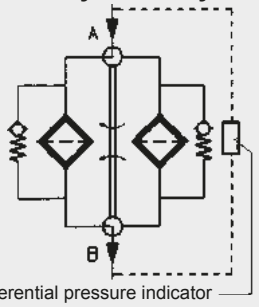
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) and CLP oils on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.
- When used with W/HC and P/HC elements, please follow the sizing recommendation under point 3.3!

Symbol for hydraulic systems



2. MODEL CODE (also order example)

RFLD ON 851 D A L 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
RFLD

Filter material

ON	Optimicron®	V	Stainless steel fibre*	P/HC	Paper*
ON/PO	Optimicron® Power[1)]	W/HC	Stainl. st. wire mesh	BN/AM	Betamicron®/Aquamicron®*
				AM	Aquamicron®*

Size of filter or element
EN-GJS-400-15: 111, 241, 261, 331, 501, 661, 851, 951, 1301, 1321
EN-GJS-400-18LT: 2701
GP 240 GH+N: 332, 502, 662, 852, 952, 1302, 1322

Operating pressure
C = 16 bar RFLD 2701
D = 25 bar RFLD 331-1321
E = 40 bar RFLD 111-261, 662-1322
F = 64 bar RFLD 332-502

Type of change-over
A = Ball

Type and size of port
EN-GJS-400-15 + EN-GJS-400-LT18 (●)
GP 240 GH+N (X)

Type	Port	Filter size 111	241	261	331 332	501 502	661 662	851 852	951 952	1301 1302	1321 1322	2701
D	G 1	●										
F	G 1½		●	●								
I	SAE DN 25	●										
J	DIN DN 50				X	X						
K	SAE DN 40		●	●	●	●						
L	SAE DN 50				●X	●X	●	●				
M	SAE DN 65						●	●				
Q	DIN DN 80						X	X				
R	DIN DN 100								X	X	X	
S	SAE/DIN DN 80						●	●	●	●	●	
T	SAE/DIN DN 100								●	●	●	
V	DIN DN 150											●

Other nominal bores, and ANSI flange version on request

Filtration rating in µm

ON:	1, 3, 5, 10, 15, 20	W/HC:	25, 50, 100, 200
ON/PO[1)], V*:	3, 5, 10, 20	P/HC*:	10, 20
BN/AM*:	3, 10		
AM*:	40		

Type of clogging indicator
Y plastic blanking plug in indicator port
A stainless steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
B. special cracking pressure of bypass (e.g. B1 = 1 bar)
DE differential pressure measurement across element
KB without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
SAK contamination retainer
SB pressure equalisation line (SB2 = with 2mm orifice)
STV stand
V FPM seals
] only for clogging indicators type "D"

2.2 REPLACEMENT ELEMENT

0850 R 010 ON /-V

Size
0110, 0240, 0260, 0330, 0500, 0660, 0850, 0950, 1300, 2600, 2700

Type
R

Filtration rating in µm

ON:	001, 003, 005, 010, 015, 020	W/HC:	025, 050, 100, 200	BN4AM*:	003, 010
ON/PO[1)], V*:	003, 005, 010, 020	P/HC*:	010, 020	AM*:	040

Filter material
ON, ON/PO[1)], V*, W/HC, P/HC*, BN4AM*, AM*

Supplementary details
V (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 2 D . X /-L24

Type
VM differential pressure measurement up to 210 bar operating pressure

Pressure setting
2 standard 2 bar, others on request

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V (for descriptions, see point 2.1)

* for RFLD 2701 on request! [1)] Optimicron® Power only in filtration rating 5, 10 and 20 µm

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

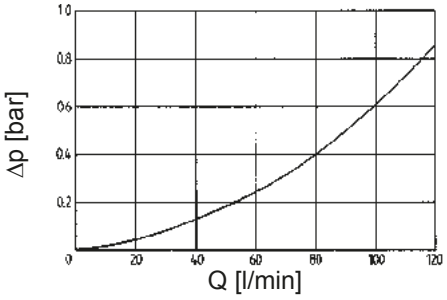
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

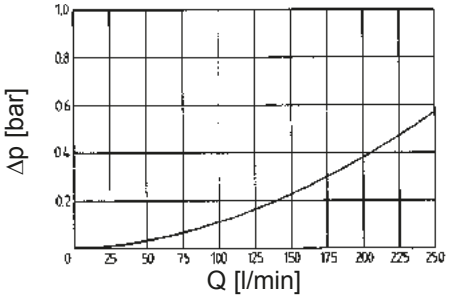
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

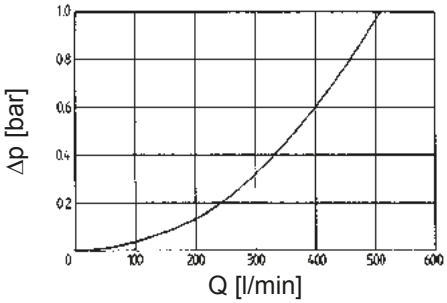
RFLD 111



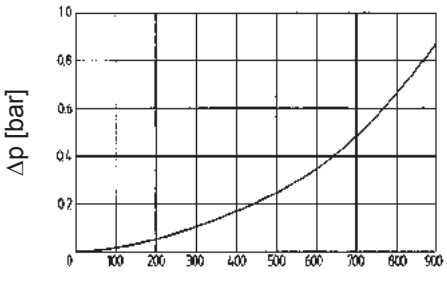
RFLD 241, 261



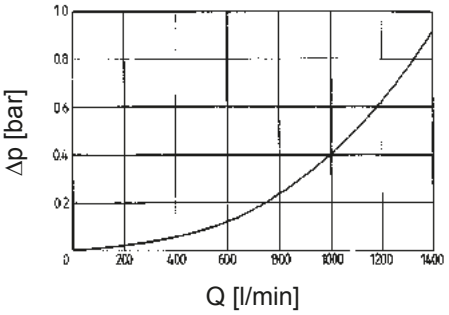
RFLD 331, 332, 501, 502



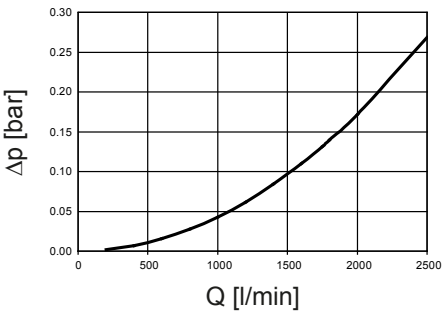
RFLD 661, 662, 851, 852



RFLD 951, 952, 1301, 1302, 1321, 1322



RFLD 2701



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

RFLD	ON						ON/PO		
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	5 µm	10 µm	20 µm
110	22.3	13.1	8.87	5.40	4.26	3.24	3.63	3.08	2.03
240	10.4	5.18	3.66	2.27	1.84	1.41	1.32	1.12	0.72
330	8.09	3.72	2.73	1.48	1.28	1.02	0.81	0.69	0.44
500	5.27	2.60	1.90	1.09	0.84	0.69	0.53	0.45	0.29
660	3.57	1.69	1.21	0.67	0.57	0.45	0.35	0.30	0.19
850	2.77	1.31	1.00	0.58	0.44	0.36	0.28	0.24	0.16
950	2.39	1.03	0.79	0.48	0.38	0.31	0.25	0.21	0.14
1300	1.72	0.72	0.59	0.35	0.32	0.22	0.18	0.15	0.10
2600	0.84	0.36	0.29	0.18	0.16	0.11	0.08	0.07	0.05
2700	0.91	0.35	0.30	0.18	0.17	0.08	0.08	0.07	0.05

RFLD	V				W/HC
	3 µm	5 µm	10 µm	20 µm	–
110	7.6	5.1	3.0	2.0	0.30
240	3.2	2.6	1.7	1.2	0.123
330	2.1	1.7	1.1	0.8	0.195
500	1.5	1.2	0.8	0.5	0.128
660	1.0	0.8	0.6	0.4	0.067
850	0.8	0.6	0.4	0.3	0.052
950	0.7	0.6	0.4	0.2	0.048
1300	0.5	0.4	0.3	0.2	0.034
2600	0.3	0.2	0.1	0.1	0.017
2700	0.2	0.1	0.1	0.1	0.013

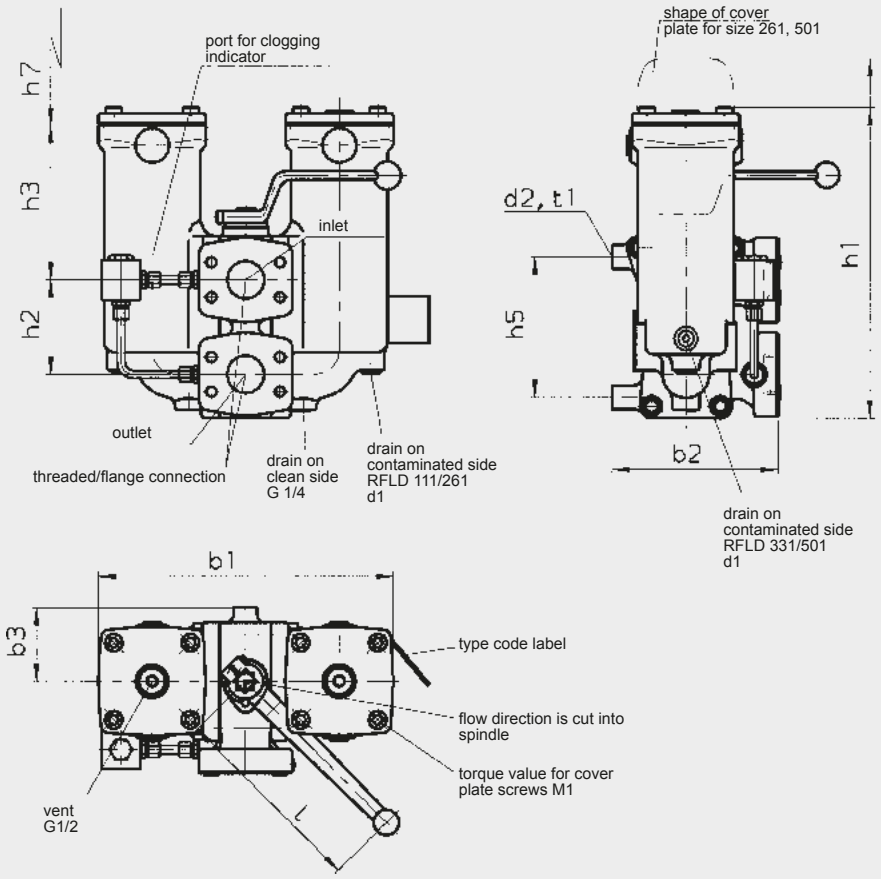
Size 260 on request!

3.3 SIZING RECOMMENDATION

Filter type	Connection	Q_{max} when using W/HC and P/HC elements
RFLD 111	G1	70 l/min
	SAE DN 25	70 l/min
RFLD 241/261	G 1½	170 l/min
	SAE DN 40	170 l/min
RFLD 331	SAE DN 40	170 l/min
RFLD 331/332	SAE DN 50	260 l/min
RFLD 332	DIN DN 50	260 l/min
RFLD 501	SAE DN 40	170 l/min
RFLD 501/502	SAE DN 50	260 l/min
RFLD 502	DIN DN 50	260 l/min
RFLD 661	SAE DN 50	260 l/min
	SAE DN 65	260 l/min
	SAE /DIN DN 80	480 l/min
RFLD 662	DIN DN 80	480 l/min
RFLD 851	SAE DN 50	260 l/min
	SAE DN 65	260 l/min
RFLD 851	SAE/DIN DN 80	480 l/min
RFLD 852	DIN DN 80	480 l/min
RFLD 951	SAE/DIN DN 80	480 l/min
	SAE/DIN DN 100	900 l/min
RFLD 952	DIN DN 100	900 l/min
RFLD 1301/1321	SAE/DIN DN 80	480 l/min
	SAE/DIN DN 100	900 l/min
RFLD 1302/1322	DIN DN 100	900 l/min
RFLD 2701	DIN DN 150	2500 l/min

4. DIMENSIONS

RFLD 111-501

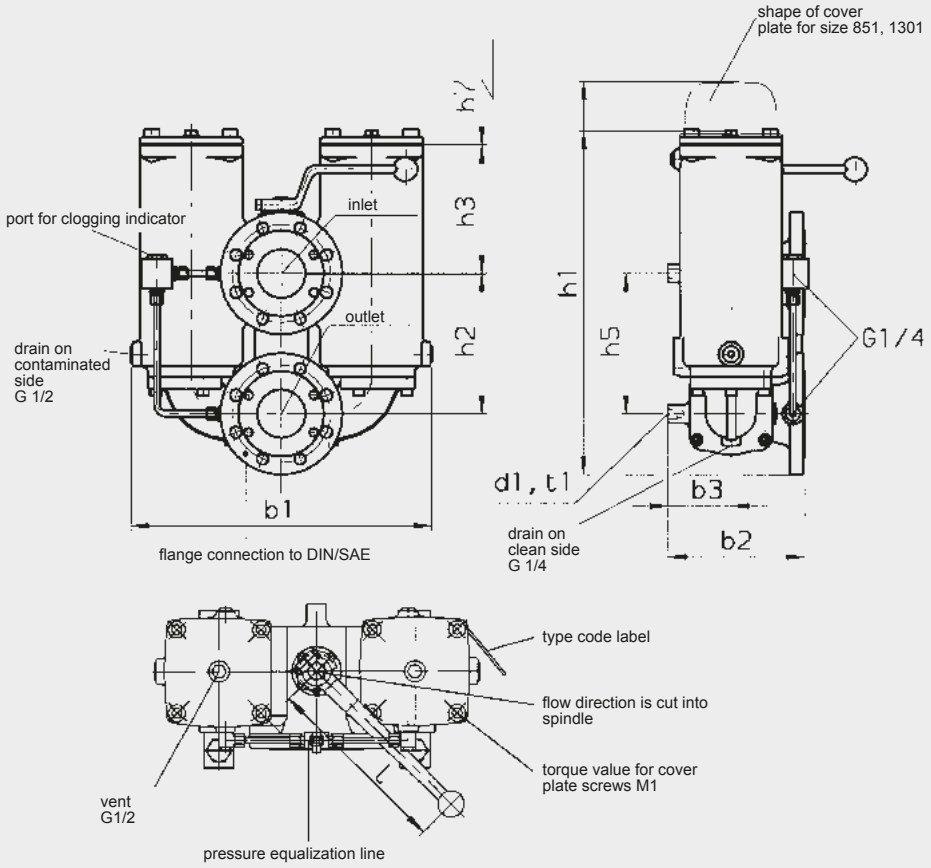


RFLD	Flange connection [1]	Threaded connection [2]	b1	b2	b3	d1	d2	h1	h2	h3	h5	h7	l	M1 (Nm)	t1	Weight including element [kg]	Volume of pressure chamber [l]
111	DN 25 (1")	G 1	233	157	63	G ¼	M12	263	80	132	80	175	173	24	25	17	2 x 0.60
241	DN 40 (1½")	G 1½	302	167	75	G ¼	M12	312	95	155	140	210	216	40	18	27	2 x 1.40
261	DN 40 (1½")	G 1½	302	167	75	G ¼	M12	366	95	155	140	270	216	40	18	28	2 x 1.80
331	DN 40 (1½")	-	396	167	75	G ½	M12	302	95	145	140	200	216	40	18	33	2 x 2.30
331	DN 50 (2")	-	380	187	85	G ½	M12	323	110	140	165	200	216	45	18	37	2 x 2.40
501	DN 40 (1½")	-	396	167	75	G ½	M12	382	95	145	140	280	216	45	18	35	2 x 3.00
501	DN 50 (2")	-	380	187	85	G ½	M12	400	110	140	165	280	216	45	18	39	2 x 3.10

[1] Flange connection to SAE J 518 C (standard pressure range 3000 psi)

[2] Threaded connection to ISO 228

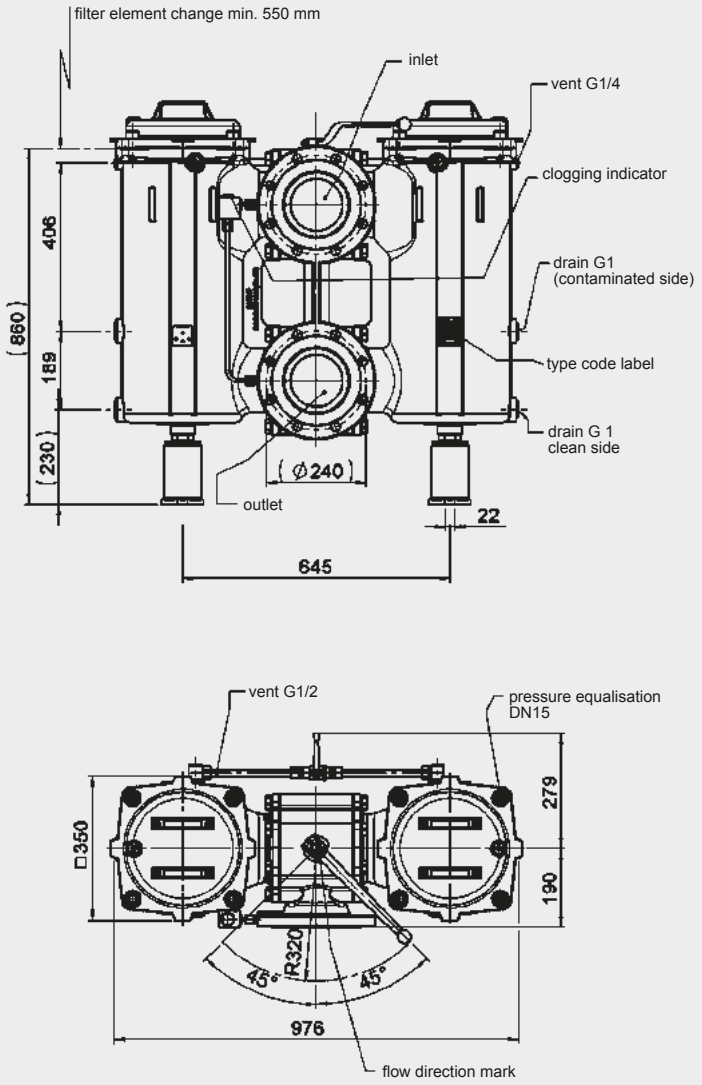
RFLD 661-1321



RFLD	Flange connection [1]	b1	b2	b3	d1	h1	h2	h3	h5	h7	l	M1 (Nm)	t1	Weight including element [kg]	Volume of pressure chamber [l]
661	DN 50 (2")	496	187	85	M12	460	110	282	165	340	216	150	18	56	2 x 6.80
661	DN 65 (2½")	496	252	85	M12	472	110	282	165	340	216	150	18	74	2 x 6.80
661	DN 80 (3")	490	222	102	M12	566	230	210	230	340	301	150	23	82	2 x 8.20
851	DN 50 (2")	496	187	85	M12	544	110	282	165	420	216	150	18	62	2 x 8.10
851	DN 65 (2½")	496	252	85	M12	556	110	282	165	420	216	150	18	80	2 x 8.10
851	DN 80 (3")	490	222	102	M12	650	230	210	230	420	301	150	23	88	2 x 9.50
951	DN 80 (3")	548	222	102	M12	595	230	243	230	370	301	250	23	105	2 x 10.80
951	DN 100 (4")	555	248	118	M16	640	250	238	250	370	301	250	23	120	2 x 13.00
1301	DN 80 (3")	548	222	102	M12	701	230	243	230	490	301	250	23	110	2 x 13.80
1301	DN 100 (4")	555	248	118	M16	746	250	238	250	490	301	250	23	125	2 x 16.00
1321	DN 80 (3")	548	222	102	M12	1190	230	804	230	950	301	250	23	167	2 x 28.80
1321	DN 100 (4")	555	248	118	M16	1307	250	799	250	950	301	250	23	167	2 x 31.00

1) Flange connection to SAE J 518 C (standard pressure series 3000 psi); DIN flange connection to DIN EN ISO 1092, PN 25/40 up to DN 100 (with sealing strip, flange shape B)

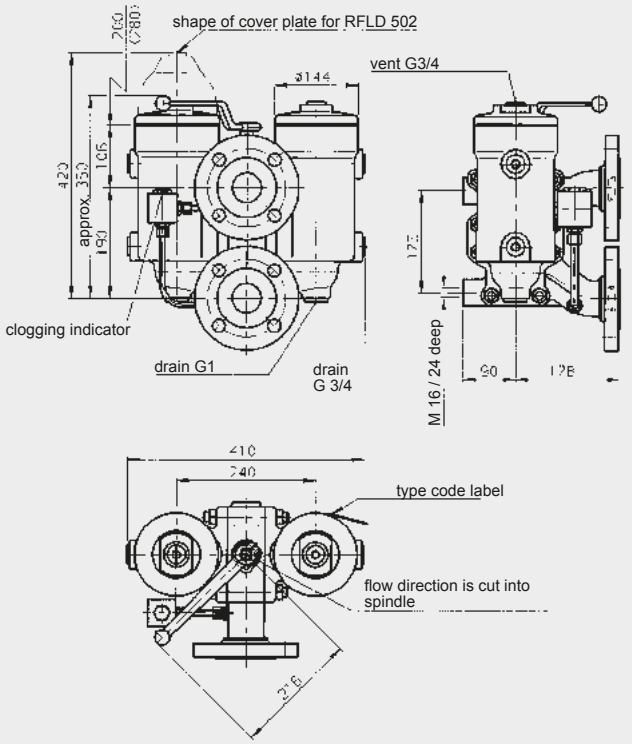
RFLD 2701



RFLD	Weight including element [kg]	Volume of pressure chamber [l]
2701	304.00	2 x 44.0

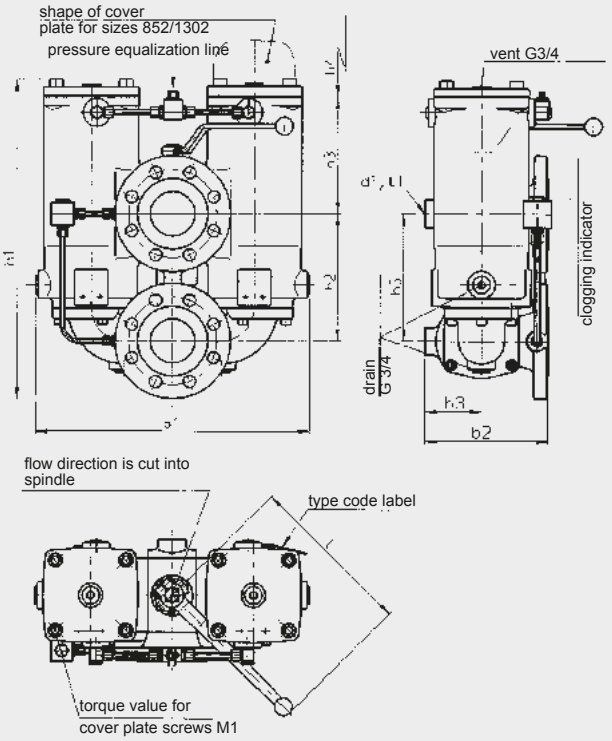
DIN flange connection to DIN EN ISO 1092-1, PN 16 (with sealing strip, flange shape B)

RFLD 332, 502



RFLD	Weight including element [kg]	Volume of pressure chamber [l]
332	37	2 x 2.40
502	39	2 x 3.10

RFLD 662-1322



RFLD	Flange connection 1)	b1	b2	b3	d1	h1	h2	h3	h4	h5	l	M1 (Nm)	t1	Weight including element [kg]	Volume of pressure chamber [l]
662	DN 80 (3")	495	222	102	M12	574	230	210	340	230	301	150	23	82	2 x 8.20
852	DN 80 (3")	495	222	102	M12	665	230	210	420	230	301	150	23	88	2 x 9.50
952	DN 100 (4")	573	248	118	M16	672	250	238	380	250	301	250	17	120	2 x 13.00
1302	DN 100 (4")	573	248	118	M16	745	250	238	490	250	301	250	17	125	2 x 16.00
1322	DN 100 (4")	573	248	118	M16	1307	250	238	950	250	301	250	17	167	2 x 31.00

1) Flange connection to SAE J 518 C (standard pressure series 3000 psi); DIN flange connection to DIN EN ISO 1092, PN 25/40 up to DN 100 (with sealing strip, flange shape B)

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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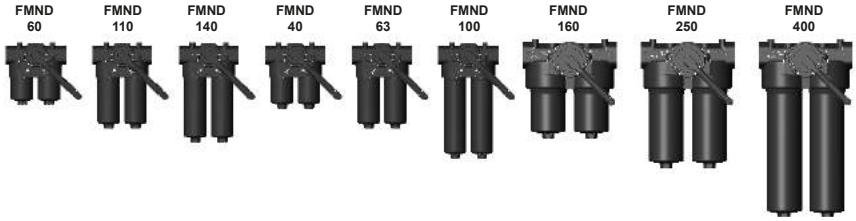
Change-Over Inline Filter FMND

to DIN 24550*, up to 400 l/min, up to 250 bar

*Filters and filter elements also available in HYDAC dimensions (FMND 40 to 140 only)



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head with built-in change-over valve and screw-in filter bowls.

Standard equipment:

- without bypass valve
- connection for a clogging indicator
- oil drain plug (FMND 160 to 400)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON)[1]:	20 bar
Betamicron® (BN4HC) [2]:	20 bar
Betamicron® (BH4HC):	210 bar
Wire mesh (W/HC, W) [3]:	20 bar

[1] only for FLND 60, 110, 140
[2] only for FLND 40, 63, 100, 160, 250, 400
[3] only for FLND 40–140

1.3 FILTER SPECIFICATIONS

Nominal pressure	210 bar (FMND 160 to 400) 250 bar (FMND 40 to 140)
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-10 °C to +100 °C
Material of filter head	EN-GJS-400-15
Material of filter bowl	Steel
Type of indicator	VM (Diff. pressure indicator up to 210 bar operating pressure) VD (Diff. pressure indicator up to 420 bar operating pressure)
Pressure setting of the clogging indicator	2.5 bar or 5 bar (others on request)
Bypass cracking pressure (optional)	3.5 bar or 7 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- With bypass valve
- Oil drain plug (FMND 40 to 140 = SO184)
- Seals in FPM, EPDM
- Reverse flow "RL" for FMND 160 and above

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

These filters can be supplied with manufacturer's test certificates O and M to DIN 55350, Part 18.
Test certificates 3.1 to DIN EN 10204 and approval certificates (Type Approval) for different approval authorities.

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

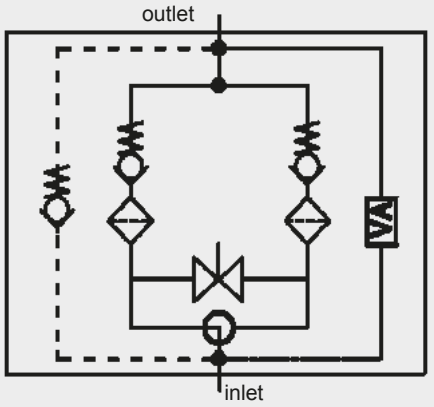
- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

* only for FMND 40 - 140

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters with switching valve are designed to have a permissible leakage depending on the operating medium.

Symbol for hydraulic systems



VA = clogging indicator

2. MODEL CODE (also order example)

FMND BN/HC 250 L D F 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
FMND

Filter material

ON	Optimicron® (BG 60, 110, 140 only)	BN/HC	Betamicron® (BN4HC) (BG 40, 63, 100, 160, 250, 400 only)
BH/HC	Betamicron® (BH4HC)	W/HC, W*	Wire mesh

Size of filter or element
FMND: 40, 60, 63, 100, 110, 140, 160, 250, 400

Operating pressure
L = 210 bar (FMND 160 to 400)
M = 250 bar (FMND 40 to 140)

Type of change-over
D single switching valve and check valve

Type and size of port
to DIN 24550 (●), possible ports (X)

Type	Port	Filter size ... not to DIN 24550			... to DIN 24550					
		60	110	140	40	63	100	160	250	400
B	G ½	X	X	X	●	X	X			
C	G ¾	X	X	X	X	●	X			
D	G 1	X	X	X	X	X	●			
E	G 1¼							●	X	X
F	G 1½							X	●	X
I	DN 25**	X	X	X	X	X	X			
K	DN 38**							X	X	●

** Flange SAE, 3000 PSI

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20 — BH/HC: 3, 5, 10, 20
BN/HC, BH/HC to DIN 24550: 3, 6, 10, 25 — W/HC, W*: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A screw plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
] for other clogging indicators see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
B. bypass cracking pressure (e.g. B3.5 = 3.5 bar; B7 = 7 bar); without details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
] only for clogging indicators type D
AV LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connections to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO specification)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz specification)
D4C LZ with plug and connector to Daimler-Chrysler specification and cold start suppression 30°C
BO-LED as for BO, but with diode strip
RL reverse flow direction
SO184 oil drain plug (FMND 40 to 140)
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0250 DN 010 BN4HC /-V

Size
0040, 0060, 0063, 0100, 0110, 0140, 0160, 0250, 0400

Type
D 0060, 0110, 0140
DN to DIN 24550: 0040, 0063, 0100, 0160, 0250, 0400

Filtration rating in µm
ON 001, 003, 005, 010, 015, 020 — BH4HC: 003, 005, 010, 020
BN4HC, BH4HC to DIN 24550: 003, 006, 010, 025 — W/HC, W*: 025, 050, 100, 200

Filter material
ON, BH4HC, W/HC, W*

Supplementary details
V, W (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

Type of indicator
VM differential pressure indicator up to 210 bar operating pressure
VD differential pressure indicator 420 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W, AV, BO, CN, DB, D4C, BO-LED (for descriptions see Point 2.1)

* only for FMND 40 - 140

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \bullet \frac{SK^*}{1000} \bullet \frac{viscosity}{30}$$

(*see Point 3.2)

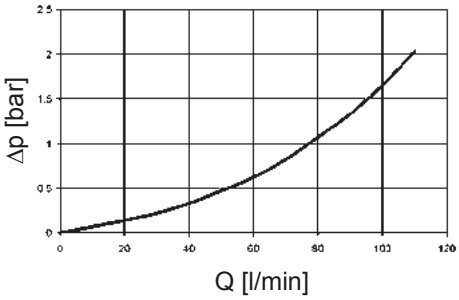
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

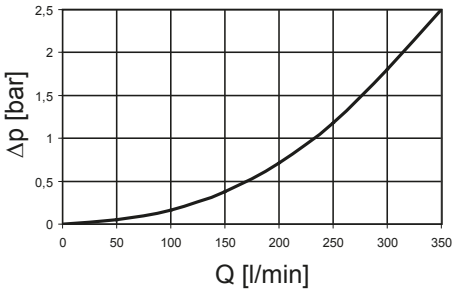
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

FMND 40, 60, 63, 100, 110, 140



FMND 160, 250, 400



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

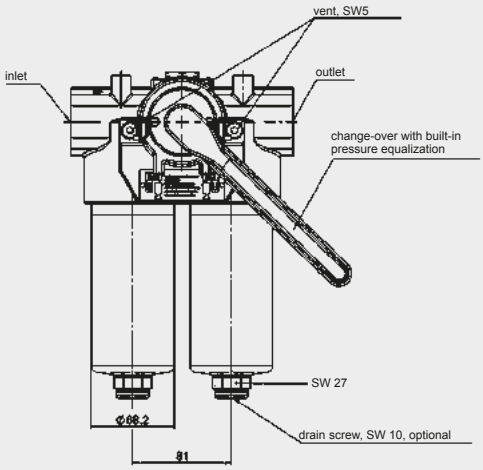
FLND	... D ... ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
60	53.5	26.0	18.3	12.1	9.78	6.32
110	25.8	13.4	9.61	6.06	4.63	2.99
140	19.9	11.5	7.39	4.38	3.54	2.29

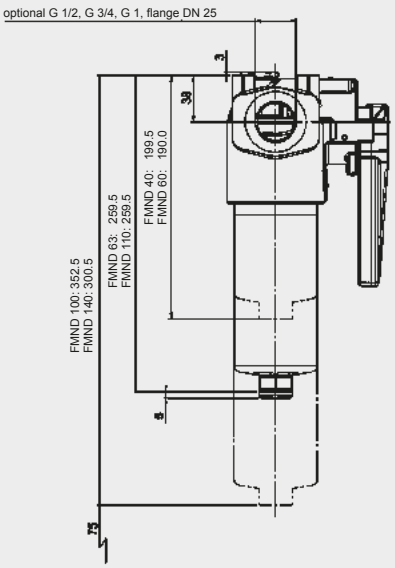
FLND	... DN ... BN4HC			
	3 µm	6 µm	10 µm	25 µm
40	40.4	24.8	16.4	10.9
63	29.0	18.2	11.7	7.6
100	19.0	11.7	7.7	5.3
160	8.0	5.1	3.8	2.5
250	5.4	3.4	2.8	1.9
400	3.4	2.1	1.7	1.1

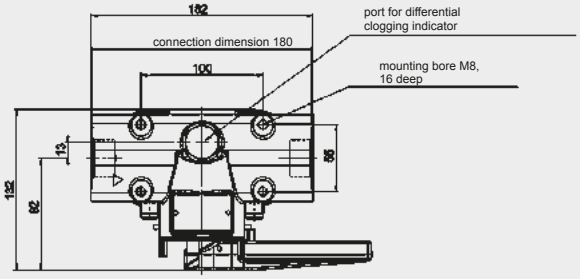
FLND	... D ... BH4HC				W/HC-W	... DN ... BH4HC			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	6 µm	10 µm	25 µm
60	58.6	32.6	18.1	12.2	0.757	-	-	-	-
110	25.4	14.9	8.9	5.6	0.413	-	-	-	-
140	19.9	11.3	8.1	4.3	0.324	-	-	-	-
40	-	-	-	-	0.966	40.4	24.8	16.4	10.9
63	-	-	-	-	0.540	29.0	18.2	11.7	7.6
100	-	-	-	-	0.325	19.0	11.7	7.7	5.3
160	-	-	-	-	0.168	8.0	5.1	3.8	2.5
250	-	-	-	-	0.101	5.4	3.4	2.8	1.9
400	-	-	-	-	0.068	3.4	2.1	1.7	1.1

4. DIMENSIONS

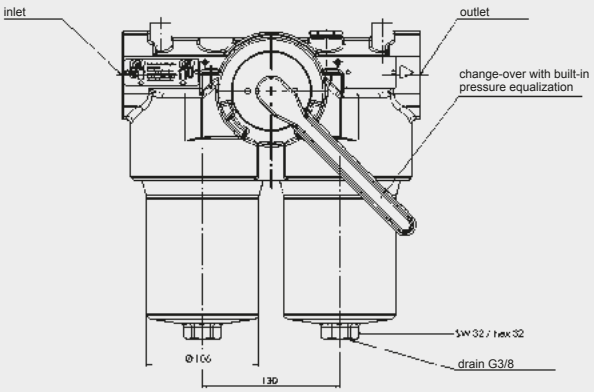
FMND 40 - 140

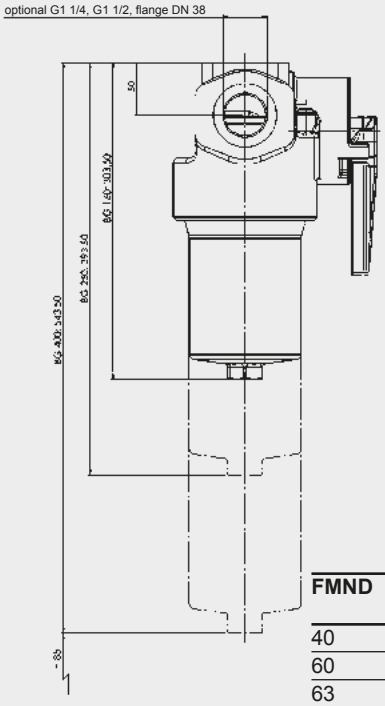


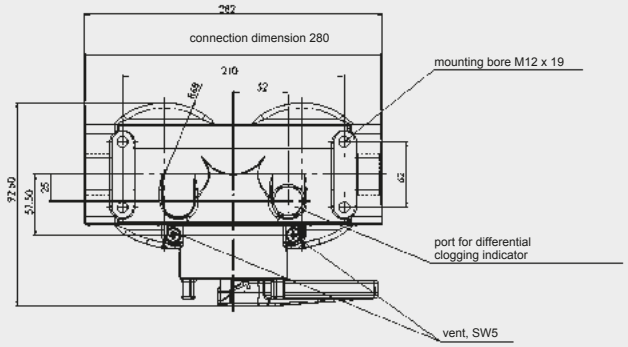




FMND 160 - 400







FMND	Weight incl. element [kg]	Vol. of pressure chamber [l]
40	9.2	2x 0.22
60	9.2	2x 0.20
63	10.5	2x 0.33
100	11.5	2x 0.50
110	10.8	2x 0.33
140	12.0	2x 0.40
160	23.9	2x 1.10
250	27.1	2x 1.70
400	32.2	2x 2.70

NOTE

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Subject to technical modifications.

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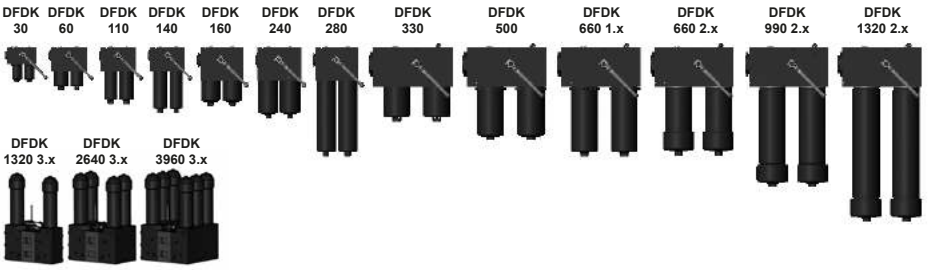
Change-Over Pressure Filter DFDK

up to 1800 l/min, up to 315 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowls.

Standard equipment:

- ball change-over valve
- two-piece filter bowl for DFDK 990, 1320, 2640, 3690 (as an option for DFDK 660)
- connection for a clogging indicator
- drain screw with pressure relief
- pressure equalization line (for size DFDK 330 and above)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Number of filter elements

DFDK	Elements per side
30	1x0030 D
60	1x0060 D
110	1x0110 D
140	1x0140 D
160	1x0160 D
240	1x0240 D
280	1x0280 D
330	1x0330 D
500	1x0500 D
660	1x0660 D
990	1x0990 D
1320	1x1320 D
1320.3.X	1x1320 D
2640.3.X	2x1320 D
3960.3.X	3x1320 D

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BH4HC):	210 bar
Wire mesh (W/HC, W):	20 bar
Stainless steel fibre (V):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	160 bar (DFDK with type code 3.X) 315 bar (DFDK with type code 1.X and 2.X)
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-10 °C to +100 °C (-30 °C to -10 °C: p_{max}= 157.5 bar)
Material of filter head	EN-GJS-400-15
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	8 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

As inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Pressure equalization line for DFDK 160 - 280
- Detent pin to lock the lever for DFDK 330-1320...1.x/2.x
- Ball change-over in T configuration (simultaneous flow on both sides including detent)

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

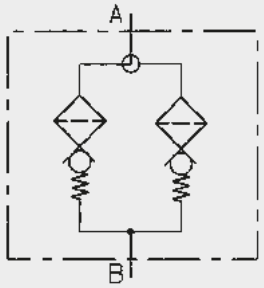
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) and CLP oils on request

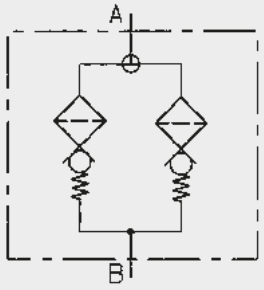
1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems DFDK ball change-over in L configuration



Symbol for hydraulic systems DFDK ball change-over in T configuration



2. MODEL CODE (also order example)

DFDK ON 160 Q L F 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
DFDK

Filter material

ON	Optimicron®	V	Metal fibre
BH/HC	Betamicron® (BH4HC)	W/HC, W	Wire mesh

Size of filter or element
DFDK: 30, 60, 110, 140, 160, 240, 280, 330, 500, 660, 990, 1320, 2640, 3960

Operating pressure
Q 315 bar
K 160 bar (only for DFDK 1320, 2640, 3960...3.x)

Type of change-over
L ball change-over in L configuration (standard)
T ball change-over in T configuration (i.e. simultaneous flow through both sides; only in combination with BH/HC and V filter elements)

Type and size of connection

Type	Port	Filter size 30	60	110	140	160	240	280	330	500	660	990	1320	1320/2640/3960...3.x
B	G ½	●												
C	G ¾		●	●	●									
F	G1 ½					●	●	●						
L	SAE DN 50*								●	●	●	●	●	
M	SAE DN 65**													●

* Flange SAE, 6000 PSI ** Flange SAE, 3000 PSI

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20 BH/HC, V: 3, 5, 10, 20
W/HC, W: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1 model with one-piece filter bowls
2 model with two-piece filter bowls (only for DFDK 660 to 1320)
3 top-removable model (only for DFDK 1320 to 3960)

Modification number
X the latest version is always supplied

Supplementary details
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light-emitting diodes up to 24 Volt
] only for clogging indicators Type D
SO668 detent pin to lock lever (only for DFDK 330-1320...1.x/2.x)
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0160 D 010 ON /-V

Size
0030, 0060, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020 BH4HC, V: 003, 005, 010, 020
W/HC, W: 025, 050, 100, 200

Filter material
ON, BH4HC, V, W/HC, W (with ball change-over in T configuration only possible for BH4HC and V filter elements!)

Supplementary details
V, W (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 8 D . X /-L24

Type
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
8 standard 8 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

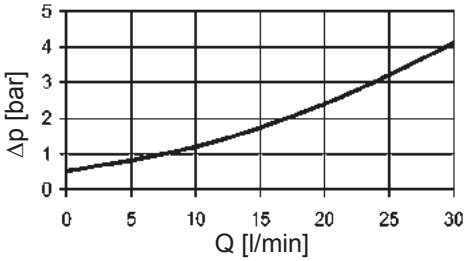
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

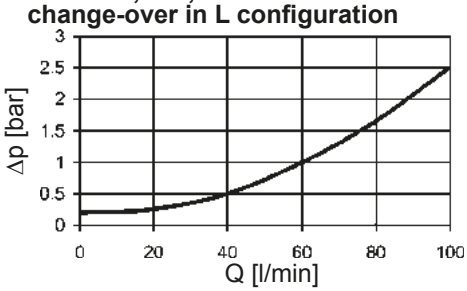
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

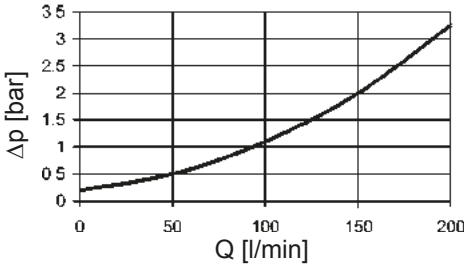
DFDK 30 ... 1.x with ball change-over in L configuration



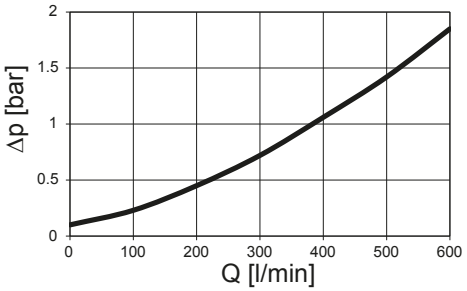
DFDK 60, 110, 140 ... 1.x with ball change-over in L configuration



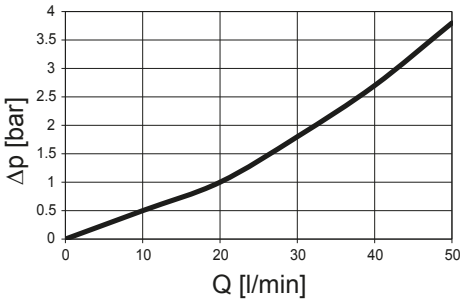
DFDK 160, 240, 280 ... 1.x with ball change-over in L configuration



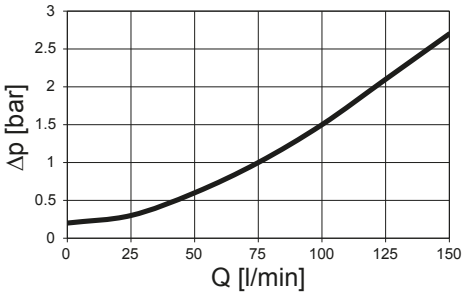
DFDK 330, 500, 660 ... 1.x
DFDK 660, 990, 1320 ... 2.x with ball change-over in L configuration



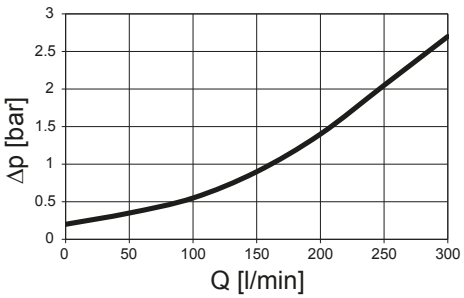
DFDK 30 ... 1.x with ball change-over in T configuration



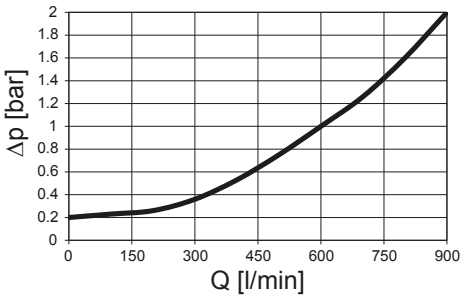
DFDK 60, 110, 140 ... 1.x with ball change-over in T configuration



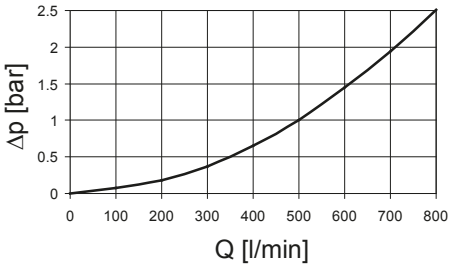
DFDK 160, 240, 280 ... 1.x with ball change-over in T configuration



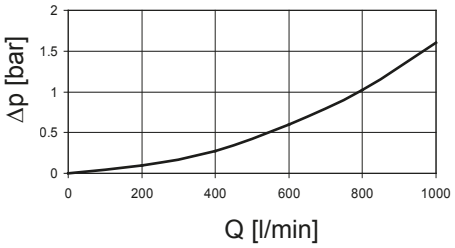
DFDK 330, 500, 660 ... 1.x
DFDK 660, 990, 1320 ... 2.x with ball change-over in T configuration



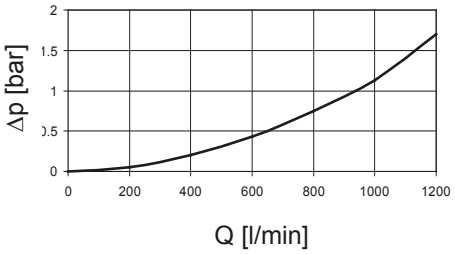
DFDK 1320 ... 3.x



DFDK 2640 ... 3.x



DFDK 3960 ... 3.x



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

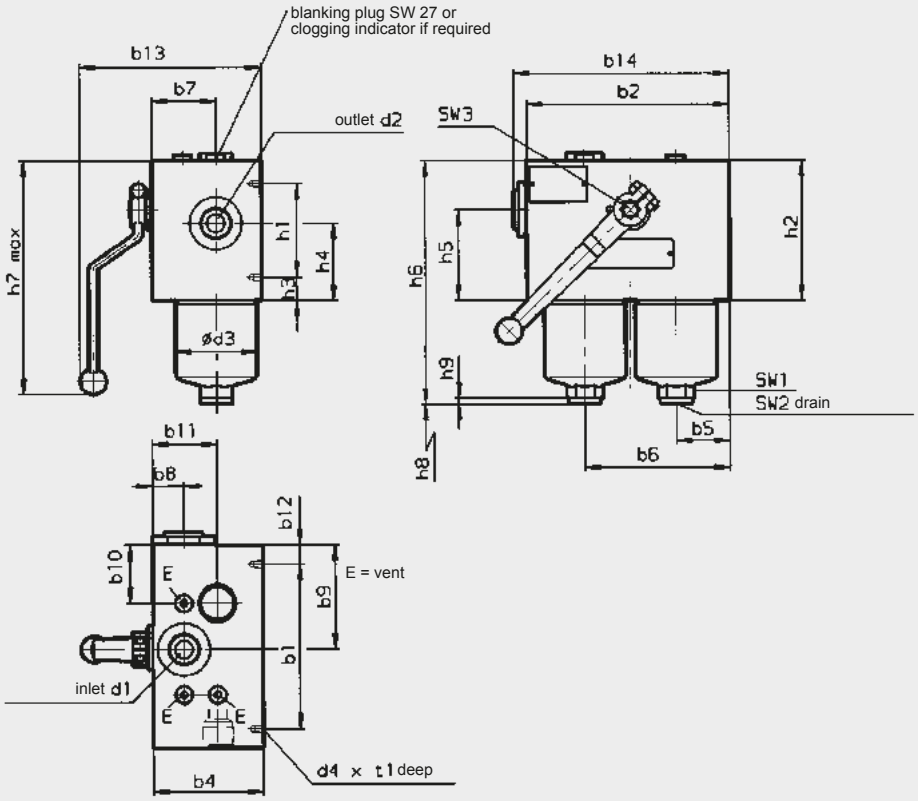
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

DFDK	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
30	77.8	63.9	43.3	22.8	14.0	11.3
60	53.5	26.0	18.3	12.1	9.78	6.32
110	25.8	13.4	9.61	6.06	4.63	2.99
140	19.9	11.5	7.39	4.38	3.54	2.29
160	18.5	11.0	7.70	4.10	3.71	3.18
240	11.5	6.90	5.34	3.19	2.44	2.10
280	5.54	3.37	2.74	1.49	1.36	1.17
330	8.23	4.19	3.37	2.46	1.55	1.22
500	5.05	2.57	2.07	1.23	0.95	0.75
660	3.78	1.93	1.56	0.93	0.71	0.56
990	2.51	1.28	1.03	0.61	0.47	0.37
1320	1.85	0.97	0.76	0.45	0.35	0.27

DFDK	V				W/HC, W	BH4HC			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	5 µm	10 µm	20 µm
30	18.4	13.5	7.5	3.6	3.030	91.2	50.7	36.3	19.0
60	16.0	9.3	5.4	3.3	0.757	58.6	32.6	18.1	12.2
110	8.2	5.6	3.3	2.2	0.413	25.4	14.9	8.9	5.6
140	5.8	4.8	3.1	2.3	0.324	19.9	11.3	8.1	4.3
160	4.6	3.2	2.3	1.4	0.284	16.8	10.4	5.9	4.4
240	3.1	2.5	1.7	1.1	0.189	10.6	6.8	3.9	2.9
280	2.3	1.7	1.2	0.8	0.162	5.7	3.4	1.8	1.6
330	2.2	1.8	1.2	0.8	0.138	7.7	4.5	2.8	2.0
500	1.5	1.2	0.8	0.5	0.091	4.2	2.6	1.5	1.2
660	1.1	0.9	0.6	0.4	0.069	3.3	1.9	1.0	0.9
990	0.8	0.6	0.4	0.3	0.046	2.2	1.3	0.8	0.6
1320	0.6	0.5	0.3	0.2	0.035	1.6	1.0	0.6	0.4

4. DIMENSIONS

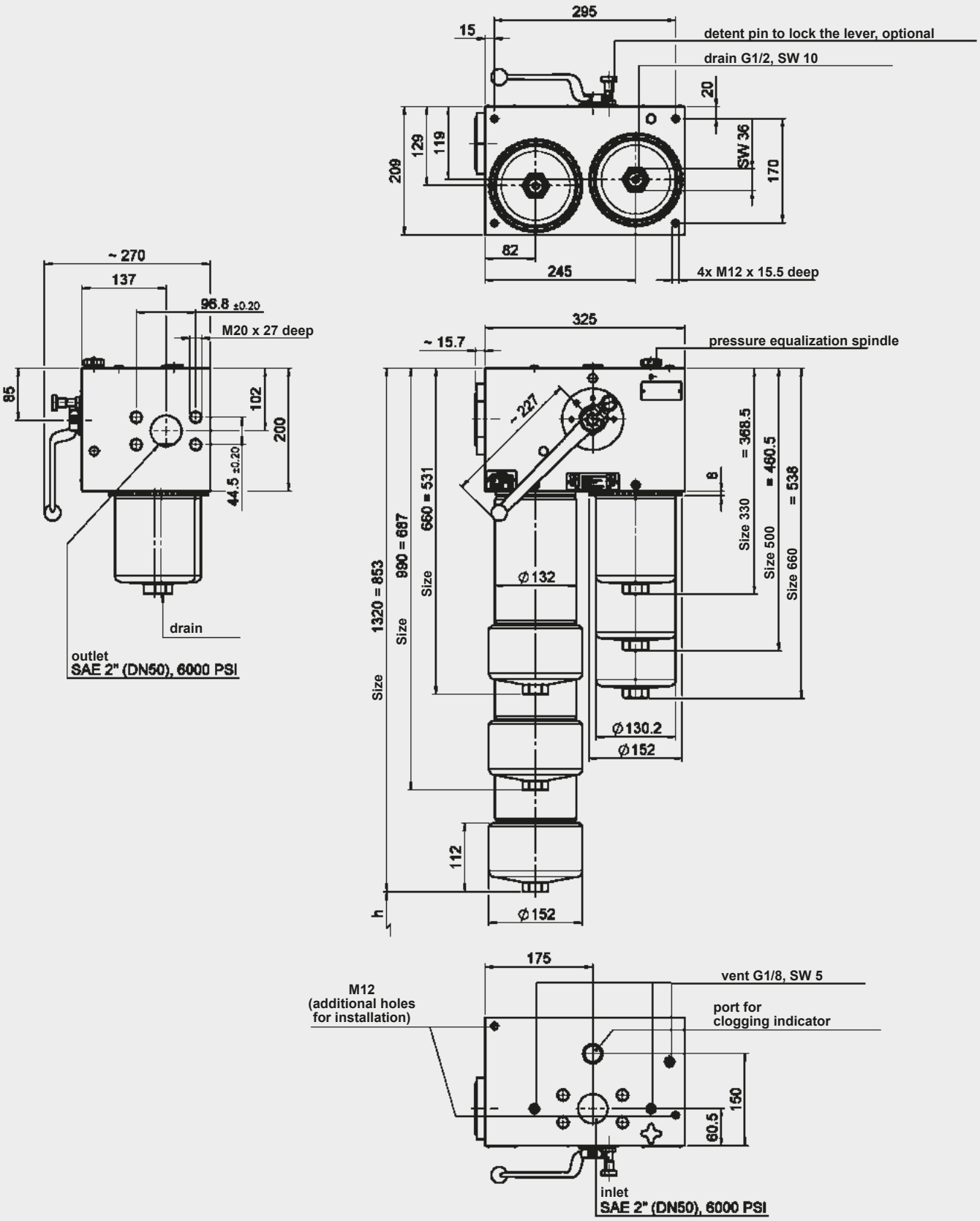
DFDK 30 - 280



* SAE connection 6000 psi

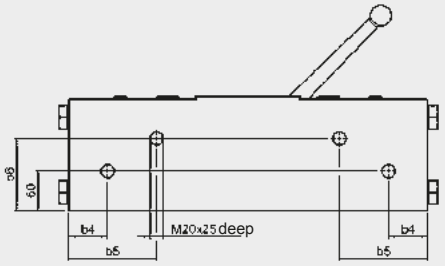
DFDK	30	60	110	140	160	240	280
b1	130	138	138	138	190	190	190
b2	145	170	170	170	210	210	210
b4	80	92	92	92	128	128	128
b5	35	45	45	45	52.5	52.5	52.5
b6	96	121.5	121.5	121.5	157.5	157.5	157.5
b7	47	54	54	54	75.5	75.5	75.5
b8	22.8	26	26	26	35.5	35.5	35.5
b9	80.9	87	87	87	105	105	105
b10	80.9	48.5	48.5	48.5	52.5	52.5	52.5
b11	59	54	54	54	75.5	75.5	75.5
b12	7.5	16	16	16	10	10	10
b13 (≈)	131	150	150	150	193	193	193
b14 (≈)	155	181	181	181	221	221	221
d1*	G ½	G ¾	G ¾	G ¾	G 1½	G 1½	G 1½
d2*	G ½	G ¾	G ¾	G ¾	G 1½	G 1½	G 1½
d3	52.2	68.2	68.2	68.2	95.2	95.2	95.2
d4	M6	M6	M6	M6	M10	M10	M10
h1	64	78	78	78	96	96	96
h2	80	117	117	117	162	162	162
h3	8	19.5	19.5	19.5	33	33	33
h4	47	64.5	64.5	64.5	106	106	106
h5	43	76	76	76	100	100	100
h6	171	205.0	276.5	317.5	284.5	346	525.5
h7 (≈)	180	205	205	205	245	245	245
h8	75	75	75	75	85	85	85
h9	5	5	5	5	5	5	5
t1	7	7	7	7	11	11	11
SW1	24	27	27	27	32	32	32
SW2	6	10	10	10	10	10	10
SW3	9	12	12	12	14	14	14
Weight incl. element [kg]	7.4	15.0	17.0	18.9	33.0	36.0	45.0
Volume of pressure chamber [l]	2x0.13	2x0.20	2x0.33	2x0.40	2x0.60	2x0.80	2x1.60

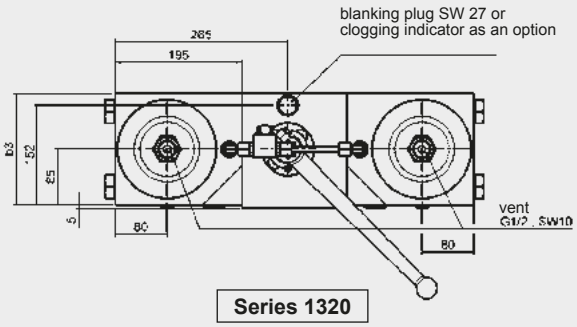
DFDK 330 - 660..1.x
DFDK 660 - 1320..2.x



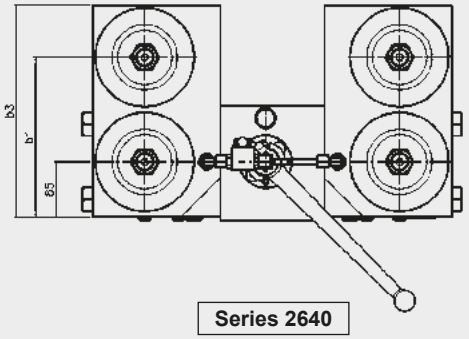
DFDK	330	500	660 1.x	660 2.x	990	1320
h	95	95	95	350	500	670
Weight incl. element [kg]	97.0	108.0	114.0	119.0	136.0	152.0
Volume of pressure chamber [l]	2x1.50	2x2.20	2x3.00	2x3.00	2x4.50	2x6.00

DFDK top-removable models 1320, 2640, 3960 ... 3.x

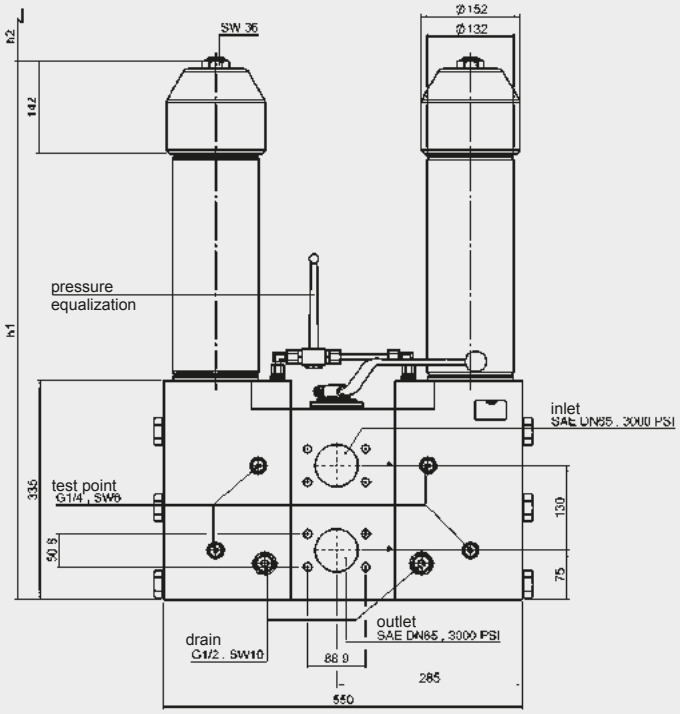


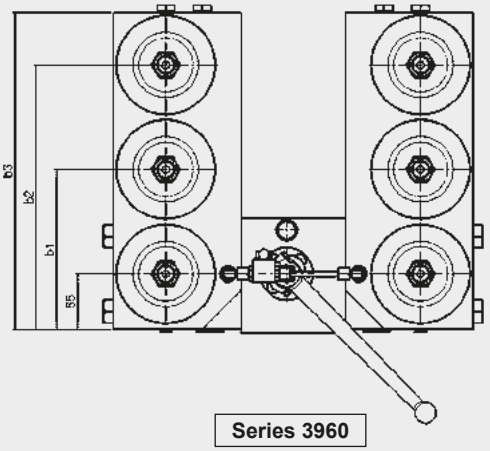


Series 1320



Series 2640





Series 3960

DFDK	1320 ... 3.x	2640 ... 3.x	3960 ... 3.x
b1	-	245	245
b2	-	-	405
b3	170	325	485
b4	60	135	135
b5	135	135	135
b6	110	265	425
h1	991	991	991
h2	570	570	570
Weight incl. element [kg]	approx. 250	approx. 445	approx. 640
Volume of pressure chamber [l]	2 x 7.00	2 x 14.00	2 x 20.00

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

HYDAC Filtertechnik GmbH
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D-66280 Sulzbach/Saar
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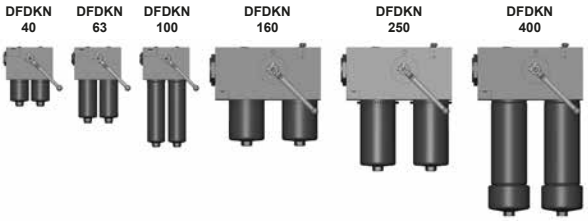
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-mail: filter@hydac.com

Change-Over Pressure Filter DFDKN

to DIN 24550,
up to 800 l/min, up to 315 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowls.

Standard equipment:

- ball change-over valve
- two-piece filter bowl for DFDKN 400
- connection for a clogging indicator
- drain screw with pressure relief
- pressure equalization line (for size DFDKN 160 and above)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

Filter elements are available with the following pressure stability values:

Betamicron® (BN4HC):	20 bar
Betamicron® (BH4HC):	210 bar
Wire mesh (W/HC):	20 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	315 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-10 °C to +100 °C (-30 °C to -10 °C: p_{max}= 157.5 bar)
Material of filter head	EN-GJS-400-15
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	8 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Detent pin to lock the lever for DFDKN 160-400
- Ball change-over in T configuration (simultaneous flow on both sides including detent)

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

on request

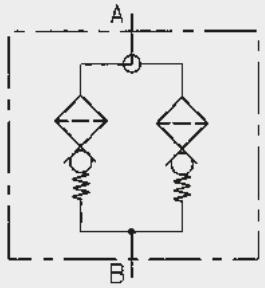
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS TO DIN ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFC and HFD
- Operating fluids with high water content (>50% water content) on request

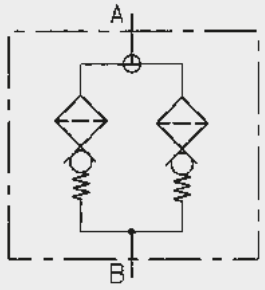
1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems DFDKN ball change-over in L configuration



Symbol for hydraulic systems DFDKN ball change-over in T configuration



2. MODEL CODE (also order example)

DFDKN BN/HC 100 Q L C 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
DFDKN

Filter material

BN/HC	Betamicron® (BN4HC)	W/HC	Wire mesh
BH/HC	Betamicron® (BH4HC)		

Size of filter or element
DFDKN: 40, 63, 100, 160, 250, 400

Operating pressure
Q = 315 bar

Type of change-over
L ball change-over in L-configuration (standard)
T ball change-over in T-configuration (i.e. simultaneous flow through both sides; only in conjunction with BH/HC filter elements)

Type and size of port
to DIN 24550 (●), possible ports (X)

Type	Port	Filter size 40	63	100	160	250	400
B	G ½	●	X	X			
C	G ¾	X *	● *	X *			
D	G1 **	X	X	●			
E	G1 ¼				●	X	X
F	G1 ½				X	●	X
L	SAE DN 50 ***				X *	X *	● *

* = Preferred range
** On request, with unequal connector *** Flange SAE, 6000 PSI

Filtration rating in µm
BN/HC, BH/HC: 3, 6, 10, 25
W/HC: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A stainl. steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1 one-piece filter bowl
2 two-piece filter bowl (DFDKN 400 only)

Modification number
X the latest version is always supplied

Supplementary details
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light-emitting diodes up to 24 Volt
] only for clogging indicators Type D
SO668 detent pin to lock lever (only for DFDKN 160-400)
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0100 DN 010 BH4HC /-V

Size
0040, 0063, 0100, 0160, 0250, 0400

Type
DN

Filtration rating in µm
BN4HC, BH4HC: 003, 006, 010, 025
W/HC: 025, 050, 100, 200

Filter material
BN4HC, BH4HC, W/HC (with ball change-over in T-configuration only possible for BH4HC filter elements!)

Supplementary details
V, W (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 8 D . X /-L24

Type
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
8 standard 8 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing} =$ (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

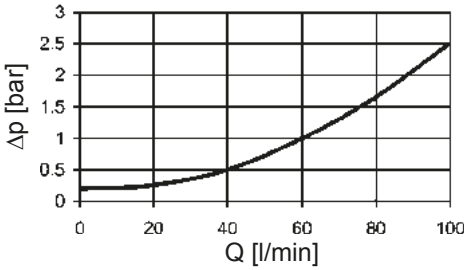
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

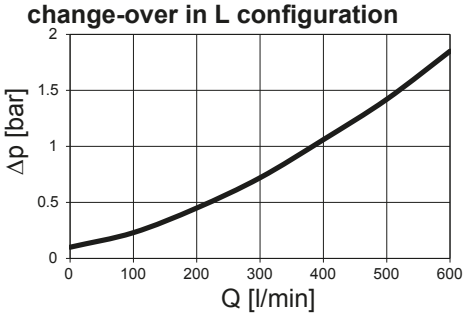
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

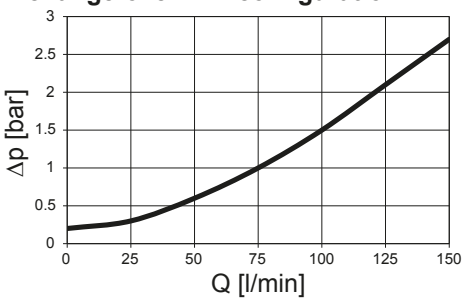
DFDKN 40, 63, 100 with ball change-over in L configuration



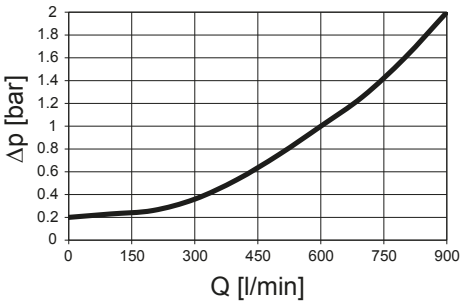
DFDKN 160, 250, 400 with ball change-over in L configuration



DFDKN 40, 63, 100 with ball change-over in T configuration



DFDKN 160, 250, 400 with ball change-over in T configuration



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

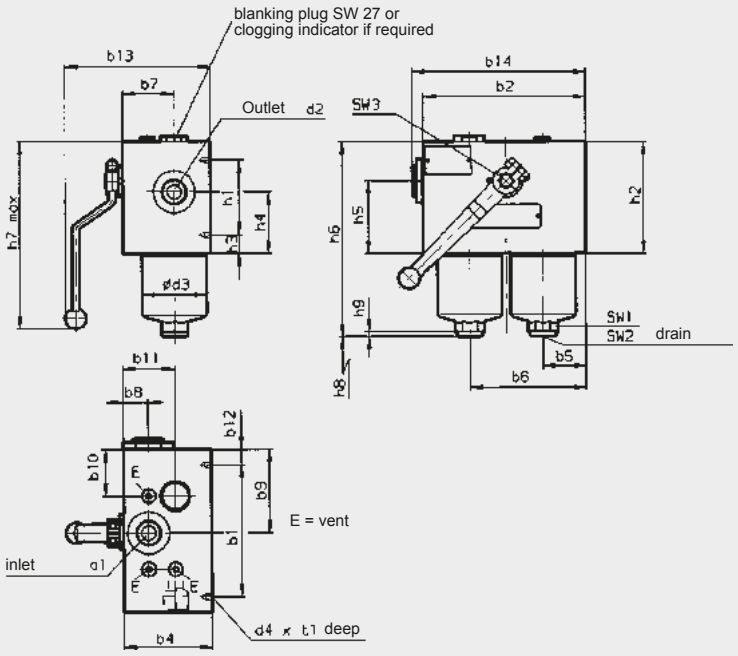
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

DFDKN	BN4HC			
	3 µm	6 µm	10 µm	25 µm
40	23.9	14.9	8.6	6.6
63	16.3	9.9	6.0	4.6
100	11.9	6.6	4.0	3.2
160	7.9	5.1	3.4	2.6
250	5.1	3.2	2.1	1.8
400	3.2	2.0	1.3	1.0

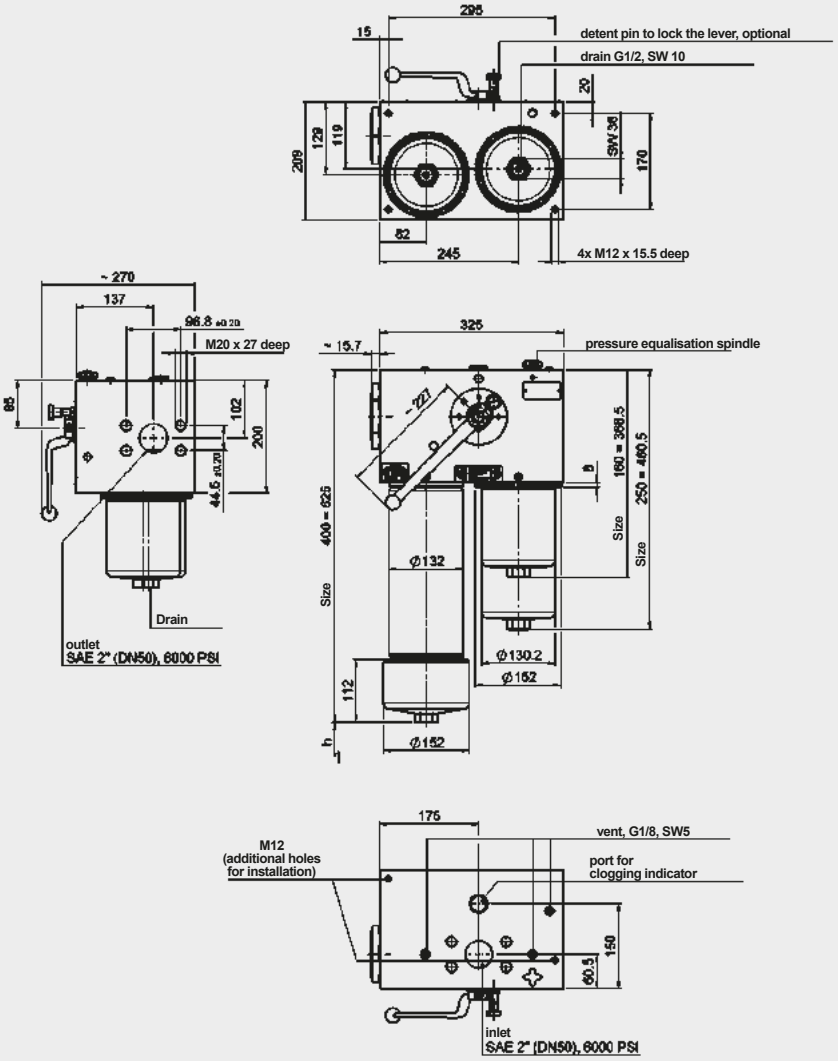
DFDKN	BH4HC				W/HC
	3 µm	6 µm	10 µm	25 µm	–
40	40.4	24.8	16.4	10.9	0.966
63	29.0	18.2	11.7	7.6	0.54
100	19.0	11.7	7.7	5.3	0.325
160	8.0	5.1	3.8	2.5	0.168
250	5.4	3.4	2.8	1.9	0.101
400	3.4	2.1	1.7	1.1	0.068

4. DIMENSIONS OF PREFERRED RANGE

DFDKN 40 - 100



DFDKN 160 - 400



DFDKN	40	63	100
b1	138		
b2	170		
b4	92		
b5	45		
b6	121.5		
b7	54		
b8	26		
b9	87		
b10	48.5		
b11	54		
b12	16		
approx. b13	150		
approx. b14	181		
d1*	G ¾ *		
d2*	G ¾ *		
d3	68.2		
d4	M6		
h1	78		
h2	117		
h3	19.5		
h4	64.5		
h5	76		
h6	214.5	272.0	363.5
approx. h7	205		
h8	75		
h9	5		
t1	7		
SW1	27		
SW2	10		
SW3	12		
Weight incl. element [kg]	15.0	16.5	18
Volume of pressure chamber [l]	2x 0.22	2x 0.33	2x 0.5

* SAE connection 6000 psi

DFDKN	160	250	400 2.x
h	95	95	420
Weight incl. element [kg]	100	107	129
Volume of pressure chamber [l]	2x 1.5	2x 2.2	2x 3.8

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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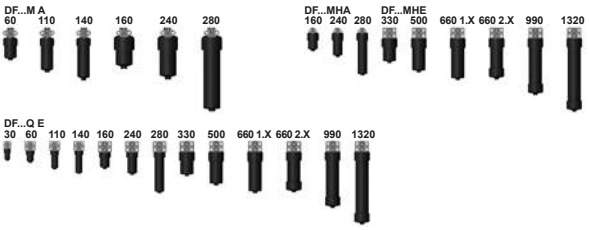
E-mail: filter@hydac.com

Pressure Filter DF...M A, DF...Q E, DF...MHA, DF...MHE Flange Mounted

up to 550 l/min, up to 315 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- mounting holes in the filter head
- two-piece bowl for size DF...990 and above (optional for size DF...660 and above)
- drain screw with pressure relief (standard for size DF...330 and above)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BH4HC):	210 bar
Optimicron® Pulse (ON/PS):	20 bar
Optimicron® Pulse (OH/PS):	210 bar
Wire mesh (W/HC):	20 bar
Stainless steel fibre (V):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	DF...M A/MHA/MHE: 250 bar DF...Q E: 315 bar
Fatigue strength	10^6 cycles (DF...M A/DF...Q E) 10^8 cycles (DF...MHA/DF...MHE) from 0 to nominal pressure (for other pressures, see graph, Point 1.8)
Temperature range	-10 °C to +100 °C (-30 °C to -10 °C: p_{max} = 0.5 x nom. press.)
Material of filter head	EN-GJS-400-15 (DF...M A/DF...Q E) ADI (DF...MHA/DF...MHE)
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Cracking pressure of bypass (optional)	6 bar (only DF...M A / Q E)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Pressure filter for flange mounting

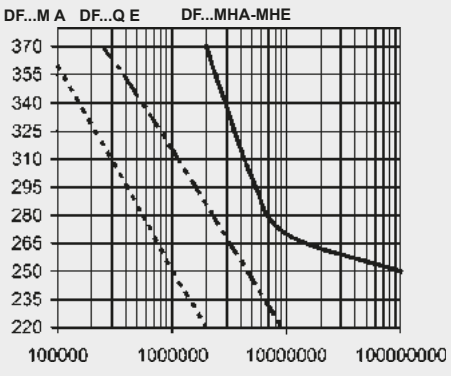
1.6 SPECIAL MODELS AND ACCESSORIES

- Bypass valve built into the head, separate from the main flow
- Seals in FPM, EPDM
- Test and approval certificates

1.7 SPARE PARTS

See Original Spare Parts List

1.8 FATIGUE STRENGTH



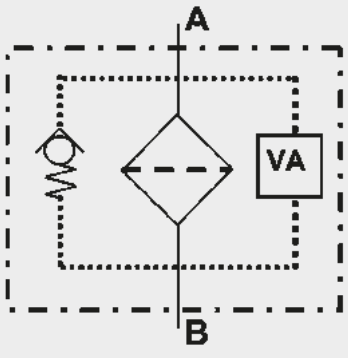
1.9 CERTIFICATES AND APPROVALS

on request

1.10 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



VA = clogging indicator

E 7.555.11/11.16

2. MODEL CODE (also order example)

DF ON 240 M H A 10 D 1 . X /-L24

2.1. COMPLETE FILTER

Filter type
DF... flange mounted

Filter material

ON	Optimicron®	ON/PS	Optimicron® Pulse
BH/HC	Betamicron® (BH4HC)	OH/PS	Optimicron® Pulse
W/HC	Stainl. st. wire mesh		
V	Stainless steel fibre		

Size of filter or element
M A: 60, 110, 140, 160, 240, 280
Q E: 30, 60, 110, 140, 160, 240, 280, 330, 500, 660, 990, 1320
MHA: 160, 240, 280
MHE: 330, 500, 660, 990, 1320

Operating pressure
M = 250 bar
Q = 315 bar

Application
No details: 10^6 cycles
H: high duty cycle, 10^8 cycles (only for DF...MHA / DF...MHE)

Type and size of connection
A 2 mounting holes
E 4 mounting holes

Filtration rating in µm

ON:	1, 3, 5, 10, 15, 20
BH/HC, ON/PS, OH/PS, V:	3, 5, 10, 20
W/HC:	25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. 7.050../..

Type code
1 model with one-piece filter bowl (up to size 660)
2 model with two-piece filter bowl (size 660 and above)

Modification number
X the latest version is always supplied

Supplementary details
B. bypass cracking pressure (e.g. B6 = 6 bar); only possible for DF...M A / DF...Q E
L... light with appropriate voltage (24, 48, 110, 220 Volt)] only for clogging indicators
LED 2 light emitting diodes up to 24 Volt] type "D"
OAI outlet above inlet (only for DF...160, 240, 280 Q E)
SO184 pressure release/oil drain screw (only DF...60-240)
SO348 for operating pressure $p_{max} \leq 210$ bar (type of clogging indicator = VM)
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0240 D 010 ON /-V

Size
0030, 0060, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320

Type
D

Filtration rating in µm

ON	001, 003, 005, 010, 015, 020
BH4HC, ON/PS, OH/PS, V:	003, 005, 010, 020
W/HC:	025, 050, 100, 200

Filter material
ON, BH4HC, ON/PS, OH/PS, V, W/HC

Supplementary details
V, W (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type
VD Differential pressure indicator up to 420 bar operating pressure
VM Differential pressure indicator up to 210 bar operating pressure (only in conjunction with SO348)

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

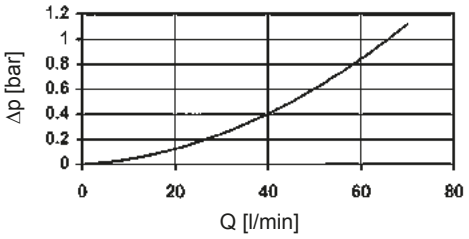
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

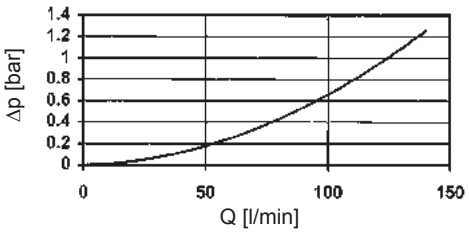
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

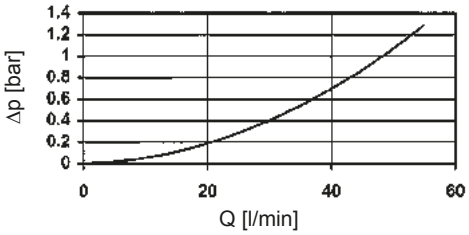
DF 60, 110, 140 M A



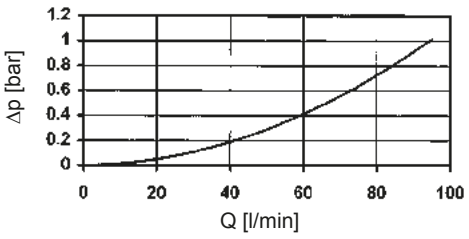
DF 160, 240, 280 M A / MHA



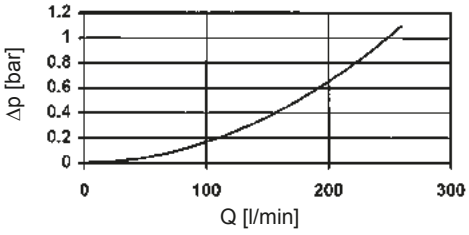
DF 30 Q E



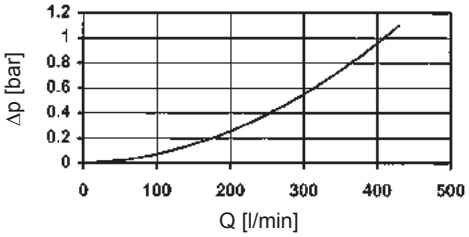
DF 60, 110, 140 QE



DF 160, 240, 280 Q E (also /-OAI)



DF 330, 500, 660, 990, 1320 Q E / MHE



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

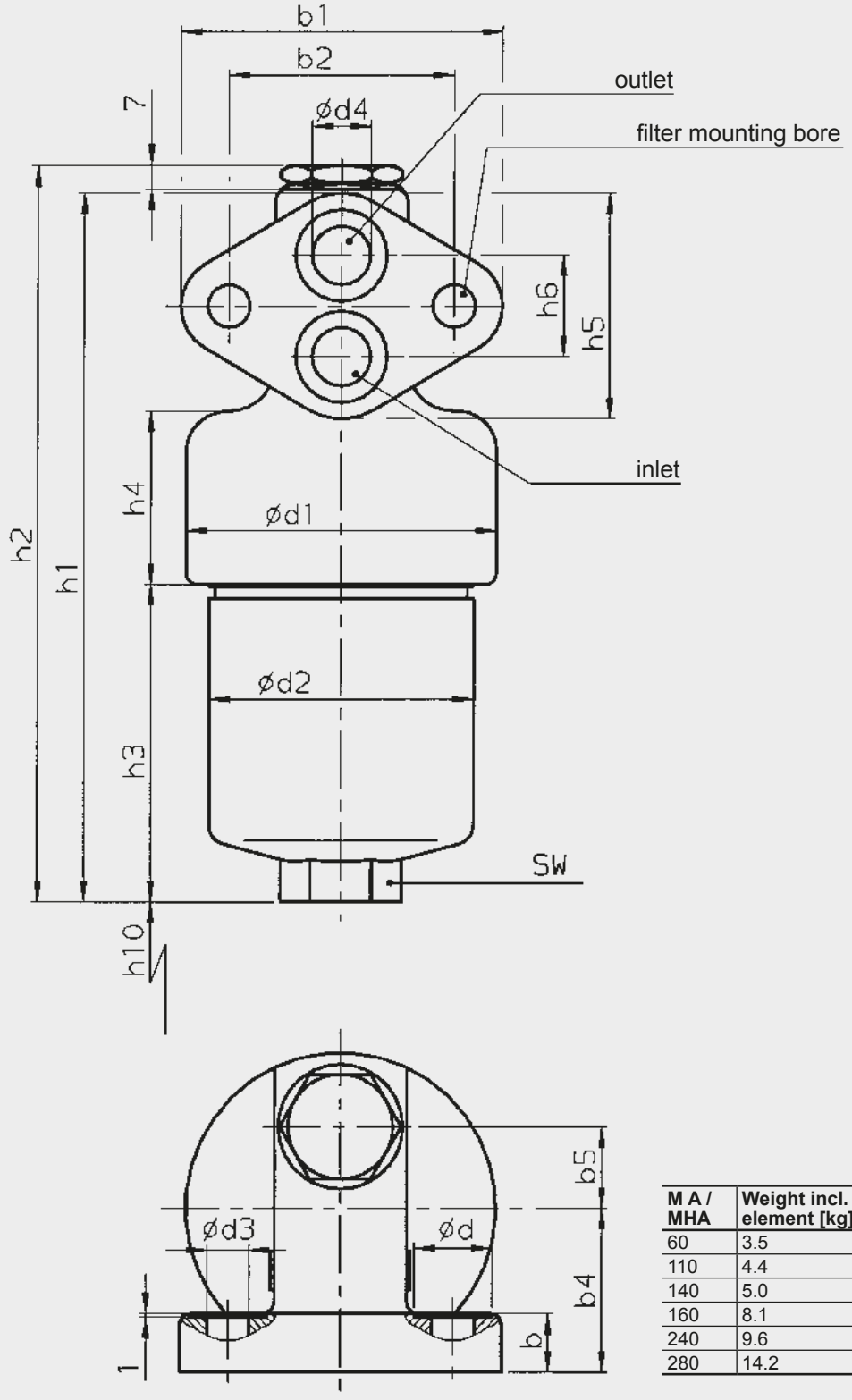
DF...	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
30	77.8	63.9	43.3	22.8	14.0	11.3
60	53.5	26.0	18.3	12.1	9.78	6.32
110	25.8	13.4	9.61	6.06	4.63	2.99
140	19.9	11.5	7.39	4.38	3.54	2.29
160	18.5	11.0	7.70	4.10	3.71	3.18
240	11.5	6.90	5.34	3.19	2.44	2.10
280	5.54	3.37	2.74	1.49	1.36	1.17
330	8.23	4.19	3.37	2.46	1.55	1.22
500	5.05	2.57	2.07	1.23	0.95	0.75
660	3.78	1.93	1.56	0.93	0.71	0.56
990	2.51	1.28	1.03	0.61	0.47	0.37
1320	1.85	0.97	0.76	0.45	0.35	0.27

DF...	ON/PS				OH/PS			
	3 µm	5 µm	10 µm	20 µm	3 µm	5 µm	10 µm	20 µm
30	63.90	43.30	25.08	11.30	87.54	59.32	34.36	15.48
60	28.90	20.40	14.52	7.90	39.59	27.95	19.89	10.82
110	14.90	10.70	7.26	3.70	20.41	14.66	9.95	5.07
140	12.80	8.20	5.28	2.90	17.54	11.23	7.23	3.97
160	13.10	8.80	5.52	3.50	17.95	12.06	7.56	4.80
240	8.20	6.10	4.32	2.30	11.23	8.36	5.92	3.15
280	4.00	3.10	2.04	1.30	5.48	4.25	2.79	1.78
330	4.86	3.90	3.00	1.70	6.66	5.34	4.11	2.33
500	2.97	2.40	1.50	1.10	4.07	3.29	2.06	1.51
660	2.25	1.80	1.10	0.80	3.08	2.47	1.51	1.10
990	1.44	1.20	0.70	0.50	1.97	1.64	0.96	0.69
1320	1.10	0.90	0.50	0.40	1.51	1.23	0.69	0.55

DF...	V				W/HC	BH4HC			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	5 µm	10 µm	20 µm
30	18.4	13.5	7.5	3.6	3.030	91.2	50.7	36.3	19.0
60	16.0	9.3	5.4	3.3	0.757	58.6	32.6	18.1	12.2
110	8.2	5.6	3.3	2.2	0.413	25.4	14.9	8.9	5.6
140	5.8	4.8	3.1	2.3	0.324	19.9	11.3	8.1	4.3
160	4.6	3.2	2.3	1.4	0.284	16.8	10.4	5.9	4.4
240	3.1	2.5	1.7	1.1	0.189	10.6	6.8	3.9	2.9
280	2.3	1.7	1.2	0.8	0.162	5.7	3.4	1.8	1.6
330	2.2	1.8	1.2	0.8	0.138	7.7	4.5	2.8	2.0
500	1.5	1.2	0.8	0.5	0.091	4.2	2.6	1.5	1.2
660	1.1	0.9	0.6	0.4	0.069	3.3	1.9	1.0	0.9
990	0.8	0.6	0.4	0.3	0.046	2.2	1.3	0.8	0.6
1320	0.6	0.5	0.3	0.2	0.035	1.6	1.0	0.6	0.4

4. DIMENSIONS

DF... M A: BG 60 - 280
DF... MHA: BG 160 - 280

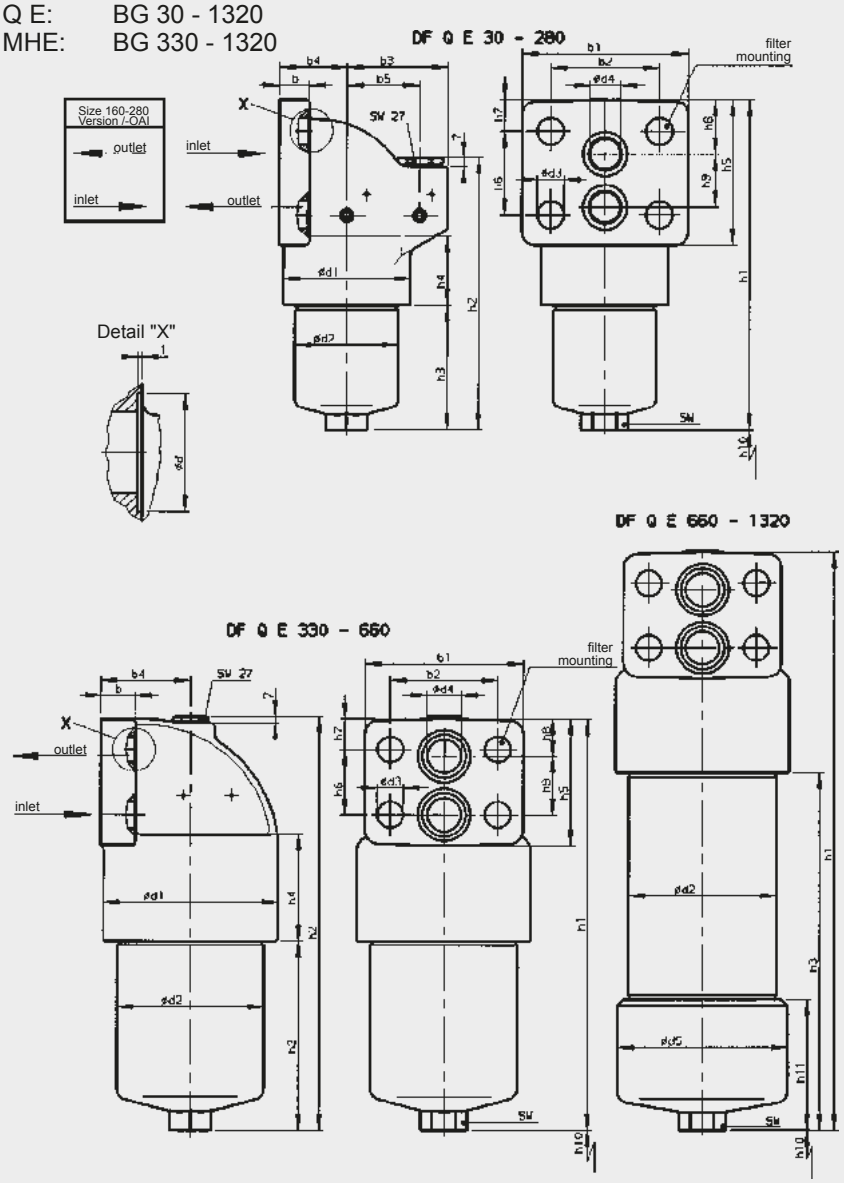


M A / MHA	Weight incl. element [kg]	Vol. of pressure chamber [l]
60	3.5	0.20
110	4.4	0.33
140	5.0	0.40
160	8.1	0.60
240	9.6	0.80
280	14.2	1.60

M A / MHA	b	b1	b2	b3	b4	b5	d	d1	d2	d3	d4	d5	h1	h2	h3	h4	h5	h6	h7	h8	h9	h10	h11	SW	O-ring[1)]
60	15	83	58	-	42	21	20	80	68	11	15	-	185	192	83	45	58	26	-	-	-	75	-	27	19 x 2.5
110	15	83	58	-	42	21	20	80	68	11	15	-	252.5	259.5	150.5	45	58	26	-	-	-	75	-	27	19 x 2.5
140	15	83	58	-	42	21	20	80	68	11	15	-	296	303	194	45	58	26	-	-	-	75	-	27	19 x 2.5
160	20	83	58	-	60	26	20	116	95	13.5	15	-	232	239	107	79	58	26	-	-	-	85	-	32	19 x 2.5
240	20	83	58	-	60	26	20	116	95	13.5	15	-	292	299	167	79	58	26	-	-	-	85	-	32	19 x 2.5
280	20	83	58	-	60	26	20	116	95	13.5	15	-	474	481	349	79	58	26	-	-	-	85	-	32	19 x 2.5

1) supplied

DF... Q E: BG 30 - 1320
DF... MHE: BG 330 - 1320



Q E / MHE	Weight incl. element [kg]	Vol. of pressure chamber [l]
30	2.9	0.13
60	5.2	0.20
110	6.1	0.33
140	6.7	0.40
160 3)	12.3	0.60
240 3)	13.7	0.80
280 3)	18.1	1.60
330	22.9	1.50
500	27.3	2.30
660	30.9	3.00
660 2)	34.1	3.00
990 2)	42.1	4.20
1320 2)	50.3	5.60
Q E /-OAI	**Weight incl. element [kg]**	**Vol. of pressure chamber [l]**
160	10.7	0.60
240	12.7	0.80
280	17.0	1.60

Q E / MHE	b	b1	b2	b3	b4	b5	d	d1	d2	d3	d4	d5	h1	h2	h3	h4	h5	h6	h7	h8	h9	h10	h11	SW	O-ring[1]
30	18	80	57	56	37	38	20	67	52	13	14	-	197	176	78	48	76	45	15.5	30.5	28	75	-	24	18 x 2.5
60	20	110	72	66	45	48	26	84	68	18	20	-	217	181	83	45.5	94	55	19.5	34.5	35	75	-	27	24 x 3
110	20	110	72	66	45	48	26	84	68	18	20	-	284	248	150	45.5	94	55	19.5	34.5	35	75	-	27	24 x 3
140	20	110	72	66	45	48	26	84	68	18	20	-	328	292	194	45.5	94	55	19.5	34.5	35	75	-	27	24 x 3
160 3)	30	140	95	100	59	79	32	116	95	22	32	-	280	222	117	61	110	60	25	31	52	85	-	32	40 x 3.5
240 3)	30	140	95	100	56	79	32	116	95	22	32	-	340	282	177	61	110	60	25	31	52	85	-	32	40 x 3.5
280 3)	30	140	95	100	59	79	32	116	95	22	32	-	522	464	359	61	110	60	25	31	52	85	-	32	40 x 3.5
330	30	140	95	-	79,5	-	32	154	130	23	30	-	353	357	157	94	110	58	26	32	52	115	-	36	40 x 3.5
500	30	140	95	-	79.5	-	32	154	130	23	30	-	446	450	250	94	110	58	26	32	52	115	-	36	40 x 3.5
660	30	140	95	-	79.5	-	32	154	130	23	30	-	523	527	329	94	110	58	26	32	52	115	-	36	40 x 3.5
660 2)	30	140	95	-	79.5	-	32	154	132	23	30	152	517	521	321	94	110	58	26	32	52	350	112	36	40 x 3.5
990 2)	30	140	95	-	79.5	-	32	154	132	23	30	152	673	677	477	94	110	58	26	32	52	500	112	36	40 x 3.5
1320 2)	30	140	95	-	79.5	-	32	154	132	23	30	152	839	843	643	94	110	58	26	32	52	670	112	36	40 x 3.5
Q E /-OAI	b	b1	b2	b3	b4	b5	d	d1	d2	d3	d4	d5	h1	h2	h3	h4	h5	h6	h7	h8	h9	h10	h11	SW	O-ring[1]
160	30	140	95	83	84	59	32	116	95	22	32	-	284	239	119	64	110	58	26	31	52	85	-	32	40 x 3.5
240	30	140	95	83	84	59	32	116	95	22	32	-	344	299	179	64	110	58	26	31	52	85	-	32	40 x 3.5
280	30	140	95	83	84	59	32	116	95	22	32	-	526	481	361	64	110	58	26	31	52	85	-	32	40 x 3.5

[1] supplier / [2] two-piece bowl version / [3] not OAI

NOTE

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Subject to technical modifications.

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Industriegebiet
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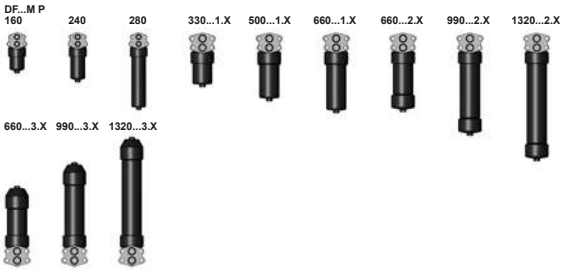
Internet: www.hydac.com
E-Mail: filter@hydac.com

Filter DF...M P side-flanged

up to 550 l/min, up to 260 bar



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1.1 FILTER HOUSING

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- bypass valve built into the head
- two-piece bowl for size DF...990 and above (optional for size DF...660 and above)
- connection for a clogging indicator
- drain screw with pressure relief (standard for size DF...330 and above)

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Filter elements are available with the following pressure stability values:

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Betamicron® (BH4HC):	210 bar
Wire mesh (W/HC):	20 bar
Stainless steel fibre (V):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	260 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-10 °C to +100 °C (-30 °C to -10 °C: p_{max} = 0.5 x nom. press.)
Material of filter head	EN-GJS-400-15
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Bypass cracking pressure	6 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Pressure filter for flange mounting

1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in FPM, EPDM
- Without clogging indicator connection
- Filter in top-removable version (version 3.x; only for size 660 to 1320 with two-piece bowl)
- Test and approval certificates

1.7 SPARE PARTS

See Original Spare Parts List

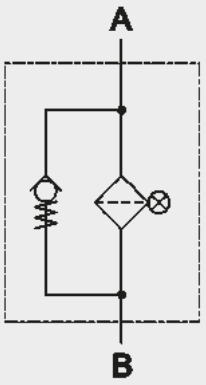
1.8 CERTIFICATES AND APPROVALS

on request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)

DF ON 240 M P 10 D 1 . X /-B6-L24

2.1. COMPLETE FILTER

Filter type
DF... flange mounted

Filter material
ON Optimicron®
BH/HC Betamicron® (BH4HC)
W/HC Stainl. st. wire mesh
V Stainless steel fibre

Size of filter or element
DF…M P: 160, 240, 280, 330, 500, 660, 990, 1320

Operating pressure
M = 260 bar

Type and size of connection
P = 4 mounting holes

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20
BH/HC, V: 3, 5, 10, 20
W/HC: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. 7.050../..

Type code
1 model with one-piece filter bowl (up to size 660)
2 model with two-piece filter bowl (size 660 and above)
3 top-removable model (size 660 and above; only with two-piece bowl)

Modification number
X the latest version is always supplied

Supplementary details
B. standard: bypass cracking pressure (e.g. B6 = 6 bar); without details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light-emitting diodes up to 24 Volt
] only for clogging indicator type "D"
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0240 D 010 ON /-V

Size
0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020
BH4HC, V: 003, 005, 010, 020
W/HC: 025, 050, 100, 200

Filter material
ON, BH4HC, V, W/HC

Supplementary details
V, W (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing} =$ (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

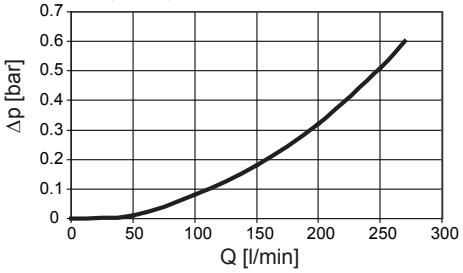
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

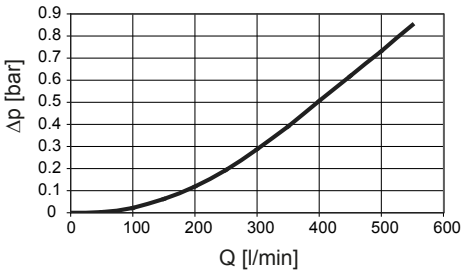
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

DF 160, 240, 280 M P



DF 330, 500, 660, 990, 1320 M P



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

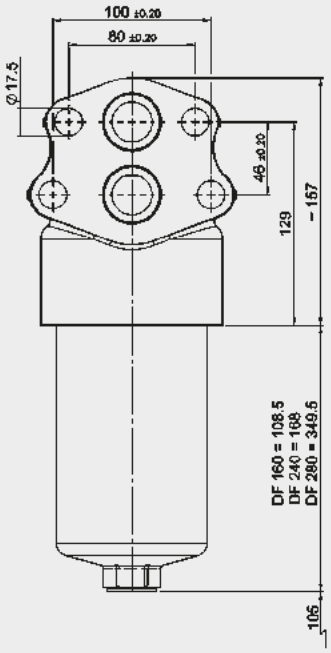
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

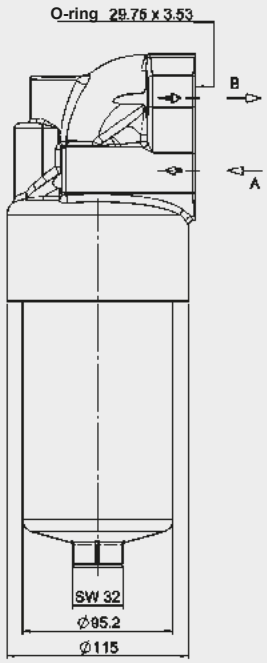
DF...	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
160	18.5	11.0	7.70	4.10	3.71	3.18
240	11.5	6.90	5.34	3.19	2.44	2.10
280	5.54	3.37	2.74	1.49	1.36	1.17
330	8.23	4.19	3.37	2.46	1.55	1.22
500	5.05	2.57	2.07	1.23	0.95	0.75
660	3.78	1.93	1.56	0.93	0.71	0.56
990	2.51	1.28	1.03	0.61	0.47	0.37
1320	1.85	0.97	0.76	0.45	0.35	0.27

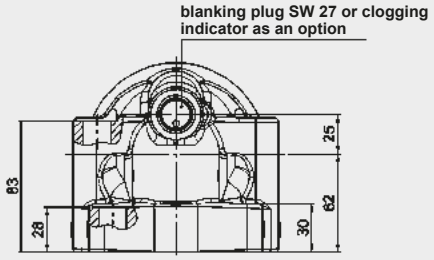
DF...	V				W/HC	BH4HC			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	5 µm	10 µm	20 µm
160	4.6	3.2	2.3	1.4	0.284	16.8	10.4	5.9	4.4
240	3.1	2.5	1.7	1.1	0.189	10.6	6.8	3.9	2.9
280	2.3	1.7	1.2	0.8	0.162	5.7	3.4	1.8	1.6
330	2.2	1.8	1.2	0.8	0.138	7.7	4.5	2.8	2.0
500	1.5	1.2	0.8	0.5	0.091	4.2	2.6	1.5	1.2
660	1.1	0.9	0.6	0.4	0.069	3.3	1.9	1.0	0.9
990	0.8	0.6	0.4	0.3	0.046	2.2	1.3	0.8	0.6
1320	0.6	0.5	0.3	0.2	0.035	1.6	1.0	0.6	0.4

4. DIMENSIONS

DF 160, 240, 280 M P...

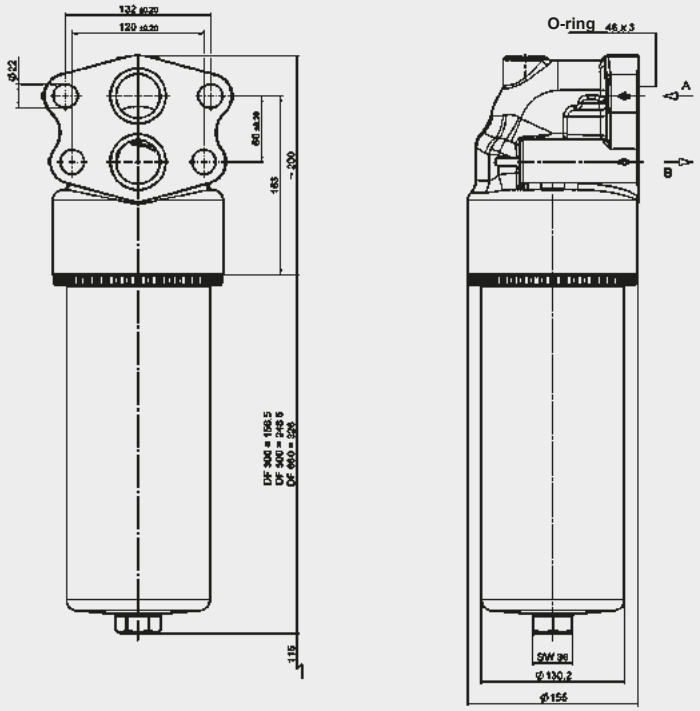




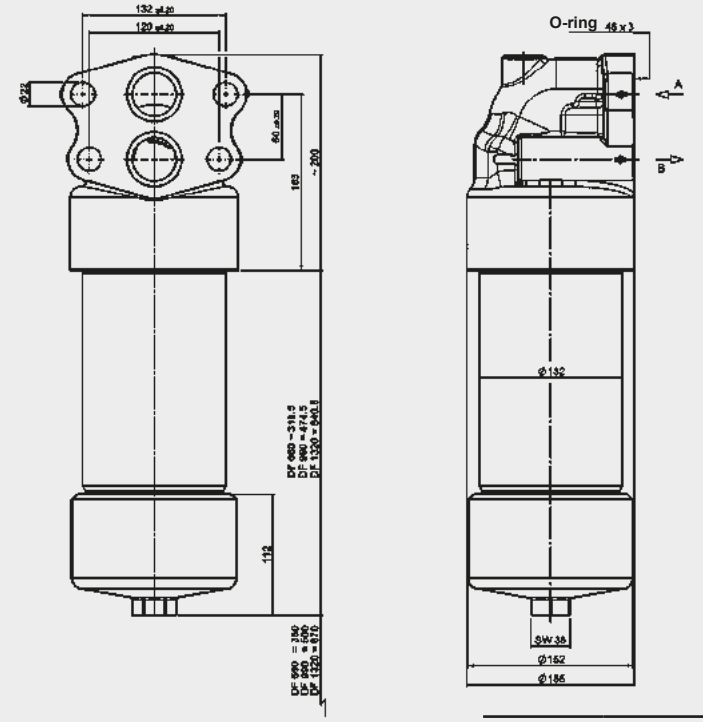


DF...M P	Weight incl. element [kg]	Volume of pressure chamber [l]
160	9.3	0.6
240	10.6	0.8
280	14.6	1.6

DF 330 - 660 M P...1.X

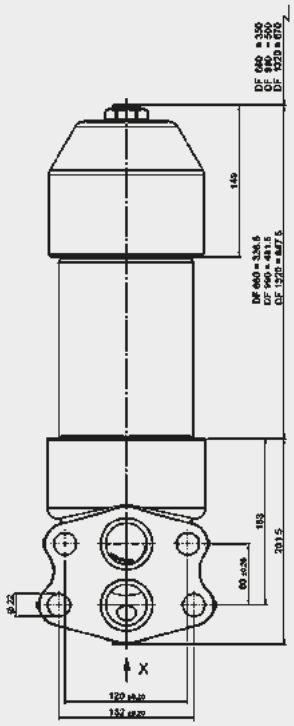


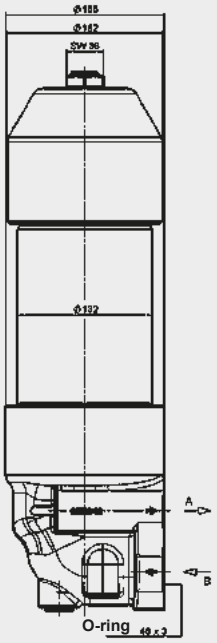
DF 660 - 1320 M P...2.X

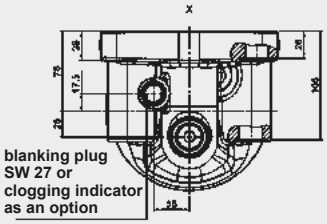


DF...M P	Weight incl. element [kg]	Volume of pressure chamber [l]
330	21.1	1.5
500	24.9	2.3
660...1.x	28.0	3.0
660...2.x	31.1	3.0
990	37.9	4.2
1320	45.2	5.6

DF 660 - 1320 M P...3.X







DF...M P	Weight incl. element [kg]	Volume of pressure chamber [l]
660	31.5	3.0
990	36.3	4.2
1320	45.6	5.6

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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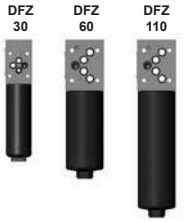
Pressure Filter for Sandwich Stacking DFZ

up to 80 l/min, up to 315 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- Service access on the right
- Without clogging indicator connection

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BH4HC):	210 bar
Optimicron® Pulse (ON/PS):	20 bar
Optimicron® Pulse (OH/PS):	210 bar
Metal fibre (V):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	315 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-30 °C to +100 °C (-30 °C to -10 °C: p_{max}= 157.5 bar)
Material of filter head	Steel
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	8 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Pressure filter for sandwich stacking

1.6 SPECIAL MODELS AND ACCESSORIES

Port for clogging indicator

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

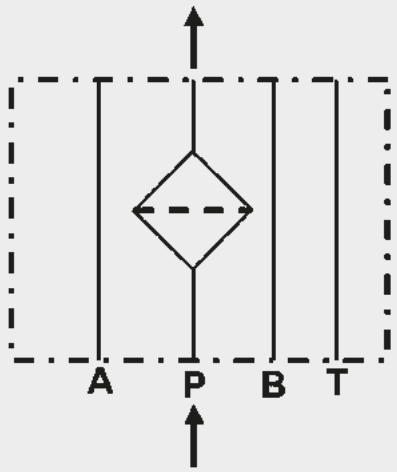
on request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

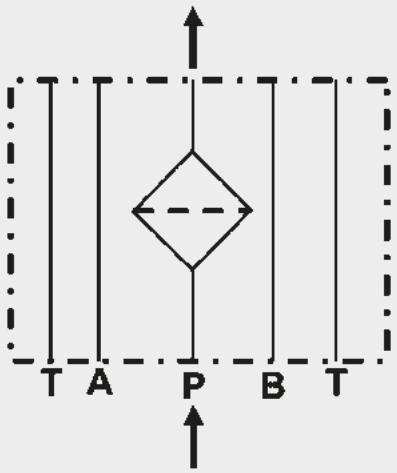
- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems

DFZ 30



DFZ 60/110



2. MODEL CODE (also order example)

DFZ ON 60 Q C 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
DFZ

Filter material

ON	Optimicron®	ON/PS	Optimicron® Pulse		
BH/HC	Betamicron® (BH4HC)	OH/PS	Optimicron® Pulse	V	Metal fibre

Size of filter or element
DFZ: 30, 60, 110

Operating pressure
Q = 315 bar

Type and size of connection

Type	Port	Filter size		
		30	60	110
B	4 ports A 6 DIN 24340/ Cetop R 35 H	●		
C	5 ports A 10 DIN 24340/ Cetop R 35 H		●	●

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20
BH/HC, ON/PS, OH/PS, V: 3, 5, 10, 20

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
BM visual
C electrical
D visual and electrical
for other clogging indicators, see brochure no. 7.050../..

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light-emitting diodes up to 24 Volt
V FPM seals
W suitable for HFA and HFC emulsions
1 service access on the left ("A" side)
only for clogging indicators type "D"

2.2 REPLACEMENT ELEMENT

0060 D 010 ON /-V

Size
0030, 0060, 0110

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020
BH/HC, ON/PS, OH/PS, V:003, 005, 010, 020

Filter material
ON, BH4HC, ON/PS, OH/PS, V

Supplementary details
V, W (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 8 D . X /-L24

Type
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
8 standard 8 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{\text{viscosity}}{30}$$

(*see Point 3.2)

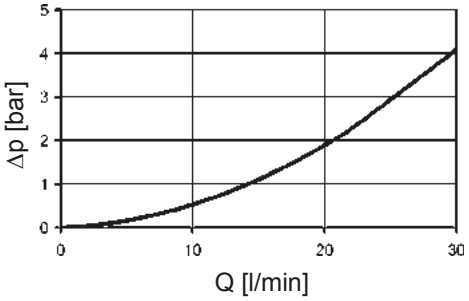
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

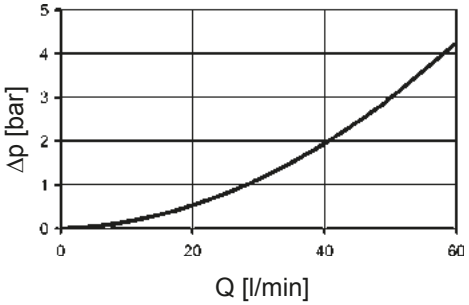
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

DFZ 30



DFZ 60/110



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

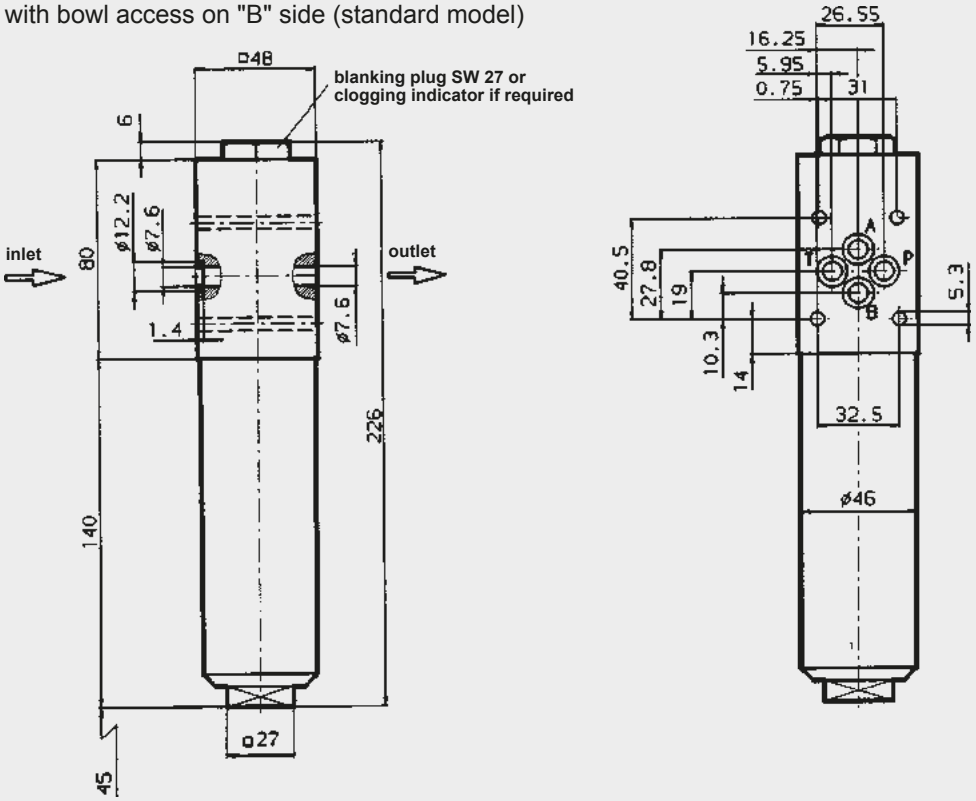
DFZ	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
30	77.8	63.9	43.3	22.8	14.0	11.3
60	53.5	26.0	18.3	12.1	9.78	6.32
110	25.8	13.4	9.61	6.06	4.63	2.99

DFZ	ON/PS				OH/PS			
	3 µm	5 µm	10 µm	20 µm	3 µm	5 µm	10 µm	20 µm
30	63.90	43.30	25.08	11.30	87.54	59.32	34.36	15.48
60	28.90	20.40	14.52	7.90	39.59	27.95	19.89	10.82
110	14.90	10.70	7.26	3.70	20.41	14.66	9.95	5.07

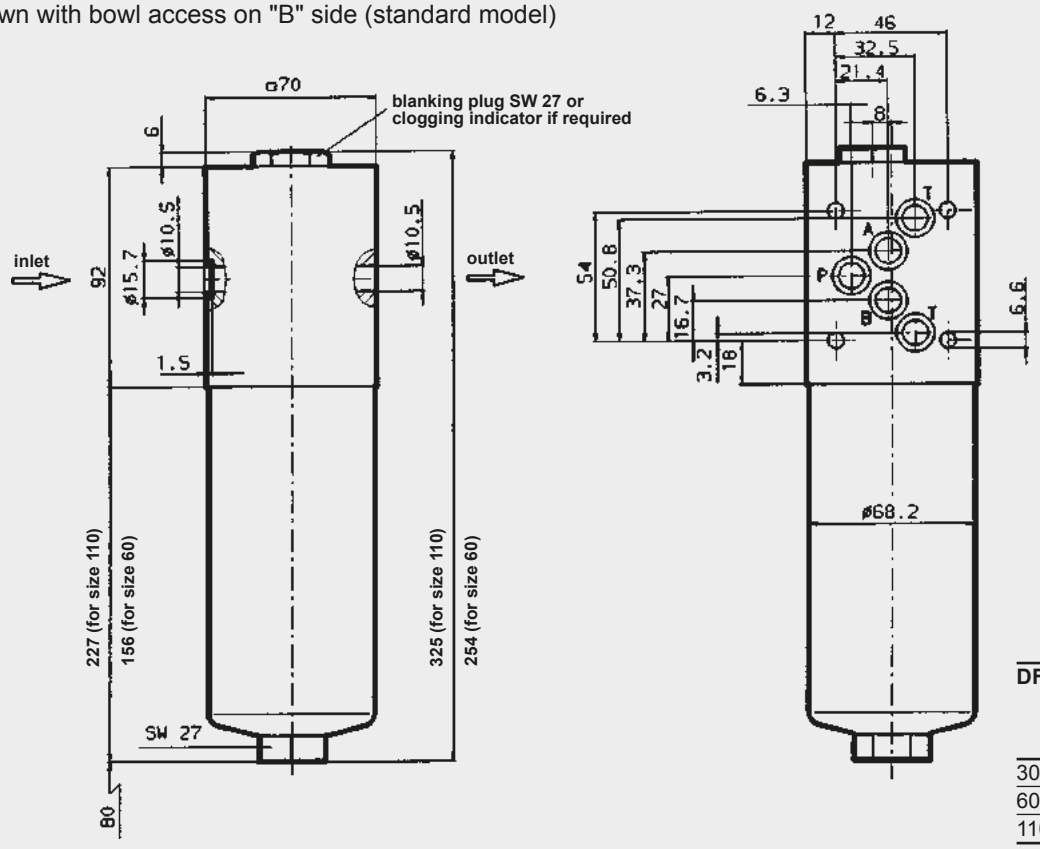
DFZ	V				BH4HC			
	3 µm	5 µm	10 µm	20 µm	3 µm	5 µm	10 µm	20 µm
30	18.4	13.5	7.5	3.6	91.2	50.7	36.3	19.0
60	16.0	9.3	5.4	3.3	58.6	32.6	18.1	12.2
110	8.2	5.6	3.3	2.2	25.4	14.9	8.9	5.6

4. DIMENSIONS

DFZ 30
shown with bowl access on "B" side (standard model)



DFZ 60/110
shown with bowl access on "B" side (standard model)



DFZ	Weight incl. element [kg]	Volume of pressure chamber [l]
30	2.4	0.13
60	5.9	0.20
110	6.8	0.33

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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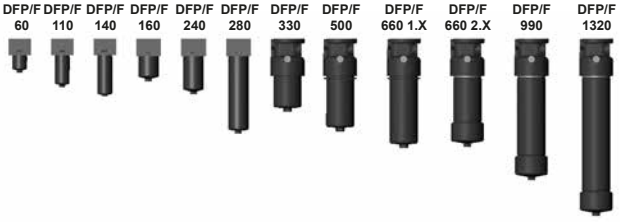
Pressure Filter for Manifold Mounting DFP and for Reversible Flow DFPF

up to 620 l/min, up to 315 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl. DFPF filters are suitable for flow in both directions.

Standard equipment:

- connection for a clogging indicator
- two-piece bowl for DFP/F 990 and above (optional for DFP/F 660 and above)
- without bypass valve
- drain screw with pressure relief (standard for DFP/F 330 and above)

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BH4HC):	210 bar
Wire mesh (W):	20 bar
Stainless steel fibre (V):	210 bar

1.4 FILTER SPECIFICATIONS

Nominal pressure	315 bar *
Fatigue strength	At nominal pressure 10^6 cycles (LC) from 0 to nominal pressure
Temperature range	-30 °C to +100 °C (-30 °C to -10 °C: p_{max}= 157.5 bar)
Material of filter head	EN-GJS 400-15
Material of filter bowl	Steel
Type of clogging indicator up to	VD (differential pressure measurement 420 bar operating pressure)
Pressure setting of the clogging indicator	DFP = 5 bar DFPF = 8 bar (others on request)
Bypass cracking pressure (optional)	6 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Pressure filter for manifold block mounting, with or without reversible oil flow

1.6 SPECIAL MODELS AND ACCESSORIES

- Bypass valve built into the head
- Seals in FPM, EPDM

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

on request

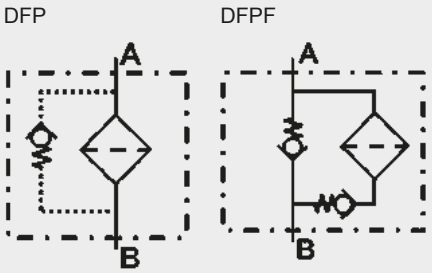
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using visual clogging indicators, the BM version (visual with manual reset) only should be used.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



*

Size 330 –660		
	with bypass	without bypass
0–315 bar	95,000 LC	400,000 LC
0–350 bar	80,000 LC	350,000 LC

LC = load cycles

E 7.551.12/11.16

2. MODEL CODE (also order example)

DFP ON 60 Q B 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type
DFP or DFPF

Filter material
ON Optmicron®
BN/HC Betamicron® (BN4HC)
V Metal fibre
W Wire mesh

Size of filter or element
DFP/F: 60, 110, 140, 160, 240, 280, 330, 500, 660, 990, 1320

Operating pressure
Q = 315 bar

Type and size of connection

Type	Port	Filter size										
		60	110	140	160	240	280	330	500	660	990	1320
B	Ø 17.5	●	●	●								
C	Ø 21.4				●	●	●					
D	Ø 41							●	●	●	●	●

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20 BH/HC, V: 3, 5, 10, 20
W: 25, 50, 100, 200

Type of clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
BM visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code
1 one-piece filter bowl
2 two-piece filter bowl (DFP/F 660 to 1320)

Modification number
X the latest version is always supplied

Supplementary details
B. bypass cracking pressure (e.g. B6 = 6 bar); without details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 volts)
LED 2 light-emitting diodes up to 24 volts
] only for clogging indicators type "D"
SO184 pressure release/oil drain screw (standard for size DFP/F 330 and above)
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

0060 D 010 ON /-V

Size
0060, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320

Type
D

Filtration range in µm
ON: 001, 003, 005, 010, 015, 020
BH4HC, V: 003, 005, 010, 020
W: 025, 050, 100, 200

Filter material
ON, BH4HC, V, W

Supplementary details
V, W (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
5 standard for DFP filters 5 bar
8 standard for DFPF filters 8 bar
] others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

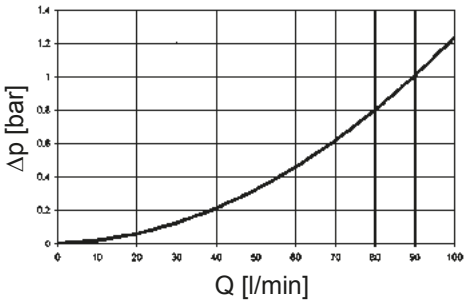
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

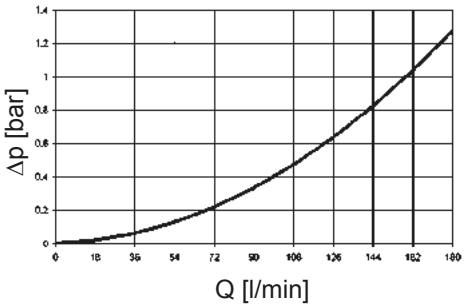
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

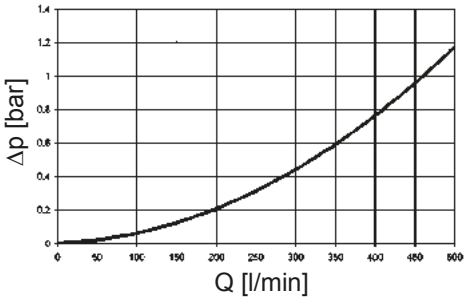
DFP 60/110/140



DFP 160/240/280



DFP 330/500/660/990/1320



DFPF Δp-Q housing curves on request

3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

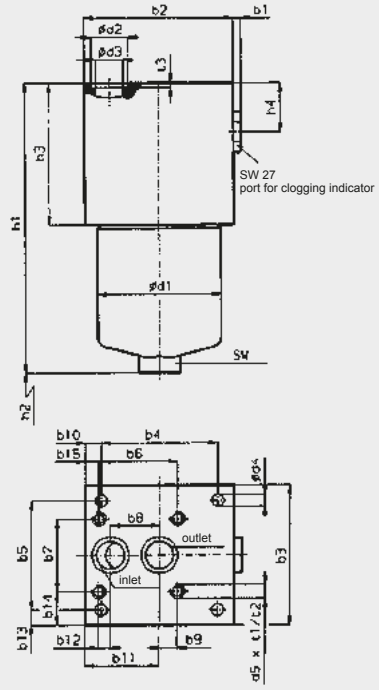
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

DFP/ DFPF	ON 1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
60	53.5	26.0	18.3	12.1	9.78	6.32
110	25.8	13.4	9.61	6.06	4.63	2.99
140	19.9	11.5	7.39	4.38	3.54	2.29
160	18.5	11.0	7.70	4.10	3.71	3.18
240	11.5	6.90	5.34	3.19	2.44	2.10
280	5.54	3.37	2.74	1.49	1.36	1.17
330	8.23	4.19	3.37	2.46	1.55	1.22
500	5.05	2.57	2.07	1.23	0.95	0.75
660	3.78	1.93	1.56	0.93	0.71	0.56
990	2.51	1.28	1.03	0.61	0.47	0.37
1320	1.85	0.97	0.76	0.45	0.35	0.27

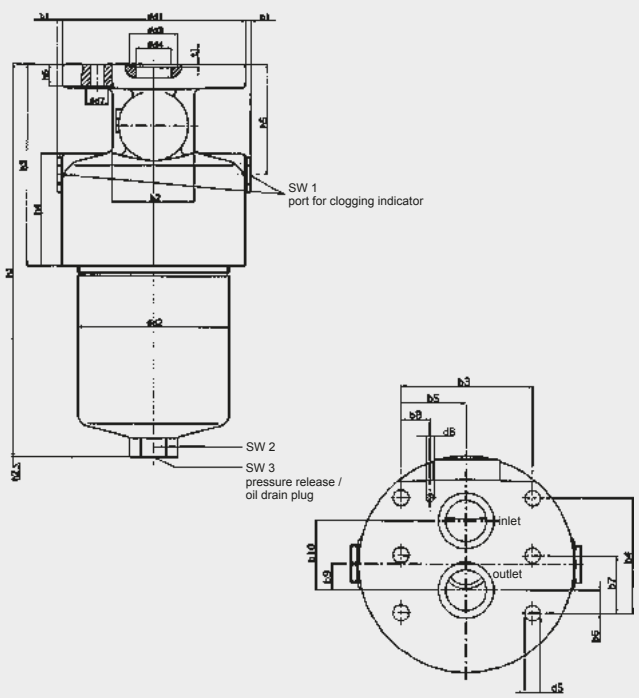
DFP/ DFPF	V 3 µm	5 µm	10 µm	20 µm	W –	BH4HC 3 µm	5 µm	10 µm	20 µm
60	16.0	11.0	6.5	3.3	0.757	58.6	32.6	18.1	12.2
110	8.3	6.0	4.2	2.1	0.413	25.4	14.9	8.9	5.6
140	8.3	6.0	4.2	2.1	0.413	25.4	14.9	8.9	5.6
160	4.5	3.2	2.3	1.4	0.284	16.8	10.4	5.9	4.4
240	3.2	2.4	1.9	1.1	0.189	10.6	6.8	3.9	2.9
280	1.5	1.2	1.0	0.8	0.162	5.7	3.4	1.8	1.6
330	2.1	1.5	1.3	0.8	0.138	7.7	4.5	2.8	2.0
500	1.4	1.0	0.8	0.5	0.091	4.2	2.6	1.5	1.2
660	1.1	0.9	0.6	0.3	0.069	3.3	1.9	1.0	0.9
990	0.7	0.5	0.4	0.3	0.046	2.2	1.3	0.8	0.6
1320	0.6	0.5	0.3	0.2	0.035	1.6	1.0	0.6	0.4

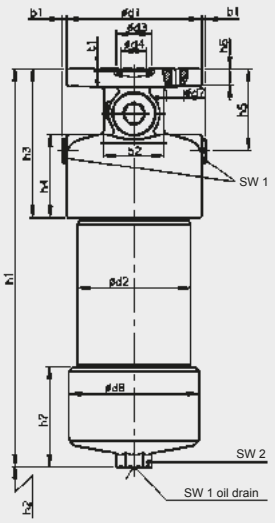
4. DIMENSIONS: DFP

DFP 60 - 280



DFP 330 - 1320

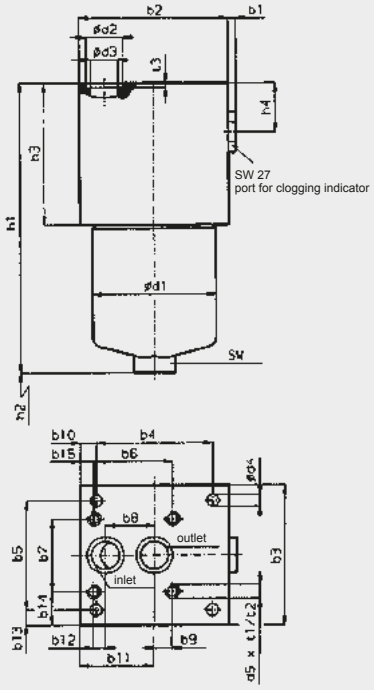




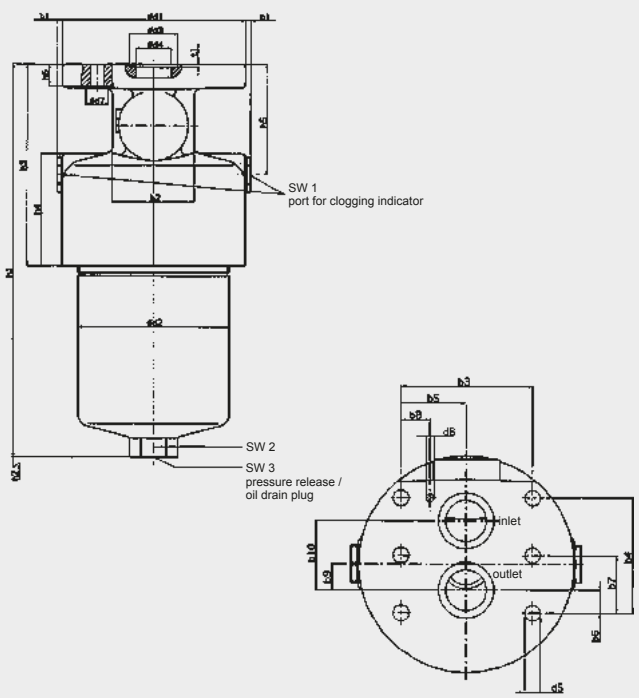
DFP	60	110	140	160	240	280	330	500	660..1.x	660..2.x	990..2.x	1320..2.x
b1	6	6	6	6	6	6	5	5	5	5	5	5
b2	104	104	104	115	115	115	70	70	70	70	70	70
b3	80	80	80	110	110	110	96.8	96.8	96.8	96.8	96.8	96.8
b4	89	89	89	90	90	90	84.1	84.1	84.1	84.1	84.1	84.1
b5	31.8	31.8	31.8	86	86	86	48.4	48.4	48.4	48.4	48.4	48.4
b6	–	–	–	61	61	61	16.7	16.7	16.7	16.7	16.7	16.7
b7	–	–	–	57	57	57	42.05	42.05	42.05	42.05	42.05	42.05
b8	31.6	31.6	31.6	38	38	38	21.4	21.4	21.4	21.4	21.4	21.4
b9	–	–	–	14	14	14	19	19	19	19	19	19
b10	7.5	7.5	7.5	12.5	12.5	12.5	50.7	50.7	50.7	50.7	50.7	50.7
b11	55.9	55.9	55.9	57.5	57.5	57.5	–	–	–	–	–	–
b12	–	–	–	9	9	9	–	–	–	–	–	–
b13	24.1	24.1	24.1	12	12	12	–	–	–	–	–	–
b14	–	–	–	26.5	26.5	26.5	–	–	–	–	–	–
b15	–	–	–	10.5	10.5	10.5	–	–	–	–	–	–
d1	68.2	68.2	68.2	95.2	95.2	95.2	158	158	158	158	158	158
d2	25.3	25.3	25.3	28.6	28.6	28.6	130	130	130	130	130	130
d3	17.5	17.5	17.5	21.4	21.4	21.4	41	41	41	41	41	41
d4	8.5	8.5	8.5	9	9	9	30	30	30	30	30	30
d5	–	–	–	7/16–14 UNC	7/16–14 UNC	7/16–14 UNC	11.5	11.5	11.5	11.5	11.5	11.5
d6	–	–	–	–	–	–	6	6	6	6	6	6
d7	–	–	–	–	–	–	20	20	20	20	20	20
d8	–	–	–	–	–	–	–	–	–	152	152	152
h1	158.5	227.5	269.5	199.5	263.5	445.0	339.5	432.5	510.0	504	660.0	826.0
h2	75	75	75	85	85	85	95	95	95	350	500	670
h3	76	76	76	83	83	83	174.5	174.5	174.5	174.5	174.5	174.5
h4	25	25	25	25	25	25	98	98	98	98	98	98
h5	–	–	–	–	–	–	96	96	96	96	96	96
h6	–	–	–	–	–	–	19	19	19	19	19	19
h7	–	–	–	–	–	–	–	–	–	112	112	112
t1	–	–	–	13	13	13	2.6	2.6	2.6	2.6	2.6	2.6
t2	–	–	–	18	18	18	–	–	–	–	–	–
t3	2	2	2	2	2	2	–	–	–	–	–	–
SW	27	27	27	32	32	32	–	–	–	–	–	–
SW1	–	–	–	–	–	–	27	27	27	27	27	27
SW2	–	–	–	–	–	–	36	36	36	36	36	36
SW 3	–	–	–	–	–	–	10	10	10	10	10	10
Weight incl. element [kg]	5.1	6.0	6.6	9.1	10.4	14.7	21.0	25.5	29.0	32.0	39.2	47.1
Volume of pressure chamber [l]	0.20	0.33	0.40	0.60	0.80	1.60	1.50	2.30	3.00	3.00	4.20	5.60

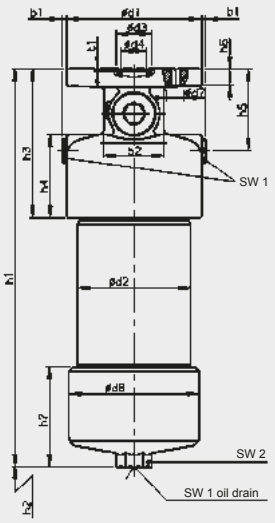
DFPF

DFPF 60 - 280



DFPF 330 - 1320





DFPF	60	110	140	160	240	280	330	500	660..1.x	660..2.x	990..2.x	1320..2.x
b1	6	6	6	6	6	6	5	5	5	5	5	5
b2	104	104	104	120	120	120	70	70	70	70	70	70
b3	80	80	80	110	110	110	96.8	96.8	96.8	96.8	96.8	96.8
b4	89	89	89	90	90	90	84.1	84.1	84.1	84.1	84.1	84.1
b5	31.8	31.8	31.8	86	86	86	48.4	48.4	48.4	48.4	48.4	48.4
b6	–	–	–	61	61	61	16.7	16.7	16.7	16.7	16.7	16.7
b7	–	–	–	57	57	57	42.05	42.05	42.05	42.05	42.05	42.05
b8	31.6	31.6	31.6	38	38	38	21.4	21.4	21.4	21.4	21.4	21.4
b9	–	–	–	14	14	14	19	19	19	19	19	19
b10	7.5	7.5	7.5	17.5	17.5	17.5	50.7	50.7	50.7	50.7	50.7	50.7
b11	55.9	55.9	55.9	62.5	62.5	62.5	–	–	–	–	–	–
b12	–	–	–	9	9	9	–	–	–	–	–	–
b13	24.1	24.1	24.1	12	12	12	–	–	–	–	–	–
b14	–	–	–	26.5	26.5	26.5	–	–	–	–	–	–
b15	–	–	–	15.5	15.5	15.5	–	–	–	–	–	–
d1	68.2	68.2	68.2	95.2	95.2	158	158	158	158	158	158	158
d2	25.3	25.3	25.3	28.6	28.6	28.6	130	130	130	130	130	130
d3	17.5	17.5	17.5	21.4	21.4	21.4	41	41	41	41	41	41
d4	8.5	8.5	8.5	9	9	9	30	30	30	30	30	30
d5	–	–	–	7/8– 14 UNC	7/8– 14 UNC	7/8– 14 UNC	11.5	11.5	11.5	11.5	11.5	11.5
d6	–	–	–	–	–	–	6	6	6	6	6	6
d7	–	–	–	–	–	–	20	20	20	20	20	20
d8	–	–	–	–	–	–	–	–	–	152	152	152
h1	158.5	227.5	269.5	206.5	266.5	448.5	339.5	432.5	510.0	504	660.0	826.0
h2	75	75	75	85	85	85	95	95	95	350	500	670
h3	76	76	76	90	90	90	174.5	174.5	174.5	174.5	174.5	174.5
h4	21	21	21	32	32	32	98	98	98	98	98	98
h5	–	–	–	–	–	–	96	96	96	96	96	96
h6	–	–	–	–	–	–	19	19	19	19	19	19
h7	–	–	–	–	–	–	–	–	–	112	112	112
t1	–	–	–	13	13	13	2.6	2.6	2.6	2.6	2.6	2.6
t2	–	–	–	18	18	18	–	–	–	–	–	–
t3	2	2	2	2	2	2	–	–	–	–	–	–
SW	27	27	27	32	32	32	–	–	–	–	–	–
SW1	–	–	–	–	–	–	27	27	27	27	27	27
SW2	–	–	–	–	–	–	36	36	36	36	36	36
SW 3	–	–	–	–	–	–	10	10	10	10	10	10
Weight incl. element [kg]	5.1	6.0	6.6	9.1	10.4	14.7	21.0	25.5	29.0	32.0	39.2	47.1
Volume of pressure chamber [l]	0.20	0.33	0.40	0.60	0.80	1.60	1.50	2.30	3.00	3.00	4.20	5.60

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department. For applications or operating conditions not described please contact the relevant technical department.
All technical details are subject to change.

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e-mail: filter@hydac.com

E 7.551.12/11.16

Return Line Filter HF4R
up to 450 l/min, up to 10 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head, filter bowl and a bolt-on cover plate.

Standard equipment:

- bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170

Filter elements are available with the following pressure stability values:

Betamicron® (BN):	10 bar
Stainl. steel wire mesh (W/HC):	10 bar
Paper (P):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	10 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-30 °C to +100 °C
Material of filter head	Aluminium
Material of filter bowl	Steel
Type of clogging indicator	VMF (return line indication)
Pressure setting of clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 MOUNTING

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Without bypass valve
- Without port for clogging indicator

1.7 SPARE PARTS

See Original Spare Parts List

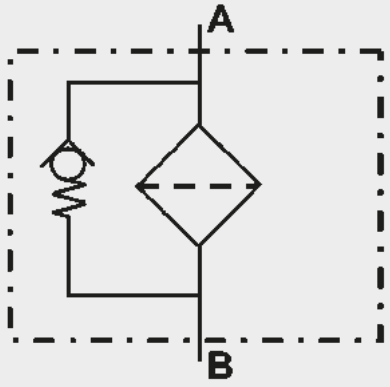
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)

HF4R BN 09 G 3 C 1 . X /12 V-B6

2.1 COMPLETE FILTER

Filter type
HF4R

Filter material of elements
BN Betamicron (BN)
W Wire mesh
P Paper

Size of filter or element
09 9"
18 18"
27 27"

Connection
G threaded port
F flange port

Filtration rating in µm
BN : 3, 5, 10, 20
W/HC : 25, 74, 149
P : 10, 20

Type of clogging indicator
W without port (no clogging indicator)
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
(for other clogging indicators, see brochure no. 7.050../..)
J electrical switch (Brad Harrison 5 Pin Mini)
J4 electrical switch (Brad Harrison 4 Pin Micro)

Type code
1 1 inlet
2 2 inlets

Modification number
X the latest version is always supplied

Supplementary details
0 BSPP 1¼"
3 NPT 1½"
12 SAE-24-O-ring boss
16 SAE 1½" flange (210 bar)

B. bypass cracking pressure (e.g. B1 = 1 bar); without details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt) (only for clogging indicator type "D")
LED 2 light emitting diodes up to 24 Volt (only for clogging indicator type "D")
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

5.03.09 D 03 BN /-V

Size
09 9"
18 18"
27 27"

Type
D

Filtration rating in µm
BN : 03, 05, 10, 20
W/HC : 25, 74, 149
P : 10, 20

Filter material
BN, W/HC, P

Supplementary details
V, W (for descriptions, see point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VMF 2 D . X /-L24

Type of indicator
VMF return line pressure indicator

Pressure setting
2 standard 2 bar, others on request

Type of clogging indicator
D (see point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
V for all VR indicators, for all VMF indicators only for types B, LE, LZ and C /-EX2G (all other VMF indicators have FKM seals as standard)
L..., LED, W (for descriptions, see point 2.1.)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

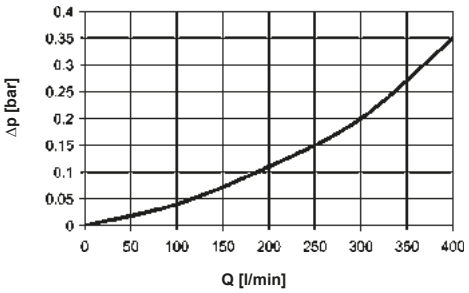
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

HF4R



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

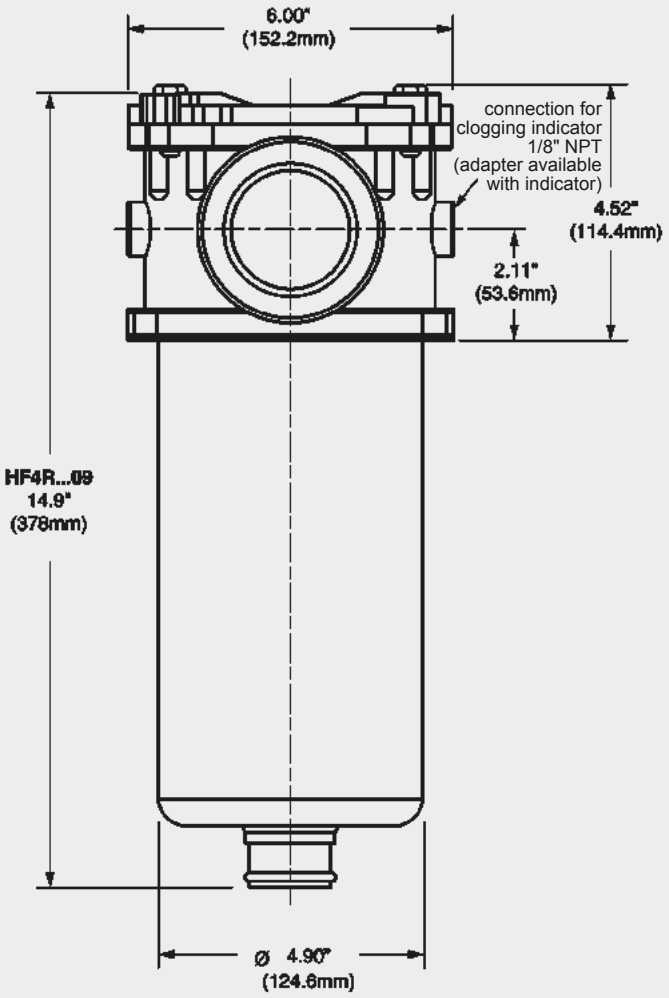
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

HF4R	BN				W
	3 µm	5 µm	10 µm	20 µm	-
09	2.85	2.17	2.02	1.13	0.128
18	1.35	1.04	0.97	0.53	0.073
27	0.88	0.67	0.62	0.35	0.036

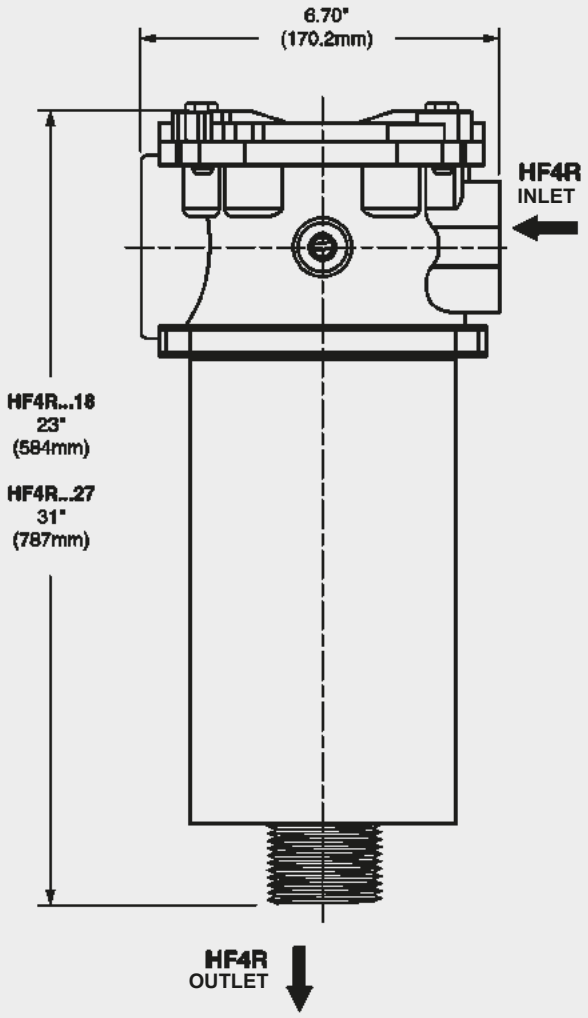
4. DIMENSIONS

HF4R

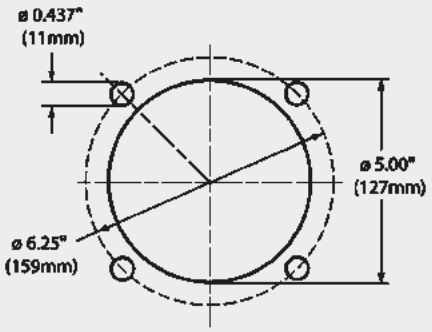
Size 9



Sizes 18 and 27



Mounting specifications



HF4R	Weight incl. element [kg]
09	4.53
18	6.58
27	8.44

NOTE

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Subject to technical modifications.

HYDAC Filtertechnik GmbH
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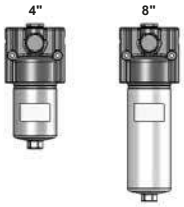
E-Mail: filter@hydac.com

Inline Filter or Pressure Filter for Manifold Mounting HF2P

up to 100 l/min, up to 280 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Betamicron® (BN): 20 bar
Betamicron® (BH): 210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	280 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-30 °C to +100 °C
Material of filter head	EN-GJS
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Bypass cracking pressure	6 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline and manifold-mounted filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Without bypass valve
- Without port for clogging indicator

1.7 SPARE PARTS

See Original Spare Parts List

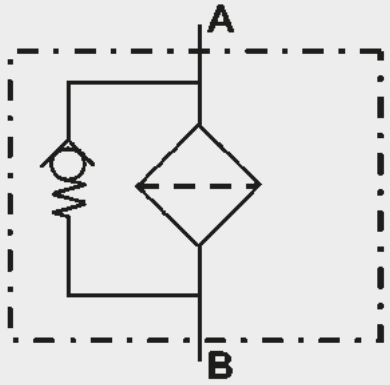
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)

HF2P BN 04 G 3 C 1 . X /12 V-B6

2.1 COMPLETE FILTER

Filter type
HF2P

Filter material of element
BN Betamicron® (BN)
BH Betamicron® (BH)

Size of filter or element
04 4"
08 8"

Connection
G threaded port
P manifold mounting

Filtration rating in µm
BN : 3, 6, 12, 25
BH : 3, 6, 10, 17

Type of clogging indicator
W without port (no clogging indicator)
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
(for other clogging indicators, see brochure no. 7.050../..)
J electrical switch (Brad Harrison 5 Pin Mini)
J4 electrical switch (Brad Harrison 4 Pin Micro)

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
no details = manifold mounting
0 G ¾" BSPP
12 SAE-12-O-ring boss

B. bypass cracking pressure (e.g. B3 = 3 bar); without details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt) (only for clogging indicator type "D")
LED 2 light emitting diodes up to 24 Volt
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

1.07.04 D 03 BN /-V

Size
04 4"
08 8"

Type
D

Filtration rating in µm
BN: 03, 06, 12, 25
BH: 03, 06, 10, 17

Filter material
BN, BH

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type of indicator
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

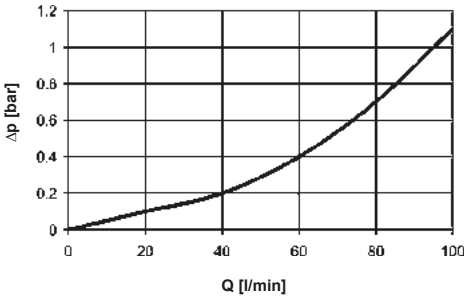
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

HF2P



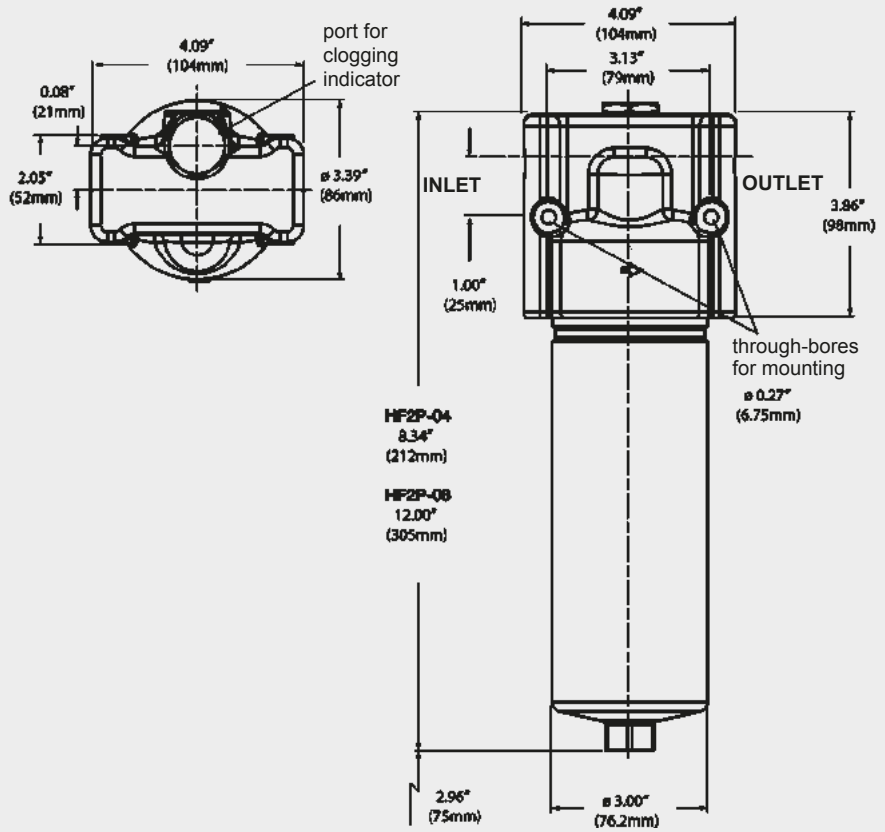
3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

HF2P	BN				BH			
	3 µm	6 µm	12 µm	25 µm	3 µm	6 µm	10 µm	17 µm
04	22.40	17.14	16.03	8.81	30.11	26.81	20.93	12.12
08	11.14	8.45	7.96	4.41	14.57	13.10	10.16	5.88

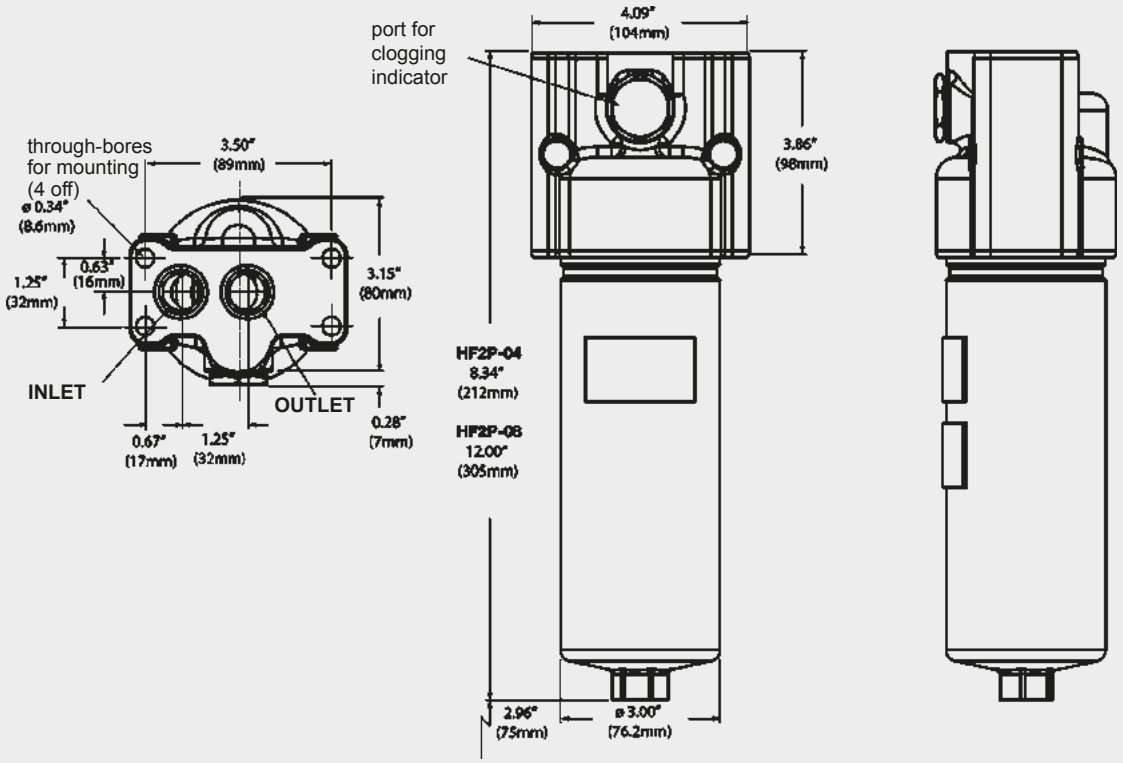
4. DIMENSIONS

HF2P



HF2P	Weight incl. element [kg]
04	4.58
08	6.08

MANIFOLD MOUNTING



NOTE

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Inline Filter or Pressure Filter for Manifold Mounting HF4P

up to 450 l/min, up to 350 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-on filter bowl.

Standard equipment:

- bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Betamicron® (BN):	20 bar
Betamicron® (BH):	210 bar
Wire mesh (W):	20 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	420 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-30 °C to +100 °C
Material of filter head	EN-GJS
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Bypass cracking pressure	6 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 Installation

Inline filter or manifold mounted filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Without bypass valve
- Without port for clogging indicator

1.7 SPARE PARTS

See Original Spare Parts List

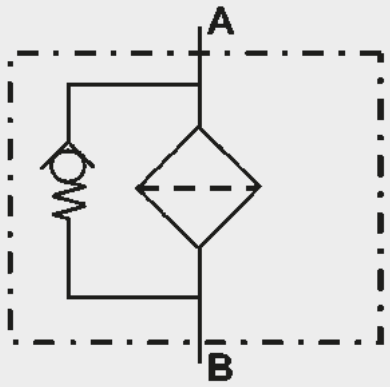
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)

HF4P BN 09 G 3 C 1 . X /12 V-B6

2.1 COMPLETE FILTER

Filter type
HF4P

Filter material of element
BN Betamicron® (BN)
BH Betamicron® (BH)
W Wire mesh

Size of filter or element
09 9"
18 18"
27 27"

Connection
G threaded port
F flange port
P manifold mounting

Filtration rating in µm
BN, BH : 3, 5, 10, 20
W : 25, 74, 149

Type of clogging indicator
W without port (no clogging indicator)
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
(for other clogging indicators, see brochure no. 7.050../..)
J electrical switch (Brad Harrison 5 Pin Mini)
J4 electrical switch (Brad Harrison 4 Pin Micro)

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
no details = manifold mounting
0 BSPP 1½"
12 SAE-24-O-ring boss
16 SAE 1½" flange (210 or 420 bar)

B. bypass cracking pressure (e.g. B6 = 6 bar); without details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt) (only for clogging indicator type "D")
LED 2 light emitting diodes up to 24 Volt (only for clogging indicator type "D")
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

5.03.09 D 03 BN /-V

Size
09 9"
18 18"
27 27"

Type
D

Filtration rating in µm
BN, BH : 03, 05, 10, 20
W : 25, 74, 149

Filter material
BN, BH, W

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type of indicator
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

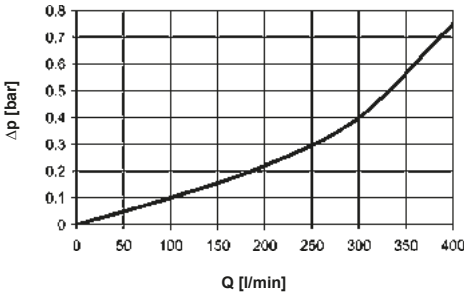
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

HF4P



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

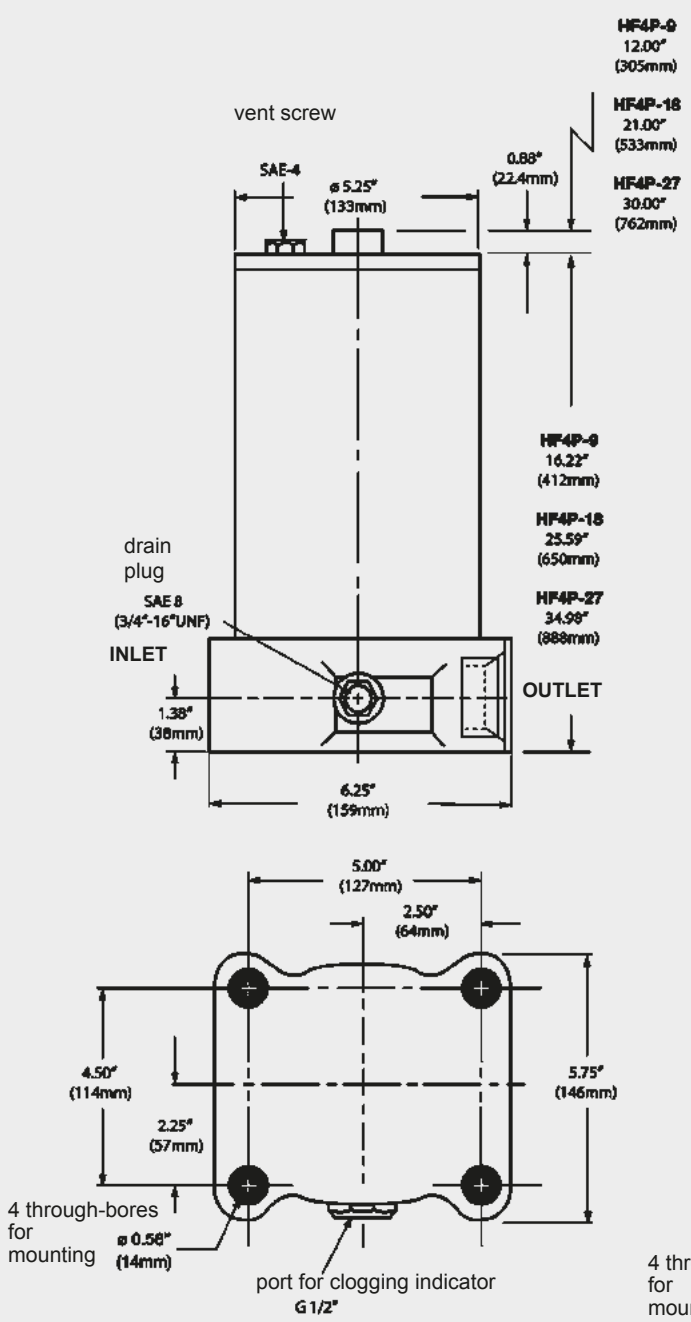
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

HF4P	BN				BH				W
	3 µm	5 µm	10 µm	20 µm	3 µm	5 µm	10 µm	20 µm	-
09	2.85	2.17	2.02	1.13	2.61	2.31	1.80	1.04	0.128
18	1.35	1.04	0.97	0.53	1.21	1.05	0.84	0.49	0.073
27	0.88	0.67	0.62	0.35	0.80	0.71	0.55	0.32	0.036

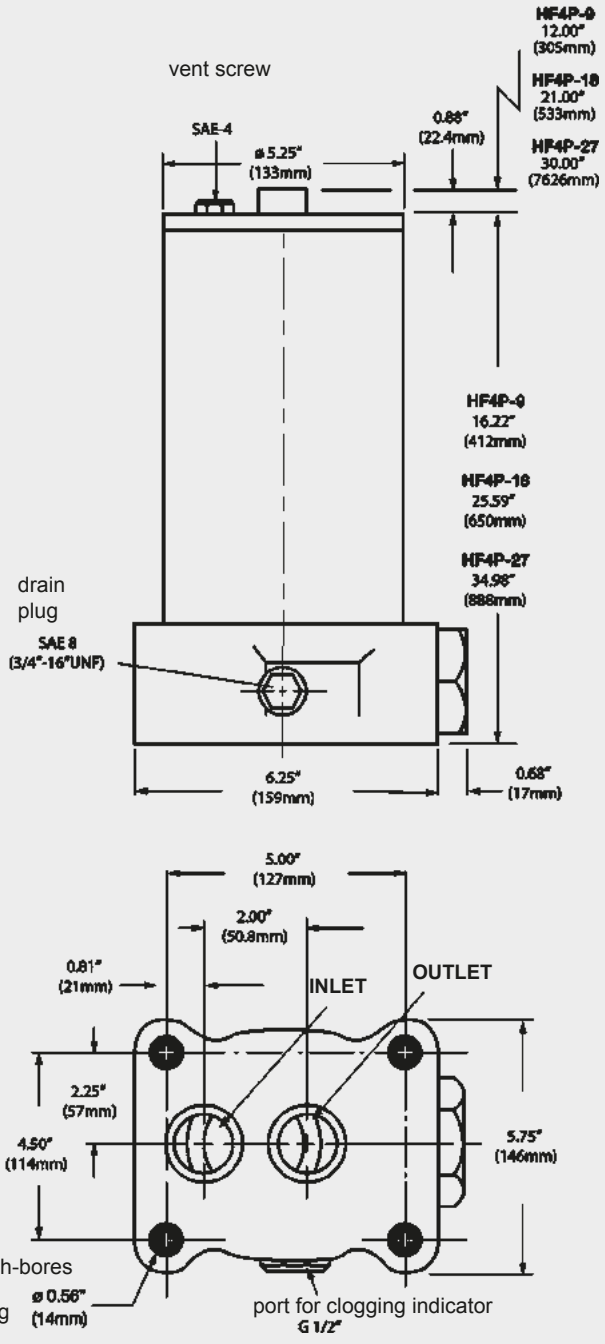
4. DIMENSIONS

HF4P

As inline filter



As manifold mounted filter



HF4P	Weight incl. element [kg]
09	26.94
18	35.97
27	47.90

NOTE

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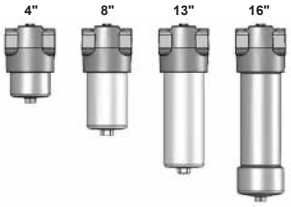
Inline Filter HF3P
up to 450 l/min, up to 420 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Betamicron® (BN):	20 bar
Betamicron® (BH):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	420 bar
Fatigue strength	At nominal pressure 10^6 cycles from 0 to nominal pressure
Temperature range	-30 °C to +100 °C
Material of filter head	EN-GJS
Material of filter bowl	Steel
Type of clogging indicator	VD (differential pressure measurement up to 420 bar operating pressure)
Pressure setting of the clogging indicator	5 bar (others on request)
Bypass cracking pressure	6 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Without bypass valve
- Without port for clogging indicator

1.7 SPARE PARTS

See Original Spare Parts List

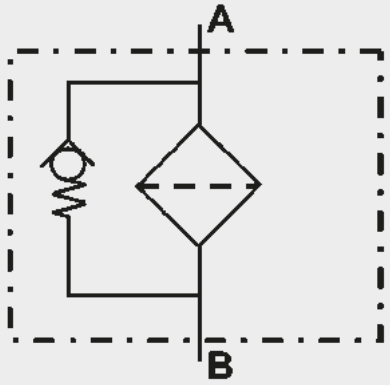
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)

HF3P BN 08 G 3 C 1 . X /12 V-B6

2.1 COMPLETE FILTER

Filter type
HF3P

Filter material
BN Betamicron® (BN)
BH Betamicron® (BH)

Size of filter or element
04 4"
08 8"
13 13"
16 16"

Port
G threaded port
F flange port

Filtration rating in µm
BN : 3, 6, 12, 25
BH : 3, 6, 10, 17

Type of clogging indicator
W without port (no clogging indicator)
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
(for other clogging indicators, see brochure no. 7.050../..)
J electrical switch (Brad Harrison 5 Pin Mini)
J4 electrical switch (Brad Harrison 4 Pin Micro)

Type code
1 2" flange (420 bar) or SAE 24" or G ½
2 1½" flange (210 bar)
3 1" SAE 16 or G 1" thread

Modification number
X the latest version is always supplied

Supplementary details
0 G 1½" or G 1 BSPP
12 SAE 24" or 16" O-ring boss
16 SAE 2" flange (420 bar) or 1½" (210 bar)

B. bypass cracking pressure (e.g. B3 = 3 bar); without details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt) (only for clogging indicator type "D")
LED 2 light emitting diodes up to 24 Volt (only for clogging indicator type "D")
V FPM seals
W suitable for HFA and HFC emulsions

2.2 REPLACEMENT ELEMENT

1.11.08 D 03 BN /-V

Size
04 4"
08 8"
13 13"
16 16"

Type
D

Filtration rating in µm
BN: 03, 06, 12, 25
BH: 03, 06, 10, 17

Filter material
BN, BH

Supplementary details
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

Type of indicator
VD differential pressure indicator up to 420 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
D (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing} =$ (see Point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see Point 3.2)

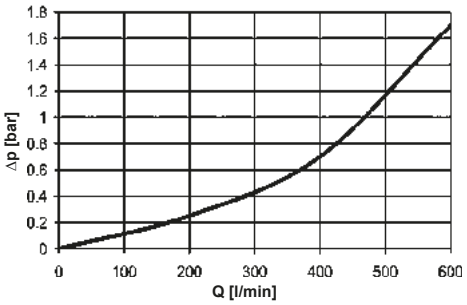
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

HF3P



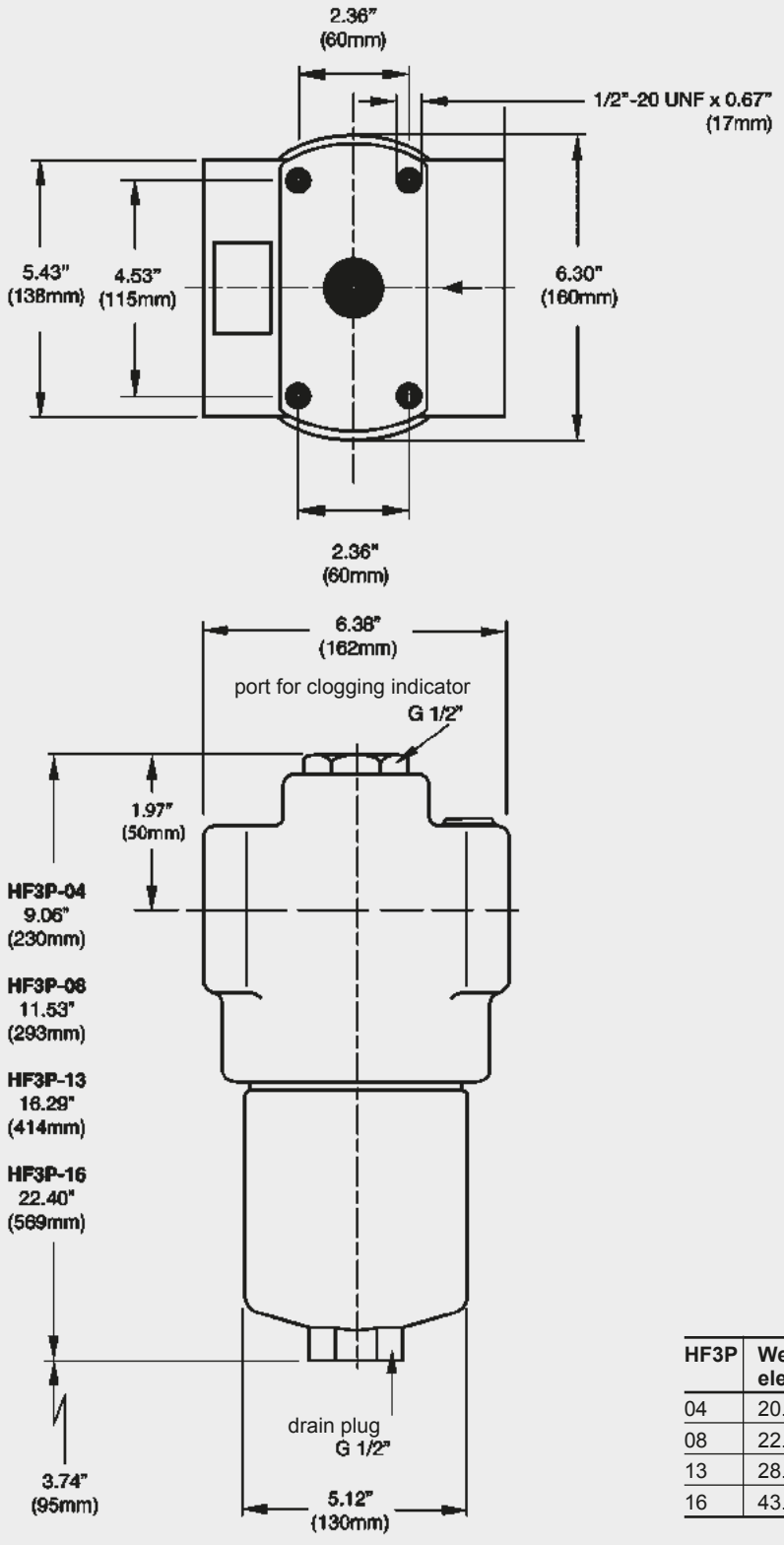
3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

HF3P	BN				BH			
	3 µm	6 µm	12 µm	25 µm	3 µm	6 µm	10 µm	17 µm
04	6.46	4.94	4.60	2.57	11.79	10.49	8.16	4.74
08	3.28	2.51	2.43	1.30	5.73	5.10	3.98	2.30
13	1.98	1.52	1.41	0.78	3.44	3.06	2.38	1.38
16	1.51	1.15	1.08	0.60	2.59	2.28	1.80	1.04

4. DIMENSIONS

HF3P



HF3P	Weight incl. element [kg]
04	20.32
08	22.45
13	28.53
16	43.41

NOTE

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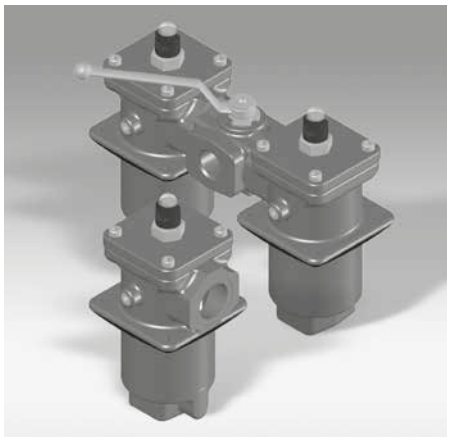
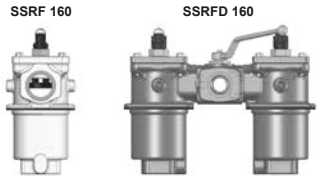


Return Line Filter SSRF and Change-Over Return Line Filter SSRFD

up to 150 l/min, up to 25 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter housing with cover plate.

Standard equipment:

- bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

NUMBER OF FILTER ELEMENTS

Filter	Elements
SSRF 160	1x0160 R elements
SSRFD 160	2x0160 R elements

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Ecomicron® (ECON2):	10 bar
Stainl. st. wire mesh (W/HC):	30 bar
Stainless steel fibre (V):	210 bar
Betamicron®/Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	25 bar
Temperature range	-10 °C to +100 °C
Material of filter housing and cover plate	Stainless steel BS 3146-ANC4BFC
Type of clogging indicator	VR Connection thread G ½ (return line indicator up to 25 bar operating pressure)
Pressure setting of clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Tank-top filter

1.6 SPECIAL MODELS AND ACCESSORIES

On request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

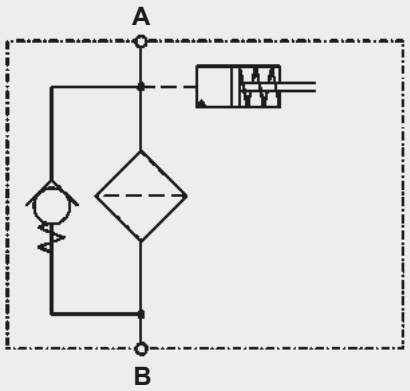
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

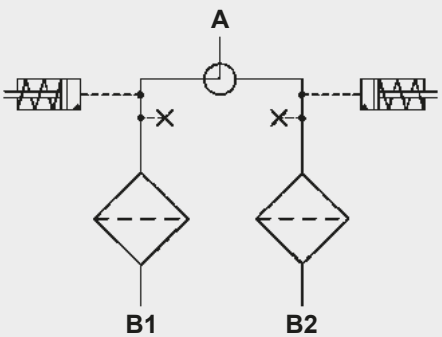
1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems SSRF



SSRFD



E 7.129.2/11.16

2. MODEL CODE (also order example)

SSRF ON 160 D D 10 D 1 . X /-L24

2.1 COMPLETE FILTER

Filter type

SSRF Single filter
SSRFD Change-over filter

Filter material

ON Optimicron®
ECO Ecomicron® (ECON2)
ECO.../SO361 Ecomicron® (ECON2) only to be used for water-glycol applications with "SO361"!
V Stainless steel fibre
W/HC Stainl. st. wire mesh
AM Aquamicron®
BN/AM Betamicron®/Aquamicron® (BN4AM)

Size of filter or element

SSRF/SSRFD: 160

Operating pressure

D = 25 bar
V = 7 bar (for SSRF/SSRFD with clogging indicator up to max. 7 bar operating pressure)

Type and size of connection

Type	Port	Filter size 160
D	G 1	●
N	NPT 1"	●
I	SAE DN 25 (1")	●

Filtration rating in µm

ON: 1, 3, 5, 10, 15, 20 W/HC: 25, 50, 100, 200 BN/AM: 3, 10
ECO, V: 3, 5, 10, 20 P/HC: 10, 20 AM: 40

Type of clogging indicator

Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. 7.050../..

Type code

1 Standard indicator port in cover
2 Standard indicator port in cover + 2 secondary take-off ports (¼ NPTF) in housing

Modification number

X the latest version is always supplied

Supplementary details

B. cracking pressure of bypass (e.g. B6 = 6 bar)
KB without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 volts)
LED 2 light-emitting diodes up to 24 volts
] only for clogging indicators type "D"
EX/ENC electrical clogging indicator EX version (Eexd IIC T6; with IP66 junction box M20x1.5)
EX/FL electrical clogging indicator EX version (Eexd IIC T6; with flying lead – 2m or 10m)
IS/ENC intrinsically safe electrical clogging indicator with IP66 junction box (M20x1.5 cable entry)
IS/FL intrinsically safe electrical clogging indicator (with flying leads – 2m or 10m)
SS elements with stainless steel support tube
V FKM seals
SO361 elements with polyamide support fibre, optimised for water-glycol (only for ECO-Material)

2.2 REPLACEMENT ELEMENT

0160 R 010 ON /-V

Size

0160

Type

R

Filtration rating in µm

ON: 001, 003, 005, 010, 015, 020 W/HC: 025, 050, 100, 200 BN4AM: 003, 010
ECON2, V: 003, 005, 010, 020 P/HC: 010, 020 AM: 040

Filter material

ON, ECON2, V, W/HC, P/HC, BN4AM, AM

Supplementary details

SO361 elements with polyamide support
V (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VR 2 D . X /-L24

Type

VR return line indicator up to 25 bar operating pressure

Pressure setting

2 standard 2 bar, others on request

Type of clogging indicator

D (see point 2.1)

Modification number

X the latest version is always supplied

Supplementary details

L..., LED, V (for descriptions, see point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

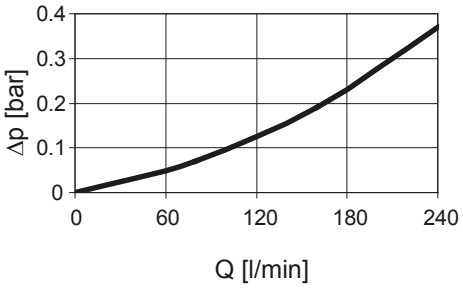
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

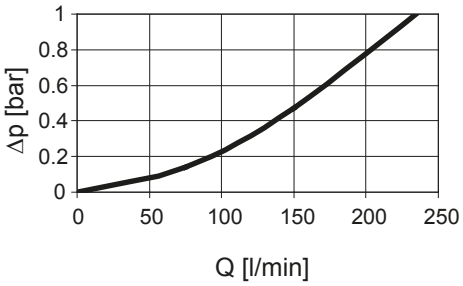
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

SSRF 160



SSRFD 160



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

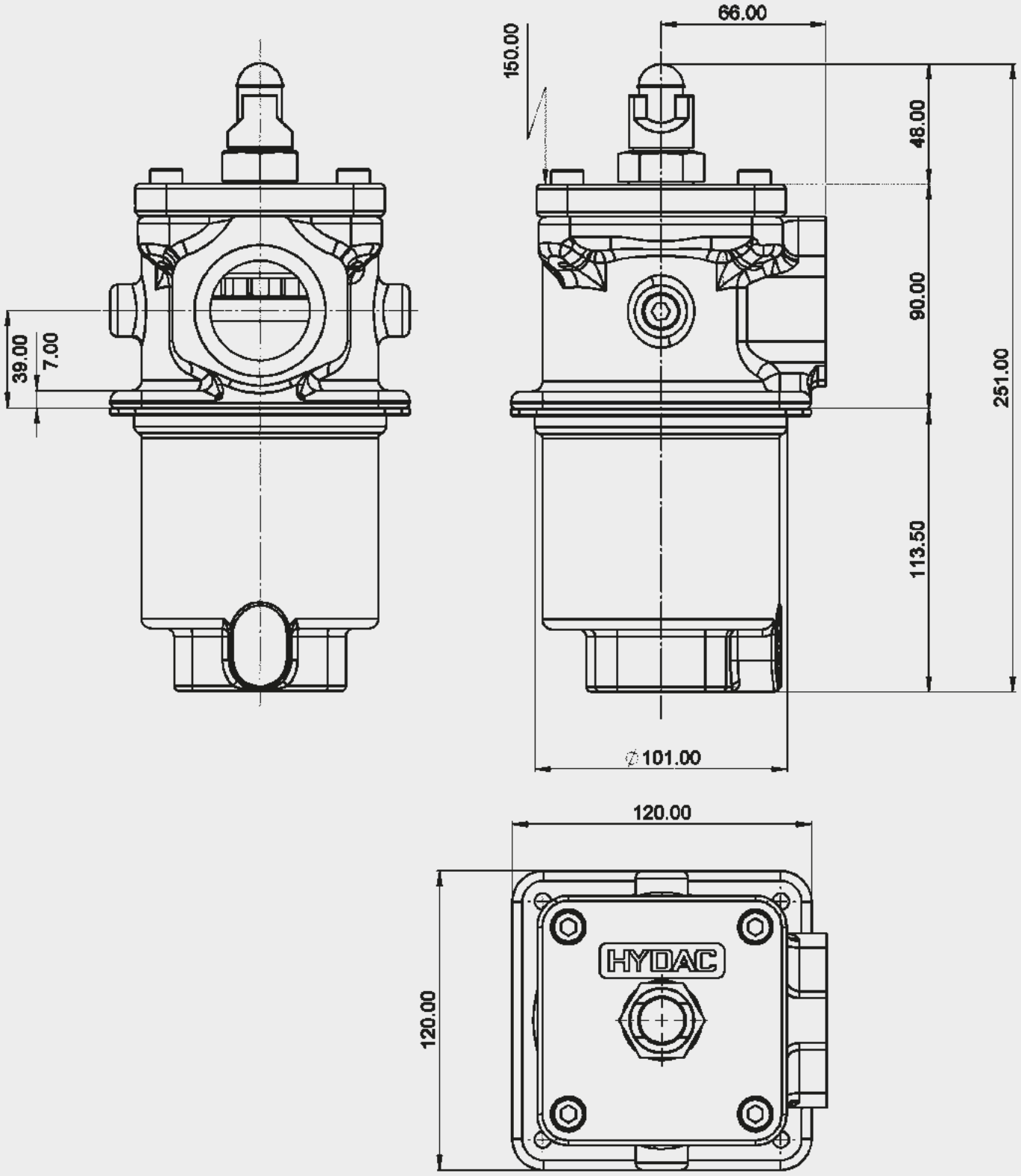
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

SSRF/ SSRFD	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
160	16.0	8.00	5.68	3.22	2.69	2.32

SSRF/ SSRFD	V				W/HC	ECON2			
	3 µm	5 µm	10 µm	20 µm	–	3 µm	5 µm	10 µm	20 µm
160	4.9	3.5	2.4	1.5	0.348	9.5	5.9	3.8	2.9

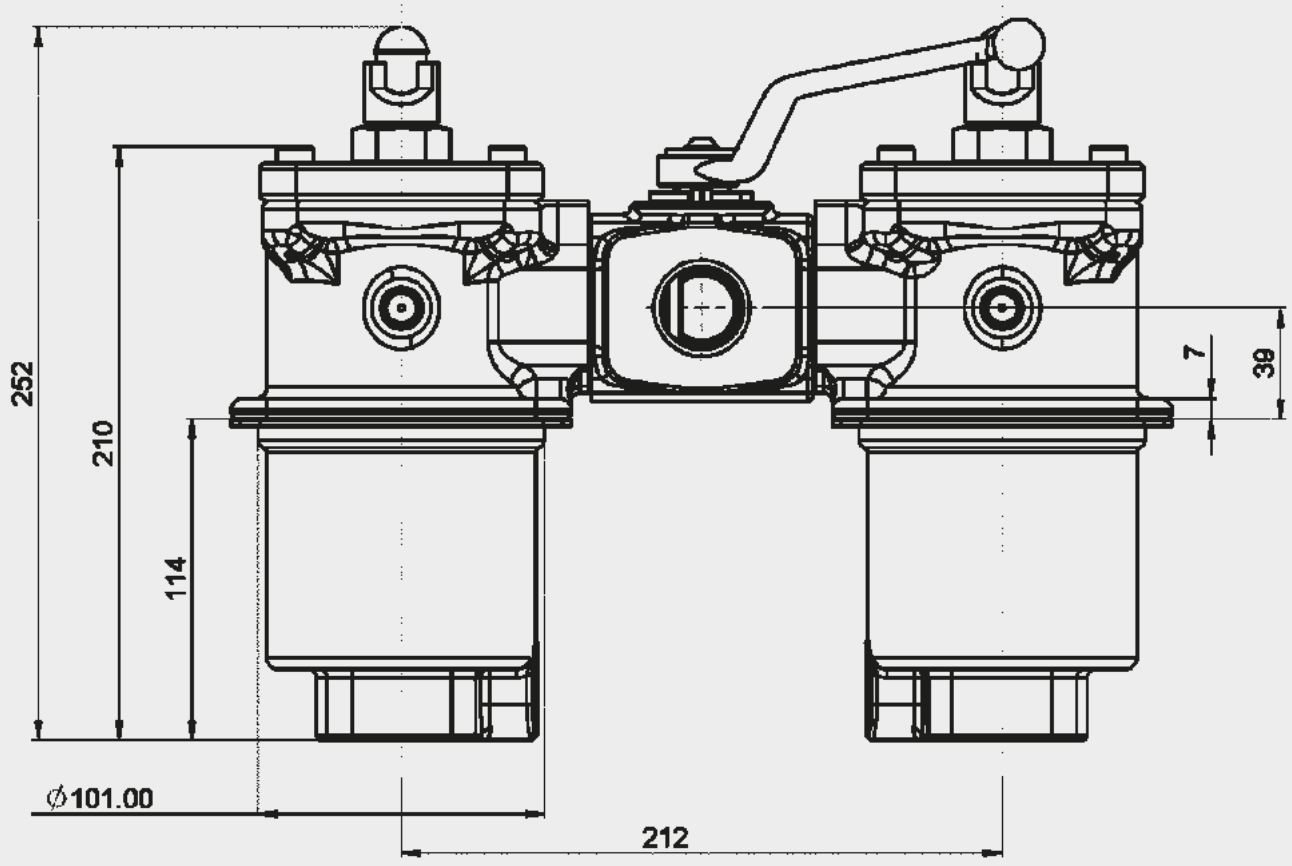
4. DIMENSIONS

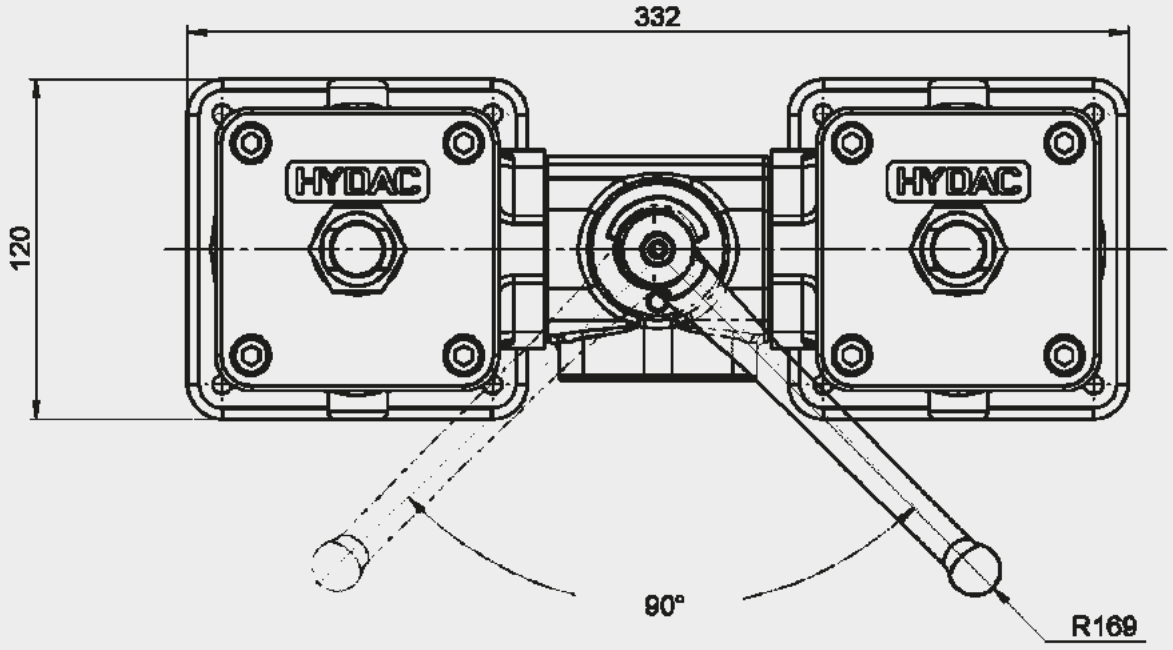
SSRF 160



SSRF	Weight incl. element [kg]	Volume of pressure chamber [l]
160	1.5	0.90

SSRFD 160





SSRFD	Weight incl. element [kg]	Volume of pressure chamber [l]
160	4.1	2.0

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Return Inline / Recirculation Filter EMLF

up to 150 l/min, up to 40 bar

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a bolt-on filter bowl.

Standard equipment:

- bypass valve
- connection for a clogging indicator
- oil drain plug in filter bowl

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BN4HC) "-SS-SO361":	20 bar
Betamicron®/ Aquamicron®(BN/AM):	10 bar
Wire mesh (W/HC):	20 bar
Ecomicron® (ECON2):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	40 bar
Test pressure	66 bar (design pressure: 44 bar)
Temperature range	-20 °C to +100 °C
Material of filter head	316S11 EN 1.4404 stainless steel
Material of filter bowl	316S11 EN 1.4404 stainless steel
Type of clogging indicator	VD (differential pressure indicator)
Pressure setting of clogging indicator	2 bar (others on request)
Bypass cracking pressure	3 bar (others on request)

1.4 SEALS

FPM (Viton)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in NBR, NLT, EPDM, HNBR, Kalrez®
- Without bypass valve
- Without port for clogging indicator
- With gauge ports (for external piping of pressure sensors)
- Reverse flow check
- Twin indicator version
- Ex or IS differential indicators available
- Flanged versions available (SAE, RF, RTJ, Destec®)

1.7 SPARE PARTS

See Original Spare Parts List

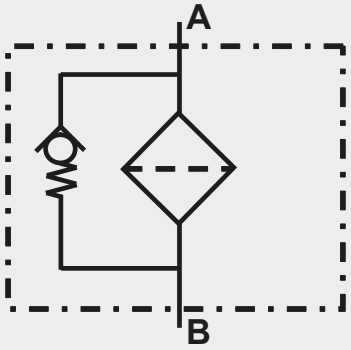
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC und HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)

2.1 COMPLETE FILTER

EMLF40 ON 660 N4 005 B X / -V

Filter type
EMLF40 40 bar

Filter material

ON	Optimicron®		
BN/HC	Betamicron® (BN4HC) only to be used for water-glycol applications with "-SS-SO361"!		
BN/AM	Betamicron®/Aquamicron® (BN4AM)		
ECO	Ecomicron (ECON2)	W/HC	wire mesh

Size of filter
330, 660

Type and size of connection

Type	Port (thread)	Filter size 330	660
B4	1"-BSPP	●	●
B5	1¼"-BSPP	●	●
N4	1"-NPT	●	●
N5	1¼"-NPT	●	●
F32	SAE 32	●	●

Filtration rating in µm

ON	: 001, 003, 005, 010, 015, 020	BN/HC (/-SS-SO361)	: 003, 010
ECO	: 003, 005, 010, 020	BN/AM	: 003, 010
W/HC	: 025, 050, 100, 200		

Type of clogging indicator

W	without port (no clogging indicator)	
A	stainless steel blanking plug in indicator port	
B	visual	for other clogging indicators see brochure no. 7.050../..
C	electrical	
D	visual and electrical	
UE	vacuum gauge	
BM+C	visual with manual reset + electrical (= 2 indicators)	
E	1/4"-NPT gauge ports for external connection of pressure sensors	

Modification number

X	the latest version is always supplied

Supplementary details

B.	bypass cracking pressure (e.g. B6 = 6 bar); without details = without bypass valve	
EX	electrical clogging indicator EX version (Eexd IIC T6; cable length 0.25 m standard)	
EX/ENC	electrical clogging indicator EX version (Eexd IIC T6; with IP66 junction box, M20x1.5 cable entry)	
IS	intrinsically safe electrical clogging indicator with cable length 0.25 m (standard)	
IS/ENC	intrinsically safe electrical clogging indicator with IP66 junction box (M20x1.5 cable entry)	
IS2GBC	intrinsically safe electrical clogging indicator with gold contacts (e. g. suitable for PLC)	
L...	lamp with appropriate voltage (24, 48, 110, 220 volts)	only for clogging indicators type "D"
LED	2 light emitting diodes up to 24 Volt	
N	NBR seals	
V	FPM seals	
NLT	nitrile low temperature seals	
HNBR	hydrogenated nitrile (high temperature) seals	
EPDM	EPDM seals	
K	Kalrez® seals	
SS-SO361	stainless steel elements with polyamide support fibre, optimised for water-glycol (only for BN/HC material)	

2.2 REPLACEMENT ELEMENT

0660 D 005 ON /-V

Size
0330, 0660

Type
D

Filtration rating in µm

ON:	: 001, 003, 005, 010, 015, 020	BN4HC /-SS-SO361	: 003, 010
BN4AM	: 003, 010	ECON2	: 003, 005, 010, 020
W/HC	: 025, 050, 100, 200		

Filter material
ON, BN4HC, ECON2, BN4AM, W/HC

Supplementary details
SS-SO361 stainl. steel core and end caps, polyamide support fibre, optimised for water-glycol
V, N, NLT, HNBR, EPDM, K (for descriptions, see Point 2.1)

2.3 REPLACEMENT CLOGGING INDICATOR

VD 2 D . X /-V-L24

Type
VD differential pressure indicator

Pressure setting
2 standard 2 bar, others on request

Type of clogging indicator
(see Point 2.1)

Modification number
X the latest version is always supplied

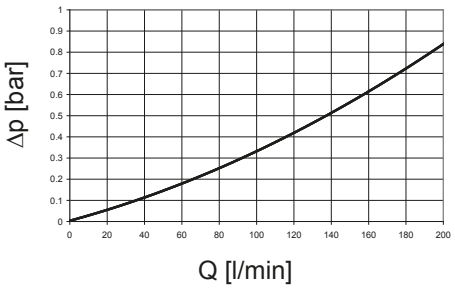
Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

EMLF



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

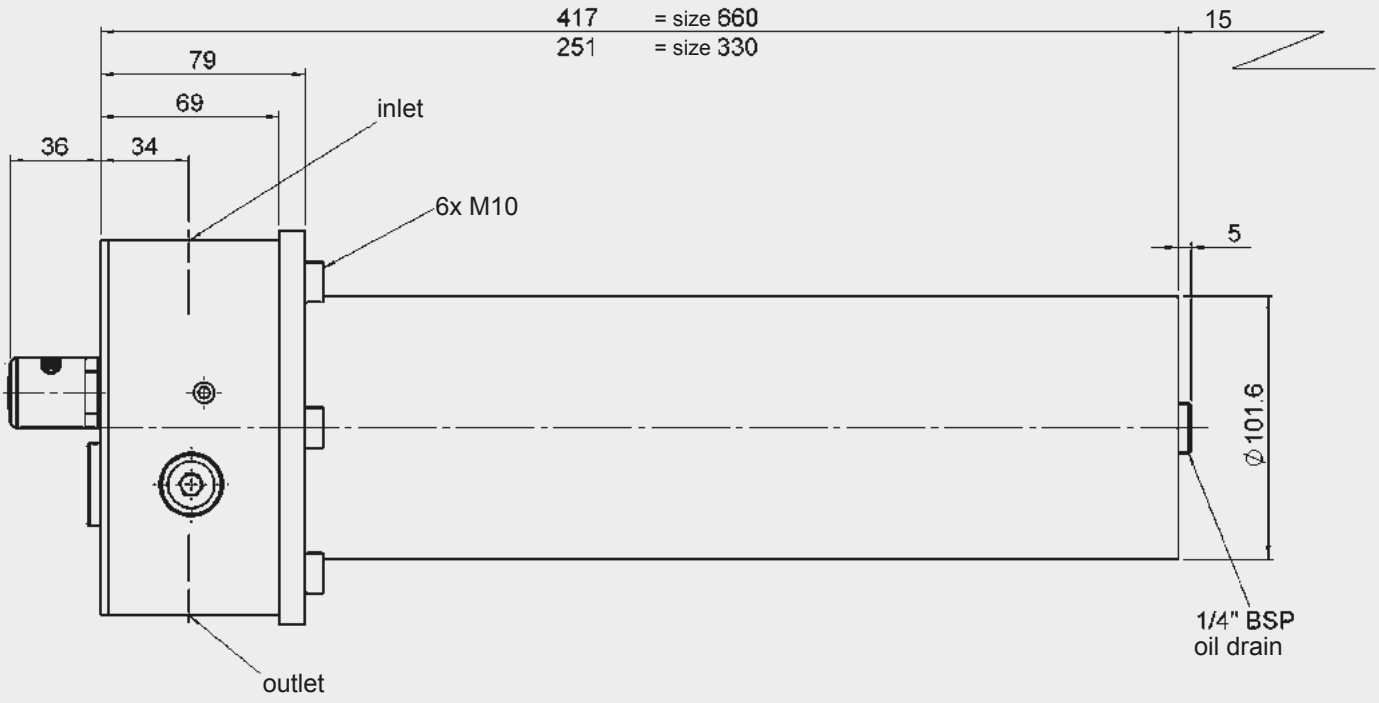
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

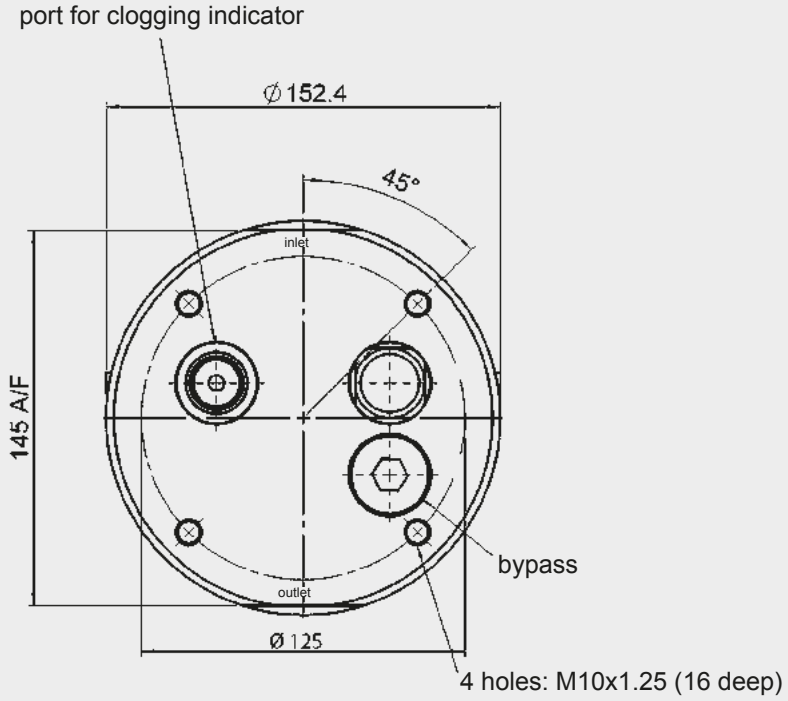
EMLF	ON						W/HC
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	–
330	8.23	4.19	3.37	2.46	1.55	1.22	0.138
660	3.78	1.93	1.56	0.93	0.71	0.56	0.069

EMLF	BN4HC		ECON2			
	3 µm	10 µm	3 µm	5 µm	10 µm	20 µm
330	5.4	3.0	4.2	2.7	1.7	1.2
660	2.5	1.1	1.9	1.2	0.8	0.5

4. DIMENSIONS

EMLF 330/660





NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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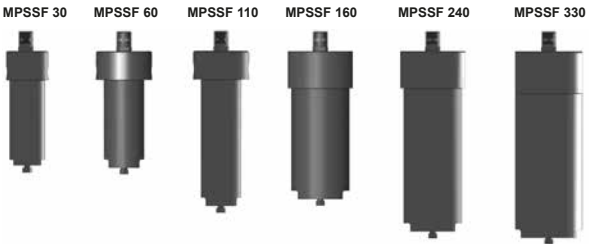
Inline Filter MPSSF and Filter for Manifold Mounting MPSSF...P

up to 130 l/min, up to 450 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-on filter bowl.

Standard equipment:

- without bypass valve
- connection for a clogging indicator
- oil drain plug in filter bowl

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BN4HC) /-SS-SO361:	20 bar
Betamicron® (BH4HC):	210 bar
Betamicron® (BH4HC) /-SS-SO361:	210 bar
Stainless steel wire mesh (D):	210 bar
Wire mesh (W/HC):	20 bar
Chemicron® (M):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	450 bar
Test pressure	742.5 bar (design pressure: 495 bar)
Temperature range	-20 °C to +100 °C
Material of filter head	316S11 EN 1.4404 stainless steel
Material of filter bowl	UNS S31803 DUPLEX EN 1.4462
Type of clogging indicator	VD (Diff. pressure indicator up to 450 bar operating pressure)
Pressure setting of clogging indicator	5 bar (others on request)
Bypass cracking pressure (optional)	6 bar (others on request)

1.4 SEALS

FPM (Viton)

1.5 INSTALLATION

Inline filter or manifold mounted filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in NBR, NLT, EPDM, HNBR, Kalrez®
- With bypass valve
- Without port for clogging indicator
- With gauge ports (for external piping of pressure sensors)
- Reverse flow check
- Twin indicator version
- Ex or IS differential pressure indicators
- Flanged versions available (SAE, RF, RTJ, Destec®)

1.7 SPARE PARTS

See Original Spare Parts List

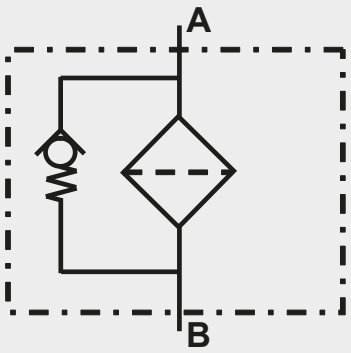
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)

2.1 COMPLETE FILTER

MPSSF450 BH/HC 60 N2 005 B X / -V

Filter type

MPSSF450	450 bar

Filter material

ON	Optimicron®
BN/HC	Betamicron® (BN4HC) only to be used for water-glycol applications with "SO361"!
BH/HC	Betamicron® (BH4HC)
BH/HC	Betamicron® (BH4HC) only to be used for water-glycol applications with "SO361"!
M	Chemicron
W/HC	wire mesh
D	stainless steel wire mesh

Size of filter

30, 60, 110, 160, 240, 330

Type and size of connection

Type	Port thread	Filter size 30	60	110	160	240	330
BO	¼" BSPP	●					
NO	¼" NPT	●					
B2	½" BSPP	●	●	●	●	●	
N2	½" NPT	●	●	●	●	●	
B3	¾" BSPP		●	●	●	●	●
N3	¾" NPT		●	●	●	●	●
B4	1" BSPP				●	●	●
N4	1" NPT				●	●	●
B5	1¼" BSPP						●
N5	1¼" NPT						●
B6	1½" BSPP						●
N6	1½" NPT						●

Also available in autoclave design!

Filtration rating in µm

ON	: 001, 003, 005, 010, 015, 020
BH/HC	: 003, 005, 010, 020
BN/HC, BH/HC (/-SS-SO361)	: 003, 010
M	: 001, 003, 005, 010, 020
W/HC	: 025, 050, 100, 200
D	: 025, 040, 060, 100, 150, 200, 250

Type of clogging indicator

W	without port (no clogging indicator)
A	stainless steel blanking plug in indicator port
B	visual
BM	visual with manual reset
C	electrical
D	visual and electrical
BM+C	visual with manual reset + electrical (= 2 indicators) – not for size 30
E	¼"-NPT gauge ports for external connection of pressure sensors – not for size 30

For other clogging indicators see brochure no. 7.050../..

Modification number

X	the latest version is always supplied

Supplementary details

B.	cracking pressure of bypass valve (e.g. B3 = 3 bar, B6 = 6 bar); no details = without bypass valve
EX	electrical clogging indicator EX version (Eexd IIC T6; cable length 0.25 m standard)
EX/ENC	electrical clogging indicator EX version (Eexd IIC T6; with IP66 junction box, M20x1.5 cable entry)
IS	intrinsically safe electrical clogging indicator with cable length 0.25 m (standard)
IS/ENC	intrinsically safe electrical clogging indicator with IP66 junction box (M20x1.5 cable entry)
IS/2GBC	intrinsically safe electrical clogging indicator with gold contacts (e. g. suitable for PLC)
L...	lamp with appropriate voltage (24, 48, 110, 220 volts)
LED	2 light-emitting diodes up to 24 volts
RC	non-return valve (not for size 30)
RCRFB	non-return and bypass valve for reversible flow
TB6	with triple bypass for reversible flow (= 1 non-return valve, 2 bypass valves – not for size 30)
N	NBR seals
V	FPM seals
NLT	nitrile low temperature seals
HNBR	hydrogenated nitrile (high temperature) seals
EPDM	EPDM seals
K	Kalrez® seals
SS-SO361	stainl. steel elements with polyamide support fibre, optimised for water-glycol (only for BN/HC and BH/HC material)

only for clogging indicators type "D"

Example for MPSSF450 in manifold version: **MPSSF450 BH/HC 60 P N2 005 B X / -V**

Sizes

60P, 160P, 240P

2.2 REPLACEMENT ELEMENT

0060 D 003 BN4HC /-V-SS-SO361

Size
0030, 060, 0110, 160, 0240, 0330

Type
D

Filtration rating in µm
ON : 001, 003, 005, 010, 015, 020
BH4HC : 003, 005, 010, 020
BN4HC, BH4HC (/-SS-SO361) : 003, 010
W/HC : 025, 050, 100, 200

Filter material
ON, BN4HC, BH4HC, W/HC

Supplementary details
SS-SO361 stainl. steel elements, polyamide support fibre
N, V, NLT, HNBR, EPDM, K (for descriptions, see Point 2.1)

2.3 REPLACEMENT ELEMENT - PROCESS TECHNOLOGY

060-DH-100-D-V

Size
030, 060, 110, 160, 240, 330

Type
DH

Filtration rating in µm
Chemicron® (M) : 001, 003, 005, 010, 020
Wire mesh (D) : 025, 040, 060, 100, 150, 200, 250

Filter material
M, D

Supplementary details
N, V, NLT, HNBR, EPDM, K (for descriptions, see Point 2.1)

2.4 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-V-L24

Type
VD differential pressure measurement

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
(see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

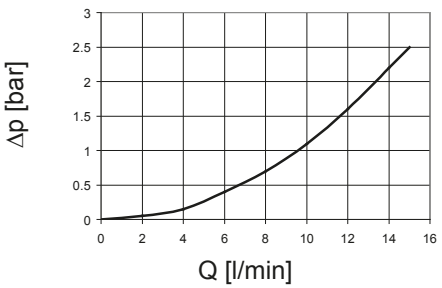
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

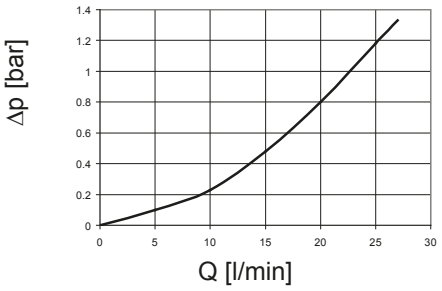
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

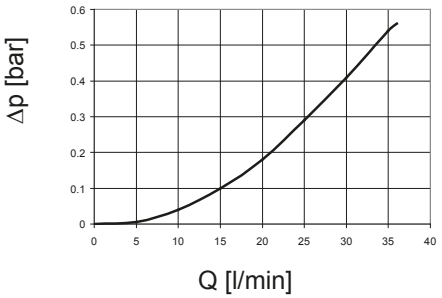
Size 30: ¼" BSPP/NPT



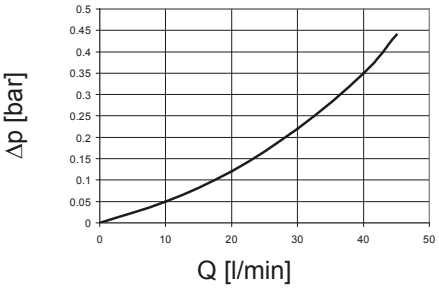
Size 30: ½" BSPP/NPT



Size 60-110: ½" BSPP/NPT

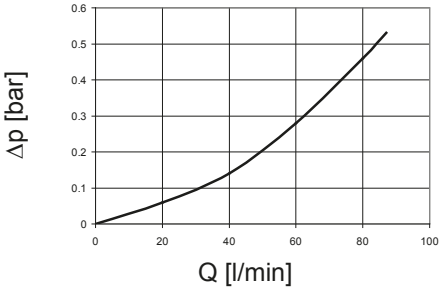


Size 60-110: ¾" BSPP/NPT



Other curves on request

Size 60-240: 1" BSPP/NPT



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

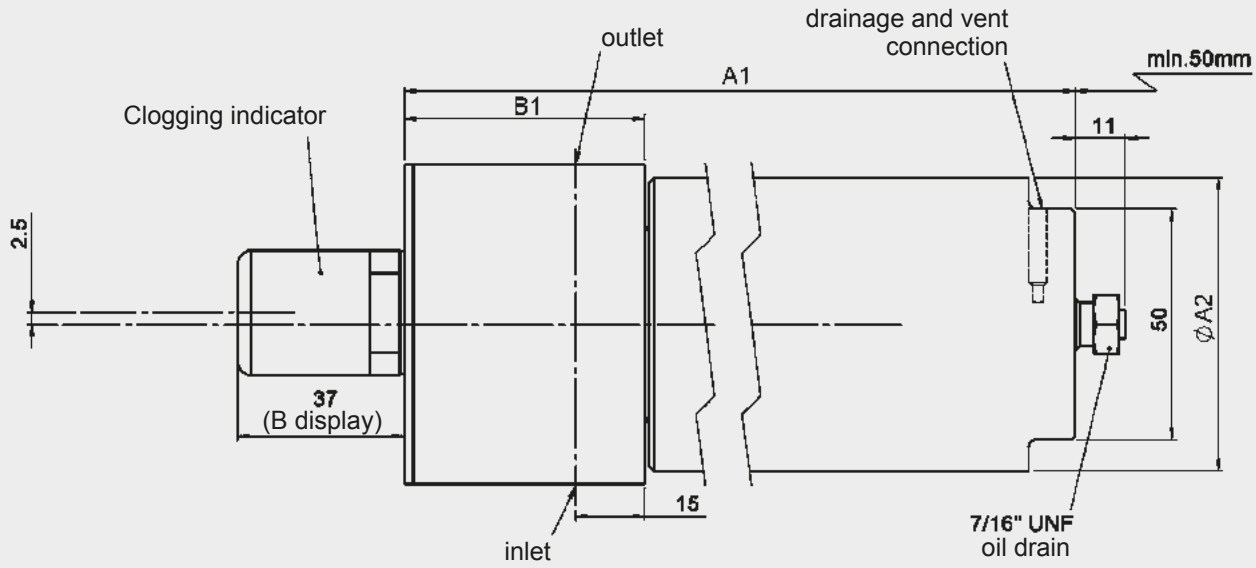
MPSSF	ON						W/HC
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	–
30	77.8	63.9	43.3	22.8	14.0	11.3	–
60	53.5	26.0	18.3	12.1	9.78	6.32	0.757
110	25.8	13.4	9.61	6.06	4.63	2.99	0.413
160	18.5	11.0	7.7	4.1	3.71	3.18	0.283
240	11.5	6.9	5.34	3.19	2.44	2.1	0.189
330	8.23	4.19	3.37	2.46	1.55	1.22	0.138

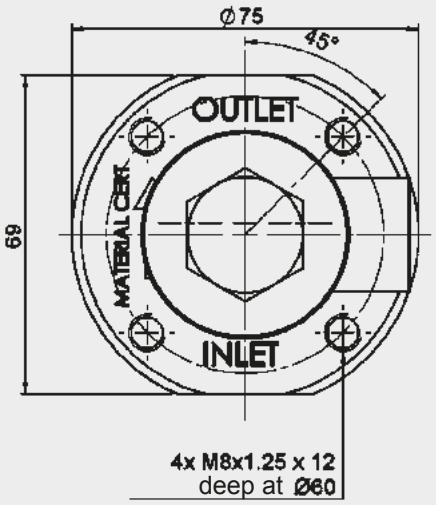
MPSSF	BN4HC		BH4HC			
	3 µm	10 µm	3 µm	5 µm	10 µm	20 µm
30	63.9	22.8	91.2	50.7	36.3	19.0
60	28.9	13.2	58.6	32.6	18.1	12.2
110	14.9	6.6	25.4	14.9	8.9	5.6
160	13.1	4.6	16.8	10.4	5.9	4.4
240	8.2	3.6	10.6	6.8	3.9	2.9
330	5.4	3.0	7.7	4.5	2.8	2.0

4. DIMENSIONS

Inline Filter MPSSF450

Size 30

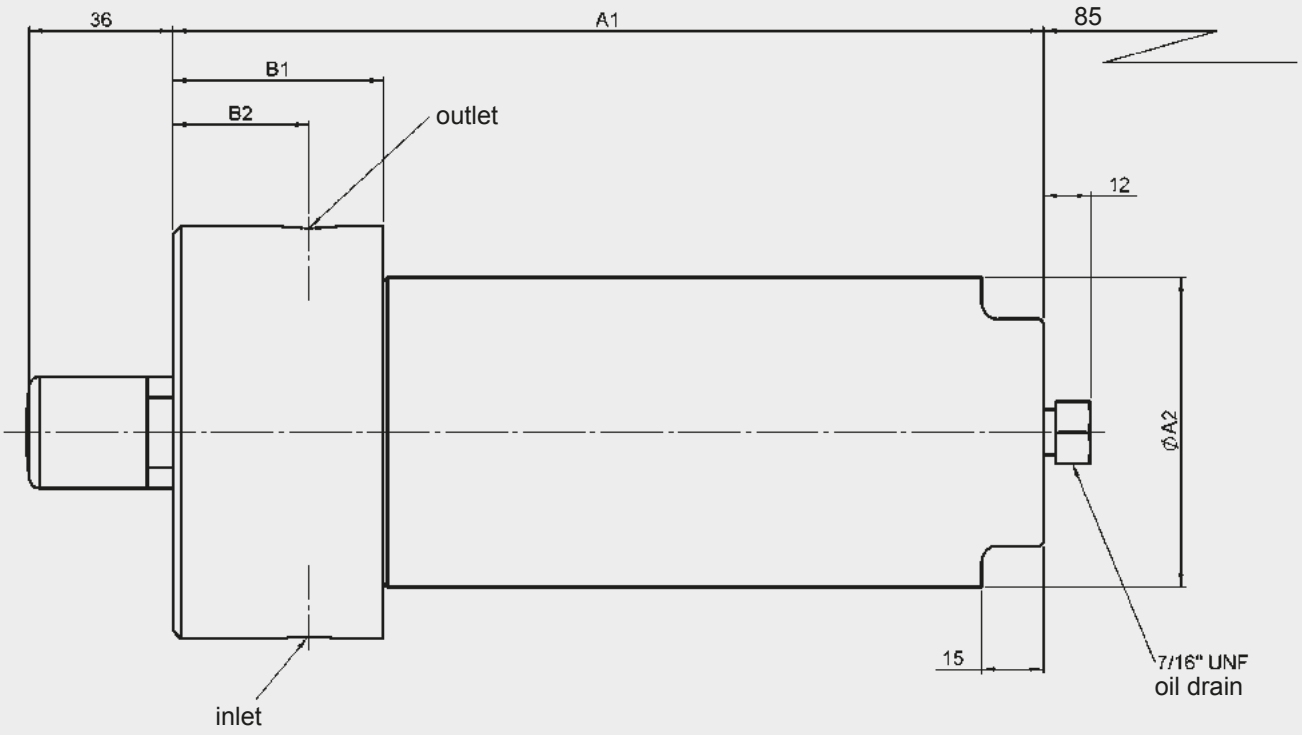


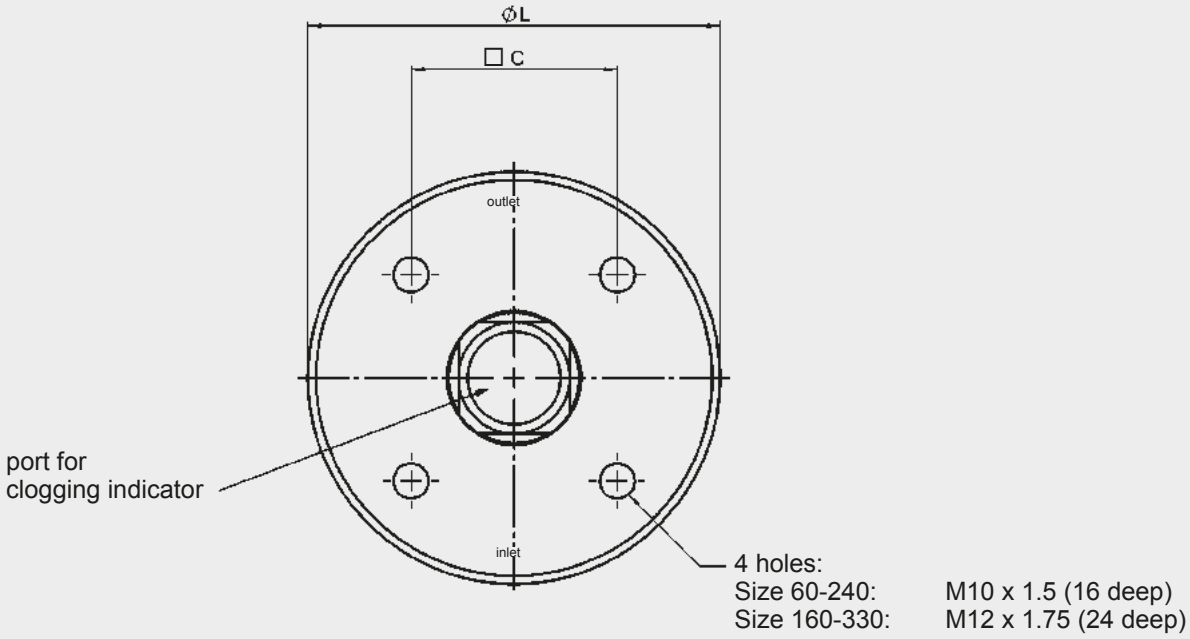


MPSSF	A1	A2	B1
30	205	63.5	52
30 (1/4" NPT)	196	63.5	44

Inline Filter MPSSF450

Size 60 - 330

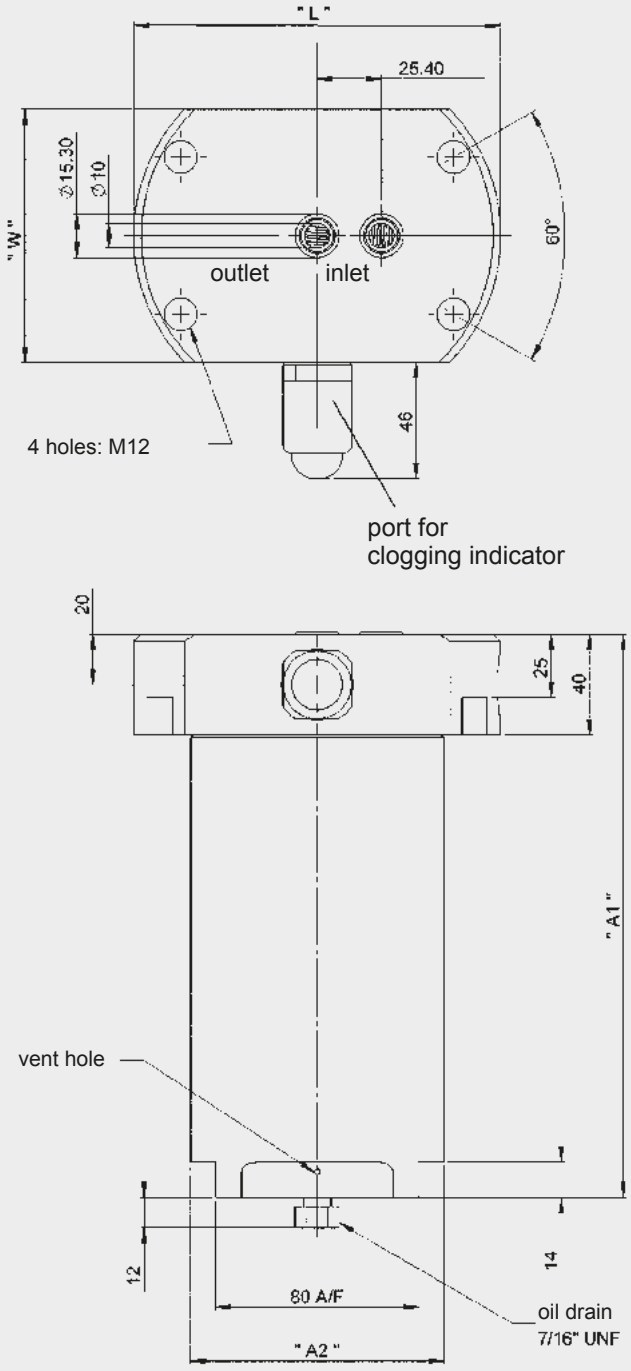




MPSSF	A1	A2	B1	B2 ±5mm	C	L	W
60	208	72	51	35	50	100	93
110	277	72	51	35	50	100	93
160	264	104	66	38	65	127	116
240	322	104	66	36	60	127	116
330	333	120	75	45	65	127	120

Inline filter, manifold-mounted MPSSF450...P

Size 60P, 160P, 240P



Type	A1	A2	W	L	PCD mounting holes	Weight incl. element [kg]
60P	201	72	88	100	76.2	7.50
160P	204	104	100	145	124.5	13.35
240P	261	104	100	145	124.5	18.93

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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D-66280 Sulzbach/Saar
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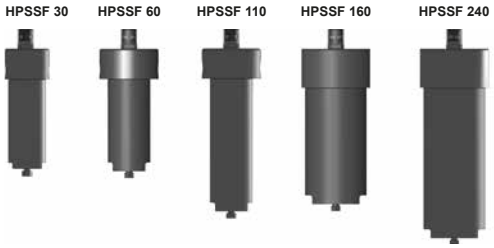
Internet: www.hydac.com
E-Mail: filter@hydac.com

Inline Filter HPSSF

up to 130 l/min, up to 700 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-on filter bowl.

Standard equipment:

- bypass valve
- connection for a clogging indicator
- oil drain plug in filter bowl

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BN4HC) /-SS-SO361:	20 bar
Betamicron® (BH4HC):	210 bar
Betamicron® (BH4HC) /-SS-SO361:	210 bar
Stainless steel wire mesh (D):	210 bar
Wire mesh (W/HC):	20 bar
Chemicron® (M):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	600 bar (with BSP thread) 700 bar (with NPT(F) thread or Autoclave)
Test pressure	990 (design pressure: 660 bar) 1137.5 bar (design pressure: 770 bar)
Temperature range	-20 °C to +100 °C
Material of filter head	316S11 EN 1.4404 stainless steel
Material of filter bowl	UNS S31803 DUPLEX EN 1.4462
Type of clogging indicator	VDHP (Diff. pressure indicator up to 700 bar opererating pressure)
Pressure setting of clogging indicator	5 bar (others on request)
Bypass cracking pressure	6 bar (others on request)

1.4 SEALS

FPM (Viton)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in NBR, NLT, EPDM, HNBR, Kalrez®
- Without bypass valve
- Without port (no clogging indicator)
- With visual/electrical clogging indicator
- With gauge ports (for external piping of pressure sensors)
- Reverse flow check
- Twin indicator version
- Ex or IS differential pressure indicators
- Flanged versions available (SAE, RF, RTJ, Destec®)

1.7 SPARE PARTS

See Original Spare Parts List

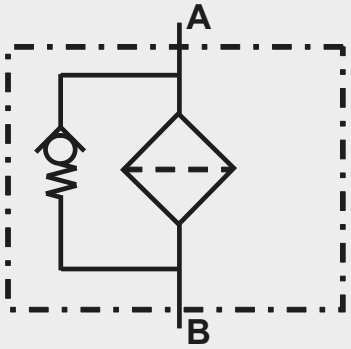
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)
2.1 COMPLETE FILTER

HPSSF600 BH/HC 60 N2 005 B X / -V

Filter type

HPSSF600	600 bar (BSP thread)
HPSSF700	700 bar (NPT/autoclave thread)

Filter material

ON	Optimicron®
BN/HC	Betamicron® (BN4HC) only to be used for water-glycol applications with "SO361"!
BH/HC	Betamicron® (BH4HC)
BH/HC	Betamicron® (BH4HC) only to be used for water-glycol applications with "SO361"!
M	Chemicron
W/HC	wire mesh
D	stainless steel wire mesh

Size of filter

30, 60, 110, 160, 240

Type and size of connection for HPSSF600

Type	Port thread	Filter size 30	60	110	160	240
B0	¼" BSPP	●				
B2	½" BSPP	●	●	●	●	●
B3	¾" BSPP		●	●	●	●
B4	1" BSPP				●	●

Type and size of connection for HPSSF700

Type	Port thread	Filter size 30	60	110	160	240
N0	¼" NPT	●	●			
N2	½" NPT	●	●	●	●	●
N3	¾" NPT		●	●	●	●
N4	1" NPT				●	●
AA	7/16"-20 SF 250 CX20 - 1/4" TUBE O.D.	●				
A0	9/16"-18 SF 375 CX20 - 3/8" TUBE O.D.	●	●	●		
A1	13/16"-16 SF 562 CX20 - 9/16" TUBE O.D.		●	●	●	●
A2	3/4"-14z SF 750 CX20 - 3/4" TUBE O.D.				●	●
A3	1-3/8"-12 SF 1000 CX20 - 1" TUBE O.D.				●	●

Filtration rating in µm

ON	: 001, 003, 005, 010, 015, 020
BH/HC	: 003, 005, 010, 020
BN/HC, BH/HC (/-SS-SO361)	: 003, 010
M	: 001, 003, 005, 010, 020
W/HC	: 025, 050, 100, 200
D	: 025, 040, 060, 100, 150, 200, 250

Type of clogging indicator

W	without port (no clogging indicator)
A	stainless steel blanking plug in indicator port
B	visual
BM	visual with manual reset
C	electrical
D	visual and electrical
BM+C	visual with manual reset + electrical (= 2 indicators) – not for size 30
E	¼"-NPT gauge ports for external connection of pressure sensors – not for size 30

For other clogging indicators see brochure no. 7.050../..

Modification number

X	the latest version is always supplied

Supplementary details

B.	cracking pressure of bypass valve (e.g. B6 = 6 bar); no details = without bypass valve
EX	electrical clogging indicator EX version (Eexd IIC T6; cable length 0.25 m standard)
EX/ENC	electrical clogging indicator EX version (Eexd IIC T6; with IP66 junction box, M20x1.5 cable entry)
IS	intrinsically safe electrical clogging indicator with cable length 0.25 m (standard)
IS/ENC	intrinsically safe electrical clogging indicator with IP66 junction box (M20x1.5 cable entry)
L...	lamp with appropriate voltage (24, 48, 110, 220 volts)
LED	2 light-emitting diodes up to 24 volts
RC	with reverse flow check (not for size 30)
TB6	with triple bypass for reversible flow (not for size 30)
N	NBR seals
V	FPM seals
NLT	nitrile low temperature seals
HNBR	hydrogenated nitrile (high temperature) seals
EPDM	EPDM seals
K	Kalrez® seals
SS-SO361	stainl. steel elements, polyamide support fibre, optimised for water-glycol (only for BN/HC and BH/HC material)

only for clogging indicators type "D"

2.2 REPLACEMENT ELEMENT

0060 D 003 BN4HC /-V-SS-SO361

Size
0030, 060, 0110, 0160, 0240

Type
D

Filtration rating in µm
ON : 001, 003, 005, 010, 015, 020
BH4HC : 003, 005, 010, 020
BN4HC, BH4HC (/-SS-SO361) : 003, 010
W/HC : 025, 050, 100, 200

Filter material
ON, BN4HC, BH4HC, W/HC

Supplementary details
SS-SO361 stainl. steel elements, polyamide support fibre
N, V, NLT, HNBR, EPDM, K (for descriptions, see Point 2.1)

2.3 REPLACEMENT ELEMENT - PROCESS TECHNOLOGY

060-DH-100-D-V

Size
030, 060, 110, 160, 240

Type
DH

Filtration rating in µm
Chemicron® (M) : 001, 003, 005, 010, 020
Wire mesh (D) : 025, 040, 060, 100, 150, 200, 250

Filter material
M, D

Supplementary details
N, V, NLT, HNBR, EPDM, K (for descriptions, see Point 2.1)

2.4 REPLACEMENT CLOGGING INDICATOR

VDHP 5 D . X /-V-L24

Type
VDHP differential pressure measurement up to 700 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
(see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
L..., LED, V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

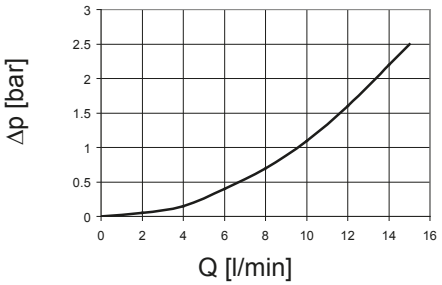
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

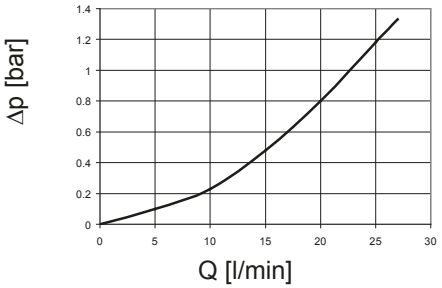
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

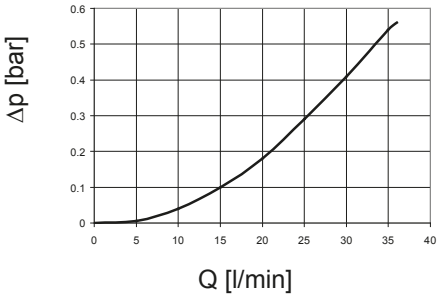
Size 30: ¼" BSPP/NPT



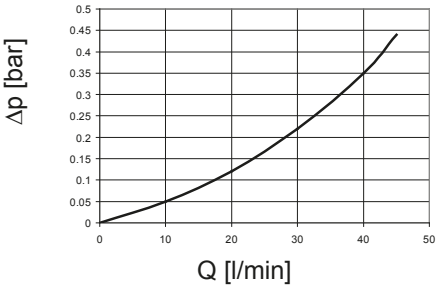
Size 30: ½" BSPP/NPT



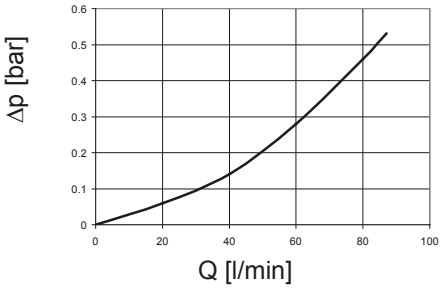
Size 60-110: ½" BSPP/NPT



Size 60-110: ¾" BSPP/NPT



Size 60-240: 1" BSPP/NPT



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

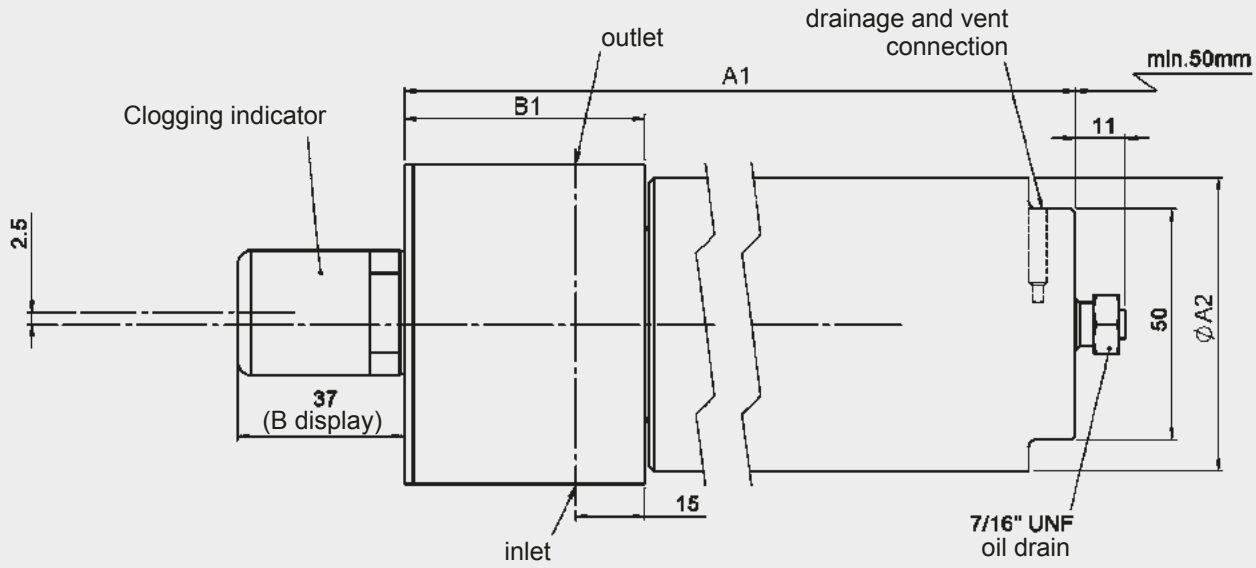
HPSSF	ON						W/HC
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	–
30	77.8	63.9	43.3	22.8	14.0	11.3	–
60	53.5	26.0	18.3	12.1	9.78	6.32	0.757
110	25.8	13.4	9.61	6.06	4.63	2.99	0.413
160	18.5	11.0	7.7	4.1	3.71	3.18	0.283
240	11.5	6.9	5.34	3.19	2.44	2.1	0.189

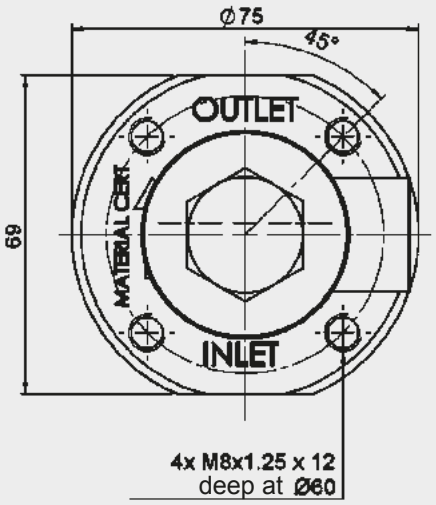
HPSSF	BN4HC		BH4HC			
	3 µm	10 µm	3 µm	5 µm	10 µm	20 µm
30	63.9	22.8	91.2	50.7	36.3	19.0
60	28.9	13.2	58.6	32.6	18.1	12.2
110	14.9	6.6	25.4	14.9	8.9	5.6
160	13.1	4.6	16.8	10.4	5.9	4.4
240	8.2	3.6	10.6	6.8	3.9	2.9

4. DIMENSIONS

Inline Filter HPSSF

size 30

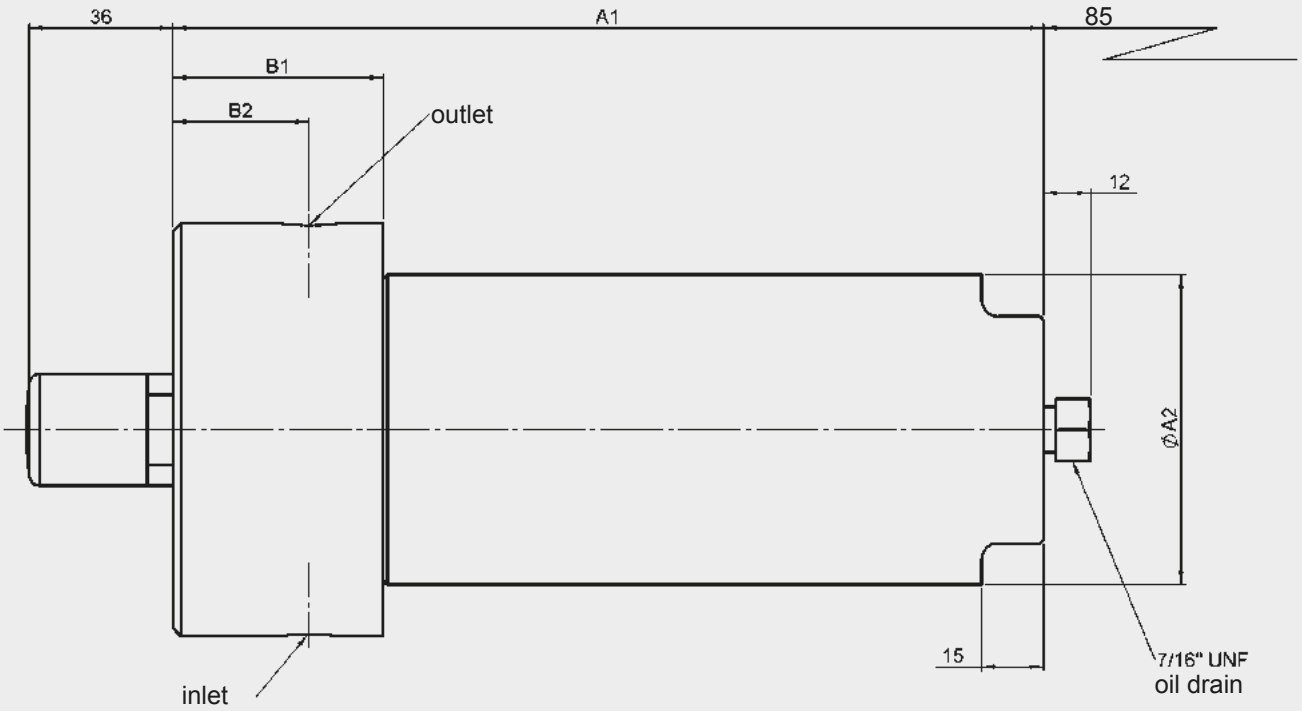


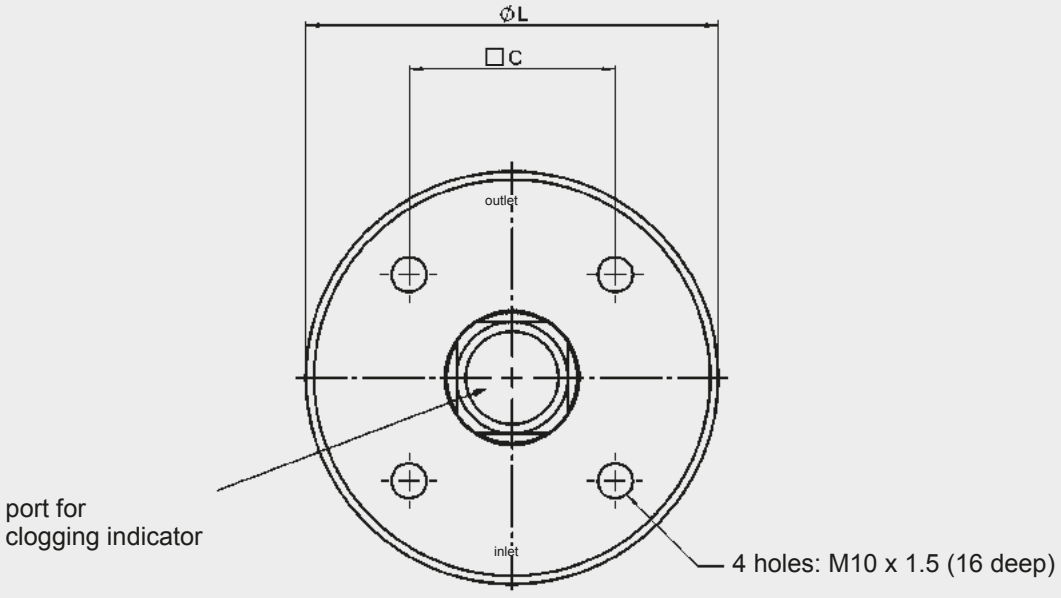


HPSSF	A1	A2	B1
30	205	63.5	52

Inline Filter HPSSF

Size 60 - 240





HPSSF	A1	A2	B1	B2 ±5mm	C	L	W
60	210	72	51	35	50	100	93
110	280	72	51	35	50	100	93
160	265	104	66	36	60	127	116
240	325	104	66	36	60	127	116

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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E-Mail: filter@hydac.com

Pressure Filter SSDF
Pressure Filter for Reversible Oil Flow SSDFF

up to 15 l/min, up to 700 bar

SSDF 30

SSDFF 30

1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl. SSDFF filters are suitable for flow in both directions.

Standard equipment:

- without bypass valve
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BN4HC) /-SS-SO361:	20 bar
Betamicron® (BH4HC):	210 bar
Betamicron® (BH4HC) /-SS-SO361:	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	700 bar
Temperature range	-10 °C to +100 °C
Material of housing and cover plate	Stainless steel 1.4462 and 1.4404
Type of clogging indicator	VD (differential pressure indication up to 420 bar operating pressure) with ATEX directive Indication for higher differential pressures on request
Pressure setting of clogging indicator	SSDF: 5 bar SSDFF: 8 bar (others on request)
Bypass cracking pressure (optional)	6 bar (others on request)

1.4 SEALS

FPM (Viton)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in NBR, EPDM
- With bypass valve
- Without port for clogging indicator

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

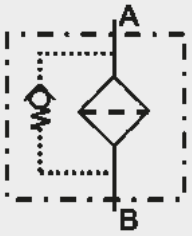
- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

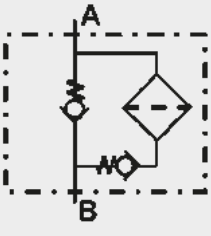
- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems

SSDF



SSDFF



2. MODEL CODE (also order example)

2.1 COMPLETE FILTER

SSDF BH/HC 30 T B 10 B 1. X /-2GC-V-5

Filter type
SSDF, SSDFF

Filter material

ON	Optimicron®
BN/HC	Betamicron® (BN4HC) only to be used for water-glycol applications with "-SS-SO361"!
BH/HC	Betamicron® (BH4HC)
BH/HC	Betamicron® (BH4HC) only to be used for water-glycol applications with "-SS-SO361"!

Size of filter or element
30

Operating pressure

T	420 bar
X	700 bar

Type and size of connection

Type	Connection	Filter size 30
B	½" NPT	●

Filtration rating in µm
ON: 1, 3, 5, 10, 15, 20
BH/HC: 3, 5, 10, 20 BN/HC…, BH/HC… /-SS-SO361: 3, 10

Type of clogging indicator

W	without port (no clogging indicator)	
A	with steel blanking plug in indicator port	
B	visual	For other clogging indicators see brochure no. 7.050../..
C	electrical	

Type code
1

Modification number
X the latest version is always supplied

Supplementary details

5	inlet/outlet NPT thread – **required data!**
2GC	for visual clogging indicator with ATEX certificate – **required data for clogging indicator "B"**
2GEXDIIC	can be used for electric display in zone 1 (category 2), gas atmosphere, category d (flameproof enclosure), explosion subgroup IIC in acc. with ATEX Directive – **required data for clogging indicator "C"**
B.	bypass cracking pressure (e.g. B6 = 6 bar); no entry = no bypass valve
L...	lamp with appropriate voltage (24, 48, 110, 220 volts) — only for clogging indicators type "D"
LED	2 light-emitting diodes up to 24 volts — only for clogging indicators type "D"
V	FPM seals (no entry = NBR seal)
E	EPDM seals
W	suitable for HFA and HFC emulsions
SS-SO361	stainless steel element with polyamide support fibre, optimised for water-glycol (only for BN/HC and BH/HC material)

2.2 REPLACEMENT ELEMENT

0030 D 010 BH4HC /-V-SS-SO361

Size
0030

Type
D

Filtration rating in µm
ON: 001, 003, 005, 010, 015, 020
BH4HC: 003, 005, 010, 020 BN4HC, BH4HC /-SS-SO361: 003, 010

Filter material
ON, BN4HC, BH4HC

Supplementary details

SS-SO361	stainl. steel core and end caps, polyamide support fibre
V, E	(for descriptions, see Point 2.1)

2.4 REPLACEMENT CLOGGING INDICATOR

VD 5 B . X /-2GC-V

Type
VD differential pressure indicator up to 420 bar operating pressure (up to 700 bar operating pressure on request!)

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator (see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details

2GC	for visual clogging indicator with ATEX certificate - **must be specified for type "B" indicator**
2GEXDIIC	for electrical indicator suitable for use in Zone 1 (Category 2), gas atmosphere, Category d (Flameproof Enclosure), Explosive subdivision IIC to ATEX directive - **must be specified for type "C" indicator**
V, W	(for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

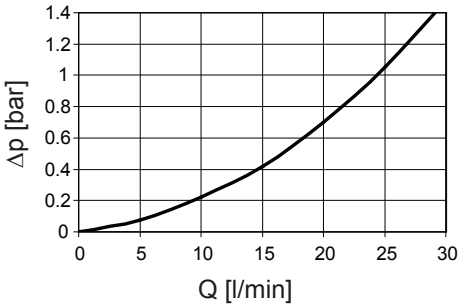
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

SSDF 30



Housing curve for SSDFF 30 filter on request

3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

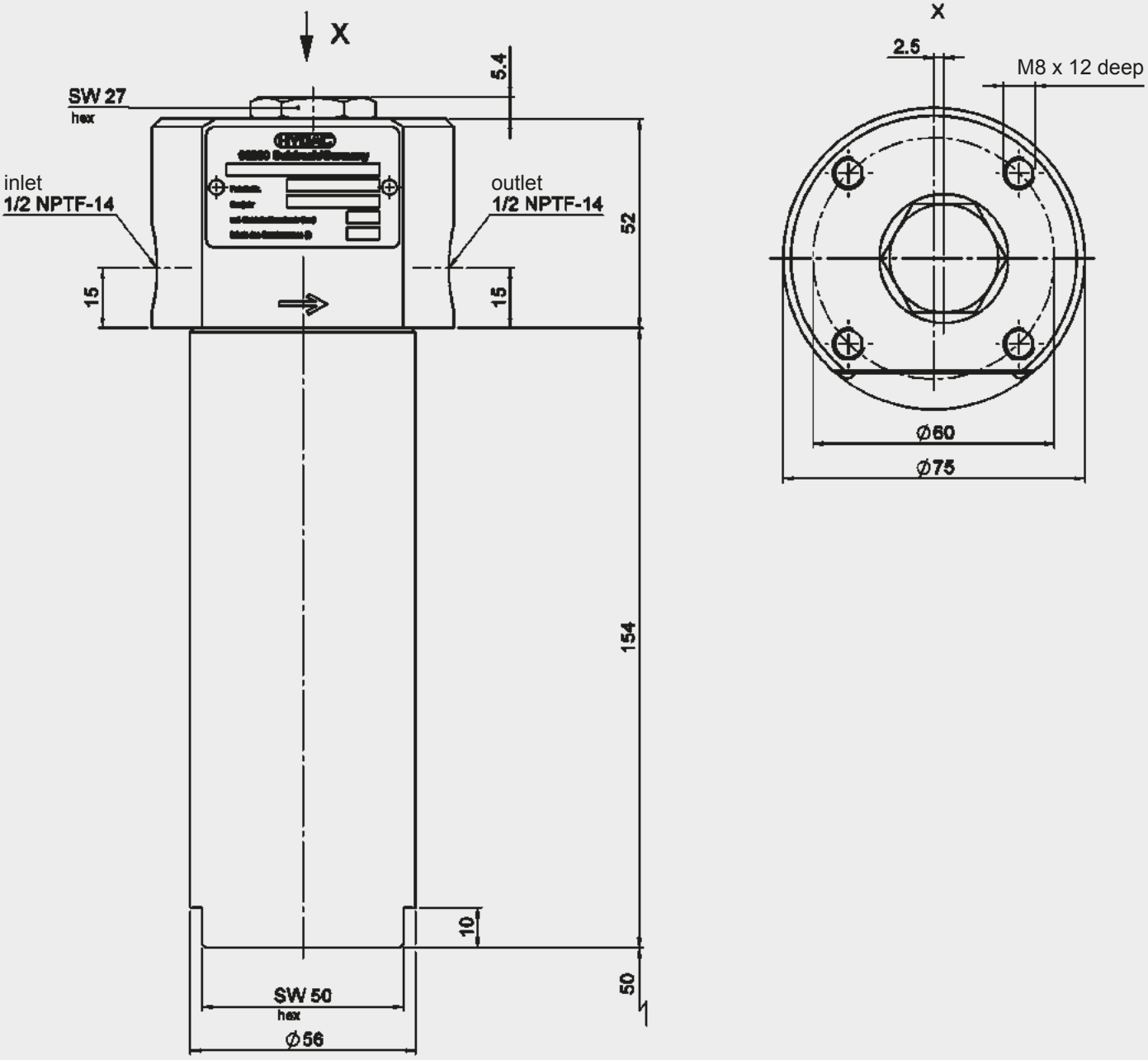
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

SSDF/ SSDFF	ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
30	77.8	63.9	43.3	22.8	14.0	11.3

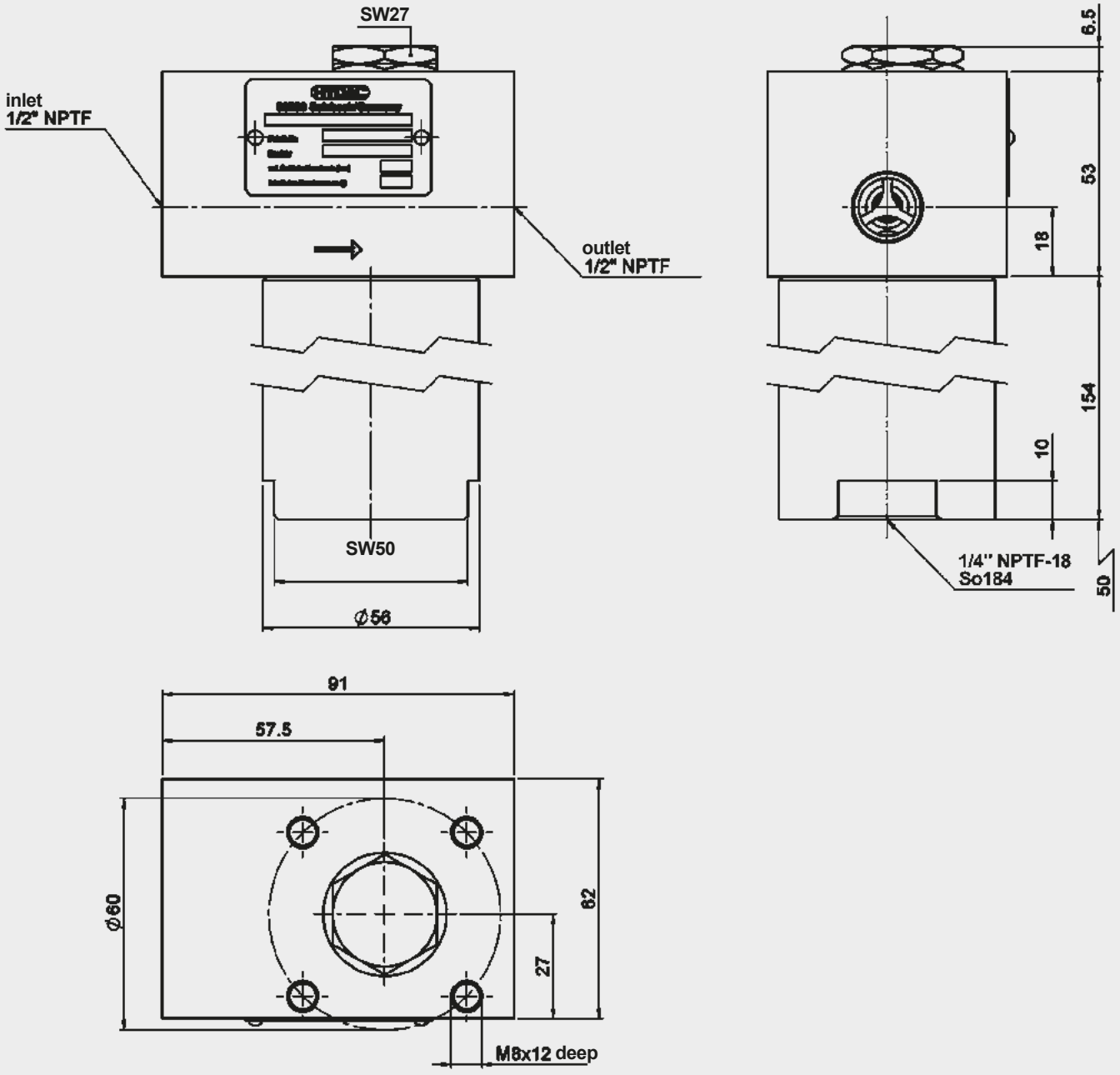
SSDF/ SSDFF	BN4HC		BH4HC			
	3 µm	10 µm	3 µm	5 µm	10 µm	20 µm
30	63.9	22.8	91.2	50.7	36.3	19.0

4. DIMENSIONS

SSDF 30



SSDF	Weight incl. element [kg]	Volume of pressure chamber [l]
30	3.65	0.17



SSDFF	Weight incl. element [kg]	Volume of pressure chamber [l]
30	4.3	0.17

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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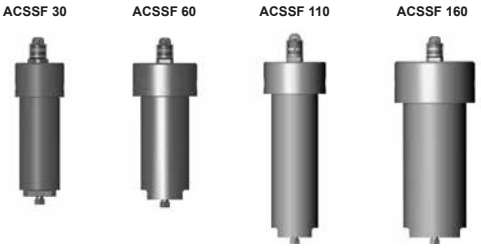
Inline Filter ACSSF

up to 100 l/min, up to 1035 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-on filter bowl.

Standard equipment:

- without bypass valve
- connection for a clogging indicator
- oil drain plug in filter bowl

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Betamicron® (BN4HC) /-SS-SO361:	20 bar
Betamicron® (BH4HC):	210 bar
Betamicron® (BH4HC) /-SS-SO361:	210 bar
Stainless steel wire mesh (D):	210 bar
Wire mesh (W/HC):	20 bar
Chemicron® (M):	210 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	1035 bar
Test pressure	1707 bar (design pressure: 1138.5 bar)
Temperature range	-20 °C to +100 °C
Material of filter head	316S11 EN 1.4404 stainless steel
Material of filter bowl	UNS S31803 DUPLEX EN 1.4462
Type of clogging indicator	VDAC (Differential pressure indicator up to 1035 bar operating pressure)
Pressure setting of clogging indicator	5 bar (others on request)
Bypass cracking pressure (optional)	6 bar (others on request)

1.4 SEALS

FPM (Viton)

1.5 INSTALLATION

Inline filter

1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in NBR, NLT, EPDM, HNBR, Kalrez®
- Without bypass valve
- Without port for clogging indicator
- With 2 clogging indicators (visual and electrical)
- With gauge ports (for external piping of pressure sensors)
- Higher pressures on request

1.7 SPARE PARTS

See Original Spare Parts List

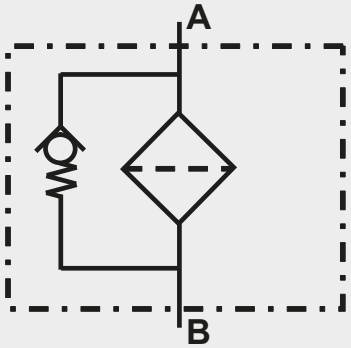
1.8 CERTIFICATES AND APPROVALS

On request

1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

Symbol for hydraulic systems



2. MODEL CODE (also order example)

2.1 COMPLETE FILTER

ACSSF1035 BH/HC 60 A0 005 B X / -V

Filter type

ACSSF1035	1035 bar

Filter material

ON	Optimicron®
BN/HC	Betamicron® (BN4HC) only use for water-glycol applications with "SO361"!
BH/HC	Betamicron® (BH4HC)
BH/HC	Betamicron® (BH4HC) only use for water-glycol applications with "SO361"!
M	Chemicron
W/HC	wire mesh
D	stainless steel wire mesh

Size of filter

30, 60, 110, 160

Type and size of connection

Type	Port thread	Filter size 30	60	110	160
A0	9/16"-18 SF 250 CX20 - 1/4" TUBE O.D.	●	●	●	
A1	13/16"-16 SF 375 CX20 - 3/8" TUBE O.D.		●	●	●
A2	3/4"-14z SF 562 CX20 - 9/16" TUBE O.D.				●
A3	1-3/8"-12 SF 750 CX20 - 3/4" TUBE O.D.				●

Filtration rating in µm

ON	: 001, 003, 005, 010, 015, 020
BH/HC	: 003, 005, 010, 020
BN/HC, BH/HC (/-SS-SO361)	: 003, 010
M	: 001, 003, 005, 010, 020
W/HC	: 025, 050, 100, 200
D	: 025, 040, 060, 100, 150, 200, 250

Type of clogging indicator

W	without port (no clogging indicator)
A	stainless steel blanking plug in indicator port
B	visual
BM	visual with manual reset
C	electrical
BM+C	visual with manual reset + electrical (= 2 indicators) – not for size 30
E	9/16" UNF Autoclave ports for external connection of pressure sensors – not for size 30

For other clogging indicators see brochure no. 7.050../..

Modification number

X	the latest version is always supplied

Supplementary details

B.	cracking pressure of bypass valve (e.g. B6 = 6 bar); no details = without bypass valve
EX	electrical clogging indicator EX protection (Eexd IIC T6; cable length 0.25 m standard)
EX/ENC	electrical clogging indicator EX protection (Eexd IIC T6; with IP66 junction box, M20x1.5 cable entry)
IS	intrinsically safe electrical clogging indicator with cable length 0.25 m (standard)
IS/ENC	intrinsically safe electrical clogging indicator with IP66 junction box (M20x1.5 cable entry)
RC	with reverse flow check (not for size 30)
TB6	with triple bypass valve for reversible flow (= 1 check valve, 2 bypass valves - not for size 30)
N	NBR seals
V	FPM seals
NLT	nitrile low temperature seals
HNBR	hydrogenated nitrile (high temperature) seals
EPDM	EPDM seals
K	Kalrez® seals
SS-SO361	stainl. steel core and end caps, polyamide support fibre, optimised for water-glyclol (only for BN/HC and BH/HC material)

2.2 REPLACEMENT ELEMENT

0060 D 003 BN4HC /-V-SS-SO361

Size

0030, 0060, 0110, 0160

Type

D

Filtration rating in µm

ON	: 001, 003, 005, 010, 015, 020
BH4HC	: 003, 005, 010, 020
BN4HC, BH4HC (/-SS-SO361)	: 003, 010
W/HC	: 025, 050, 100, 200

Filter material

ON, BN4HC, BH4HC, W/HC

Supplementary details

SS-SO361	stainl. steel core and end caps, polyamide support fibre

V, N, NLT, HNBR, EPDM, K (for descriptions, see Point 2.1)

2.3 REPLACEMENT ELEMENT - PROCESS TECHNOLOGY

060 - DH - 100 - D - V

Size
030, 060, 110, 160

Type
DH

Filtration rating in µm
Chemicron® (M) : 001, 003, 005, 010, 020
Wire mesh (D) : 025, 040, 060, 100, 150, 200, 250

Filter material
M, D

Supplementary details
N, V, NLT, HNBR, EPDM, K (for descriptions, see Point 2.1)

2.4 REPLACEMENT CLOGGING INDICATOR

VDAC 5 B . X /-V

Type
VDAC differential pressure measurement up to 1035 bar operating pressure

Pressure setting
5 standard 5 bar, others on request

Type of clogging indicator
(see Point 2.1)

Modification number
X the latest version is always supplied

Supplementary details
V, W (for descriptions, see Point 2.1)

3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing} =$ (see Point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see Point 3.2)

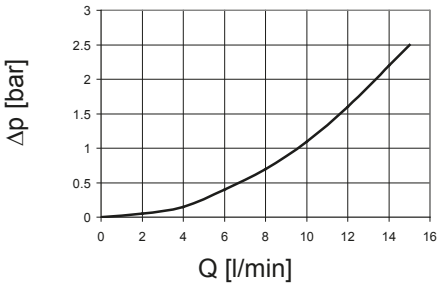
For ease of calculation, our Filter Sizing Program is available on request free of charge.

NEW: Sizing online at www.hydac.com

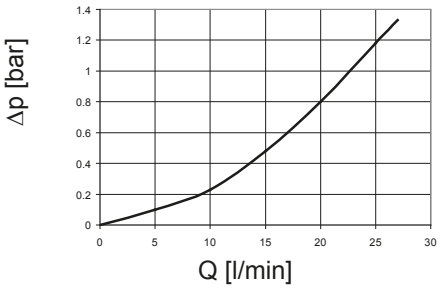
3.1 Δp-Q HOUSING CURVES BASED ON ISO 3968

The housing curves apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

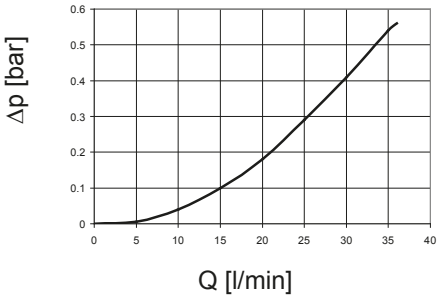
Size 30: ¼" BSPP/NPT



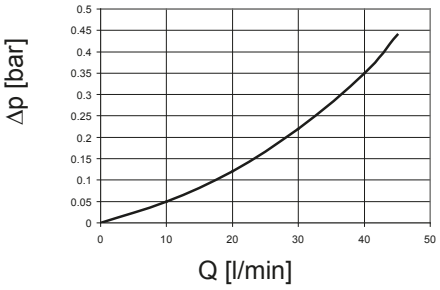
Size 30: ½" BSPP/NPT



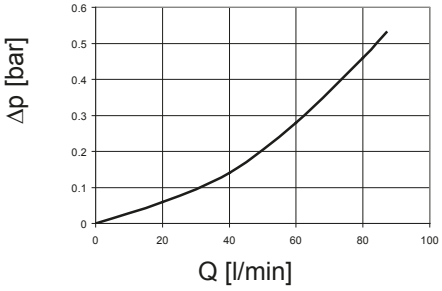
Size 60-110: ½" BSPP/NPT



Size 60-110: ¾" BSPP/NPT



Size 160: 1" BSPP/NPT



3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

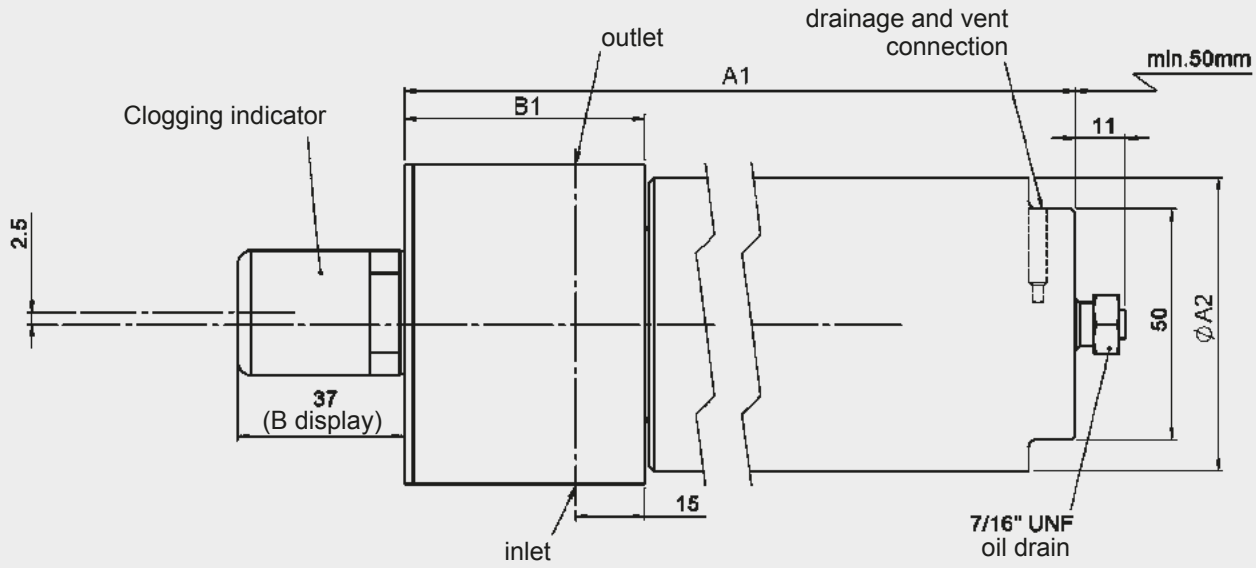
ACSSF	ON						W/HC
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	–
30	77.8	63.9	43.3	22.8	14.0	11.3	–
60	53.5	26.0	18.3	12.1	9.78	6.32	0.757
110	25.8	13.4	9.61	6.06	4.63	2.99	0.413
140	19.9	11.5	7.39	4.38	3.54	2.29	0.283

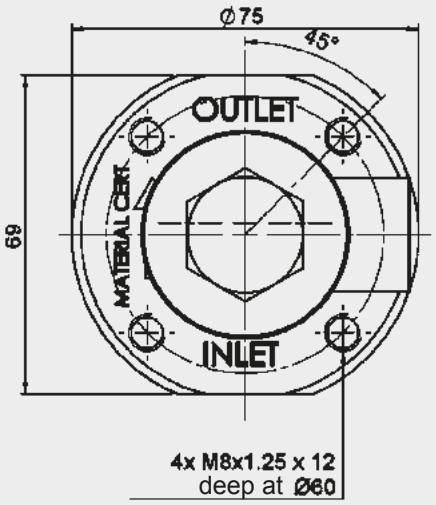
ACSSF	BN4HC		BH4HC			
	3 µm	10 µm	3 µm	5 µm	10 µm	20 µm
30	63.9	22.8	91.2	50.7	36.3	19.0
60	28.9	13.2	58.6	32.6	18.1	12.2
110	14.9	6.6	25.4	14.9	8.9	5.6
140	12.8	4.8	19.9	11.3	8.1	4.3

4. DIMENSIONS

Inline Filter ACSSF

Size 30

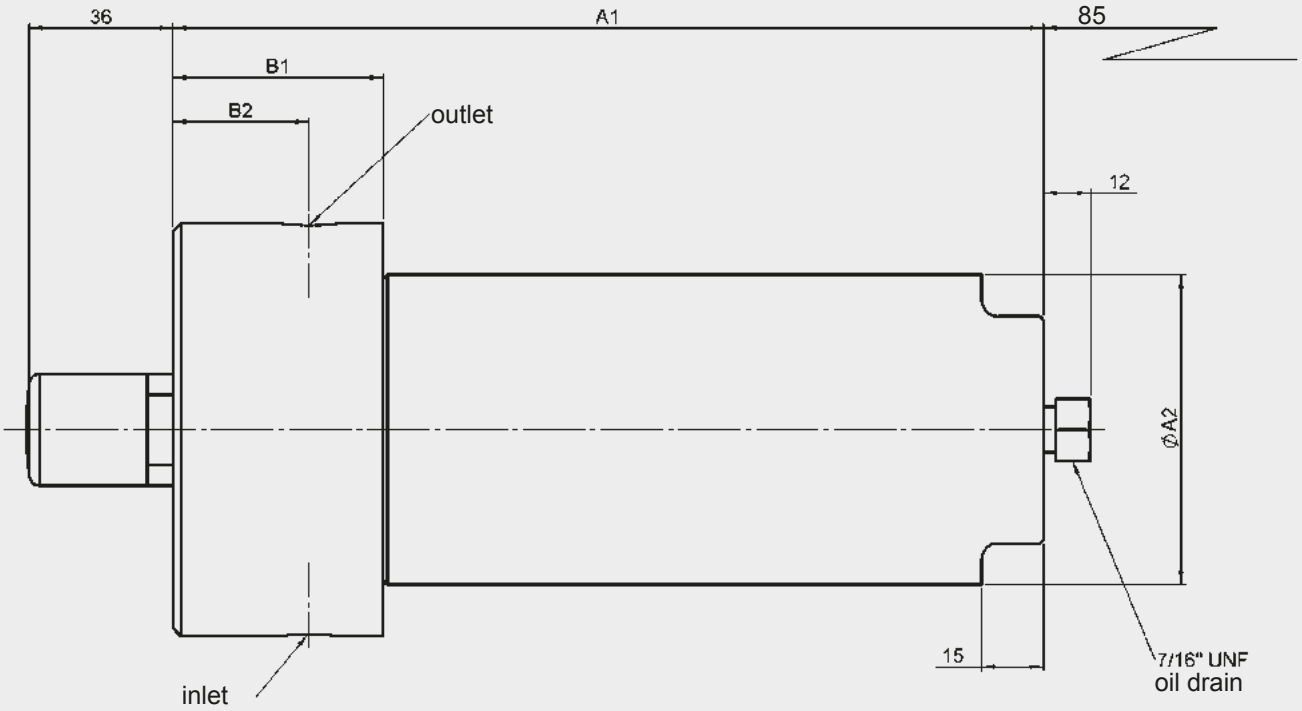


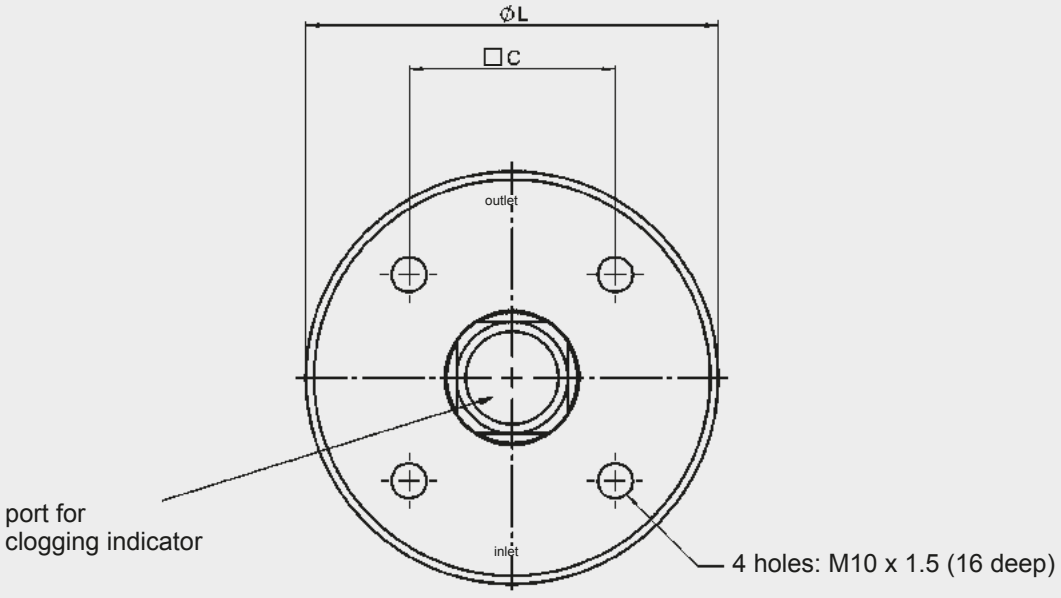


ACSSF	A1	A2	B1
30	205	63.5	52

Inline Filter ACSSF

Size 60 - 160





ACSSF	A1	A2	B1	B2 ±5mm	C	L
60	213	85	51	33	50	100
110	281	85	51	33	50	100
160	275	127	65	35	60	127

NOTE

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Subject to technical modifications.

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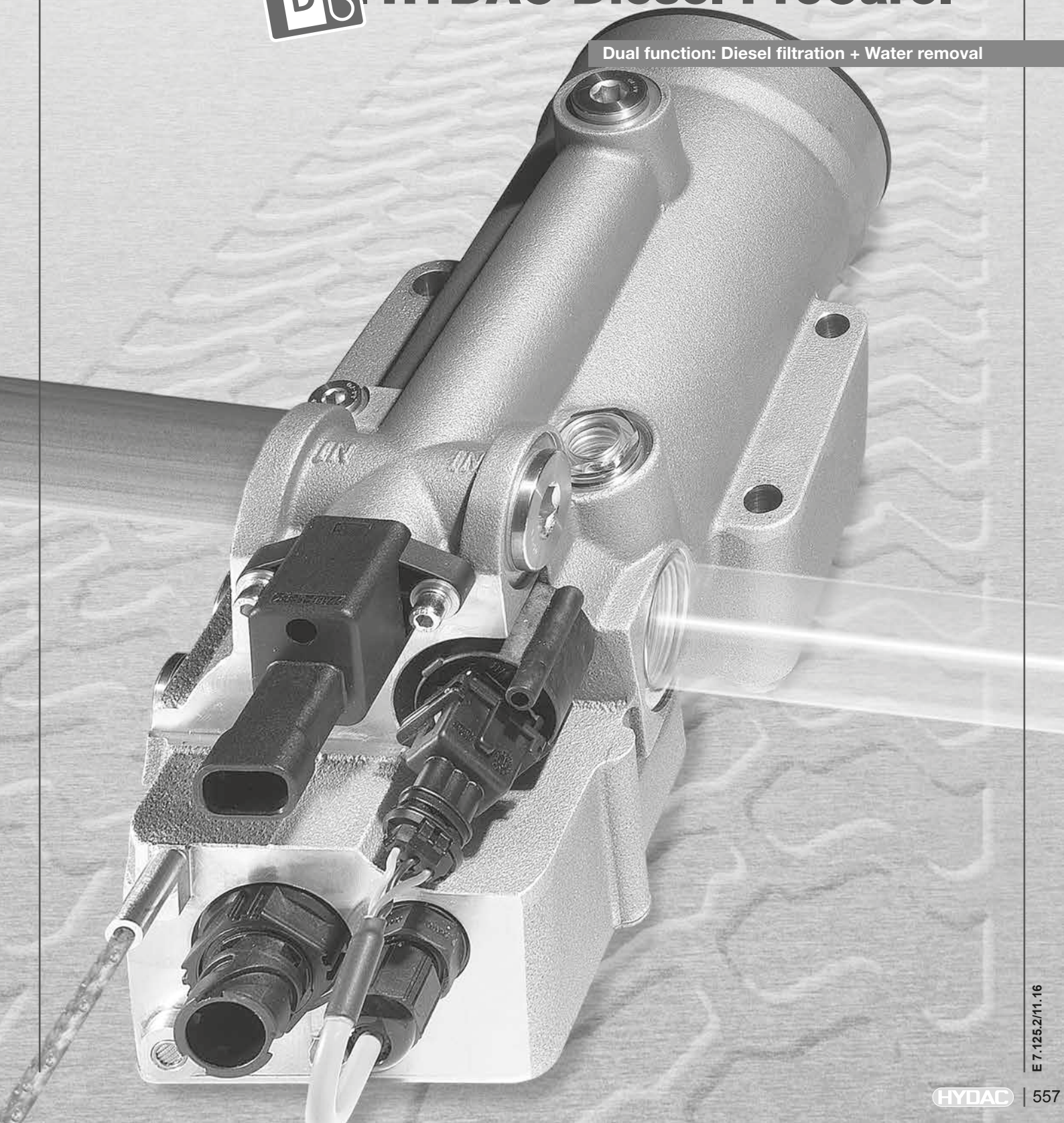
Pre-Filtration for Ultimate Cleanliness and Efficiency: HYDAC Diesel PreCare.

Dual function: Diesel filtration + Water removal



Diesel PreCare.

Recipe for success: Constant progress.

Continuous product improvement is our driving force.

It is through product innovation and efficient solutions that we meet the steadily growing demands of our customers as leaders in technology.

With over 8,000 employees and over 500 sales and service partners we are in close contact with our customers all over the world.

Innovative solution and sound design.

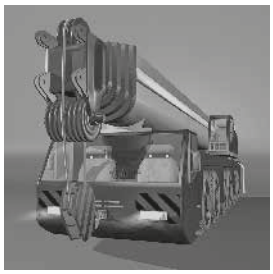
Mobile machines and commercial vehicles are subject to the toughest working conditions all over the world. To ensure smooth running of vehicles and to protect both the engine and the whole drive system from damage, optimum diesel fuel conditioning is particularly important. With its new Diesel PreCare, HYDAC offers a modern system for diesel filtration which protects vehicle manufacturers and operators from failures, breakdowns and expensive service interventions.

Our solution "HYDAC Diesel PreCare", is a cup filter system available in two versions:

- **Manual water discharge (BestCost design)**
  The conventional, operator-dependent solution.
- **Fully automatic discharge Plug & Play (High Tech design)**
  The innovative solution for fully automatic dewatering, independent of the operator, even during suction-side operation.

Outstanding performance data achieved by 2-stage water removal and superb filtration characteristics through the use of synthetic media - these are the special features of these filters.

Both systems are designed for use as pre-filters on the suction-side and as such protect all the pumps and components in the fuel system from water and contamination.



Innovative diesel filter. In black and white:

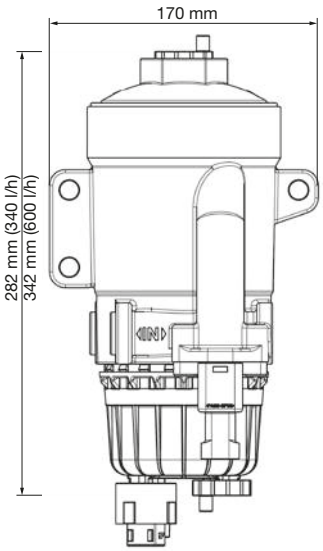
SPECIFICATIONS

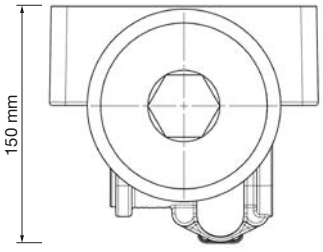
Flow rate:	BestCost design: up to 600 l/h HighTech design: up to 600 l/h
Temperature range:	BestCost design: -40 °C to +90 °C HighTech design: -20 °C to +90 °C
Nominal voltage:	24 V DC (option 12 V)
Rated power Fuel preheating:	300 W
Filtration rating:	Various (Standard: 10 µm)
Water separation efficiency:	> 95 % to ISO CD 16332
Operating pressure:	< 1 bar (suction-side application)

BestCost design

- Inlet / Outlet: M22x1.5 (others on request)
- Water discharge: manual drain plug
- Available in 2 sizes: HDP BC 340 and HDP BC 600

DIMENSIONS

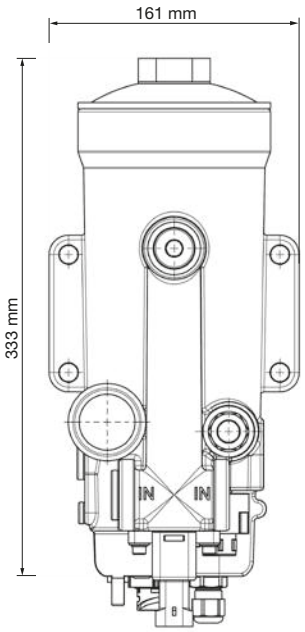


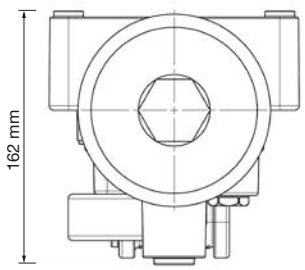


HighTech Design

- Inlet / Outlet: G 3/4 (others on request)
- Water discharge: Automatic discharge unit (including electronic control, safety valve, pump and water sensor)

DIMENSIONS



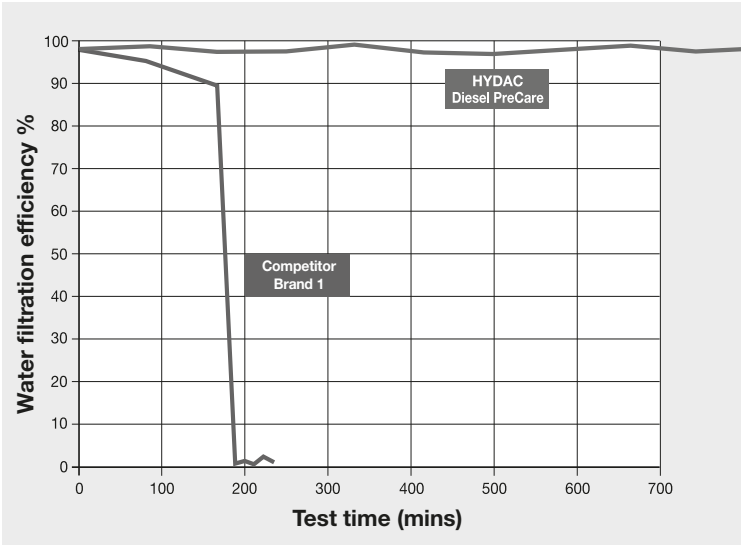


Reliable performance.

Unbeatable quality!

Compared to the competition, HYDAC Diesel PreCare shows clear advantages with regard to water removal and filtration performance.

Clean-side water removal using purely synthetic filter media combined with the hydrophobic barrier, has proved itself under the toughest conditions.



Competition: Massive water penetration
after a test time of just 180 minutes.

HYDAC Diesel PreCare:
Clean-side water removal using purely synthetic filter media combined with hydrophobic barrier has proved itself in comparison to the competition, and after a very long test time (730 minutes).

TÜV certified filtration system.

Both versions of the HYDAC Diesel PreCare Filtration System are certified by TÜV .

HYDAC Filtertechnik GmbH

Fuel filter, 340 l/h

Fuel filter, 600 l/h

Test of fuel / water separation efficiency according to ISO CD 16332 (edition of 15.05.2009) and filtration effeciency using particle counting and contaminant retention capacity according ISO 19438:2003, conducted at 300 / 600 l/h filter element

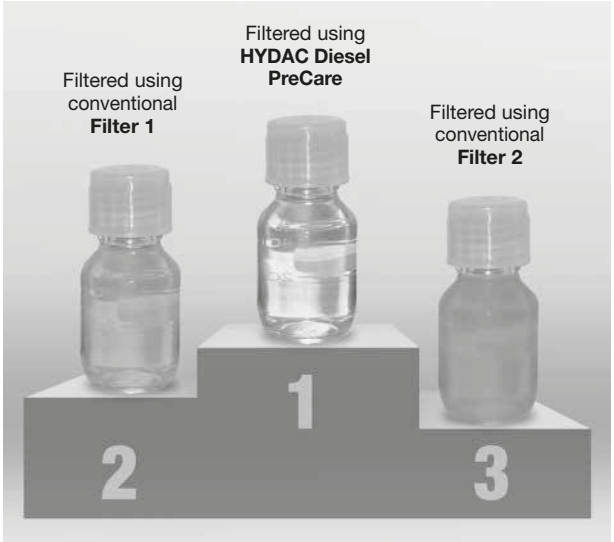
For further information, please contact
Technical Sales, HYDAC Filtertechnik GmbH.
Tel.: +49 6897-509-1438
E-Mail: fuel@hydac.com

HYDAC Diesel PreCare Product benefits.

- Low residues of diesel left in the filter element when servicing
- Compact design
- Reliable radial seal
- Captive seal design
- Visual analysis of the contamination possible (Rust, metallic swarf, unusual deposits, which require further investigation)
- Protection from imitations by means of Quality Protection
- Prevents first-line contamination by hard particles
- Prevents ingress of contamination as a result of corrosion

Reliable machine availability.

- Resulting from first-class contamination retention
- Due to highly effective and stable water removal on the clean-side for the entire life of the filter element
- Life-long efficiency, because at element change, the water removal stage is always replaced
- Due to the excellent water removal, (achieved by using first class materials) of >95 % to ISO/CD 16332



This comparison of three diesel samples after filtration provides the proof. Even with the naked eye the exceptional cleanliness of the diesel **filtered with the HYDAC Diesel PreCare** is obvious.

Diesel PreCare: The Clear

Guaranteed HYDAC quality
thanks to HYDAC Quality Protection.

TÜV Certification

Best cold start characteristics
due to low pressure drop
and cup filter design

Environmentally responsible
uses incinerable elements.

Outstanding water removal
achieved by the two-stage system.

Link between Diesel Fuel and Diesel Power.

High performance stability

Efficient water removal
over the entire service life.

Element change = Complete overhaul

The water removal stage built into the element
is replaced when the element is changed.

Extremely easy to maintain

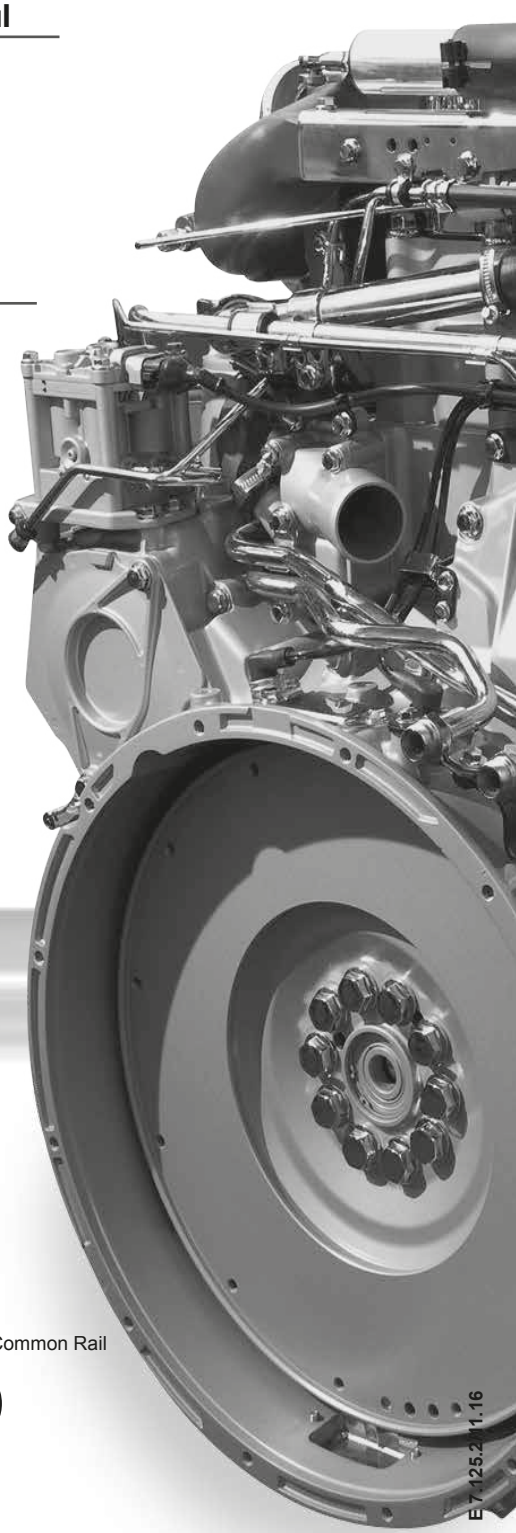
due to quick and simple element change.

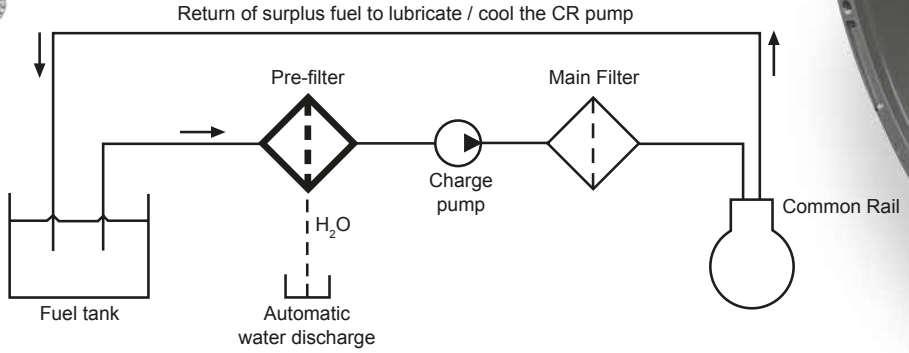
Flexible in use

due to inlet/outlet options

Ready-to-use at any time

self-sufficient system, Plug & Play



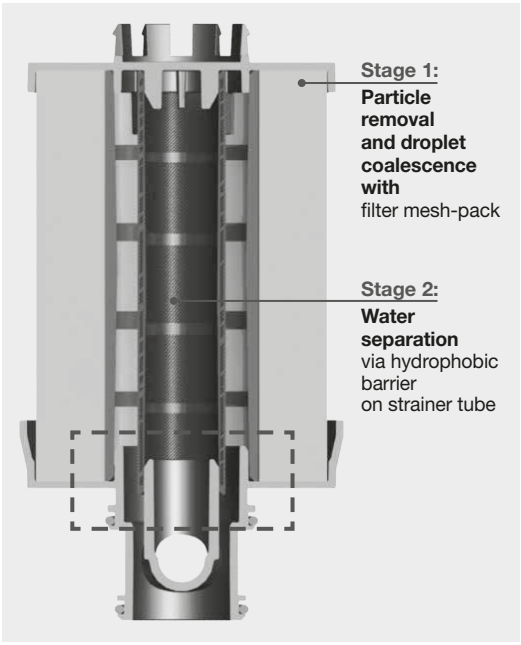


E 7.125.2/11.16

Compact and Easy-to-Service.

New element technology: Fuelmicron Filter element with 2-stage system.

Element construction



Particle removal and droplet coalescence (1st Stage)
By using purely synthetic filter media, a high contamination retention capacity and steady coalescence is guaranteed.

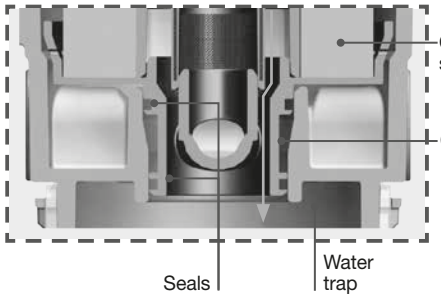
Water removal (2nd Stage)
A hydrophobic barrier on the strainer tube guarantees reliable separation of the water droplets formed during Stage 1.

Filter element Fuelmicron

A new type of filter element in two-stage design which combines outstanding dewatering irrespective of the contamination level with excellent particle filtration at the same time.

Unique filter element design.

The Diesel PreCare in the BestCost design has a filter element with a **unique end cap design which is integral to its function.**



Function:
The end cap has separate fluid pathways so that the cleaned fuel flows to the clean side (ring channel in the filter housing), while the separated water collects in the water trap.

Increased operating reliability:
achieved through strict separation of contaminated and clean sides.

No risk of contamination at the fluid outlet of the housing during element change
because the clean-side and inlet-side channels are vertically parallel to each other.

Integrated Quality Protection: Highest level of reliability.

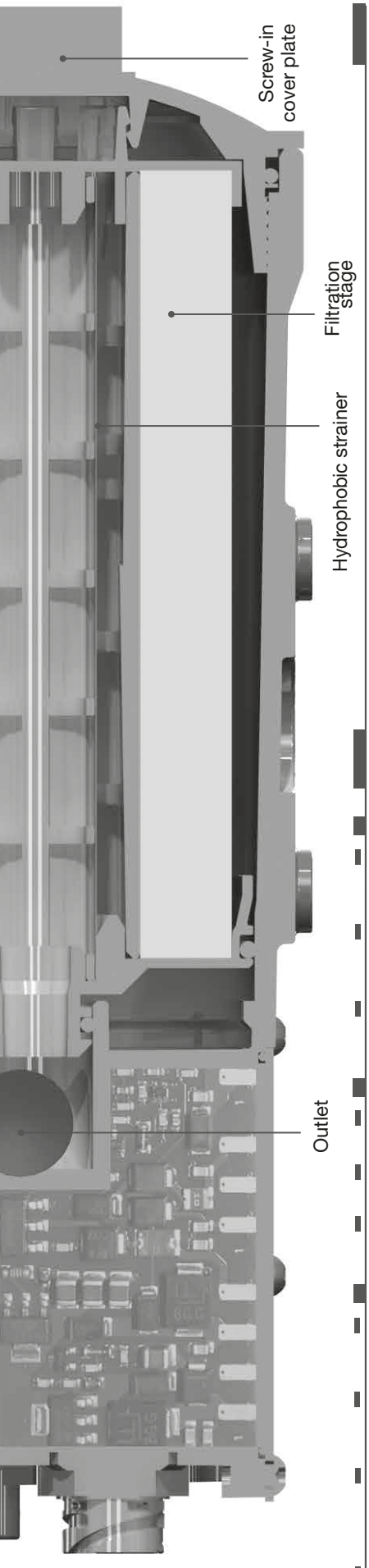
Unless an original HYDAC element is fitted in the housing, then the full function of the filter is not guaranteed

because element end cap which is integral to its function will be missing.

We prevent inferior quality imitation elements from being fitted because the element end cap design is critical to its function, and has **Quality Protection**. As a consequence, we can always guarantee our customers proven and f irst-class HYDAC Quality.

Ultimate system protection and guaranteed operating reliability achieved through guaranteed spare part quality.

Innovative Technology



Easy to service and environmentally sound.

Easy to service as the element can be changed in 3 simple steps:

1. Unscrew clogged element
2. Fit O-ring to new element and cover plate
3. Screw in new element

We are helping to protect our environment by using **fully incinerable filter elements (no metallic components).**

HYDAC Diesel PreCare Customer Benefits.

General:

- **Great flexibility with regard to installation position**
  since inlet and outlet can be in either direction
- **Consistent dewatering over the entire life of the filter element**
  since water is removed on the clean side
- **Robust design**
  thanks to aluminium housing

BestCost design:

- **Low investment costs**
  due to cost-optimized design
- **Economical and technically reliable operation**
  as a result of long element service life
- **Water sensor and fuel preheating available as options**

HighTech design:

- **Reliable dewatering**
  thanks to automatic water discharge, even during suction-side operation
- **Small installation space required,**
  since lower section of filter does not have to be accessible
- **Simple adaptation to the on-board power supply (Plug & Play)**
  through the use of independently controlled water discharge
- **Ultimate in weather protection**
  Robust design for the rough, long-term site operations

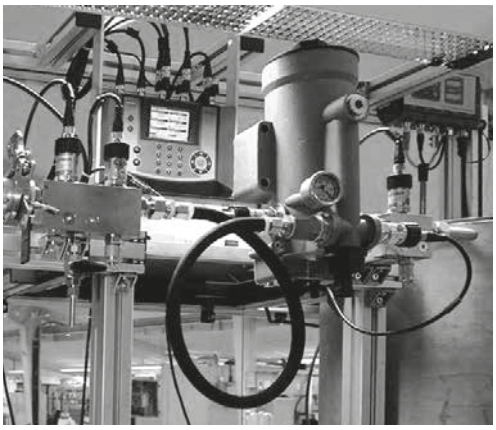
Development on a scientific basis.

In developing filter solutions to suit specific applications, HYDAC leaves nothing to chance. In addition to using the most up-to-date programs from CAD to FEM to make their designs, HYDAC invests heavily in the most modern research and test laboratories. Based on the results of scientific tests, efficient filters can be produced and tested systematically.

Development of filter and element to suit the specific application.

Tensiometers, Karl Fischer titration equipment, rinsing cabinets to determine component cleanliness, test rigs for multipass tests and water removal efficiency are in use on a daily basis.
These are just some of our in-house capabilities for testing and improving our products in addition to numerous other test and measuring equipment.

With filters which have passed through these test laboratories, you can be sure of success.



HYDAC Laboratory and test rig
to determine the efficiency of water removal.

Oil analysis in the HYDAC Laboratory at company headquarters.

Just one example of the numerous filter testing procedures: **Multipass test rig.**

NOTES

NOTE

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Subject to technical modifications.

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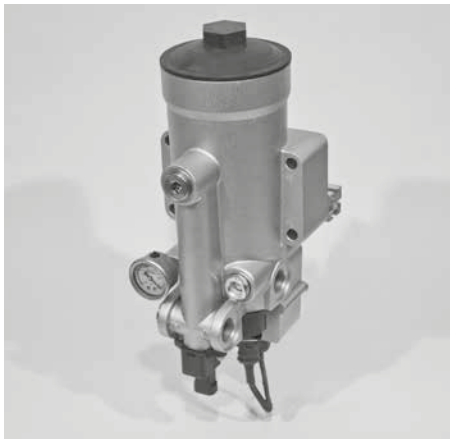
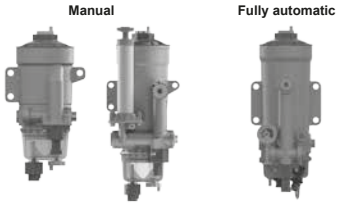


Diesel PreCare HDP
up to 1800 l/h



1. TECHNICAL SPECIFICATIONS

1.1 FILTER

The Diesel PreCare is an innovative system for diesel prefiltration which protects vehicle manufacturers and operators against breakdowns, downtime and expensive service calls. The HYDAC solution "Diesel PreCare" is available as a cup filter in two versions:

- Manual water discharge (BestCost) - the conventional, operator-dependent solution
- Fully automatic water discharge Plug&Play (HighTech) - the innovative solution for fully automatic dewatering, independent of the operator, even during suction side operation.

1.2 FILTER ELEMENTS

The filter element Dieselmicron® features 2-stage water separation.

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO CD 16332
- ISO 19438

1.3 FILTER SPECIFICATIONS

Operating pressure	< 1 bar absolute
Flow rate	BestCost: up to 1800 l/h HighTech: up to 1800 l/h
Mounting thread	BestCost: M22x1.5; M27x2 HighTech: G ¾ (others on request)
Temperature range	BestCost: -40 °C to +90 °C HighTech: -20 °C to +90 °C (extended temperature range on request)
Nominal voltage	24 V DC (optional 12 V)
Rated output Fuel pre-heating	up to approx. 300 W
Water separation efficiency	>95% in accordance with ISO CD 16332

1.4 SPECIAL MODELS AND ACCESSORIES

- Water sensor (present as standard on HDP "HighTech")
- Fuel pre-heating
- Clogging indicator (only HDP "HighTech")
- Multiple filter module (2-fold or 3-fold version) for higher service life or higher flow rate
- With integrated hand pump or electric pump (only HDP 600 BestCost and multiple modules)
- Others on request!

1.5 SPARE PARTS

See Original Spare Parts List

1.6 CERTIFICATES AND APPROVALS

On request

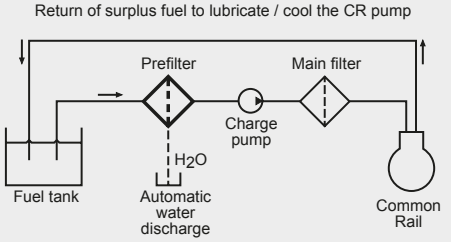
1.7 COMPATIBILITY WITH FUELS

Diesel, biodiesel (B0-B100), (non-conductive)
Others on request.

1.8 MAINTENANCE INSTRUCTIONS

- Only for suction-side operation
- Filter housings must be earthed.
- When using electrical clogging indicators, the system must be disconnected from the power source before removing the clogging indicator plug.
- Due to the likelihood of freezing, there must be no restriction in the drain line. This is to compensate for the expansion.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

HDP KF1 340 BC1 10 W 1.X /-AS1

2.1 COMPLETE FILTER "BESTCOST" (MANUAL DESIGN)

Filter type
HDP

Filter material
KF1 Dieselmicron®

Size
HDP: 340, 600

Evolution stage
BC1

Filtration rating
10 µm standard, fully synthetic
30 µm fully synthetic
7 µm high performance fibre mix (glass/synthetic)

Type of clogging indicator
W no connection for a clogging indicator

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
ASx with integrated water sensor
Hx with integrated fuel pre-heating
PHx with integrated hand pump (only HDP 600 BC1)
PEx with electric pump (only HDP 600 BC1)
Kxxx customer-specific

2.2 SPARE ELEMENT "BESTCOST"

0340 BC1 010 KF1 /-Kxxx

Size
0340, 0600

Evolution stage
BC1

Filtration rating in µm
010 standard, fully synthetic
030 fully synthetic
007 high performance fibre mix (glass/synthetic)

Filter material
KF1 Dieselmicron®

Supplementary details
Kxxx (for descriptions, see point 2.1)

2.3 COMPLETE FILTER "HIGHTECH" (FULLY AUTOMATIC DESIGN)

HDP KF1 600 HT1 10 UED 1.X /-AS1

Filter type
HDP

Filter material
KF1 Dieselmicron®

Size
HDP: 600

Evolution stage
HT1

Filtration rating
10 µm standard, fully synthetic
30 µm fully synthetic
7 µm high performance fibre mix (glass/synthetic)

Type of clogging indicator
A steel blanking plug in indicator port
UED vacuum gauge

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
AS1 Standard: with integrated water sensor
H1 with integrated fuel pre-heating
Kxxx customer-specific

2.4 SPARE ELEMENT "HIGHTECH"

600 HT1 010 KF1 /-Kxxx

Size
0600

Evolution stage
HT1

Filtration rating in µm
010 standard, fully synthetic
030 fully synthetic
007 high performance fibre mix (glass/synthetic)

Filter material
KF1 Dieselmicron®

Supplementary details
Kxxx (for descriptions, see point 2.3)

2.5 REPLACEMENT CLOGGING INDICATOR

VMF 1 UED . X

Type
VMF Thread G 1/8

Pressure setting
1 standard -1 to 0 bar (others on request)

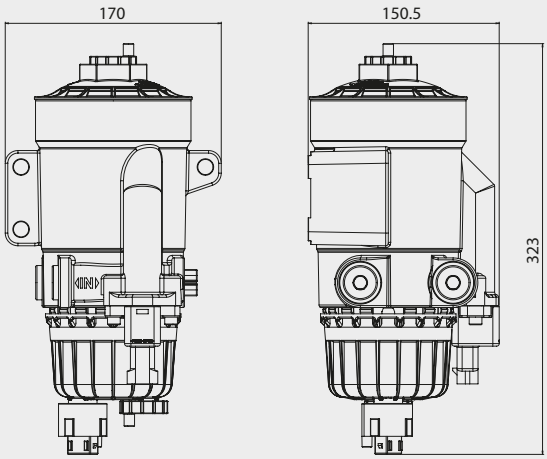
Type of clogging indicator
(see Point 2.3)

Modification number
X the latest version is always supplied

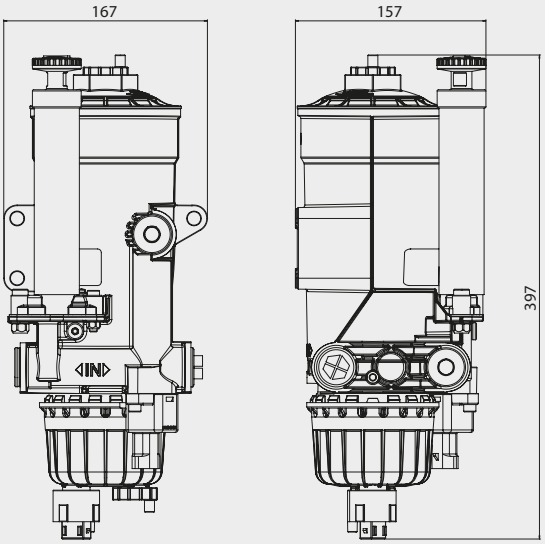
3. DIMENSIONS

3.1. MANUAL DESIGN

HDP 340 "BestCost"

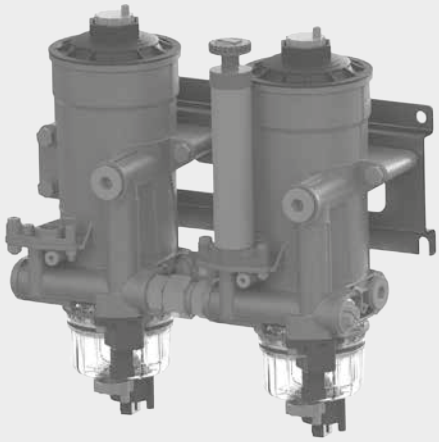


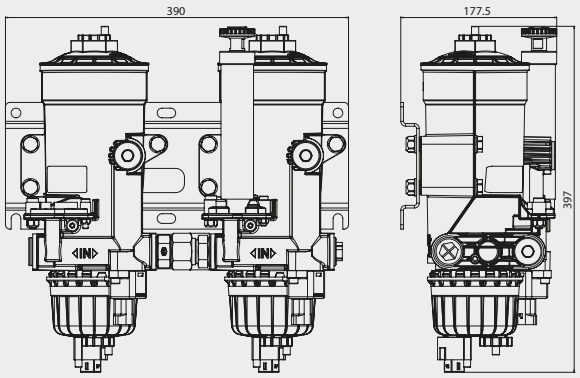
HDP 600 "BestCost"



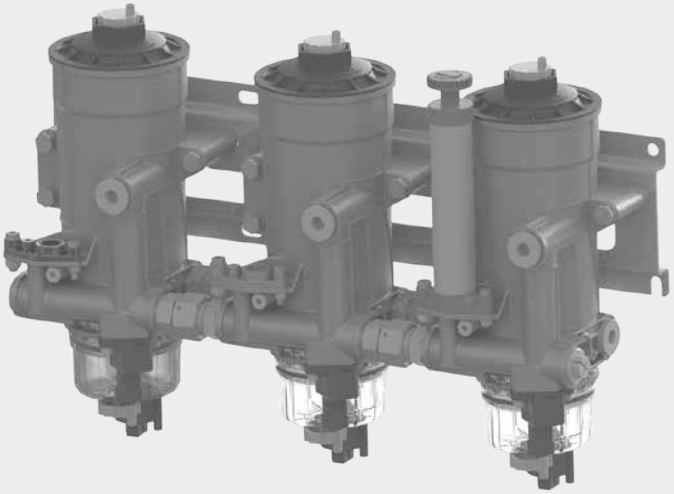
3.2. MULTI-EXTENDABLE

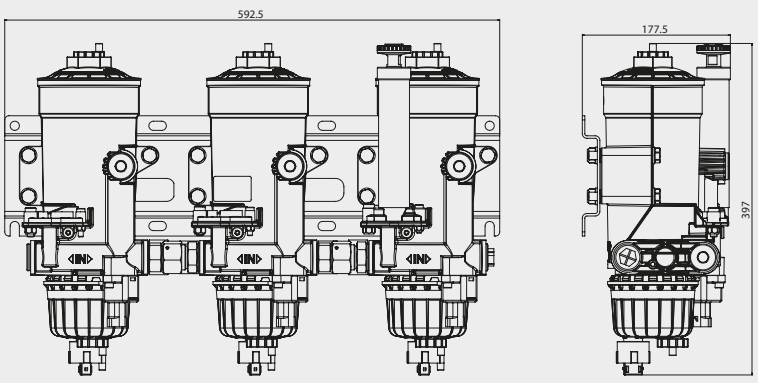
HDP 1200 "BestCost"





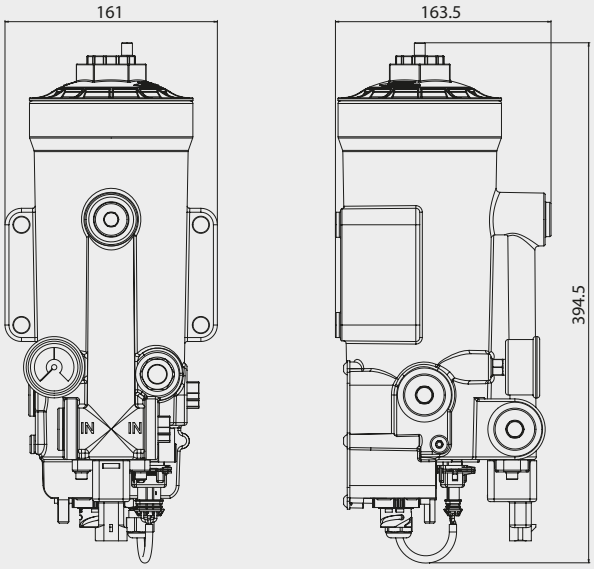
HDP 1800 "BestCost"



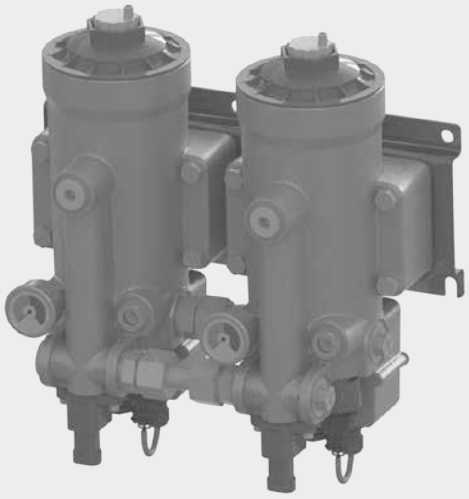


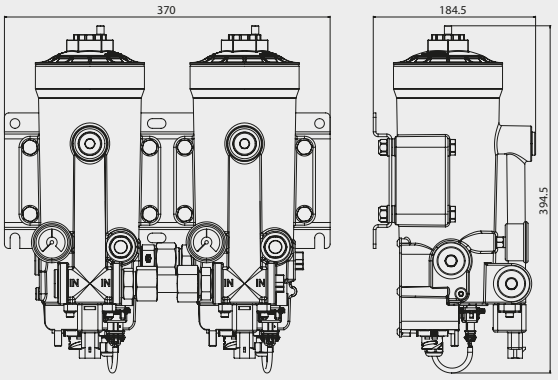
HDP	340 BC	600 BC	1200 BC	1800 BC
Weight incl. element [kg]	2.30	3.10	9.10	14.00

3.3. FULLY AUTOMATIC DESIGN
HDP 600 "HighTech"

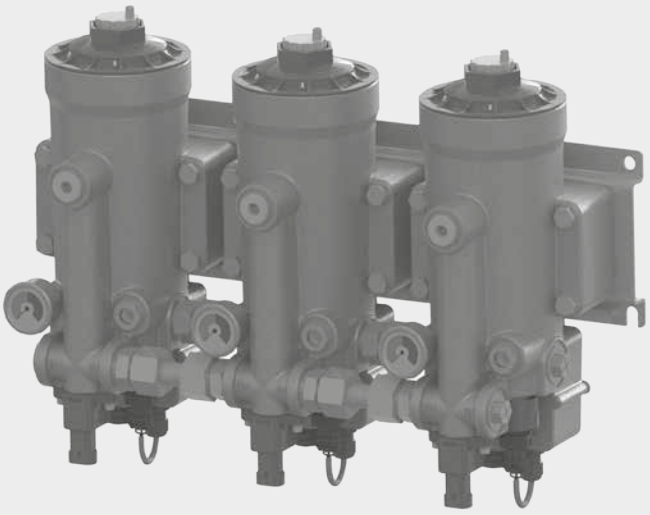


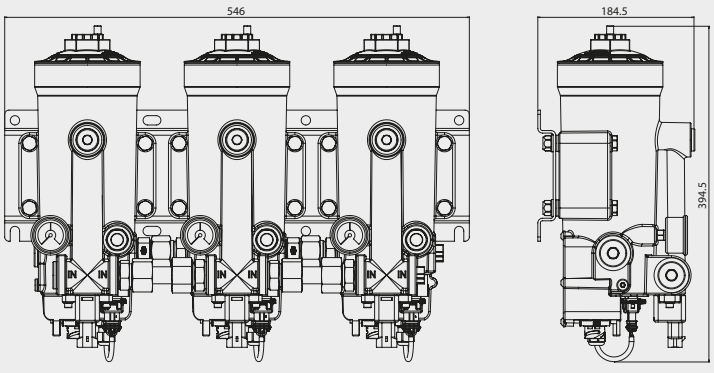
3.4. MULTI-EXTENDABLE
HDP 1200 "HighTech"





HDP 1800 "HighTech"





HDP	600 HT	1200 HT	1800 HT
Weight incl. element [kg]	4.25	11.00	17.00

NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

HYDAC Filtertechnik GmbH
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Internet: www.hydac.com
E-Mail: filter@hydac.com

Series

Diesel MainCare HDM Diesel Fine Filtration for Engine-Side Installation

HDM 170

HDM 340

1. TECHNICAL SPECIFICATIONS

1.1 FILTER

Extremely high dirt holding capacity and filtration ratings which meet the requirements of modern injection systems are core features of our HYDAC Diesel MainCare (HDM) Standard series.

Easy installation and maintenance as well as excellent filtration performance for engine-side installation ensure this is the filter of choice for exacting end users.

The filter element is completely incinerable and the materials are used in an ecologically responsible manner.

1.2 FILTER ELEMENTS

The filter element (Dieselmicron®) is notable for its fully synthetic filter media.

For us, outstanding service life in conjunction with maximum filter efficiency is just as important as demonstrating excellent cold start characteristics and compatibility with all conventional diesel fuels.

In comparison to commonly available fuel filters, HYDAC Diesel MainCare filters are significantly more compact in size without any loss in service life.

Constant monitoring of the filter performance according to ISO 19438 and stringent criteria regarding component cleanliness are considered essential for state-of-the-art fine filters.

1.3 SEALS

Perbunan (=NBR)

1.4 INSTALLATION

Main filtration, diesel filtration

1.5 SPARE PARTS

See Original Spare Parts List

1.6 CERTIFICATES AND APPROVALS

On request

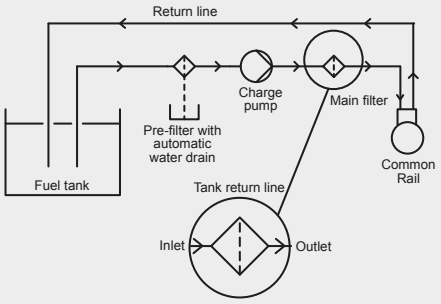
1.7 COMPATIBILITY WITH FUELS

Diesel, biodiesel (B0-B100), (non-conductive)

1.8 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

HDM KF1 340 EC1 4 W 1 . X /-Kxx

2.1 COMPLETE FILTER "ECONOMY"

Filter type
HDM

Filter material
KF1 Dieselmicron®

Size of filter or element
HDM 170, 340

Evolution stage
EC1

Filtration rating
4 µm standard, fully synthetic

Type of clogging indicator
W no connection for a clogging indicator

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
Kxx customer-specific

2.2 SPARE ELEMENT "ECONOMY"

0340 EC1 004 KF1 /-Kxx

Size
0170, 0340

Evolution stage
EC1

Filtration rating
4 µm standard, fully synthetic

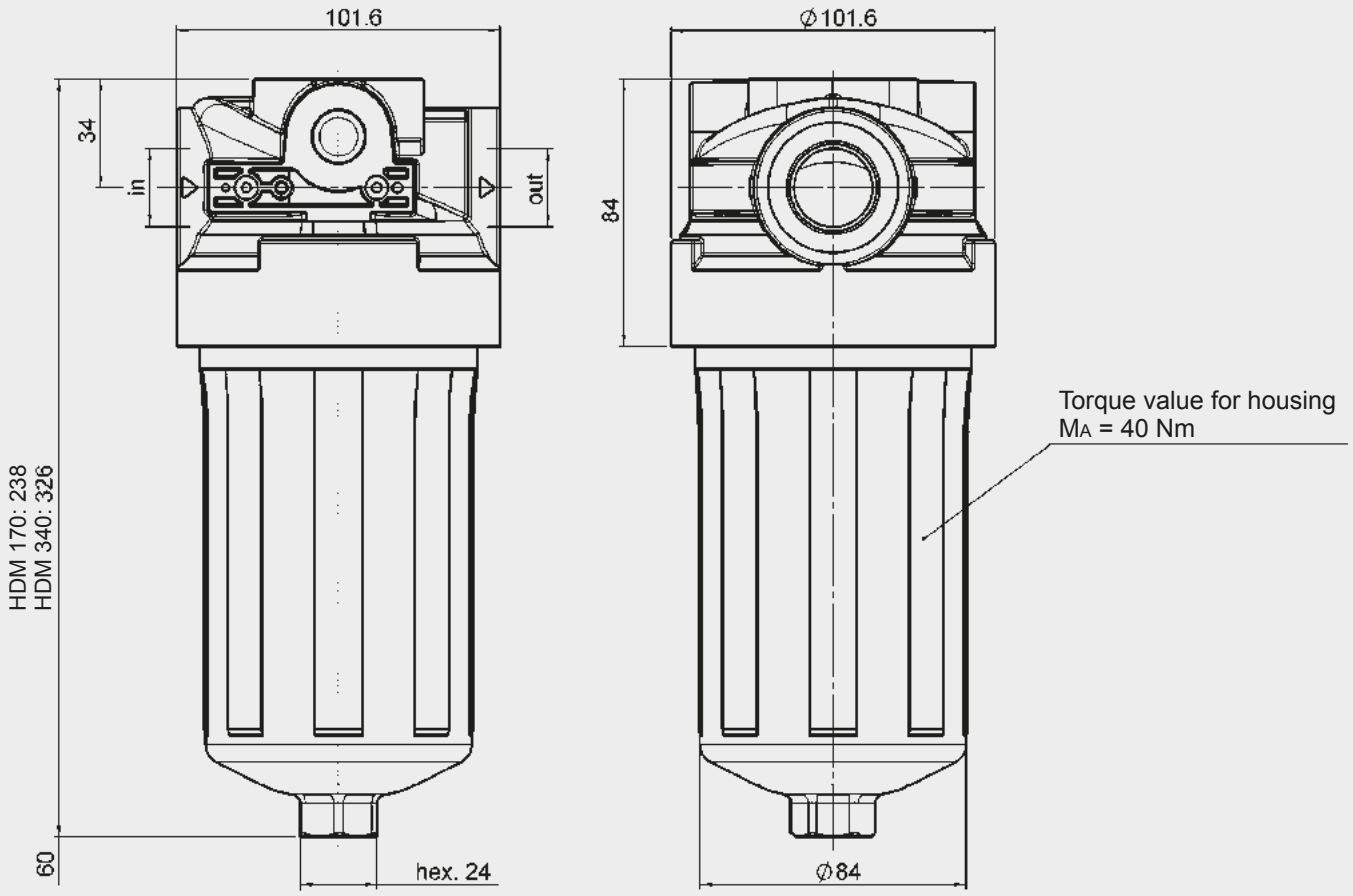
Filter material
KF1 Dieselmicron®

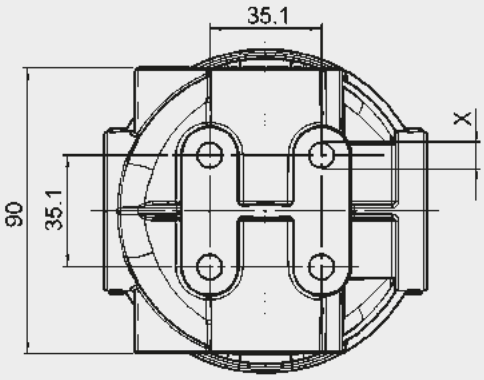
Supplementary details
Kxx customer-specific

Other sizes and model codes on request!

3. DIMENSIONS

HDM 170, 340





HDM	Weight incl. element [kg]
170	1.46
340	1.74

NOTES

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E-Mail: filter@hydac.com

Customer specification

Diesel MainCare HDM Diesel Fine Filtration for Engine-Side Installation

1. DESCRIPTION

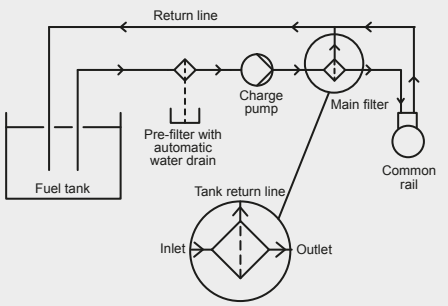
1.1 FILTER

Today's injection pressures of up to 3000 bar call for very high fuel cleanliness levels. Effective fine filtration is crucial to preserve the injection components. HYDAC Diesel MainCare was developed as a cup filter system to meet the stringent demands for fine filtration and achieves a cleanliness class of 12/9/6 even when subjected to engine vibration and load cycle changes. High capacity filter elements designed for specific applications and highly compact, complete filters form the basis of our products. Our products are also compatible with all standard mineral fuels and bio-fuels and demonstrate sustainability through the use of metal-free elements. Excellent cold-start characteristics, even when fuel has already thickened up, completes the picture.

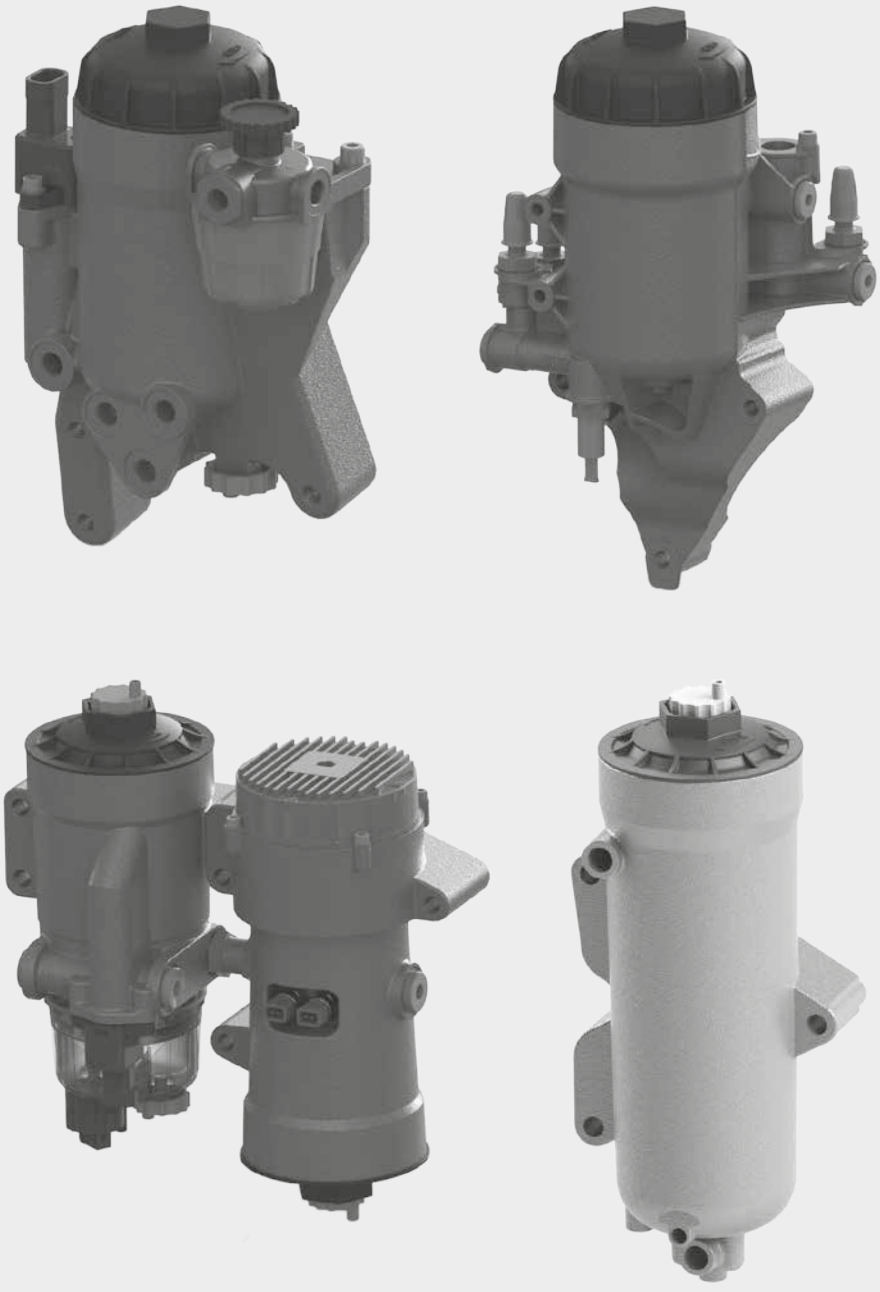
1.2 PRODUCT ADVANTAGES

- Fitted with the latest Dieselmicron® element technology
- Increased operational reliability due to high-performance filter media
- Extremely easy to service due to simple, quick element changes
- Environmentally friendly due to incinerable filter elements
- Versatile in use due to flexible types of connection
- Cost-effective and efficient pipe installation due to optimised connection options in the housing

Symbol for hydraulic systems



Examples of customised applications:



Please contact HYDAC Head oOfice or your local area office for further advice.

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NOTES

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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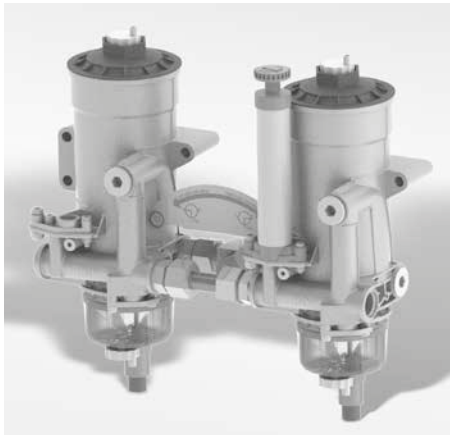
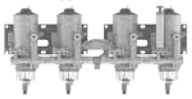


Change-Over Diesel PreCare HDPD
up to 1800 l/h

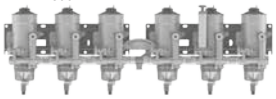
Manual
HDPD 340

HDPD 600

HDPD 1200

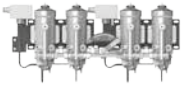


HDPD 1800

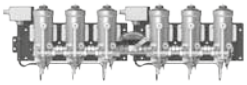


Fully automatic
HDPD 600

HDPD 1200



HDPD 1800



1. TECHNICAL SPECIFICATIONS

1.1 FILTER

The change-over Diesel PreCare is a modern system for diesel prefiltration which protects vehicle manufacturers and operators against breakdowns, downtimes and expensive service calls.

The change-over "Diesel PreCare" filters consist of a module with multiple filter housings. They are connected by a ball change-over valve with single-lever operation. The HYDAC solution is available in two versions:

- Manual water discharge (BestCost) - the conventional, operator-dependent solution
- Fully automatic discharge Plug&Play (HighTech) - the innovative solution for fully automatic dewatering, independent of the operator, even during suction-side operation.

1.2 FILTER ELEMENTS

HYDAC filter elements Dieselmicron® are validated and their quality is constantly monitored according to the following standards:

- ISO CD 16332
- ISO 19438

1.3 FILTER SPECIFICATIONS

Operating pressure	< 1 bar absolute
Flow rate	BestCost: up to 1800 l/h HighTech: up to 1800 l/h
Mounting thread	BestCost: M22x1.5; M27x1.5 HighTech: G ¾ (others in request)
Temperature range	BestCost: -40 °C to +90 °C HighTech: -20 °C to +90 °C (extended temperature range on request)
Nominal voltage	24 V DC (optional 12 V)
Rated output for fuel pre-heater	up to approx. 300 W
Water separation efficiency	>95% in accordance with ISO CD 16332

1.4 SPECIAL MODELS AND ACCESSORIES

- Water sensor (present as standard on HDPD "HighTech")
- Fuel pre-heater
- Clogging indicator (only HDPD "HighTech")
- With integrated hand pump or electric pump (only HDPD 600 BestCost and multiple modules)
- Others on request!

1.5 SPARE PARTS

See Original Spare Parts List

1.6 CERTIFICATES AND APPROVALS

On request

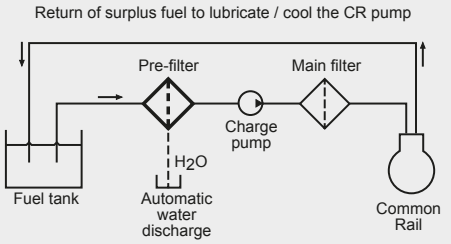
1.7 COMPATIBILITY WITH FUELS

Diesel, biodiesel (B0-B100), (non-conductive)
Others on request.

1.8 MAINTENANCE INSTRUCTIONS

- Only for suction-side operation
- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Due to the likelihood of freezing, there must be no restriction in the drain line. This is to compensate for the expansion.

Symbol for hydraulic systems



2. MODEL CODE (also order example)

HDPD KF1 340 BC1 10 W 1.X /-AS1

2.1 COMPLETE FILTER "BESTCOST" (MANUAL DESIGN)

Filter type
HDPD

Filter material
KF1 Dieselmicron®

Size
HDPD: 340 (=left side 1x HDP 340, right side 1x HDP 340)
600 (=left side 1x HDP 600, right side 1x HDP 600)
1200 (=left side 2x HDP 600, right side 2x HDP 600)
1800 (=left side 3x HDP 600, right side 3x HDP 600)

Evolution stage
BC1

Filtration rating in µm
10 µm standard, fully synthetic
30 µm fully synthetic
7 µm high performance mixed media (glass/synthetic)

Type of clogging indicator
W no connection for a clogging indicator

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
ASx with integrated water sensor
Hx with integrated fuel pre-heater
PHx with integrated hand pump (only HDPD 600 BC1)
PEx with integrated electric pump (only HDPD 600 BC1)
Kxxx customer-specific

2.2 SPARE ELEMENT "BESTCOST"

0340 BC1 010 KF1 /-Kxxx

Size
0340, 0600

Evolution stage
BC1

Filtration rating in µm
010 standard, fully synthetic
030 fully synthetic
007 high performance mixed media (glass/synthetic)

Filter material
KF1 Dieselmicron®

Supplementary details
Kxxx (for descriptions, see point 2.1)

2.3 COMPLETE FILTER "HIGHTECH" (FULLY AUTOMATIC DESIGN)

HDPD KF1 600 HT1 10 UED 1.X /-AS1

Filter type
HDPD

Filter material
KF1 Dieselmicron®

Size
HDPD: 600 (=left side 1x HDP 600, right side 1x HDP 600)
600 (=left side 1x HDP 600, right side 1x HDP 600)
1200 (=left side 2x HDP 600, right side 2x HDP 600)
1800 (=left side 3x HDP 600, right side 3x HDP 600)

Evolution stage
HT1

Filtration rating in µm
10 µm standard, fully synthetic
30 µm fully synthetic
7 µm high performance mixed media (glass/synthetic)

Type of clogging indicator
A Steel screw plug in indicator port
UED Vacuum gauge

Type code
1

Modification number
X the latest version is always supplied

Supplementary details
ASx standard: with integrated water sensor
Hx with integrated fuel pre-heater
Kxxx customer-specific

2.4 SPARE ELEMENT "HIGHTECH"

600 HT1 010 KF1 /-Kxxx

Size
0600

Evolution stage
HT1

Filtration rating in µm
010 standard, fully synthetic
030 fully synthetic
007 high performance mixed media (glass/synthetic)

Filter material
KF1 Dieselmicron®

Supplementary details
Kxxx (for descriptions, see point 2.3)

2.5 REPLACEMENT CLOGGING INDICATOR

VMF 1 UED . X

Type
VMF Thread G 1/8

Pressure setting
1 standard -1 to 0 bar (others on request)

Type of clogging indicator
(see Point 2.3)

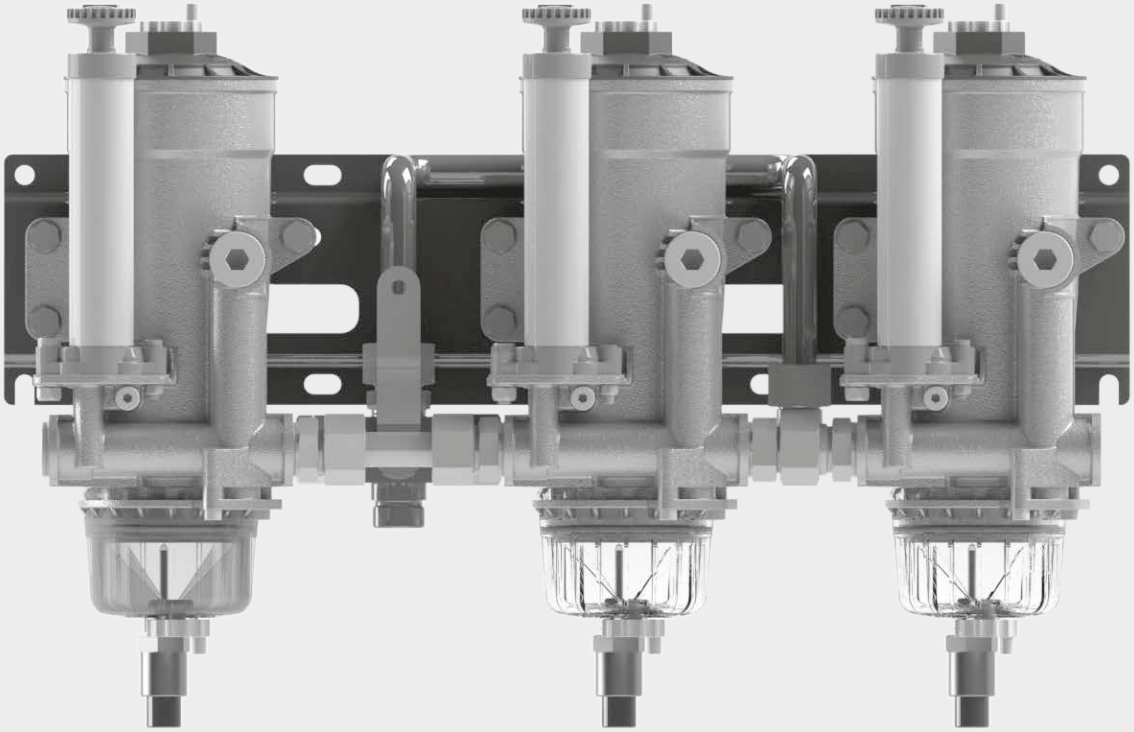
Modification number
X the latest version is always supplied

Other standard models on request

3. SPECIAL MODELS

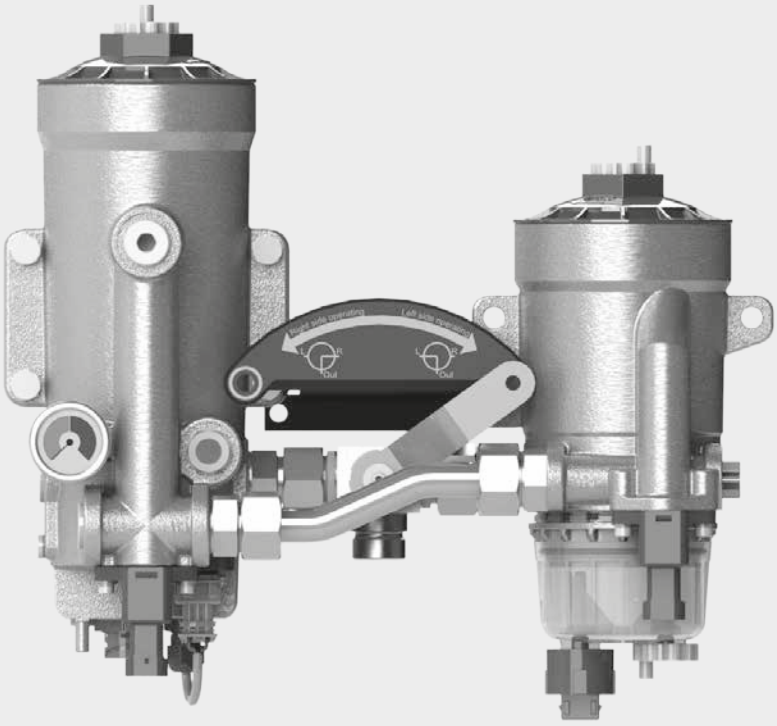
Further variations of our "standard" change-over filters HDPD are possible:

3.1. DIFFERENT NUMBER OF FILTERS ON EACH SIDE



Order example: HDPD KF1 600/1200 BC1 10 W 1.0 /-PH1

3.2. DIFFERENT EVOLUTION STAGES ON EACH SIDE



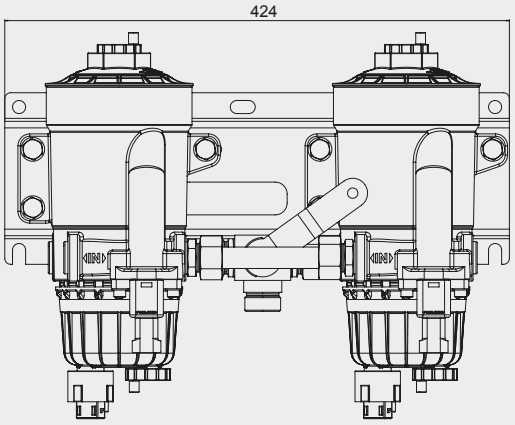
Order example: HDPD KF1 600/340 HT1/BC1 10 W 1.0 /-AS1

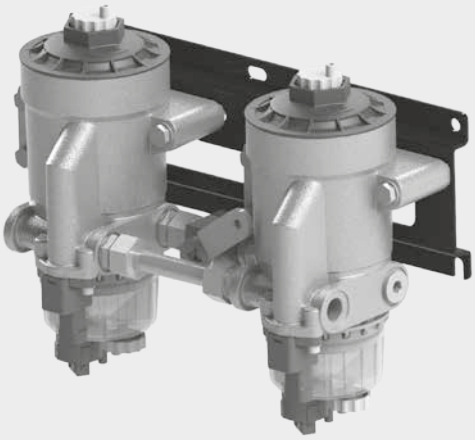
Please contact HYDAC Head Office or your local area office for further advice.

4. DIMENSIONS

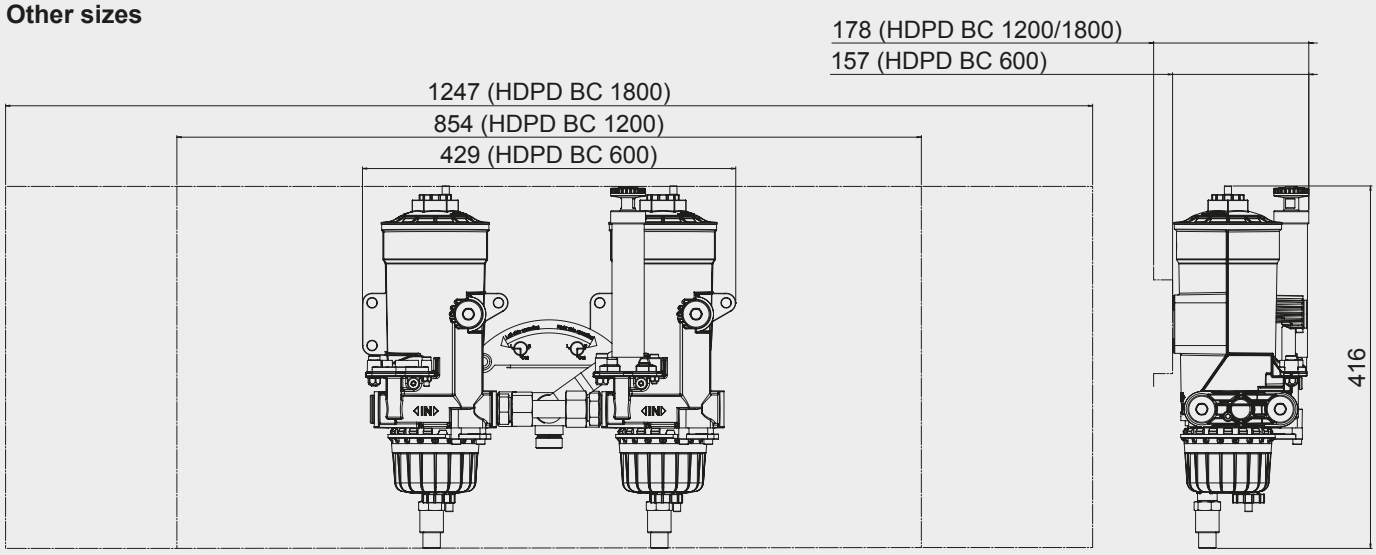
4.1. MANUAL DESIGN

HDPD 340 "BestCost"



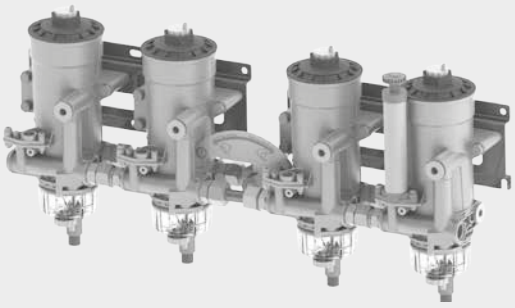


Other sizes



HDPD KF1 600 BC1 ...

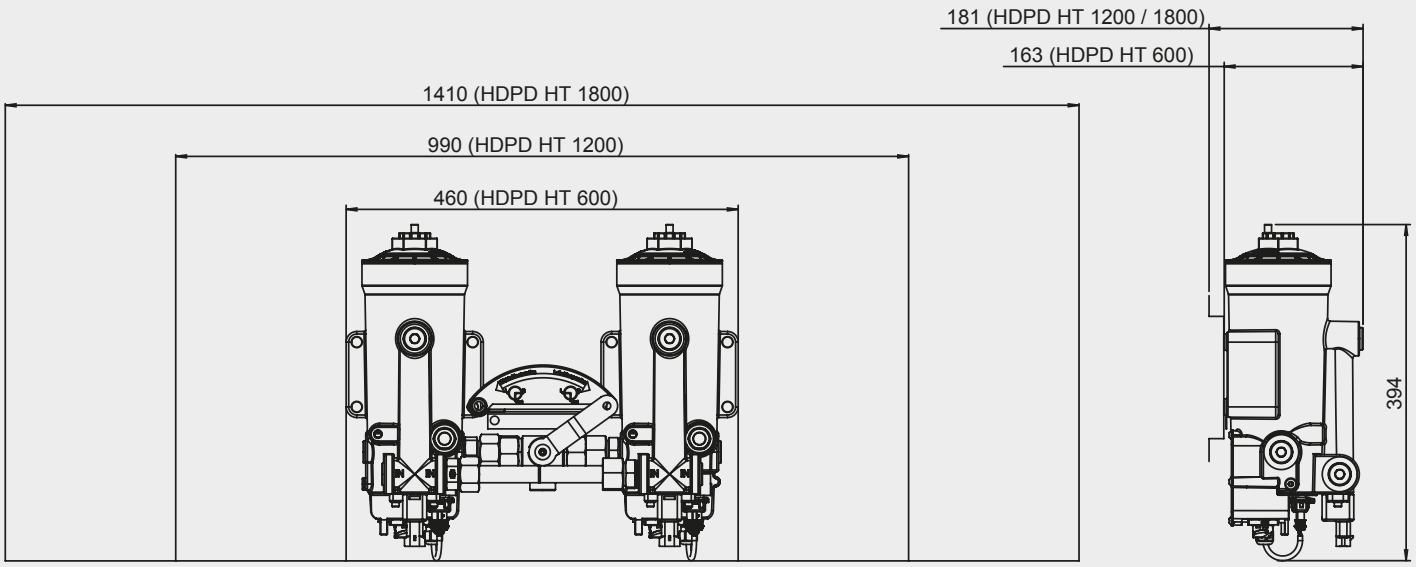
HDPD KF1 1200 BC1 ...

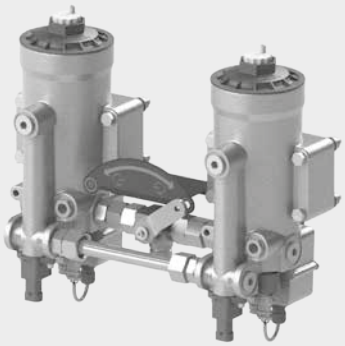


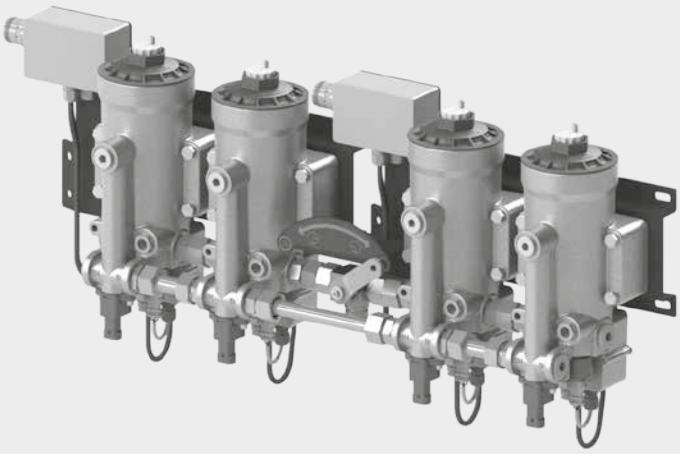
HDPD KF1 1800 BC1 ...

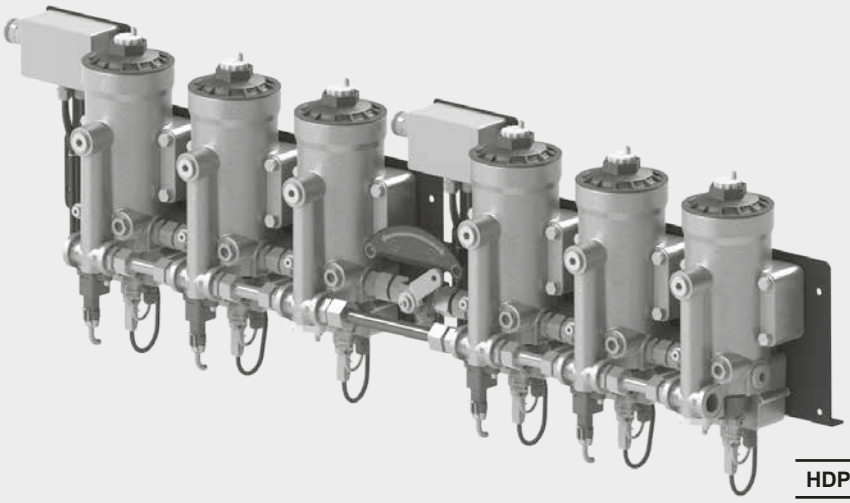
HDPD	340 BC	600 BC	1200 BC	1800 BC
Weight incl. element [kg]	approx. 9.0	approx. 11.0	approx. 19.6	approx. 30.0

4.2. FULLY AUTOMATIC DESIGN
HDPD "HighTech"









HDPD	600 HT	1200 HT	1800 HT
Weight incl. element [kg]	approx. 20.0	approx. 40.0	approx. 60.0

NOTE

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Subject to technical modifications.

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MAINTENANCE INSTRUCTIONS for Hydraulic Filters

INSTRUCTIONS FOR USE FOR FILTERS


Information

This pressure equipment must only be operated in conjunction with a machine or system.


Information

The pressure equipment must only be used as stipulated in the operating instructions of the machine or system.


Information

This pressure equipment must only be operated using hydraulic or lubricating fluid.


Caution

The user must take appropriate action (e.g. venting) to prevent the formation of air pockets.


Caution

Repairs, maintenance work and commissioning must only be carried out by trained personnel.

Allow the pressure equipment to cool before handling.

The stipulations of the operating instructions of the machine or the system must be followed.


Danger

Caution: pressure equipment! Before any work is carried out on the pressure equipment, ensure the pressure chamber concerned (filter housing) is depressurized.


Danger

On no account must any modifications (welding, drilling, opening by force...) be carried out on the pressure equipment.


Information

It is the responsibility of the operator to comply with the water regulations of the country concerned.


Caution

Statutory accident prevention regulations, safety regulations and safety data sheets for fluids must be observed.


Caution

When working on, or in the vicinity of, hydraulic systems, naked flames, spark generation and smoking are forbidden.


Caution

Hydraulic oils and water-polluting fluids must not be allowed to enter the soil or watercourses or sewer systems. Please ensure safe and environmentally friendly disposal of hydraulic oils. The relevant regulations in the country concerned with regard to ground water pollution, used oil and waste must be complied with.


Caution

Whenever work is carried out on the filter, be prepared for hot oil to escape which can cause injury or scalding as a result of its high pressure or temperature.


Caution

Filter housings must be earthed.


Danger

When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

CUSTOMER INFORMATION IN RESPECT OF MACHINERY DIRECTIVE 2006/42/EC

Hydraulic filters are fluid power parts/ components and are therefore excluded from the scope of the Machinery Directive.

Before using these components, ensure compliance with the specifications provided by HYDAC Filtertechnik GmbH in this documentation.

The specifications also contain information on the relevant essential health and safety requirements (based on Machinery Directive 2006/42/EC) that are to be applied by the user.

We hereby declare that the filters are intended to be incorporated into machinery within the terms of the Machinery Directive 2006/42/EC.

It is prohibited to put the filters into service until the machinery as a whole is in conformity with the provisions of the Machinery Directive. Furthermore, our Terms of Sale and Delivery are available on our website (www.hydac.com).

GENERAL MAINTENANCE

This section describes maintenance work which must be carried out periodically. The operational safety and life expectancy of the filter, and whether it is ready for use, depend to a large extent on regular and careful maintenance.

MAINTENANCE PROCEDURES

- Spare parts must fulfil the technical requirements specified by the manufacturer.
  This is always guaranteed for original HYDAC spare parts.
- Keep tools, working area and equipment clean.
- After disassembling the filter, clean all parts, check for damage or wear and replace parts if necessary.
- When changing a filter element, a high level of cleanliness must be observed!

INTERVAL BETWEEN ELEMENT CHANGES

In principle we recommend that the filter element is changed after 1 year of operation at the latest.

We recommend fitting the filter with a clogging indicator (visual and/or electrical or electronic) to monitor the filter element.

If the clogging indicator responds, it is necessary to change or clean the filter element without delay (only W and V elements can be cleaned).

When no clogging indicator has been fitted, we recommend changing the elements at specific intervals. (The frequency of changing the filter elements depends on the filter design and the conditions under which the filter is operated). When filter elements are subject to high dynamic loading it may prove necessary to change them more frequently. The same applies when the hydraulic system is commissioned, repaired or when the oil is changed

The standard clogging indicators only respond when fluid is flowing through the filter. With electrical indicators the signal can also be converted into a continuous display on the control panel. In this case the continuous display must be switched off during a cold start or after changing the element.

If the clogging indicator responds during a cold start only, it is possible that the element does not yet need to be changed.

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MAINTENANCE INSTRUCTIONS for Fuel Filters

INSTRUCTIONS FOR USE FOR FILTERS


Information

This pressure equipment must only be put into operation in conjunction with a machine or system.


Information

The pressure equipment must only be used as stipulated in the operating instructions of the machine or system.


Information

This pressure equipment must only be operated using diesel fuel.


Caution

The user must take appropriate action (e.g. venting) to prevent the formation of air pockets.


Caution

Repairs, maintenance work and commissioning must only be carried out by trained personnel.

Allow the pressure equipment to cool before handling.

The stipulations of the operating instructions of the machine or the system must be followed.


Danger

Caution: pressure equipment! Before any work is carried out on the pressure equipment, ensure the pressure chamber concerned (filter housing) is depressurised.


Danger

On no account must any modifications (welding, drilling, opening by force...) be carried out on the pressure equipment.


Information

It is the responsibility of the operator to comply with the water regulations of the country concerned.


Caution

Statutory accident prevention regulations, safety regulations and safety data sheets for fluids must be observed.


Caution

When working on, or in the vicinity of, fuel systems, naked flames, sparks and smoking are forbidden.


Caution

Fuels and water-polluting fluids must not be allowed to enter the soil or watercourses/ sewer systems. Please ensure safe and environmentally friendly disposal of fuels. The relevant regulations in the country concerned with regard to ground water pollution, used oil and waste must be complied with.


Caution

Whenever work is carried out on the filter, be prepared for hot fuel to escape which can cause injury or scalding as a result of its high pressure or temperature.


Caution

Filter housings must be earthed.


Caution

HYDAC is not liable for inappropriate use.


Caution

Ensure that the design specifications and parameters are adhered to.


Information

The Diesel MainCare HDM is approved solely for use in technical applications. The device must not be used in situations where human lives depend on the correct functioning of the device.

CUSTOMER INFORMATION IN RESPECT OF MACHINERY DIRECTIVE 2006/42/EC

Diesel fuel filters are fluid power parts/ components and are therefore excluded from the scope of the Machinery Directive.

Before using these components, ensure compliance with the specifications provided by HYDAC Filtertechnik GmbH in this documentation.

The specifications also contain information on the relevant essential health and safety requirements (based on Machinery Directive 2006/42/EC) that are to be applied by the user.

We hereby declare that the filters are intended to be incorporated into machinery within the terms of the Machinery Directive 2006/42/EC.

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GENERAL MAINTENANCE

This section describes maintenance work which must be carried out periodically. The operational safety and life expectancy of the filter, and whether it is ready for use, depend to a large extent on regular and careful maintenance.

MAINTENANCE PROCEDURES

- Spare parts must fulfil the technical requirements specified by the manufacturer.
- This is always guaranteed for original HYDAC spare parts.
- Tools, working area and equipment are to be kept clean.
- After disassembling the filter, clean all parts, check for damage or wear and replace parts if necessary.
- When changing a filter element, a high level of cleanliness must be observed!

INTERVAL BETWEEN CHANGING ELEMENTS

In principle we recommend that the filter element is changed after 1 year of operation at the latest.

When filter elements are subject to high dynamic loading it may prove necessary to change them more frequently. The same applies for commissioning, repairs, etc. of the fuel system.

Service addresses

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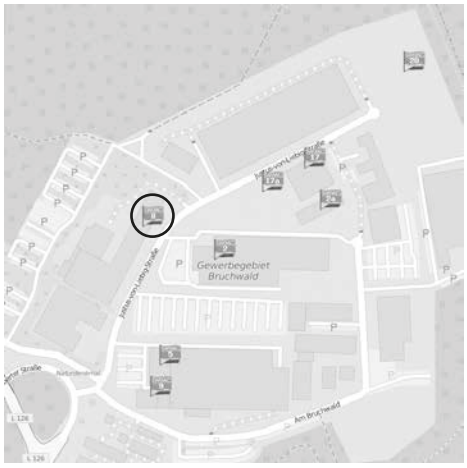

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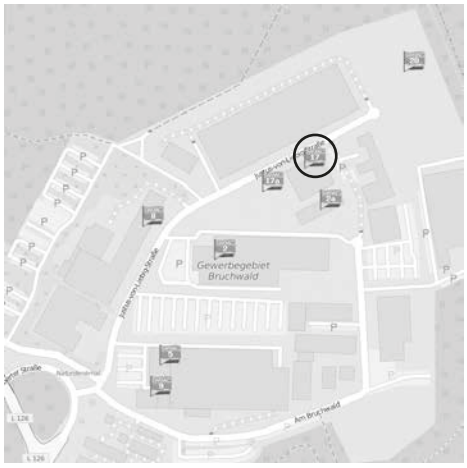

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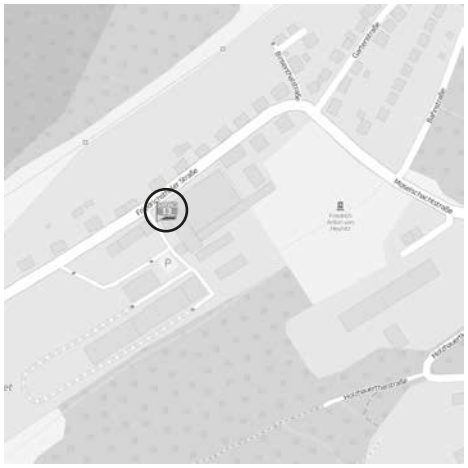

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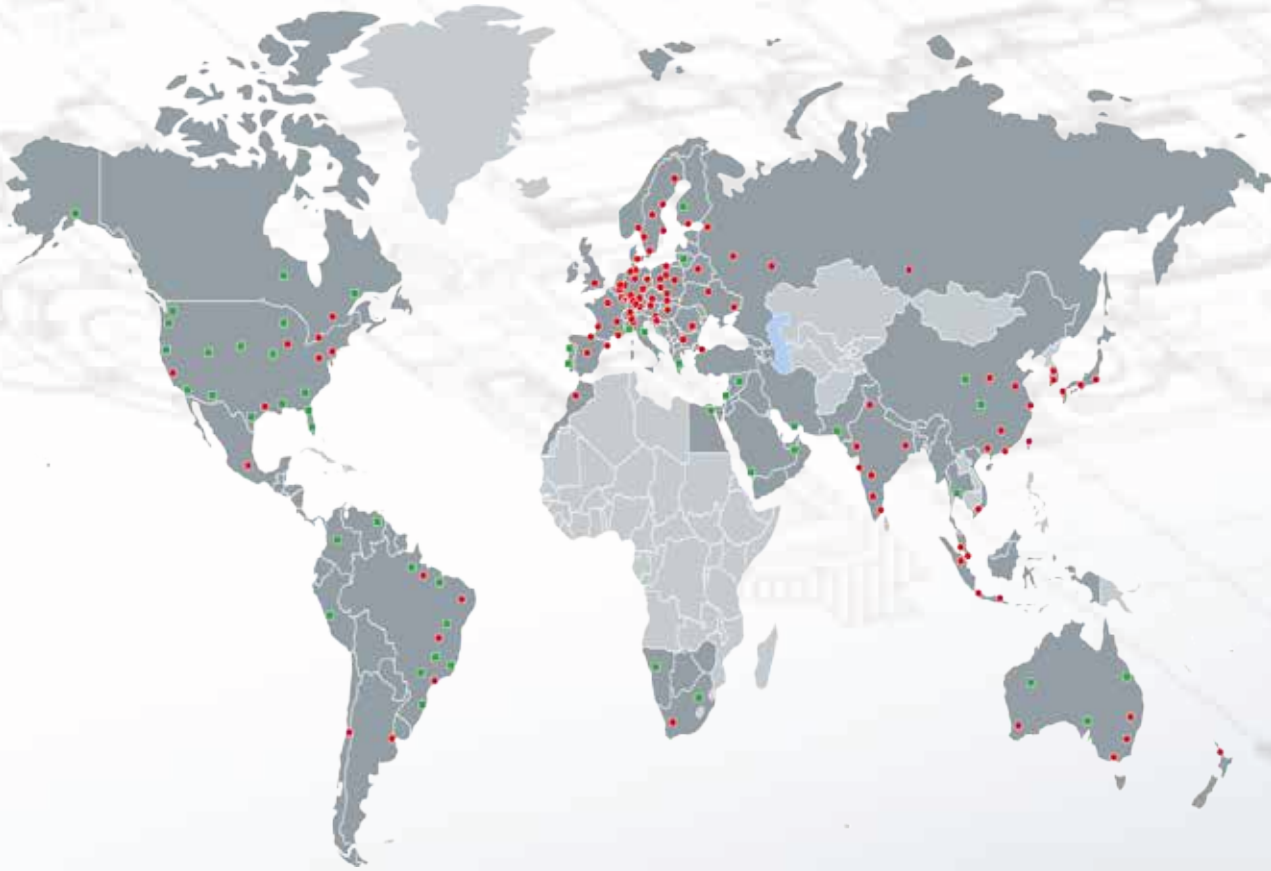

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