

HI PRESSURE FILTERS

**HYDRAULIC
FILTRATION**

CATALOGUE



PASSION TO PERFORM



A WORLDWIDE LEADER IN THE FIELD OF HYDRAULIC FILTRATION EQUIPMENT.

Our company started life in 1964, when Bruno Pasotto decided to attempt to cater for the requests of a market still to be fully explored, with the study, design, development, production and marketing of a vast range of filters for hydraulic equipment, capable of satisfying the needs of manufacturers in all sectors. The quality of our products, our extreme competitiveness compared with major international producers and our constant activities of research, design and development has made us a worldwide leader in the field of hydraulic circuit filtering. Present for over 50 years in the market, we have played a truly decisive role in defining our sector, and by now we are a group capable of controlling our entire chain of production, monitoring all manufacturing processes to guarantee superior quality standards and to provide concrete solutions for the rapidly evolving needs of customers and the market.

HYDRAULIC FILTRATION PRODUCTS

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28	page	SUCTION FILTERS			up to P_{max}	up to Q_{max}
					bar	psi
31	STR & MPA - MPM	Submerged suction filter, with bypass or magnetic filter			1000	264
38	SFEX	In-line filter with plastic bowl			100	26
49	SF2 250 - 350	Semi-submerged positive head suction filter, low flow rate			160	42
57	SF2 500	Semi-submerged positive head suction filter, high flow rate			700	185
679	CLOGGING INDICATORS					

66	page	RETURN FILTERS			up to P_{max}	up to Q_{max}
					bar	psi
68	RFX	Return filter, tank mounted filter suitable for all mineral oil and water glycol applications	16	232	260	69
78	MPFX	Tank top semi-immersed filter, standard filter element disassembly	8	116	900	238
106	MPLX	Tank top semi-immersed filter, standard filter element disassembly	10	145	1800	476
114	MPTX	Tank top semi-immersed filter, easy filter element disassembly	8	116	300	79
132	MFBX	Bowl assembly	8	116	700	185
141	MPF	Tank top semi-immersed filter, standard filter element disassembly	8	116	900	238
169	MPT	Tank top semi-immersed filter, easy filter element disassembly	8	116	300	79
187	MFB	Bowl assembly	8	116	700	185
195	MDH	Heavy industrial applications integrated in the tank - air separation	10	145	500	132
203	MPH	Tank top semi-immersed filter, standard filter element disassembly	10	145	3500	925
227	MPI	Tank top semi-immersed filter, standard filter element disassembly	10	145	3500	925
239	FRI	Tank top semi-immersed filter, easy filter element disassembly, it can be used also as in-line filter	20	290	2500	660
255	RF2	Semi-immersed under-head filter, easy filter element disassembly	20	290	615	162
262	ACCESSORIES					
680	CLOGGING INDICATORS					

264	page	RETURN / SUCTION FILTERS			up to P_{max}	up to Q_{max}
					bar	psi
266	MRSX	Unique TANK TOP filter for mobile machinery, with combined filtration on return and suction to the inlet at the hydrostatic transmissions in closed circuit	10	145	250	66
279	LMP 124 MULTIPORT	Unique IN-LINE filter for mobile machinery, with combined filtration on return and suction to the inlet at the hydrostatic transmissions in closed circuit	80	1160	120	32
682	CLOGGING INDICATORS					

288	page	SPIN-ON FILTERS			up to P_{max}	up to Q_{max}
					bar	psi
291	MPS	Low pressure filter, available with single cartridge (CS) for in-line or flange mounting or with two cartridge on the same axis on the opposite sides	12	174	365	96
684	CLOGGING INDICATORS					

306 page	LOW & MEDIUM PRESSURE FILTERS	up to P _{max}		up to Q _{max}		
		bar	psi	l/min	gpm	
308	LFEX	In-line filter with plastic bowl	16	232	300	79
319	LMP 110 - 120 - 123 MULTIPORT	In-line filter with Multiport design for multiple choice connection	80	1160	175	46
335	LMP 210 - 211	In-line low & medium pressure filter, low flow rate	60	870	365	96
345	LMP 400 - 401 & 430 - 431	In-line low & medium pressure filter, high flow rate	60	870	780	206
357	LMP 950 - 951	In-line filter, available with 2 and up to 6 different heads	30	435	2400	634
365	LMP 952 - 953 - 954	In-line low pressure filter specifically designed to be mounted in series	25	363	4500	1189
377	LMD 211	In-line duplex medium pressure filter	60	870	200	53
385	LMD 400 - 401 & 431	In-line duplex low pressure filter	16	232	600	159
401	LMD 951	In-line duplex filter, available with 2 up to 6 different heads	16	232	1200	317
409		Filter elements designed according to DIN 24550				
411	LDP - LDD	In-line and duplex medium pressure filter	60	870	360	95
421	LMP 900 - 901	In-line low pressure filter	30	435	2000	528
429	LMP 902 - 903	In-line filter specifically designed to be mounted in series	20	290	3000	793
438	ACCESSORIES					
686	CLOGGING INDICATORS					

440 page	HIGH PRESSURE FILTERS	up to P _{max}		up to Q _{max}		
		bar	psi	l/min	gpm	
442	FMMX 050	Typical high pressure filter for mobile applications, low flow rate	420	6092	154	41
451	FMM	Typical high pressure filter for mobile applications, low flow rate	420	6092	300	79
461	FHA 051	Filter optimized for use in high pressure operating systems, low flow rate	560	8122	150	40
469	FMP 039	Filter high pressure, low flow rate applications	110	1595	80	21
477	FMP	Filter high pressure, high flow rate applications	320	4641	500	132
489	FHP	Typical high pressure filter for mobile applications, high flow rate	450	6527	630	166
509	FHM	High pressure filter with intermediate manifold construction	320	4641	400	106
527	FHB	High pressure for block mounting	320	4641	485	128
541	FHF 325	In-line manifold top mounting	350	5076	550	145
551	FHD	In-line duplex high pressure filter	350	5076	250	66
565	HPB	Pressure filter kits for integration in control manifolds	420	6092	300	79
687	CLOGGING INDICATORS					

574 page	STAINLESS STEEL HIGH PRESSURE FILTERS	up to P _{max}		up to Q _{max}		
		bar	psi	l/min	gpm	
577	FZP	In-line pressure filter with threaded mount	420	6092	160	42
587	FZH	In-line pressure filter with threaded mount for higher pressure	700	10153	80	21
597	FZX	In-line pressure filter with threaded mount up to 1000 bar	1000	14504	10	3
605	FZM	Manifold top mounting	320	4641	70	18
613	FZB	Manifold side mounting	320	4641	70	18
621	FZD	Duplex pressure filter for continuous operation requirements	350	5076	60	16
688	CLOGGING INDICATORS					

632 page	FILTERS FOR POTENTIALLY EXPLOSIVE ATMOSPHERE	up to P _{max}		up to Q _{max}		
		bar	psi	l/min	gpm	
634	FMMX 050	Typical high pressure filter for mobile applications, low flow rate	420	6092	154	41
643	FZP	In-line pressure filter with threaded mount	700	10153	80	21
653	FZH	In-line pressure filter with threaded mount for higher pressure	1000	14504	10	3
663	FZX	In-line pressure filter with threaded mount up to 1000 bar	320	4641	70	18
689	CLOGGING INDICATORS					

669 page	CLOGGING INDICATORS
674	QUICK REFERENCE GUIDE
679	DESIGNATION AND ORDERING CODES
690	TECHNICAL DATA

MARKET LEADER



Our work is based on a skillful interaction between advanced technology and fine workmanship, **customizing products according to specific market requests**, focusing strongly on innovation and quality, and following every step in the manufacturing of both standard and special products, fully respecting customer expectations.



Our customer-oriented philosophy, which enables us to satisfy all customer requests **rapidly and with personalized products**, makes us a **dynamic and flexible enterprise**. The possibility of constantly controlling and monitoring the entire production process is essential to allow us to guarantee the quality of our products.

WORLDWIDE PRESENCE

Our foreign Branches enable us to offer a diversified range of products that allow us to successfully face the aggressive challenge of international competition, and also to maintain a stable presence at a local level.

The Group boasts **9** business branches



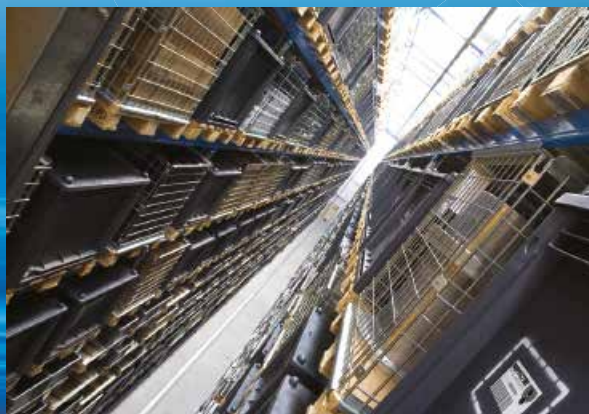
TECHNOLOGY

Our constant **quest for excellence in quality and technological innovation** allows us to offer only the best solutions and services for applications in many fields, including general industry, test rigs, lubrication, heavy engineering, renewable energies, naval engineering, offshore engineering, aviation systems, emerging technologies and mobile plant (i.e. tractors, excavators, concrete pumps, platforms).



AND PRODUCTION

Our high level of technological expertise means **we can rely entirely on our own resources, without resorting to external providers.** This in turn enables us to satisfy a growing number of customer requests, also exploiting our constantly updated range of machines and equipment, featuring **fully-automated workstations** capable of **24-hour production.**





SUCTION FILTERS

Flow rates
up to 875 l/min

Mounting:
- Tank immersed
- In-Line
- In tank with
shut off valve
- In tank
with flooded suction

RETURN FILTERS

Flow rates
up to 3000 l/min

Pressure
up to 20 bar

Mounting:
- In-Line
- Tank top
- In single
and duplex designs

RETURN / SUCTION FILTERS

Flow rates
up to 300 l/min

Pressure
up to 80 bar

Mounting:
- In-Line
- Tank top

SPIN-ON FILTERS

Flow rates
up to 365 l/min

Pressure
up to 35 bar

Mounting:
- In-Line
- Tank top

LOW & MEDIUM PRESSURE FILTERS

Flow rates
up to 3000 l/min

Pressure
up to 80 bar

Mounting:
- In-Line
- Parallel manifold version
- In single
and duplex designs

HIGH PRESSURE FILTERS

Flow rates
up to 750 l/min

Pressure from 110 bar
up to 560 bar

Mounting:
- In-Line
- Manifold
- In single
and duplex designs

PRODUCT RANGE

MP Filtri can offer a vast and articulated range of products for the global market, suitable for all industrial sectors using hydraulic equipment.

This includes filters (suction, return, return/suction, spin-on, pressure, stainless steel pressure, ATEX filters) and structural components (motor/pump bell-housings, transmission couplings, damping rings, foot brackets, aluminium tanks, cleaning covers).

We can provide all the skills and solutions required by the modern hydraulics industry to monitor contamination levels and other fluid conditions.

Mobile filtration units and a full range of accessories allow us to supply everything necessary for a complete service in the hydraulic circuits.



STAINLESS STEEL HIGH PRESSURE FILTERS

Flow rates up to 150 l/min

Pressure from 320 bar up to 1000 bar

Mounting:

- In-Line
- Manifold
- In single and duplex designs

FILTERS FOR POTENTIALLY EXPLOSIVE ATMOSPHERE

Flow rates up to 154 l/min

Pressure from 420 bar up to 1000 bar

Mounting:

- In-Line

CONTAMINATION CONTROL SOLUTIONS

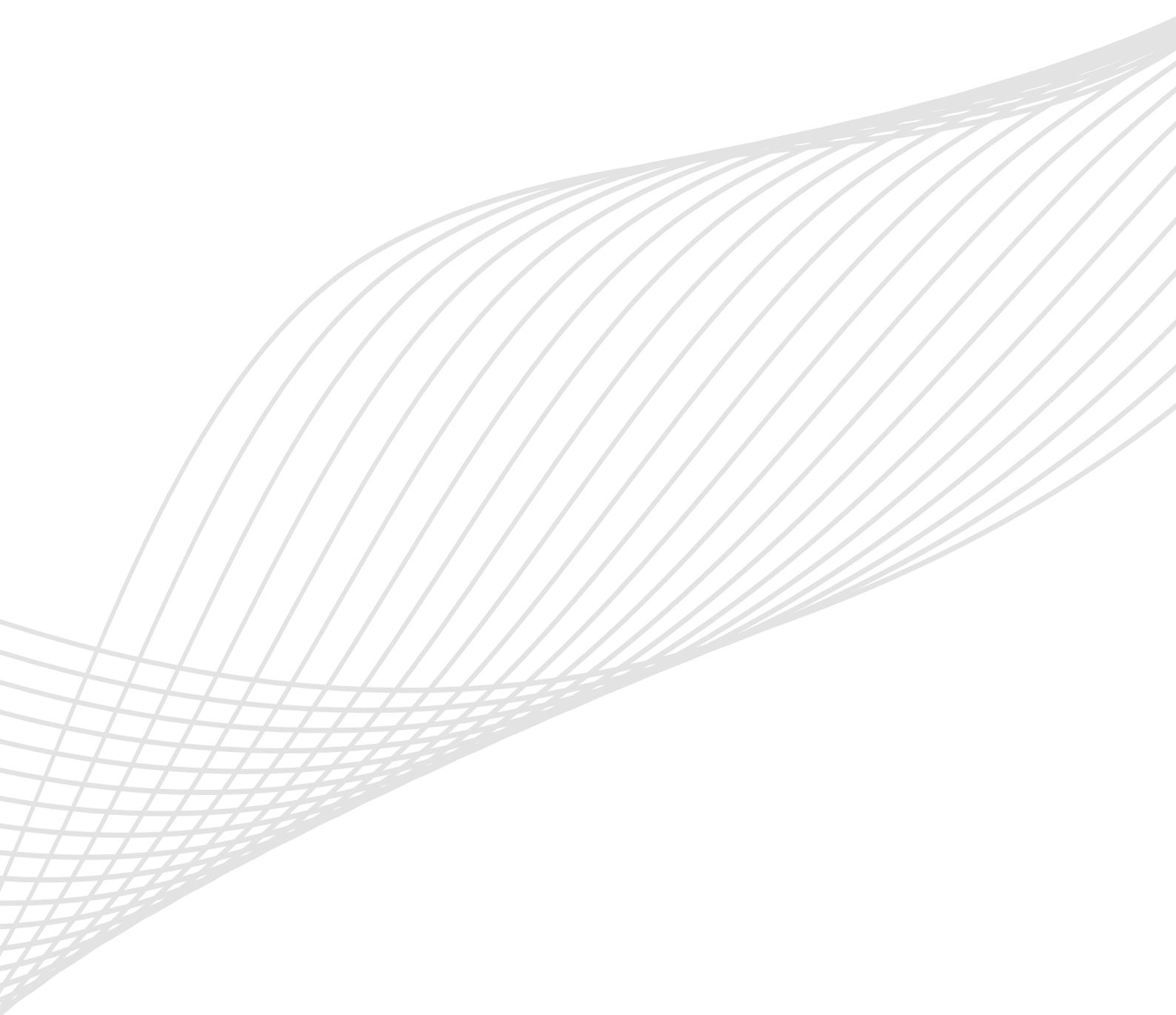
- Off-line, in-line particle counters
- Off-line bottle sampling products
- Fully calibrated using relevant ISO standards
- A wide range of variants to support fluid types and communication protocols
- Mobile Filtration Units with flow rates from 15 l/min up to 200 l/min

POWER TRANSMISSION PRODUCTS

- Aluminium bell-housings for motors from 0.12 kW to 400 kW
- Couplings in Aluminium Cast Iron - Steel
- Damping rings
- Foot bracket
- Aluminium tanks
- Cleaning covers

TANK ACCESSORIES

- Oil filler and air breather plugs
- Optical and electrical level gauges
- Pressure gauge valve selectors
- Pipe fixing brackets
- Pressure gauges



CONTAMINATION MANAGEMENT

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1 HYDRAULIC FLUIDS

The fluid is the vector that transmits power, energy within an oleodynamic circuit. In addition to transmitting energy through the circuit, it also performs additional functions such as lubrication, protection and cooling of the surfaces.

The classification of fluids used in hydraulic systems is coded in many regulatory references, different Standards.

The most popular classification criterion divides them into the following families:

- MINERAL OILS

Commonly used oil deriving fluids.

- FIRE RESISTANT FLUIDS

Fluids with intrinsic characteristics of incombustibility or high flash point.

- SYNTHETIC FLUIDS

Modified chemical products to obtain specific optimized features.

- ECOLOGICAL FLUIDS

Synthetic or vegetable origin fluids with high biodegradability characteristics.

The choice of fluid for an hydraulic system must take into account several parameters.

These parameters can adversely affect the performance of an hydraulic system, causing delay in the controls, pump cavitation, excessive absorption, excessive temperature rise, efficiency reduction, increased drainage, wear, jam/block or air intake in the plant.

The main properties that characterize hydraulic fluids and affect their choice are:

- DYNAMIC VISCOSITY

It identifies the fluid's resistance to sliding due to the impact of the particles forming it.

- KINEMATIC VISCOSITY

It is a widespread formal dimension in the hydraulic field.

It is calculated with the ratio between the dynamic viscosity and the fluid density.

Kinematic viscosity varies with temperature and pressure variations.

- VISCOSITY INDEX

This value expresses the ability of a fluid to maintain viscosity when the temperature changes.

A high viscosity index indicates the fluid's ability to limit viscosity variations by varying the temperature.

- FILTERABILITY INDEX

It is the value that indicates the ability of a fluid to cross the filter materials. A low filterability index could cause premature clogging of the filter material.

- WORKING TEMPERATURE

Working temperature affects the fundamental characteristics of the fluid. As already seen, some fluid characteristics, such as cinematic viscosity, vary with the temperature variation.

When choosing a hydraulic oil, must therefore be taken into account of the environmental conditions in which the machine will operate.

- COMPRESSIBILITY MODULE

Every fluid subjected to a pressure contracts, increasing its density.

The compressibility module identifies the increase in pressure required to cause a corresponding increase in density.

- HYDROLYTIC STABILITY

It is the characteristic that prevents galvanic pairs that can cause wear in the plant/system.

- ANTIOXIDANT STABILITY AND WEAR PROTECTION

These features translate into the capacity of a hydraulic oil to avoid corrosion of metal elements inside the system.

- HEAT TRANSFER CAPACITY

It is the characteristic that indicates the capacity of hydraulic oil to exchange heat with the surfaces and then cool them.

2 FLUID CONTAMINATION

Whatever the nature and properties of fluids, they are inevitably subject to contamination. Fluid contamination can have two origins:

- INITIAL CONTAMINATION

Caused by the introduction of contaminated fluid into the circuit, or by incorrect storage, transport or transfer operations.

- PROGRESSIVE CONTAMINATION

Caused by factors related to the operation of the system, such as metal surface wear, sealing wear, oxidation or degradation of the fluid, the introduction of contaminants during maintenance, corrosion due to chemical or electrochemical action between fluid and components, cavitation. The contamination of hydraulic systems can be of different nature:

- SOLID CONTAMINATION

For example rust, slag, metal particles, fibers, rubber particles, paint particles or additives

- LIQUID CONTAMINATION

For example, the presence of water due to condensation or external infiltration or acids

- GASEOUS CONTAMINATION

For example, the presence of air due to inadequate oil level in the tank, drainage in suction ducts, incorrect sizing of tubes or tanks.

3 EFFECTS OF CONTAMINATION ON HYDRAULIC COMPONENTS

Solid contamination is recognized as the main cause of malfunction, failure and early degradation in hydraulic systems. It is impossible to delete it completely, but it can be effectively controlled by appropriate devices.

CONTAMINATION IN PRESENCE OF LARGE TOLERANCES



CONTAMINATION IN PRESENCE OF NARROW TOLERANCES



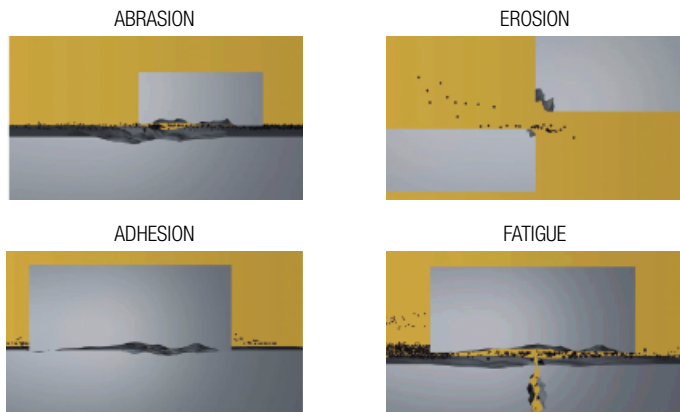
Solid contamination mainly causes surface damage and component wear.

- ABRASION OF SURFACES

Cause of leakage through mechanical seals, reduction of system performance, failures.

- SURFACE EROSION
Cause of leakage through mechanical seals, reduction of system performance, variation in adjustment of control components, failures.
- ADHESION OF MOVING PARTS
Cause of failure due to lack of lubrication.
- DAMAGES DUE TO FATIGUE
Cause of breakdowns and components breakdown.

- MODIFICATION OF FLUID PROPERTIES (COMPRESSIBILITY MODULE, DENSITY, VISCOSITY)
Cause of system's reduction of efficiency and of control.
It is easy to understand how a system without proper contamination management is subject to higher costs than a system that is provided.
- MAINTENANCE
Increase maintenance activities, spare parts, machine stop costs.
- ENERGY AND EFFICIENCY
Efficiency and performance reduction due to friction, drainage, cavitation.



Liquid contamination mainly results in decay of lubrication performance and protection of fluid surfaces.

DISSOLVED WATER

- INCREASING FLUID ACIDITY
Cause of surface corrosion and premature fluid oxidation
- GALVANIC COUPLE AT HIGH TEMPERATURES
Cause of corrosion

FREE WATER - ADDITIONAL EFFECTS

- DECAY OF LUBRICANT PERFORMANCE
Cause of rust and sludge formation, metal corrosion and increased solid contamination
- BATTERY COLONY CREATION
Cause of worsening in the filterability feature
- ICE CREATION AT LOW TEMPERATURES
Cause damage to the surface
- ADDITIVE DEPLETION
Free water retains polar additives

Gaseous contamination mainly results in decay of system performance.

- CUSHION SUSPENSION
Cause of increased noise and cavitation.
- FLUID OXIDATION
Cause of corrosion acceleration of metal parts.

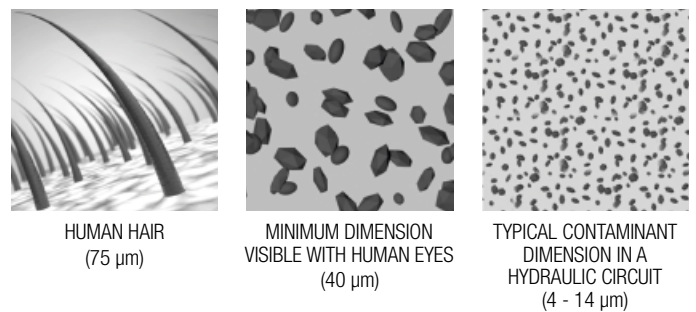
4 MEASURING THE SOLID CONTAMINATION LEVEL

The level of contamination of a system identifies the amount of contaminant contained in a fluid.

This parameter refers to a unit volume of fluid.

The level of contamination may be different at different points in the system. From the information in the previous paragraphs it is also apparent that the level of contamination is heavily influenced by the working conditions of the system, by its working years and by the environmental conditions.

What is the size of the contaminating particles that we must handle in our hydraulic circuit?



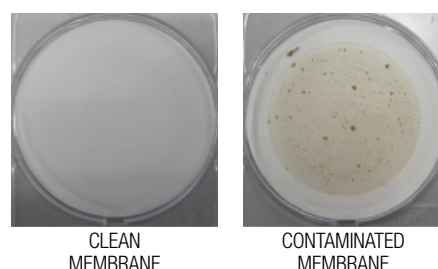
Contamination level analysis is significant only if performed with a uniform and repeatable method, conducted with standard test methods and suitably calibrated equipment.

To this end, ISO has issued a set of standards that allow tests to be conducted and express the measured values in the following ways.

- GRAVIMETRIC LEVEL - ISO 4405

The level of contamination is defined by checking the weight of particles collected by a laboratory membrane. The membrane must be cleaned, dried and desiccated, with fluid and conditions defined by the Standard.

The volume of fluid is filtered through the membrane by using a suitable suction system. The weight of the contaminant is determined by checking the weight of the membrane before and after the fluid filtration.



CONTAMINATION MANAGEMENT

- CUMULATIVE DISTRIBUTION OF THE PARTICLES SIZE - ISO 4406

The level of contamination is defined by counting the number of particles of certain dimensions per unit of volume of fluid. Measurement is performed by Automatic Particle Analysers (APCs).

Following the count, the contamination classes are determined, corresponding to the number of particles detected in the unit of fluid.

The most common classification methods follow ISO 4406 and SAE AS 4059 (Aerospace Sector) regulations. NAS 1638 is still used although obsolete.

Classification example according to ISO 4406

The International Standards Organization standard ISO 4406 is the preferred method of quoting the number of solid contaminant particles in a sample. The level of contamination is defined by counting the number of particles of certain dimensions per unit of volume of fluid. The measurement is performed by Automatic Particle Analysers (APCs) or Particle Contamination Monitors (PCMs).

The numbers represent a code which identifies the number of particles of certain sizes in 1ml of fluid. Each code number has a particular size range. The first scale number represents the number of particles equal to or larger than 4 $\mu\text{m}_{(c)}$ per millilitre of fluid; The second scale number represents the number of particles equal to or larger than 6 $\mu\text{m}_{(c)}$ per millilitre of fluid; The third scale number represents the number of particles equal to or larger than 14 $\mu\text{m}_{(c)}$ per millilitre of fluid.

ISO 4406 - Allocation of Scale Numbers

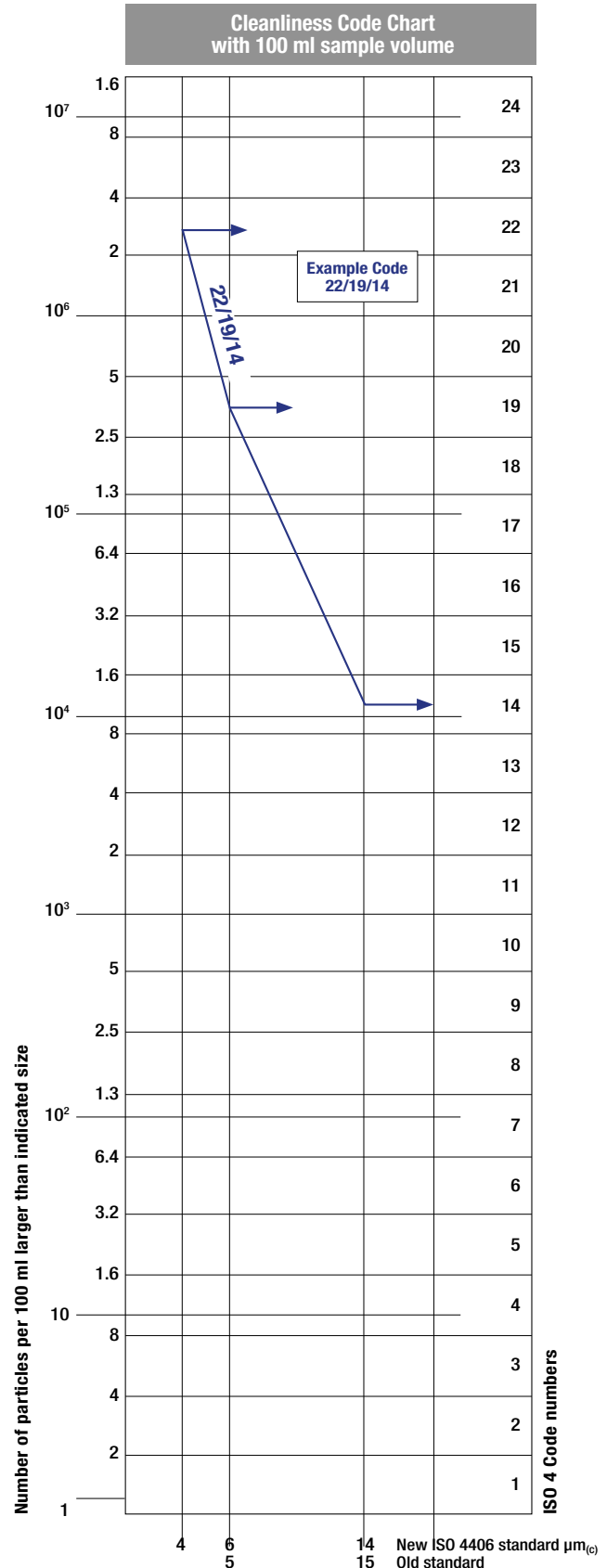
Class	Number of particles per ml	
	Over	Up to
28	1 300 000	2 500 000
27	640 000	1 300 000
26	320 000	640 000
25	160 000	320 000
24	80 000	160 000
23	40 000	80 000
22	20 000	40 000
21	10 000	20 000
20	5 000	10 000
19	2 500	5 000
18	1 300	2 500
17	640	1 300
16	320	640
15	160	320
14	80	160
13	40	80
12	20	40
11	10	20
10	5	10
9	2.5	5
8	1.3	2.5
7	0.64	1.3
6	0.32	0.64
5	0.16	0.32
4	0.08	0.16
3	0.04	0.08
2	0.02	0.04
1	0.01	0.02
0	0	0.01

- > 4 $\mu\text{m}_{(c)}$ = 350 particles
 - > 6 $\mu\text{m}_{(c)}$ = 100 particles
 - > 14 $\mu\text{m}_{(c)}$ = 25 particles
- 16 / 14 / 12

ISO 4406 Cleanliness Code System

Microscope counting examines the particles differently to APCs and the code is given with two scale numbers only.

These are at 5 μm and 15 μm equivalent to the 6 $\mu\text{m}_{(c)}$ and 14 $\mu\text{m}_{(c)}$ of APCs.



- CUMULATIVE DISTRIBUTION OF THE PARTICLES SIZE
SAE AS4059-1 and SAE AS4059-2

Classification example according to SAE AS4059 - Rev. G

The code, prepared for the aerospace industry, is based on the size, quantity, and particle spacing in a 100 ml fluid sample. The contamination classes are defined by numeric codes, the size of the contaminant is identified by letters (A-F).

This SAE Aerospace Standard (AS) defines cleanliness levels for particulate contamination of hydraulic fluids and includes methods of reporting data relating to the contamination levels. Tables 1 and 2 below provide differential and cumulative particle counts respectively for counts obtained by an automatic particle counter, e.g. LPA3.

Table 1 - Class for differential measurement

Class	Dimension of contaminant Maximum Contamination Limits per 100 ml (3)				
	5-15 µm	15-25 µm	25-50 µm	50-100 µm	>100 µm (1)
	6-14 µm(c)	14-21 µm(c)	21-38 µm(c)	38-70 µm(c)	>70 µm(c) (2)
00	125	22	4	1	0
0	250	44	8	2	0
1	500	89	16	3	1
2	1 000	178	32	6	1
3	2 000	356	63	11	2
4	4 000	712	126	22	4
5	8 000	1 425	253	45	8
6	16 000	2 850	506	90	16
7	32 000	5 700	1 012	180	32
8	64 000	11 400	2 025	360	64
9	128 000	22 800	4 050	720	128
10	256 000	45 600	8 100	1 440	256
11	512 000	91 200	16 200	2 880	512
12	1 024 000	182 400	32 400	5 760	1 024

6 - 14 µm(c) = 15 000 particles
14 - 21 µm(c) = 2 200 particles
21 - 38 µm(c) = 200 particles
38 - 70 µm(c) = 35 particles
> 70 µm(c) = 3 particles
SAE AS4059 REV G - Class 6

(1) Size range, optical microscope, based on longest dimension as measured per AS598 or ISO 4407. (2) Size range, APC calibrated per ISO 11171 or an optical or electron microscope with image analysis software, based on projected area equivalent diameter.

Table 2 - Class for cumulative measurement

Class	Dimension of contaminant Maximum Contamination Limits per 100 ml					
	>1 µm	>5 µm	>15 µm	>25 µm	>50 µm	>100 µm (1)
	>4 µm(c)	>6 µm(c)	>14 µm(c)	>21 µm(c)	>38 µm(c)	>70 µm(c) (2)
000	195	76	14	3	1	0
00	390	152	27	5	1	0
0	780	304	54	10	2	0
1	1 560	609	109	20	4	1
2	3 120	1 217	217	39	7	1
3	6 250	2 432	432	76	13	2
4	12 500	4 864	864	152	26	4
5	25 000	9 731	1 731	306	53	8
6	50 000	19 462	3 462	612	106	16
7	100 000	38 924	6 924	1 224	212	32
8	200 000	77 849	13 849	2 449	424	64
9	400 000	155 698	27 698	4 898	848	128
10	800 000	311 396	55 396	9 796	1 696	256
11	1 600 000	622 792	110 792	19 592	3 392	512
12	3 200 000	1 245 584	221 584	39 184	6 784	1 024

> 4 µm(c) = 45 000 particles
> 6 µm(c) = 15 000 particles
> 14 µm(c) = 1 500 particles
> 21 µm(c) = 250 particles
> 38 µm(c) = 15 particles
> 70 µm(c) = 3 particle
SAE AS4059 REV G cpc* Class 6 6/6/5/5/4/2

(1) Size range, optical microscope, based on longest dimension as measured per AS598 or ISO 4407. (2) Size range, APC calibrated per ISO 11171 or an optical or electron microscope with image analysis software, based on projected area equivalent diameter. (3) Contamination classes and particle count limits are identical to NAS 1638.

* cumulative particle count

- CLASSES OF CONTAMINATION ACCORDING TO NAS 1638 (January 1964)

The NAS system was originally developed in 1964 to define contamination classes for the contamination contained within aircraft components.

The application of this standard was extended to industrial hydraulic systems simply because nothing else existed at the time.

The coding system defines the maximum numbers permitted of 100 ml volume at various size intervals (differential counts) rather than using cumulative counts as in ISO 4406. Although there is no guidance given in the standard on how to quote the levels, most industrial users quote a single code which is the highest recorded in all sizes and this convention is used on MP Filtri APC's.

The contamination classes are defined by a number (from 00 to 12) which indicates the maximum number of particles per 100 ml, counted on a differential basis, in a given size bracket.

Size Range Classes (in microns)

Class	Maximum Contamination Limits per 100 ml				
	5-15	15-25	25-50	50-100	>100
00	125	22	4	1	0
0	250	44	8	2	0
1	500	89	16	3	1
2	1 000	178	32	6	1
3	2 000	356	63	11	2
4	4 000	712	126	22	4
5	8 000	1 425	253	45	8
6	16 000	2 850	506	90	16
7	32 000	5 700	1 012	180	32
8	64 000	11 400	2 025	360	64
9	128 000	22 800	4 050	720	128
10	256 000	45 600	8 100	1 440	256
11	512 000	91 200	16 200	2 880	512
12	1 024 000	182 400	32 400	5 760	1 024

5-15 µm = 42 000 particles
15-25 µm = 2 200 particles
25-50 µm = 150 particles
50-100 µm = 18 particles
> 100 µm = 3 particles
Class NAS 8

- CUMULATIVE DISTRIBUTION OF THE PARTICLES SIZE - ISO 4407

The level of contamination is defined by counting the number of particles collected by a laboratory membrane per unit of fluid volume. The measurement is done by a microscope. The membrane must be cleaned, dried and desiccated, with fluid and conditions defined by the Standard. The fluid volume is filtered through the membrane, using a suitable suction system.

The level of contamination is identified by dividing the membrane into a predefined number of areas and by counting the contaminant particles using a suitable laboratory microscope.

MICROSCOPE CONTROL AND MEASUREMENT



Example figure 1 and 2

COMPARISON PHOTOGRAPHS
1 graduation = 10µm

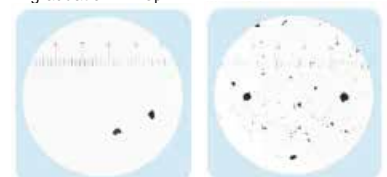


Fig. 1

Fig. 2

For other comparison photographs for contamination classes see the "Fluid Condition and Filtration Handbook".

- CLEANLINESS CODE COMPARISON

Although ISO 4406 standard is being used extensively within the hydraulics industry other standards are occasionally required and a comparison may be requested. The table below gives a very general comparison but often no direct comparison is possible due to the different classes and sizes involved.

ISO 4406	SAE AS4059 Table 2	SAE AS4059 Table 1	NAS 1638
> 4 $\mu\text{m}_{(c)}$ 6 $\mu\text{m}_{(c)}$ 14 $\mu\text{m}_{(c)}$	> 4 $\mu\text{m}_{(c)}$ 6 $\mu\text{m}_{(c)}$ 14 $\mu\text{m}_{(c)}$	4-6 6-14 14-21 21-38 38-70 >70	5-15 15-25 25-50 50-100 >100
23 / 21 / 18	13A / 12B / 12C	12	12
22 / 20 / 17	12A / 11B / 11C	11	11
21 / 19 / 16	11A / 10B / 10C	10	10
20 / 18 / 15	10A / 9B / 9B	9	9
19 / 17 / 14	9A / 8B / 8C	8	8
18 / 16 / 13	8A / 7B / 7C	7	7
17 / 15 / 12	7A / 6B / 6C	6	6
16 / 14 / 11	6A / 5B / 5C	5	5
15 / 13 / 10	5A / 4B / 4C	4	4
14 / 12 / 09	4A / 3B / 3C	3	3

5 FILTRATION TECHNOLOGIES

Various mechanisms such as mechanical stoppage, magnetism, gravimetric deposit, or centrifugal separation can be used to reduce the level of contamination.

The mechanical stoppage method is most effective and can take place in two ways:

- SURFACE FILTRATION

It is by direct interception. The filter prevents particles larger than the pores from continuing in the plant / system. Surface filters are generally manufactured with metal canvases or meshes.

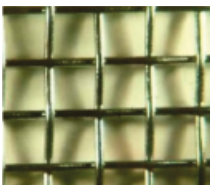
- DEPTH FILTERING

Filters are constructed by fiber interlacing. Such wraps form pathways of different shapes and sizes in which the particles remain trapped when they find smaller apertures than their diameter.

Depth filters are generally produced with papers impregnated with phenolic resins, metal fibers or inorganic fibers.

In inorganic fiber filtration, commonly called microfibre, the filtering layers are often overlapped in order to increase the ability to retain the contaminant.

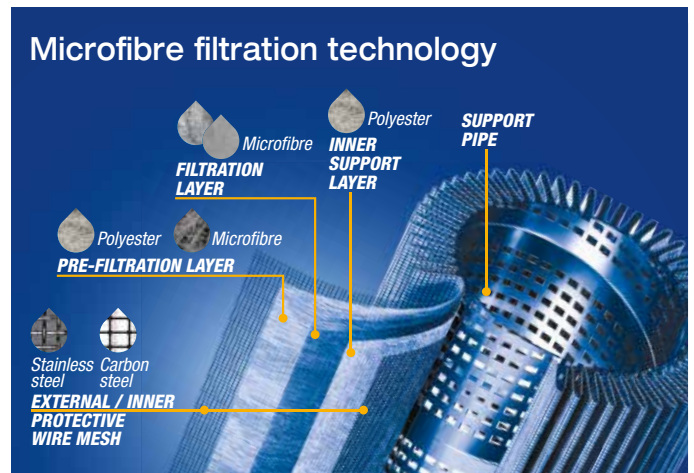
WIRE MESH FILTRATION



PAPER FILTRATION



MICROFIBER FILTRATION



The filtration efficiency of metallic mesh filtrations is defined as the maximum particle size that can pass through the meshes of the filtering grid.

The efficiency of microfibre and paper filtration ($\beta_{x(c)}$) is defined through a lab test called Multipass Test. The efficiency value ($\beta_{x(c)}$) is defined as the ratio between the number of particles of certain dimensions detected upstream and downstream of the filter.

$$\frac{\text{Upstream particles number} > X \mu\text{m}_{(c)}}{\text{Downstream particles number} > X \mu\text{m}_{(c)}} = \beta_{x(c)}$$



Value ($\beta_{x(c)}$)	2	10	75	100	200	1000
Efficiency	50%	90%	98.7%	99%	99.5%	99.9%

Test conditions, such as type of fluid to be used (MIL-H-5606), type of contaminant to be used (ISO MTD), fluid viscosity, test temperature, are determined by ISO 16889.

In addition to the filtration efficiency value during the Multipass test, other important features, such as filtration stability (β stability) and dirt holding capacity (DHC), are also tested.

Poor filtration stability is the cause of the filtering quality worsening as the filter life rises. Low dirt holding capacity causes a reduction in the life of the filter.

Filtration ISO Standard Comparison

$\beta_{x(c)} > 1000$ ISO 16889	$\beta_x > 200$ ISO 4572	MP Filtri Filter media code
5 $\mu\text{m}_{(c)}$	3 μm	A03
7 $\mu\text{m}_{(c)}$	6 μm	A06
10 $\mu\text{m}_{(c)}$	10 μm	A10
16 $\mu\text{m}_{(c)}$	18 μm	A16
21 $\mu\text{m}_{(c)}$	25 μm	A25

6 RECOMMENDED CONTAMINATION CLASSES

Any are the nature and the properties of fluids, they are inevitably subject to contamination. The level of contamination can be managed by using special components called filters.

Hydraulic components builders, knowing the problem of contamination, recommend the filtration level appropriate to the use of their products.

Example of recommended contamination levels for pressures below 140 bar.

Piston pumps with fixed flow rate	•					
Piston pumps with variable flow rate			•			
Vane pumps with fixed flow rate		•				
Vane pumps with variable flow			•			
Engines	•					
Hydraulic cylinders	•					
Actuators					•	
Test benches						•
Check valve	•					
Directional valves	•					
Flow regulating valves	•					
Proportional valves				•		
Servo-valves					•	
Flat bearings			•			
Ball bearings				•		
ISO 4406 CODE	20/18/15	19/17/14	18/16/13	17/15/12	16/14/11	15/13/10
Recommended filtration $\beta_{x(c)} \geq 1.000$	$\beta_{21(c)} > 1000$	$\beta_{15(c)} > 1000$	$\beta_{10(c)} > 1000$	$\beta_{7(c)} > 1000$	$\beta_{7(c)} > 1000$	$\beta_{5(c)} > 1000$
MP Filtri media code	A25	A16	A10	A06	A06	A03

The common classification of filters is determined by their position in the plant.

7 TYPES OF FILTERS

Suction filters

They are positioned before the pump and are responsible for protecting the pump from dirty contaminants. It also provides additional flow guidance to the pump suction line.

Being subject to negligible working pressures are manufactured with simple and lightweight construction.

They are mainly produced with gross grade surface filtrations, mainly $60 \div 125 \mu\text{m}$.

They can be equipped with a magnetic filter for retaining ferrous particles.

They are generally placed under the fluid head to take advantage of the piezometric thrust of the fluid and reduce the risk of cavitation.

There are two types of suction filters:

- IMMERSION FILTERS

Simple filter element screwed on the suction pipe

- FILTERS WITH CONTAINER

Container filters that are more bulky, but provide easier maintenance of the tank

Delivery (or Pressure) filters

They are positioned between the pump and most sensitive regulating and controlling components, such as servo valves or proportional valves, and are designed to ensure the class of contamination required by the components used in the circuit.

Being subjected to high working pressures are manufactured with more robust and articulated construction. In particular situations of corrosive environments or aggressive fluids can be made of stainless steel.

They are mainly produced with filtering depths of $3 \div 25 \mu\text{m}$.

They can be manufactured with in-line connections, with plate or flange connections or directly integrated into the circuit control blocks / manifolds.

They can also be manufactured in duplex configuration to allow the contaminated section to be maintained even when the plant / system is in operation without interruption of the working cycle.

Return filters

They are positioned on the return line to the tank and perform the task of filtering the fluid from particles entering the system from the outside or generated by the wear of the components.

They are generally fixed to the reservoir (for this reason also called top tank mounted), positioned semi-immersed or completely immersed.

The positioning of the return filters must guarantee in all operating conditions that the fluid drainage takes place in immersed condition; this is to avoid creating foams in the tank that can cause malfunctions or cavitation in the pumps.

For the sizing of the return filters, account must be taken of the presence of accumulators or cylinders that can make the return flow considerably greater than the pump suction flow rate.

Being subject to contained working pressures are manufactured with simple and lightweight construction.

Normally it is possible to extract the filter element without disconnecting the filter from the rest of the system.

Combined filters

They are designed to be applied to systems with two or more circuits. They are commonly used in hydrostatic transmission machines where they have a dual filtration function of the return line and suction line of the hydrostatic transmission pump.

The filter is equipped with a valve that keeps the 0.5 bar pressure inside the filter. A portion of the fluid that returns to the tank is filtered by the return filter element, generally produced with absolute filtration, and returns to the transmission booster pump.

Only excess fluid returns to the tank through the valve.

The internal pressure of the filter and the absolute filtration help to avoid the cavitation phenomenon inside the pump.

Off-line filters

They are generally used in very large systems / plants, placed in a closed circuit independent from the main circuit. They remain in operation regardless of the operation of the main circuit and are crossed by a constant flow rate.

They can also be manufactured in duplex configuration to allow the contaminated section to be maintained even when the unit is in operation without interruption of the work cycle.

Venting filters

During the operation of the plants, the fluid level present in the reservoir changes continuously.

The result of this continuous fluctuation is an exchange of air with the outside environment.

The venting filter function, positioned on the tank, is to filter the air that enters the tank to compensate for fluid level variations.

8 FILTER SIZING PARAMETERS

The choice of the filter system for an hydraulic system is influenced by several factors.

It is necessary to consider the characteristics of the various components present in the plant and their sensitivity to contamination.

It is also necessary to consider all the tasks that the filter will have to do within the plant:

- FLUID PROTECTION FROM CONTAMINATION
- PROTECTION OF OLEODYNAMIC COMPONENTS SENSITIVE TO CONTAMINATION
- PROTECTION OF OLEODYNAMIC PLANTS FROM ENVIRONMENTAL WASTE
- PROTECTION OF OLEODYNAMIC PLANTS FROM CONTAMINATION CAUSED BY COMPONENTS' FAILURES

The advantages of proper positioning and sizing of the filters are

- MORE RELIABILITY OF THE SYSTEM
- LONGER LIFE OF THE FLUID COMPONENTS
- REDUCTION OF STOP TIME
- REDUCTION OF FAILURE CASUALTIES

Each hydraulic filter is described by general features that identify the possibility of use in different applications.

- **MAXIMUM WORKING PRESSURE (P_{max})**

The maximum working pressure of the filter must be greater than or equal to the pressure of the circuit section in which it will be installed.

- **PRESSURE DROP (ΔP)**

The pressure drop depends on a number of factors, such as the working circuit temperature, the fluid viscosity, the filter element cleaning condition.

- **WORKING TEMPERATURE (T)**

The working temperature deeply affect the choice of materials. Excessively high or low temperatures may adversely affect the strength of the materials or the characteristics of the seals.

- **FILTRATION EFFICIENCY (%) / FILTRATION RATIO ($\beta_{x(c)}$)**

Filtration efficiency is the most important parameter to consider when selecting a filter.

When choosing the filtration performances, the needs of the most sensitive components in the system must be considered.

- **FLUID TYPE**

The type of fluid influences the choice of filters in terms of compatibility and viscosity. It is always mandatory to check the filterability.

- **PLACEMENT IN THE PLANT**

The position of the filter in the system conditions the efficiency of all filter performances.

9 APPLICABLE STANDARDS FOR FILTER DEVELOPMENT

In order to obtain unique criteria for development and verification of the filters performance, specific regulations for the filters and filter elements testing have been issued by ISO. These norms describe the target, the methodology, the conditions and the presentation methods for the test results.

ISO 2941

Hydraulic fluid power -- Filter elements -- Verification of collapse/burst pressure rating

This Standard describes the method for testing the collapse / burst resistance of the filter elements.

The test is performed by crossing the contaminated fluid filter element at a predefined flow rate. The progressive clogging of the filter element, determined by contamination, causes an increase in differential pressure.

ISO 2942

Hydraulic fluid power -- Filter elements -- Verification of fabrication integrity and determination of the first bubble point

This Standard describes the method to verify the integrity of the assembled filter elements.

It can be used to verify the quality of the production process or the quality of the materials by verifying the pressure value of the first bubble point.

ISO 2943

Hydraulic fluid power -- Filter elements -- Verification of material compatibility with fluids

This Standard describes the method to verify the compatibility of materials with certain hydraulic fluids.

The test is carried out by keeping the element (the material sample) immersed in the fluid under high or low temperature conditions for a given period of time and verifying the retention of the characteristics.

ISO 3723

Hydraulic fluid power -- Filter elements -- Method for end load test

This Standard describes the method for verifying the axial load resistance of the filter elements.

After performing the procedure described in ISO 2943, the designed axial load is applied to the filter element. To verify the test results, then the test described in ISO 2941 is performed.

ISO 3968

Hydraulic fluid power -- Filters -- Evaluation of differential pressure versus flow characteristics

This Standard describes the method for checking the pressure drop across the filter.

The test is carried out by crossing the filter from a given fluid and by detecting upstream and downstream pressures.

Some of the parameters defined by the Standard are the fluid, the test temperature, the size of the tubes, the position of the pressure detection points.

ISO 16889

Hydraulic fluid power -- Filters -- Multi-pass method for evaluating filtration performance of a filter element

This Standard describes the method to check the filtration characteristics of the filter elements.

The test is performed by constant introduction of contaminant (ISO MTD). The characteristics observed during the test are the filtration efficiency and the dirty holding capacity related to the differential pressure.

ISO 23181

Hydraulic fluid power -- Filter elements -- Determination of resistance to flow fatigue using high viscosity fluid

This Standard describes the method for testing the fatigue resistance of the filter elements. The test is carried out by subjecting the filter to continuous flow variations, thus differential pressure, using a high viscosity fluid.

ISO 11170

Hydraulic fluid power -- Sequence of tests for verifying performance characteristics of filter elements

The Standard describes the method for testing the performance of filter elements. The protocol described by the regulations provides the sequence of all the tests described above in order to verify all the working characteristics (mechanical, hydraulic and filtration).

ISO 10771-1

Hydraulic fluid power -- Fatigue pressure testing of metal pressure-containing envelopes -- Test method

This Standard describes the method to check the resistance of the hydraulic components with pulsing pressure.

It can be applied to all metal components (excluding tubes) subject to cyclic pressure used in the hydraulic field.

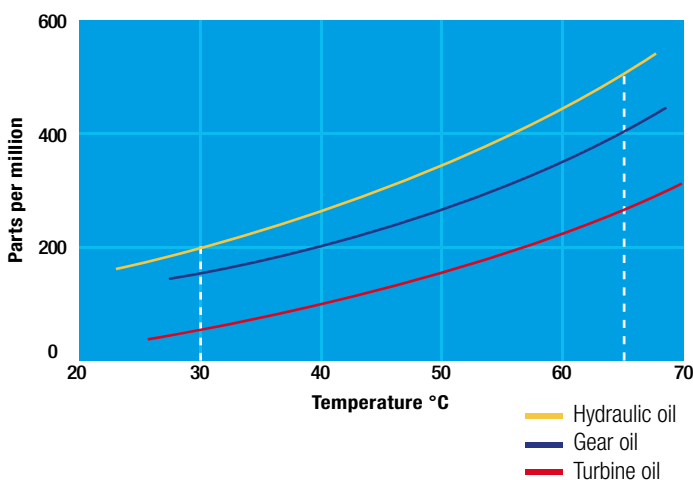
10 WATER IN HYDRAULIC AND LUBRICATING FLUIDS

Water Content

In mineral oils and non aqueous resistant fluids water is undesirable. Mineral oil usually has a water content of 50-300 ppm (@40°C) which it can support without adverse consequences.

Once the water content exceeds about 300ppm the oil starts to appear hazy. Above this level there is a danger of free water accumulating in the system in areas of low flow. This can lead to corrosion and accelerated wear.

Similarly, fire resistant fluids have a natural water which may be different to mineral oil.



Saturation Levels

Since the effects of free (also emulsified) water is more harmful than those of dissolved water, water levels should remain well below the saturation point.

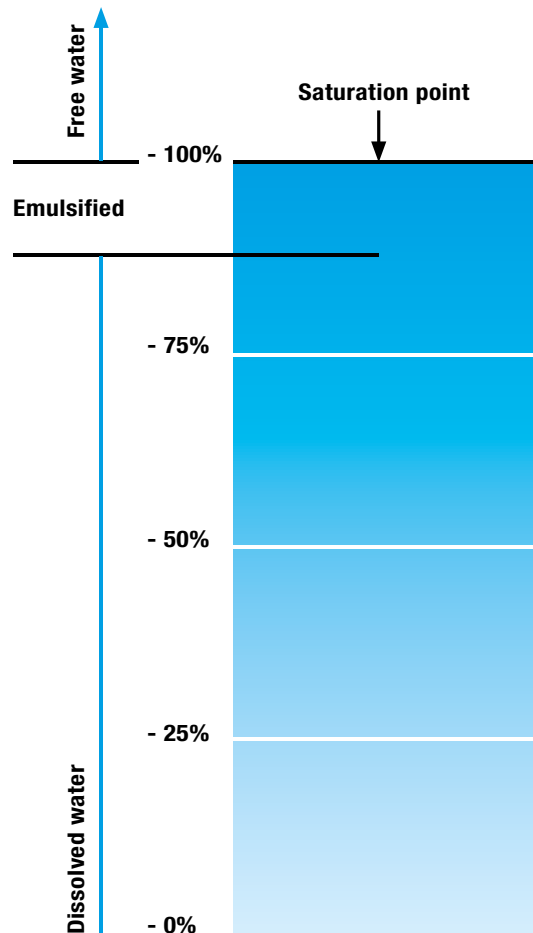
However, even water in solution can cause damage and therefore every reasonable effort should be made to keep saturation levels as low as possible. There is no such thing as too little water. As a guideline, we recommend maintaining saturation levels below 50% in all equipment.

TYPICAL WATER SATURATION LEVEL FOR NEW OILS

Examples:

Hydraulic oil @ 30°C = 200 ppm = 100% saturation

Hydraulic oil @ 65°C = 500 ppm = 100% saturation



Water absorber

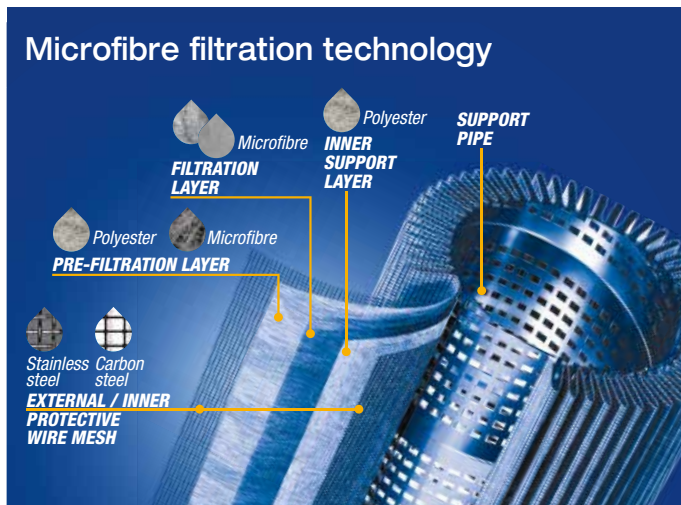
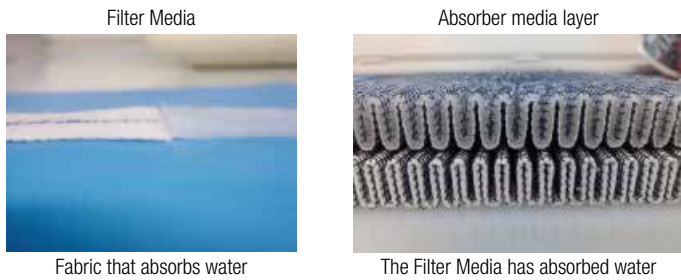
Water is present everywhere, during storage, handling and servicing.

MP Filtri filter elements feature an absorbent media which protects hydraulic systems from both particulate and water contamination.

MP Filtri's filter element technology is available with inorganic microfiber media with a filtration rating 25 µm (therefore identified with media designation WA025), providing absolute filtration of solid particles to $\beta_{x(c)} = 1000$.

Absorbent media is made by water absorbent fibres which increase in size during the absorption process.

Free water is thus bonded to the filter media and completely removed from the system (it cannot even be squeezed out).



By removing water from your fluid power system, you can prevent such key problems as:

- corrosion (metal etching)
- loss of lubricant power
- accelerated abrasive wear in hydraulic components
- valve-locking
- bearing fatigue
- viscosity variance (reduction in lubricating properties)
- additive precipitation and oil oxidation
- increase in acidity level
- increased electrical conductivity (loss of dielectric strength)
- slow/weak response of control systems

Product availability:

LOW & MEDIUM PRESSURE FILTERS - LMP Series

LMP 210	LMP 900
LMP 211	LMP 901
LMP 400	LMP 902
LMP 401	LMP 903
LMP 430	LMP 950

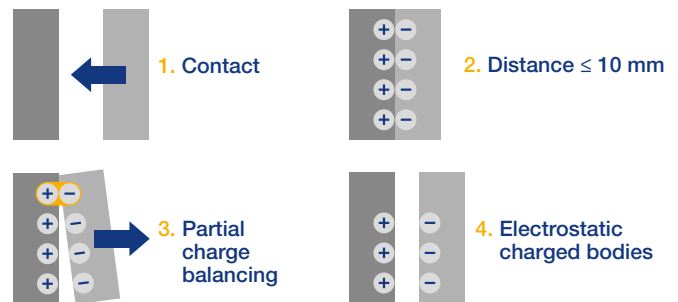
11 THE ANTI-STATIC FILTERS



zerospark is a specialist solution designed to solve the problem of electrostatic discharge inside hydraulic filters. Caused by the electrical charge build-up due to the passage of oil through the filters, this can result in damage to filter elements, oils and circuit components. It can even cause fire hazards in environments where flammable materials are present.

THE TRIBOELECTRIC EFFECT

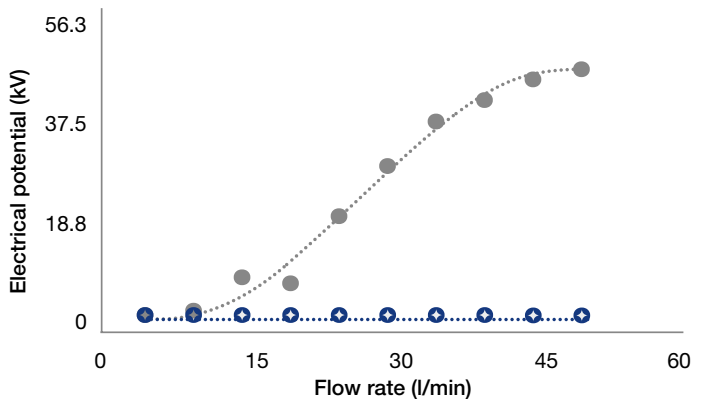
The body with the most electronegativity strips electrons from the other, generating a build-up of a net negative charge on itself. The other body is charged by the same amount but with the opposite sign, giving rise to very high potential differences. These, if not dissipated, can give rise to electrostatic discharges.



DISSIPATIVE FILTER ELEMENTS

To solve the problem of charge build-up in filters, MP Filtri has developed an innovative solution. By replacing certain insulating components with conductive zerospark versions, the charges on the media are free to move towards the head and are thus dissipated to the ground.

- ⊕ Dissipative elements
- Standard elements



Under standard working conditions, the potential goes from tens of kV to zero, clearly showing the effectiveness of our dissipative filters.

The following table summarises some examples of test results at the same flow rate and temperature for elements of the same size but made of different materials.

Filter element	Electrical potential (kV)	Current (µA)
Standard glass microfibre	11	-6.0
Dissipative glass microfibre	0	-9.0
Standard cellulose	6	-1.3
Dissipative cellulose	0	-2.1
Other glass microfibre	9-15	-7.0
Other glass microfibre	3-8	-16.0

When using a synthetic oil instead of mineral oil, the values and sign of the two electrical quantities may vary.

Filter element	Mineral oil	Synthetic oil
	Electrical potential (kV)	
Standard glass microfibre	+11	+30
Dissipative glass microfibre	0	~0.0
Standard cellulose	+6	-43
Dissipative cellulose	0	~0.0

FILTER SIZING

INDEX

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CALCULATION	23
CORRECTIVE FACTOR	24

THE CORRECT FILTER SIZING HAS TO BE BASED ON THE TOTAL PRESSURE DROP DEPENDING BY THE APPLICATION.

FOR EXAMPLE, THE MAXIMUM TOTAL PRESSURE DROP ALLOWED BY A NEW AND CLEAN RETURN FILTER HAVE TO BE IN THE RANGE 0.4 - 0.6 bar / 5.80 - 8.70 psi.

The pressure drop calculation is performed by adding together the value of the housing with the value of the filter element. The pressure drop Δpc of the housing is proportional to the fluid density (kg/dm^3 / lb/ft^3). The filter element pressure drop Δpe is proportional to its viscosity (mm^2/s / SUS), the corrective factor Y have to be used in case of an oil viscosity different than $30 \text{ mm}^2/\text{s}$ (cSt) / 150 SUS.

Sizing data for single filter element, head at top

- Δpc = Filter housing pressure drop [bar / psi]
- Δpe = Filter element pressure drop [bar / psi]
- Y = Corrective factor Y (see correspondent table), depending on the filter type, on the filter element size, on the filter element length and on the filter media
- Q = flow rate (l/min - gpm)
- V1 reference oil viscosity = $30 \text{ mm}^2/\text{s}$ (cSt) / 150 SUS
- V2 = operating oil viscosity in mm^2/s (cSt) / SUS

Filter element pressure drop calculation with an oil viscosity different than $30 \text{ mm}^2/\text{s}$ (cSt) / 150 SUS

- International system:
 $\Delta pe = Y : 1000 \times Q \times (V2:V1)$
- Imperial system:
 $\Delta pe = Y : 17.2 \times Q \times (V2:V1)$

$\Delta p \text{ Tot.} = \Delta pc + \Delta pe$

Verification formula
 $\Delta p \text{ Tot.} \leq \Delta p \text{ max allowed}$

Maximum total pressure drop ($\Delta p \text{ max}$) allowed by a new and clean filter

Application	Range:[bar]	[psi]
Suction filters	0.08 - 0.10 bar	1.16 - 1.45 psi
Return filters	0.4 - 0.6 bar	5.80 - 8.70 psi
Return - Suction filters (*)	0.8 - 1.0 bar	11.60 - 14.50 psi
Low & Medium Pressure filters	0.4 - 0.6 bar	5.80 - 8.70 psi return lines
	0.3 - 0.5 bar	4.35 - 7.25 psi lubrication lines
	0.3 - 0.4 bar	4.35 - 5.80 psi off-line in power systems
	0.1 - 0.3 bar	1.45 - 4.35 psi off-line in test benches
	0.4 - 0.6 bar	5.80 - 8.7 psi over-boost
High Pressure filters	0.8 - 1.5 bar	11.60 - 21.75 psi
Stainless Steel filters	0.8 - 1.5 bar	11.60 - 21.75 psi

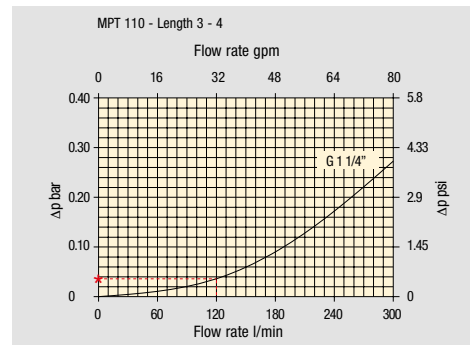
(*)The suction flow rate should not exceed 30% of the return flow rate

Generic filter calculation example

- Application data:
- Tank top return filter
- Pressure $P_{\text{max}} = 10 \text{ bar}$
- Flow rate $Q = 120 \text{ l/min}$
- Viscosity $V2 = 46 \text{ mm}^2/\text{s}$ (cSt)
- Oil density = $0.86 \text{ kg}/\text{dm}^3$
- Required filtration efficiency = $25 \mu\text{m}$ with absolute filtration
- With bypass valve and G 1 1/4" inlet connection

Calculation:

$\Delta pc = 0.03 \text{ bar} / 0.43 \text{ psi}$ (see graphic below)



Filter housings Δp pressure drop. The curves are plotted using mineral oil with density of $0.86 \text{ kg}/\text{dm}^3$ in compliance with ISO 3968. Δp varies proportionally with density.

$\Delta pe = (2.00 : 1000) \times 120 \times (46 : 30) = 0.37 \text{ bar}$
 $\Delta pe = (2.00 : 17.2) \times 32 \times (216 : 150) = 5.36 \text{ psi}$

Filter element	Absolute filtration H Series					Nominal filtration N Series		
	A03	A06	A10	A16	A25	P10	P25	M25 M60 M90
Return filters	74.00	50.08	20.00	16.00	9.00	6.43	5.51	4.40
MF 020	2 29.20	24.12	8.00	7.22	5.00	3.33	2.85	2.00
	3 22.00	19.00	6.56	5.33	4.33	1.68	1.44	1.30
MF 030 MFX 030	1 74.00	50.08	20.00	16.00	9.00	6.43	5.51	3.40
MF 100 MFX 100	1 28.20	24.40	8.67	8.17	6.88	4.62	3.96	1.25
	2 17.33	12.50	6.86	5.70	4.00	3.05	2.47	1.10
	3 10.25	9.00	3.65	3.33	2.50	1.63	1.32	0.96
	4 6.10	5.40	2.30	2.20	2.00	1.19	0.96	0.82

$\Delta p \text{ Tot.} = 0.03 + 0.37 = 0.4 \text{ bar}$
 $\Delta p \text{ Tot.} = 0.43 + 5.36 = 5.79 \text{ psi}$

The selection is correct because the total pressure drop value is inside the admissible range for top tank return filters. In case the allowed max total pressure drop is not verified, it is necessary to repeat the calculation changing the filter length/size.

FILTER SIZING Corrective factor

Corrective factor Y to be used for the filter element pressure drop calculation. The values depend to the filter size and length and to the filter media.
Reference oil viscosity 30 mm²/s

Return filters

Filter element	Absolute filtration H Series					Nominal filtration N Series			
	Type	A03	A06	A10	A16	A25	P10	P25	M25 M60 M90
MF 020	1	74.00	50.08	20.00	16.00	9.00	6.43	5.51	4.40
	2	29.20	24.12	8.00	7.22	5.00	3.33	2.85	2.00
	3	22.00	19.00	6.56	5.33	4.33	1.68	1.44	1.30
MF 030 MFX 030	1	74.00	50.08	20.00	16.00	9.00	6.43	5.51	3.40
MF 100 MFX 100	1	28.20	24.40	8.67	8.17	6.88	4.62	3.96	1.25
	2	17.33	12.50	6.86	5.70	4.00	3.05	2.47	1.10
	3	10.25	9.00	3.65	3.33	2.50	1.63	1.32	0.96
	4	6.10	5.40	2.30	2.20	2.00	1.19	0.96	0.82
MF 180 MFX 180	1	3.67	3.05	1.64	1.56	1.24	1.18	1.06	0.26
	2	1.69	1.37	0.68	0.54	0.51	0.43	0.39	0.12
MF 190 MFX 190	2	1.69	1.37	0.60	0.49	0.44	0.35	0.31	0.11
MF 400 MFX 400	1	3.20	2.75	1.39	1.33	1.06	0.96	0.87	0.22
	2	2.00	1.87	0.88	0.85	0.55	0.49	0.45	0.13
	3	1.90	1.60	0.63	0.51	0.49	0.39	0.35	0.11
MF 750 MFX 750	1	1.08	0.84	0.49	0.36	0.26	0.21	0.19	0.06
MLX 250	2	3.00	3.04	1.46	1.25	1.17	-	-	M25 0.20
MLX 660	2	1.29	1.26	0.52	0.44	0.38	-	-	M25 0.10
CU 025		78.00	48.00	28.00	24.00	9.33	9.33	8.51	1.25
CU 040		25.88	20.88	10.44	10.00	3.78	3.78	3.30	1.25
CU 100		15.20	14.53	5.14	4.95	2.00	2.00	0.17	1.10
CU 250		3.25	2.55	1.55	1.35	0.71	0.71	0.59	0.25
CU 630		1.96	1.68	0.85	0.72	0.42	0.42	0.36	0.09
CU 850		1.06	0.84	0.42	0.33	0.17	0.17	0.13	0.04
DH 250	2	3.61	4.08	1.81	1.71	1.35	-	-	M25 0.55
	4	2.10	1.70	1.14	0.77	0.53	-	-	0.60
MR 100	1	19.00	17.00	6.90	6.30	4.60	2.94	2.52	1.60
	2	11.70	10.80	4.40	4.30	3.00	2.94	2.52	1.37
	3	7.80	6.87	3.70	3.10	2.70	2.14	1.84	1.34
	4	5.50	4.97	2.60	2.40	2.18	1.72	1.47	1.34
	5	4.20	3.84	2.36	2.15	1.90	1.60	1.37	1.34
MR 250	1	5.35	4.85	2.32	1.92	1.50	1.38	1.20	0.15
	2	4.00	3.28	1.44	1.10	1.07	0.96	0.83	0.13
	3	2.60	2.20	1.08	1.00	0.86	0.77	0.64	0.12
	4	1.84	1.56	0.68	0.56	0.44	0.37	0.23	0.11
MR 630	1	3.10	2.48	1.32	1.14	0.92	0.83	0.73	0.09
	2	2.06	1.92	0.82	0.76	0.38	0.33	0.27	0.08
	3	1.48	1.30	0.60	0.56	0.26	0.22	0.17	0.08
	4	1.30	1.20	0.48	0.40	0.25	0.21	0.16	0.08
	5	0.74	0.65	0.30	0.28	0.13	0.10	0.08	0.04
MR 850	1	0.60	0.43	0.34	0.25	0.13	0.12	0.09	0.03
	2	0.37	0.26	0.23	0.21	0.11	0.08	0.07	0.03
	3	0.27	0.18	0.17	0.17	0.05	0.04	0.04	0.02
	4	0.23	0.16	0.13	0.12	0.04	0.03	0.03	0.02

Return / Suction filters

Filter element	Absolute filtration								
	Type	A10	A16	A25					
RSX 116	1	5.12	4.33	3.85					
	2	2.22	1.87	1.22					
RSX 165 RSX 166	1	2.06	1.75	1.46					
	2	1.24	1.05	0.96					
	3	0.94	0.86	0.61					
Filter element	Absolute filtration N Series								
	Type	A03	A06	A10	A16	A25	P10	P25	M25 M60 M90
CU 110	1	16.25	15.16	8.75	8.14	5.87	2.86	2.65	0.14
	2	12.62	10.44	6.11	6.02	4.16	1.60	1.49	0.12
	3	8.57	7.95	5.07	4.07	2.40	1.24	1.15	0.11
	4	5.76	4.05	2.80	2.36	1.14	0.91	0.85	0.05

Low & Medium pressure filters

Filter element	Absolute filtration N-W Series					Nominal filtration N Series			
	Type	A03	A06	A10	A16	A25	P10	P25	M25
CU 110	1	16.25	15.16	8.75	8.14	5.87	2.86	2.65	0.14
	2	12.62	10.44	6.11	6.02	4.15	1.60	1.49	0.12
	3	8.57	7.95	5.07	4.07	2.40	1.24	1.15	0.11
	4	5.76	4.05	2.80	2.36	1.14	0.91	0.85	0.05
CU 210	1	5.30	4.80	2.00	1.66	1.32	0.56	0.43	0.12
	2	3.44	2.95	1.24	1.09	0.70	0.42	0.35	0.09
	3	2.40	1.70	0.94	0.84	0.54	0.33	0.23	0.05
DN	016	7.95	7.20	3.00	2.49	1.98	0.84	0.65	0.18
	025	5.00	4.53	1.89	1.57	1.25	0.53	0.41	0.11
	040	3.13	2.66	1.12	0.98	0.63	0.38	0.32	0.08
CU 400	2	3.13	2.55	1.46	1.22	0.78	0.75	0.64	0.19
	3	2.15	1.70	0.94	0.78	0.50	0.40	0.34	0.10
	4	1.60	1.28	0.71	0.61	0.40	0.34	0.27	0.08
	5	1.00	0.83	0.47	0.34	0.20	0.24	0.19	0.06
	6	0.82	0.58	0.30	0.27	0.17	0.22	0.18	0.05
	CU 900	1	0.86	0.63	0.32	0.30	0.21	-	-
CU 950	2	1.03	0.80	0.59	0.40	0.26	-	-	0.05
	3	0.44	0.40	0.27	0.18	0.15	-	-	0.02
MR 630	7	0.88	0.78	0.36	0.34	0.16	0.12	0.96	0.47

Corrective factor Y to be used for the filter element pressure drop calculation. The values depend to the filter size and length and to the filter media.
Reference oil viscosity 30 mm²/s

High pressure filters

Filter element	Absolute filtration N - R Series					Nominal filtration N Series	
	Type	A03	A06	A10	A16	A25	M25
HP 011	1	332.71	250.07	184.32	152.36	128.36	-
	2	220.28	165.56	74.08	59.13	37.05	-
	3	123.24	92.68	41.48	33.08	20.72	-
	4	77.76	58.52	28.37	22.67	16.17	-
HP 039	2	70.66	53.20	25.77	20.57	14.67	4.90
	3	36.57	32.28	18.00	13.38	8.00	2.90
	4	26.57	23.27	12.46	8.80	5.58	2.20
HP 050	1	31.75	30.30	13.16	12.3	7.29	1.60
	2	24.25	21.26	11.70	9.09	4.90	1.40
	3	17.37	16.25	8.90	7.18	3.63	1.25
	4	12.12	10.75	6.10	5.75	3.08	1.07
	5	7.00	6.56	3.60	3.10	2.25	0.80
HP 065	1	58.50	43.46	23.16	19.66	10.71	1.28
	2	42.60	25.64	16.22	13.88	7.32	1.11
	3	20.50	15.88	8.18	6.81	3.91	0.58
HP 135	1	20.33	18.80	9.71	8.66	4.78	2.78
	2	11.14	10.16	6.60	6.38	2.22	1.11
	3	6.48	6.33	3.38	3.16	2.14	1.01
HP 150	1	17.53	15.91	7.48	6.96	5.94	1.07
	2	8.60	8.37	3.54	3.38	3.15	0.58
	3	6.53	5.90	2.93	2.79	2.12	0.49
HP 320	1	10.88	9.73	5.02	3.73	2.54	1.04
	2	4.40	3.83	1.75	1.48	0.88	0.71
	3	2.75	2.11	1.05	0.87	0.77	0.61
	4	2.12	1.77	0.98	0.78	0.55	0.47
HP 500	1	4.44	3.67	2.30	2.10	1.65	0.15
	2	3.37	2.77	1.78	1.68	1.24	0.10
	3	2.22	1.98	1.11	1.09	0.75	0.08
	4	1.81	1.33	0.93	0.86	0.68	0.05
	5	1.33	1.15	0.77	0.68	0.48	0.04
Filter element	Absolute filtration N Series						
Type	A03	A06	A10	A16	A25	M25	
HF 325	1	3.65	2.95	2.80	1.80	0.90	0.38
	2	2.03	1.73	1.61	1.35	0.85	0.36
	3	1.84	1.42	1.32	1.22	0.80	0.35

Suction filters

Filter element	Nominal filtration N Series						
	Type	P10	P25	M25	M60	M90	M250
SF 250		0.65	0.20	0.10	0.08	0.05	0.03
SF 503		-	-	0.17	0.11	0.11	0.11
SF 504		-	-	0.11	0.08	0.08	0.08
SF 505		-	-	0.23	0.18	0.18	0.18
SF 510		-	-	0.18	0.14	0.14	0.14
SF 535		-	-	0.08	0.05	0.05	0.05
SF 540		-	-	0.05	0.04	0.04	0.04

Stainless steel high pressure filters and Filters for potentially explosive atmosphere

Filter element	Absolute filtration N Series					
	Type	A03	A06	A10	A16	A25
HP 011	1	332.71	250.07	184.32	152.36	128.36
	2	220.28	165.56	74.08	59.13	37.05
	3	123.24	92.68	41.48	33.08	20.72
	4	77.76	58.52	28.37	22.67	16.17
HP 039	2	70.66	53.20	25.77	20.57	14.67
	3	36.57	32.28	18.00	13.38	8.00
	4	26.57	23.27	12.46	8.80	5.58
HP 050 HPX 050	1	31.75	30.30	13.16	12.3	7.29
	2	24.25	21.26	11.70	9.09	4.90
	3	17.37	16.25	8.90	7.18	3.63
	4	12.12	10.75	6.10	5.75	3.08
	5	7.00	6.56	3.60	3.10	2.25
HP 135	1	20.33	18.80	9.71	8.66	4.78
	2	11.14	10.16	6.60	6.38	2.22
	3	6.48	6.33	3.38	3.16	2.14
Filter element	Absolute filtration H - U Series					
Type	A03	A06	A10	A16	A25	
HP 011	1	424.58	319.74	235.17	194.44	163.78
	2	281.06	211.25	94.53	75.45	47.26
	3	130.14	97.50	43.63	34.82	21.81
	4	109.39	82.25	36.79	29.37	18.40
HP 039	2	73.00	57.00	28.00	24.00	17.20
	3	40.90	36.33	21.88	18.80	11.20
	4	31.50	28.22	17.22	9.30	6.70
HP 050 HPX 050	1	47.33	34.25	21.50	20.50	14.71
	2	29.10	25.95	14.04	10.90	5.88
	3	20.85	19.50	10.68	8.61	4.36
	4	14.55	12.90	7.32	6.90	3.69
	5	9.86	9.34	6.40	4.80	2.50
HP 135	1	29.16	25.33	13.00	12.47	5.92
	2	14.28	11.04	7.86	7.60	4.44
	3	8.96	7.46	4.89	4.16	3.07

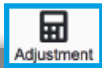
Step 4

Choose the most suitable filter from the proposed list.

Image	Code	Peak bar	Qmax gal/min	ΔP bar	Housing ΔP bar	Element ΔP bar	Connection	Seal	Link			
	MPFX-103-3-A-C3-A25-H-BPFI	8	116	25.74	25.3	0.47	T	0.12 2	0.35 5	G 1"	A	Adjustment Report
	MPFX-104-3-A-C3-A25-H-BPFI	8	116	25.74	25.3	0.47	T	0.12 2	0.35 5	G 1"	A	Adjustment Report

Step 5

It is possible to change the filter modifying every parameter.



A SAVE YOUR FILTER'S REPORT



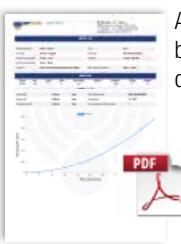
B MANUAL EDIT



SAVE IN YOUR ARCHIVE
typing your reference data and then SAVE AS PDF

A new browser window displays the pdf

see A



Close the report window



By clicking your WELCOME button, the SHOW REPORTS is displayed: select it to see your filters list.

High pressure filters are used as process filters to protect individual valves or the entire hydraulic circuit from contamination as per ISO 4406.

9 versions are available with operating pressures range from 110 bar up to 560 bar.

A range of products is available to resolve all filter mounting problems, in the following configurations:

- In-line, with threaded and flange mounting
- Manifold top mounting
- Manifold side mounting
- Manifold mounting, to DIN 24340 CETOP R 35 H
- Manifold threaded/flange mounting in the top extraction filter cartridge version
- Duplex versions for continuous operation requirements

FMP series is specifically designed and suitable for:

- feed pumps of hydrostatic drives
- pressure lubrication
- hydraulic systems in the high pressure range

FMMX & FMM series is optimized for the protection of servo and proportional hydraulics:

- in agricultural machinery
- in construction machinery
- in commercial vehicles

HPB are kits designed for the direct integration into the control block; they can be easily integrated into the block through a simple cavity.

FHP & FHA series are the typical high-pressure filters optimized for industrial applications.

FHM series is designed for intermediate plate construction, CETOP design.

FHB series is designed for block mounting; the filter head can be screwed in from the outside.

FHF series is designed to assemble HF4 filter element according to SAE J2066.

FHD series is the duplex high pressure filter; with two independent filter heads, the flow can be switched without interruption during operation.

The range includes a complete set of valves:

- Bypass valve
- Check valve
- Bypass + check valve
- Reverse-flow valve
- Reverse-flow + bypass valve

FILTER SIZING

For the proper corrective factor Y see chapter at page 25

High pressure filters



FMMX 050	page 442
FMM	451
FHA 051	461
FMP 039	469
FMP	477
FHP	489

FHM	page 509
FHB	527
FHF 325	541
FHD	551
HPB	565
INDICATORS	687



THE X CONCEPT FOR OUR FILTERS

Protect the performance of your system with MYclean.
Quality and efficiency are fundamental for MP Filtri:
this exclusive new filter element possesses polygon shape geometry and specific seal
that ensures only original spare parts can be used - ensuring correct operation and
higher system reliability.

FMMX 050 series

with MYCLEAN HPX 050 Filter Element



- Protects the machine from improper use of non-original products.
- Safety of constant quality protection & reliability

With exclusive filter element you are sure that only MP Filtri filter elements can be used, ensuring the best cleaning level of the oil due to the use of originals filter elements.



The products identified as FMMX 050 are protected by:

- Italian Patent n° 102014902261205
- Canadian Patent n° 2,937,258
- European Patent n° 3 124 092 B1
- US Patent n° 20170030384 A1

TOGETHER WITH MYCLEAN, AS OPTION, FMMX 050 SERIES CAN BE PROVIDED WITH

zerospark®
THE ANTI-STATIC FILTERS

THE Z CONCEPT FOR OUR FILTERS



Zerospark® is a specialist solution designed to solve the problem of electrostatic discharge inside hydraulic filters. Caused by the electrical charge build-up due to the passage of oil through the filters, this can result in damage to filter elements, oils and circuit components. It can even cause fire hazards in environments where flammable materials are present.

FMMX 050 series

Maximum working pressure up to 42 MPa (420 bar) - Flow rate up to 154 l/min



FMMX 050 GENERAL INFORMATION

Description

Technical data

High Pressure filters

In-line

Maximum working pressure up to 42 MPa (420 bar)

Flow rate up to 154 l/min

FMMX is a range of versatile high pressure filter for protection of sensitive components in high pressure hydraulic systems in the mobile machines.

They are directly connected to the lines of the system through the hydraulic fittings.

Available features:

- Female threaded connections up to 1 1/4", for a maximum flow rate of 250 l/min
- Fine filtration rating, to get a good cleanliness level into the system
- Bypass valve, to relieve excessive pressure drop across the filter media
- Low collapse filter element "N", for use with filters provided with bypass valve
- Visual, electrical and electronic differential clogging indicators
- MYclean interface connection for the filter element, to protect the product against non-original spare parts.
- External protective wrap, to optimize the flow through the element and to save the element efficiency against non-proper handling

Common applications:

- Agricultural machines
- Mobile machines

Filter housing materials

- Head: Painted cast iron, black RAL 9005
- Housing: Phosphatized steel
- Bypass valve: Steel

Pressure

- Test pressure: 63 MPa (630 bar)
- Burst pressure: 126 MPa (1260 bar)
- Pulse pressure fatigue test: 1 000 000 cycles with pressure from 0 to 42 MPa (420 bar)

Bypass valve

- Opening pressure 600 kPa (6 bar) ±10%
- Other opening pressures on request.

Δp element type

- Microfiber filter elements - series N: 20 bar
- Wire mesh filter elements - series N: 20 bar
- Fluid flow through the filter element from OUT to IN

Seals

- Standard NBR series A
- Optional FPM series V

Temperature

From -25 °C to +110 °C

Connections

In-line Inlet/Outlet

Note

FMMX filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]					Volumes [dm ³]						
	Length	1	2	3	4	5	Length	1	2	3	4	5
FMMX 050		3.11	3.48	3.90	4.36	5.54		0.34	0.48	0.63	0.81	1.23

Filter series	Length	Filter element design - N Series					
		A03	A06	A10	A16	A25	M25
FMMX 050	1	42	43	79	82	106	147
	2	52	57	85	96	121	149
	3	66	69	97	106	130	150
	4	83	89	113	115	134	152
	5	107	110	130	134	141	154

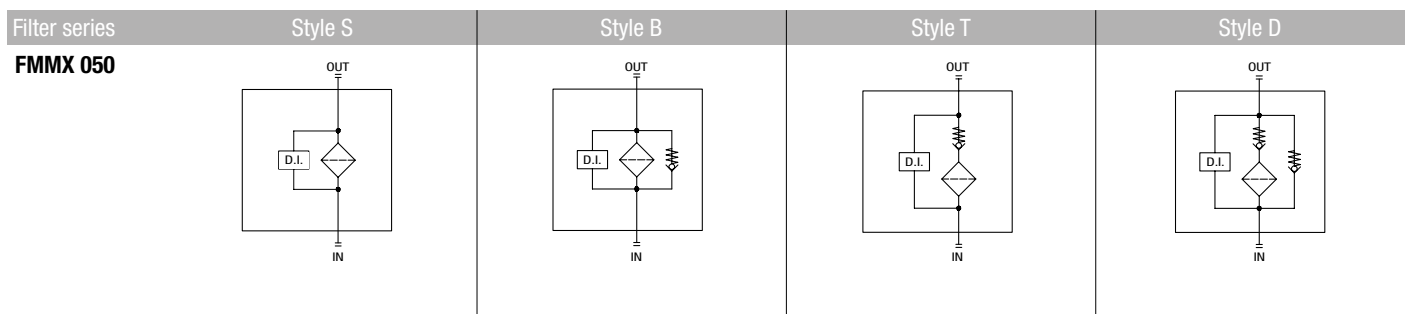
Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

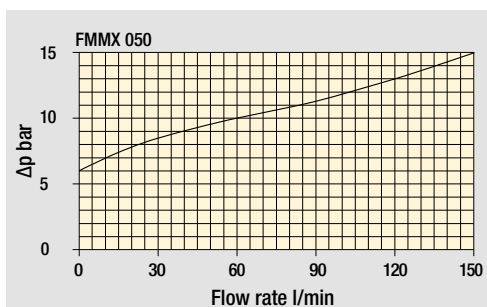
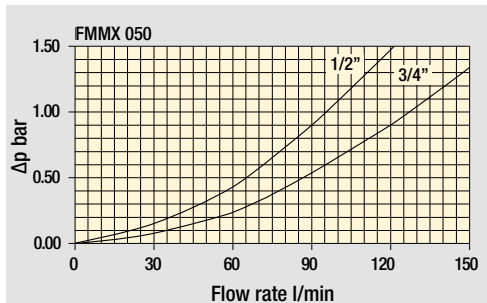
For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

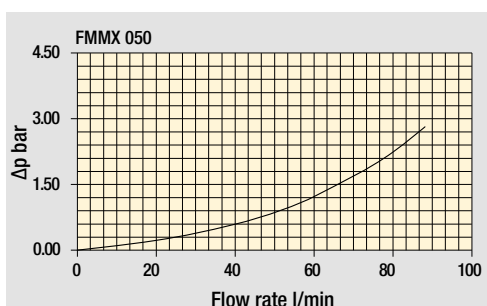
Hydraulic symbols



Pressure drop
Filter housings
 Δp pressure drop



Bypass valve
pressure drop



Filter housing
with check valve

Valves

The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968. Δp varies proportionally with density.

FMMX 050

Designation & Ordering code

COMPLETE FILTER

Series and size Configuration example: **FMMX050** | **3** | **B** | **A** | **G** | **A10** | **N** | **P01**

FMMX050 Filter featuring **MYCLEAN** Filter Element

Length
1 | **2** | **3** | **4** | **5**

Valves
B With bypass 6 bar
D With check valve, with bypass 6 bar

Seals
A NBR
V FPM

Connections
A M18x1.5 - ISO 6149 **E** 1/2" NPT
B M22x1.5 - ISO 6149 **F** 3/4" NPT
C G 1/2" **G** SAE 8 - 3/4" - 16 UNF
D G 3/4" **H** SAE 12 - 1 1/16" - 12 UN

Filtration rating (filter media)
A03 Inorganic microfiber 3 µm
A06 Inorganic microfiber 6 µm
A10 Inorganic microfiber 10 µm
A16 Inorganic microfiber 16 µm
A25 Inorganic microfiber 25 µm
M25 Wire mesh 25 µm

Element Δp
N 20 bar

Executions		
Base	zérospark ⁺	
P01	Z01	Upper connection for clogging indicator
P02	Z02	Without connection for clogging indicator
P03	Z03	Frontal connection for clogging indicator
Pxx	Zxx	Customized

FILTER ELEMENT

Element series and size Configuration example: **HPX050** | **3** | **A10** | **A** | **N** | **P01**

HPX050 Filter Element with **MYCLEAN** feature

Element length
1 | **2** | **3** | **4** | **5**

Filtration rating (filter media)
A03 Inorganic microfiber 3 µm
A06 Inorganic microfiber 6 µm
A10 Inorganic microfiber 10 µm
A16 Inorganic microfiber 16 µm
A25 Inorganic microfiber 25 µm
M25 Wire mesh 25 µm

Seals
A NBR
V FPM

Element Δp
N 20 bar

Executions		
Base	zérospark ⁺	
P01	Z01	MP Filtri standard
Pxx	Zxx	Customized

CLOGGING INDICATORS

See page 687

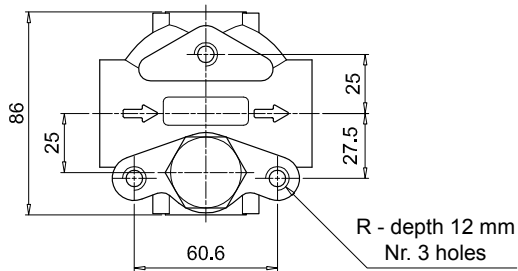
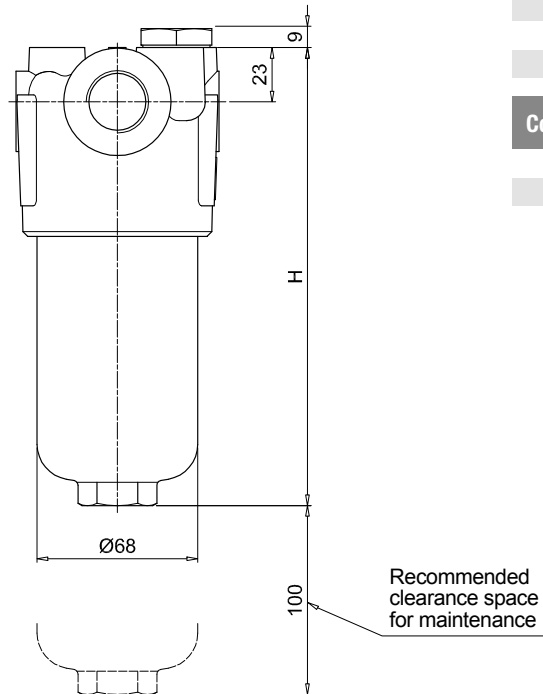
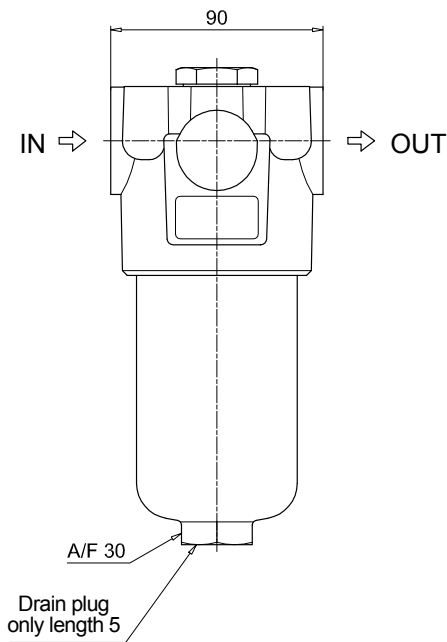
DEA Electrical differential indicator
DEM Electrical differential indicator
DLA Electrical / visual differential indicator
DLE Electrical / visual differential indicator

DTA Electrical differential indicator
DVA Visual differential indicator
DVM Visual differential indicator

PLUGS

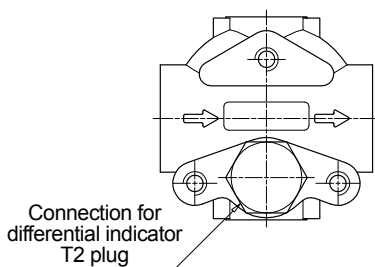
See page 706

T2 Differential indicator plug

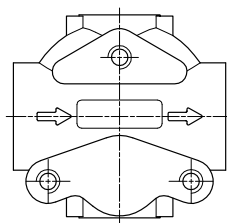


FMMX050	
Filter length	H [mm]
1	158
2	195
3	237
4	285
5	407
Connections	R
A-B-C-D	M10
E-F-G-H	3/8" UNC

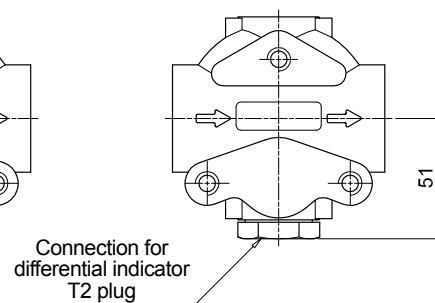
Execution P01



Execution P02



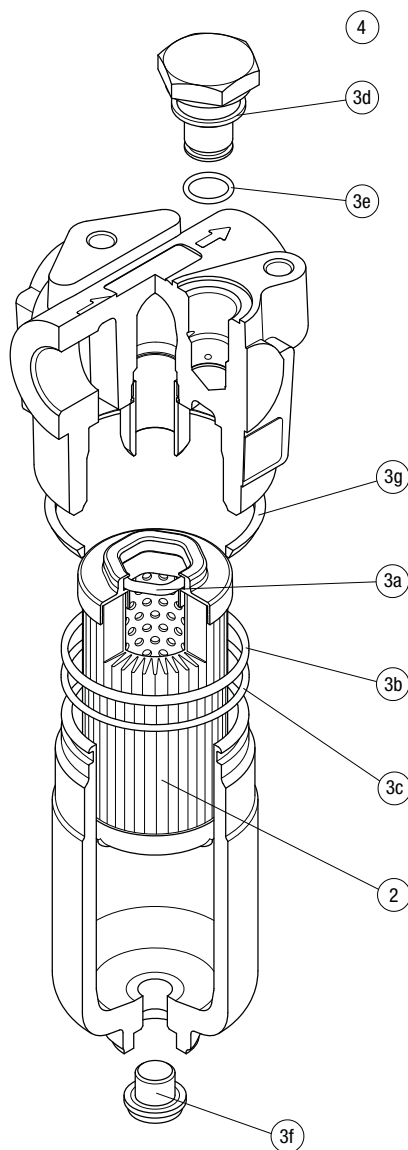
Execution P03



FMMX 050 SPARE PARTS

Order number for spare parts

FMMX 050



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.		Q.ty: 1 pc.	
Filter series	Filter element	Seal Kit code number		Indicator connection plug	
FMMX 050	See order table	NBR	FPM	NBR	FPM
	2	3 (3a ÷ 3g)		4	
		02050864	02050865	T2H	T2V

FMM series

Maximum working pressure up to 42 MPa (420 bar) - Flow rate up to 300 l/min



Description

Technical data

High Pressure filters

In-line

Maximum working pressure up to 42 MPa (420 bar)

Flow rate up to 300 l/min

FMM is a range of versatile high pressure filter for protection of sensitive components in high pressure hydraulic systems in the mobile machines.

They are directly connected to the lines of the system through the hydraulic fittings.

Available features:

- Female threaded connections up to 1 1/4", for a maximum flow rate of 250 l/min
- Fine filtration rating, to get a good cleanliness level into the system
- Bypass valve, to relieve excessive pressure drop across the filter media
- Low collapse filter element "N", for use with filters provided with bypass valve
- Low collapse filter element with external support "R", for filter element protection against the back pressure caused by the check valve in filters provided with the bypass valve
- High collapse filter element with external support "S", for filter element protection against the back pressure caused by the check valve in filters not provided with the bypass valve
- Visual, electrical and electronic differential clogging indicators

Common applications:

- Agricultural machines
- Mobile machines

Filter housing materials

- Head: Painted cast iron, black RAL 9005
- Housing: Phosphatized steel
- Bypass valve: Steel

Pressure

- Test pressure: 63 MPa (630 bar)
- Burst pressure: 126 MPa (1260 bar)
- Pulse pressure fatigue test: 1 000 000 cycles with pressure from 0 to 42 MPa (420 bar)

Bypass valve

- Opening pressure 600 kPa (6 bar) ±10%
- Other opening pressures on request.

Δp element type

- Microfiber filter elements - series N-R: 20 bar
- Microfiber filter elements - series S: 210 bar
- Wire mesh filter elements - series N: 20 bar
- Fluid flow through the filter element from OUT to IN

Seals

- Standard NBR series A
- Optional FPM series V

Temperature

From -25 °C to +110 °C

Connections

In-line Inlet/Outlet

Note

FMM filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]					Volumes [dm ³]						
	Length	1	2	3	4	5	Length	1	2	3	4	5
FMM 050		3.11	3.48	3.90	4.36	5.54		0.34	0.48	0.63	0.81	1.23
FMM 150		7.50	9.50	10.90	-	-		0.60	1.00	1.25	-	-

Filter series	Length	Filter element design - N Series						Filter element design - S Series				
		A03	A06	A10	A16	A25	M25	A03	A06	A10	A16	A25
FMM 050	1	42	43	79	82	106	147	29	39	57	59	74
	2	52	57	85	96	121	149	45	49	76	88	114
	3	66	69	97	106	130	150	58	61	89	99	125
	4	83	89	113	115	134	152	74	80	106	108	129
	5	107	110	130	134	141	154	93	95	111	121	139
FMM 150	1	81	88	156	163	179	295					
	2	142	145	227	230	236	312					
	3	170	180	242	245	263	315					

Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

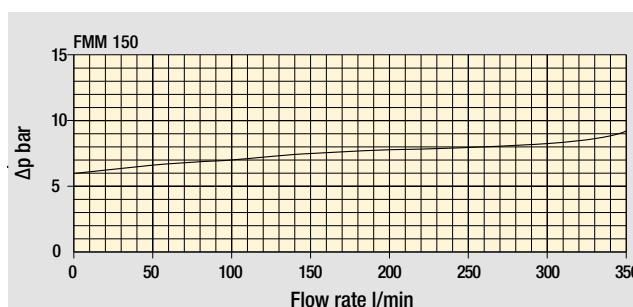
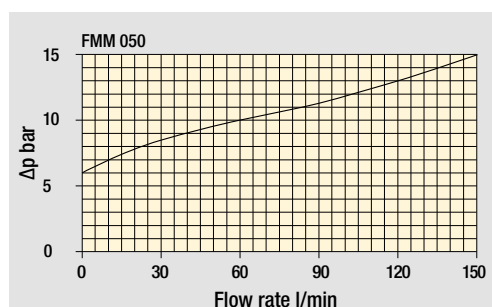
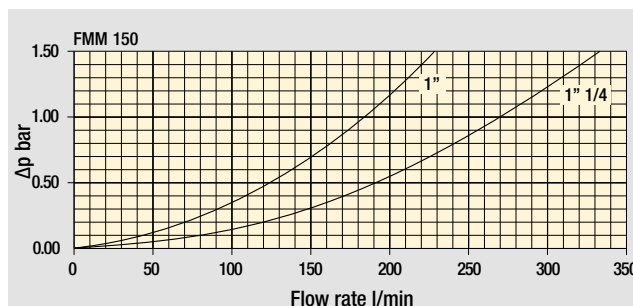
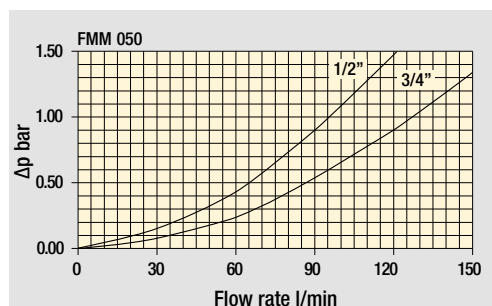
You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

Hydraulic symbols

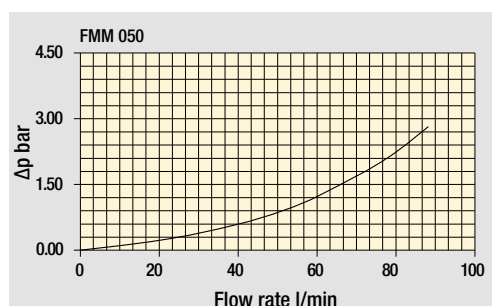
Filter series	Style S	Style B	Style T	Style D
FMM 050	•	•	•	•
FMM 150	•	•	-	-

--	--	--	--

Pressure drop
Filter housings
 Δp pressure drop



Bypass valve
pressure drop



Filter housing
with check valve

Valves

The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968. Δp varies proportionally with density.

Designation & Ordering code

COMPLETE FILTER

Series and size Configuration example: **FMM050** **3** **B** **A** **G** **A10** **N** **P01**

FMM050

Length

1 | **2** | **3** | **4** | **5** |

Valves

- S** Without bypass
- B** With bypass 6 bar
- T** With check valve, without bypass
- D** With check valve, with bypass 6 bar

Seals

- A** NBR
- V** FPM

Connections

- | | |
|-----------------------------|-----------------------------------|
| A M18x1.5 - ISO 6149 | E 1/2" NPT |
| B M22x1.5 - ISO 6149 | F 3/4" NPT |
| C G 1/2" | G SAE 8 - 3/4" - 16 UNF |
| D G 3/4" | H SAE 12 - 1 1/16" - 12 UN |

Filtration rating (filter media)

- A03** Inorganic microfiber 3 µm
- A06** Inorganic microfiber 6 µm
- A10** Inorganic microfiber 10 µm
- A16** Inorganic microfiber 16 µm
- A25** Inorganic microfiber 25 µm
- M25** Wire mesh 25 µm

Element Δp	Valves			
	S	B	T	D
N 20 bar	-	•	-	-
R 20 bar	-	-	-	•
S 210 bar	•	-	•	-

Executions

- P01** Upper connection for clogging indicator
- P02** Without connection for clogging indicator
- P03** Frontal connection for clogging indicator
- Pxx** Customized

FILTER ELEMENT

Element series and size Configuration example: **HP050** **3** **A10** **A** **N** **P01**

HP050

Element length

1 | **2** | **3** | **4** | **5** |

Filtration rating (filter media)

- A03** Inorganic microfiber 3 µm
- A06** Inorganic microfiber 6 µm
- A10** Inorganic microfiber 10 µm
- A16** Inorganic microfiber 16 µm
- A25** Inorganic microfiber 25 µm
- M25** Wire mesh 25 µm

Seals	
A	NBR
V	FPM

Element Δp	
N	20 bar
R	20 bar
S	210 bar

Execution	
P01	MP Filtri standard
Pxx	Customized

CLOGGING INDICATORS

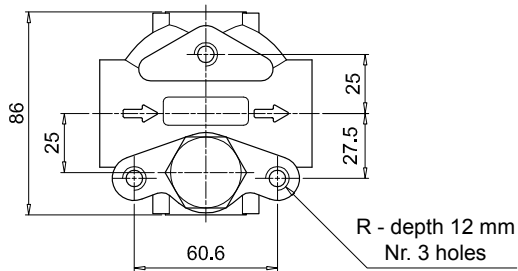
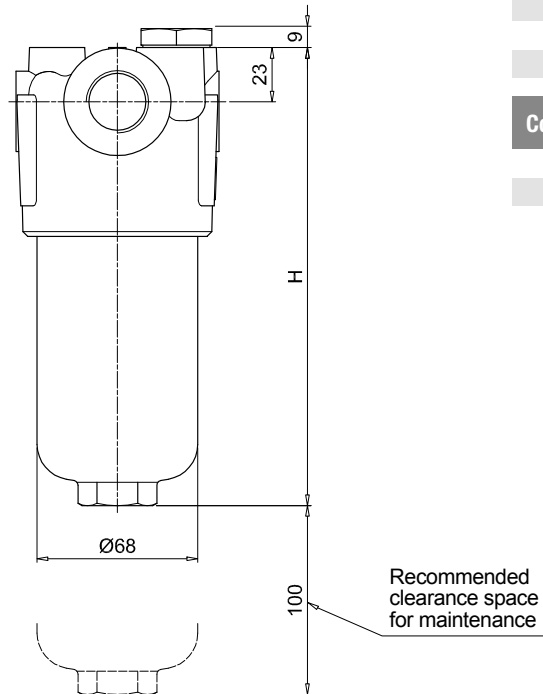
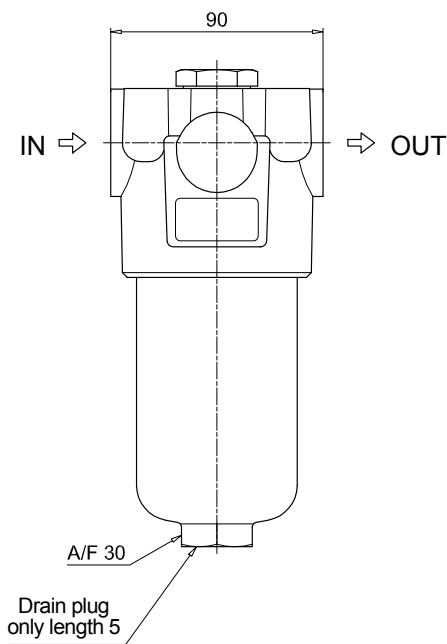
See page 687

- | | |
|---|--|
| DEA Electrical differential indicator | DTA Electrical differential indicator |
| DEM Electrical differential indicator | DVA Visual differential indicator |
| DLA Electrical / visual differential indicator | DVM Visual differential indicator |
| DLE Electrical / visual differential indicator | |

PLUGS

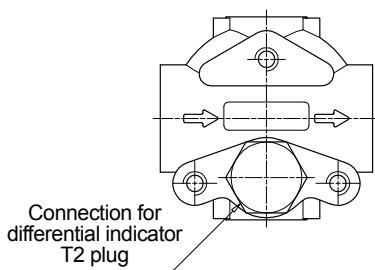
See page 706

- T2** Differential indicator plug

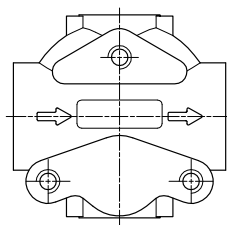


FMM050	
Filter length	H [mm]
1	158
2	195
3	237
4	285
5	407
Connections	R
A-B-C-D	M10
E-F-G-H	3/8" UNC

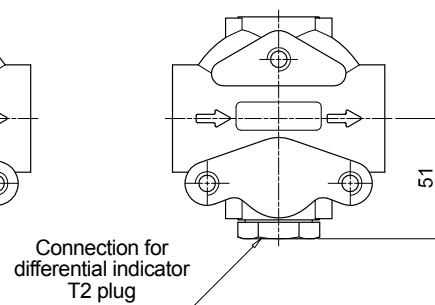
Execution P01



Execution P02



Execution P03



Designation & Ordering code

COMPLETE FILTER

Configuration example: **FMM150** | **2** | **B** | **A** | **D** | **2** | **M25** | **N** | **P01**

Series and size
FMM150

Length
1 | **2** | **3**

Valves
S Without bypass
B With bypass 6 bar

Seals
A NBR
V FPM

Connections
C G 1" **F** 1 1/4" NPT
D G 1 1/4" **G** SAE 16 - 1 5/16" - 12 UN
E 1" NPT **H** SAE 20 - 1 5/8" - 12 UN

Connection for differential indicator
1 Without connection
2 Upper connection
3 Frontal connection

Filtration rating (filter media)

A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Element Δp	S	B
N	20 bar	- •
S	210 bar	• •

Execution	
P01	MP Filtri standard
Pxx	Customized

FILTER ELEMENT

Configuration example: **HP150** | **2** | **M25** | **A** | **N** | **P01**

Element series and size
HP150

Element length
1 | **2** | **3**

Filtration rating (filter media)

A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Seals	
A	NBR
V	FPM

Element Δp	
N	20 bar
S	210 bar

Execution	
P01	MP Filtri standard
Pxx	Customized

CLOGGING INDICATORS

See page 687

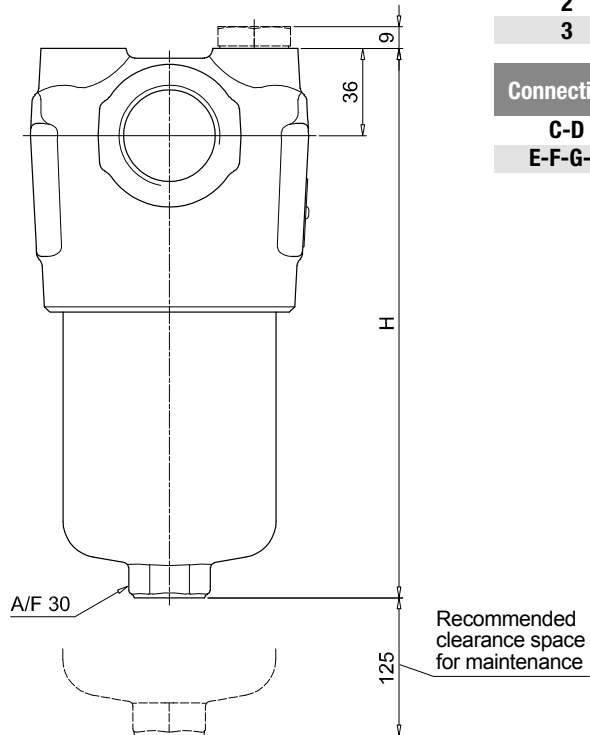
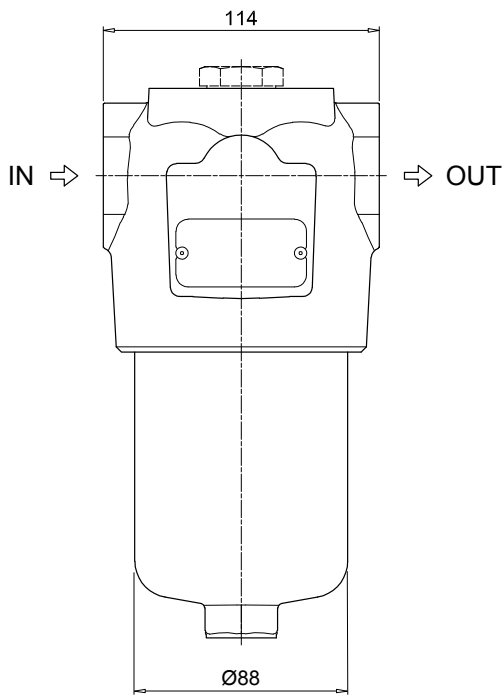
DEA Electrical differential indicator
DEM Electrical differential indicator
DLA Electrical / visual differential indicator
DLE Electrical / visual differential indicator

DTA Electrical differential indicator
DVA Visual differential indicator
DVM Visual differential indicator

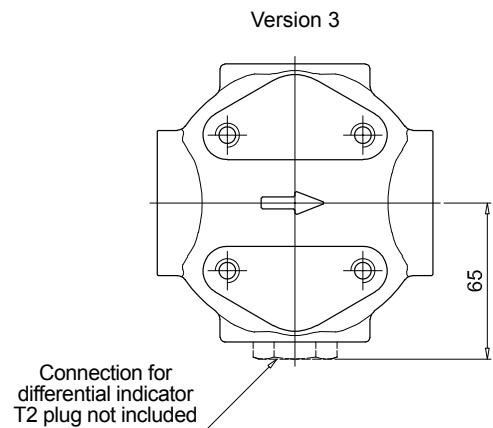
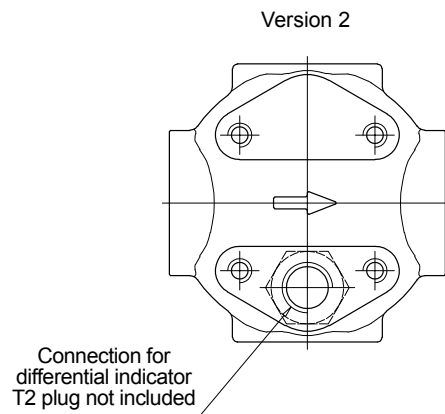
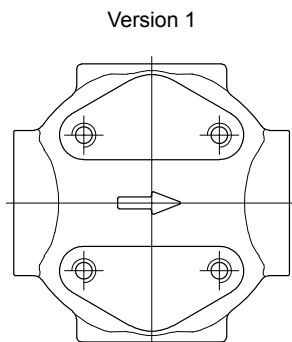
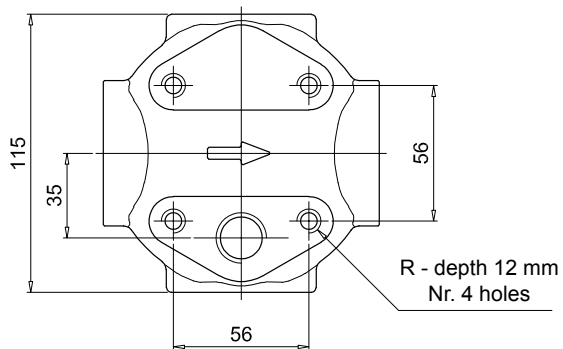
PLUGS

See page 706

T2 Differential indicator plug (not included)



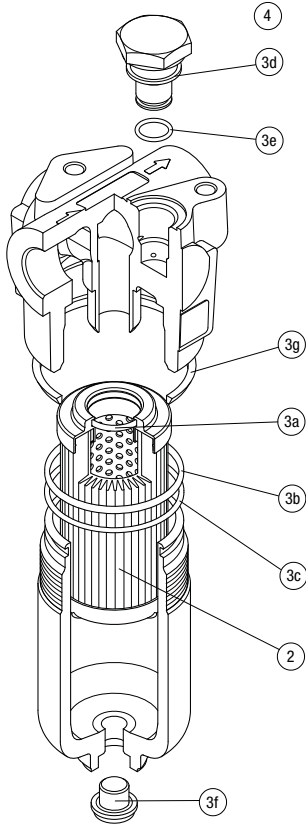
FMM150	
Filter length	H [mm]
1	230
2	340
3	415
Connections	R
C-D	M10
E-F-G-H	3/8" UNC



FMM SPARE PARTS

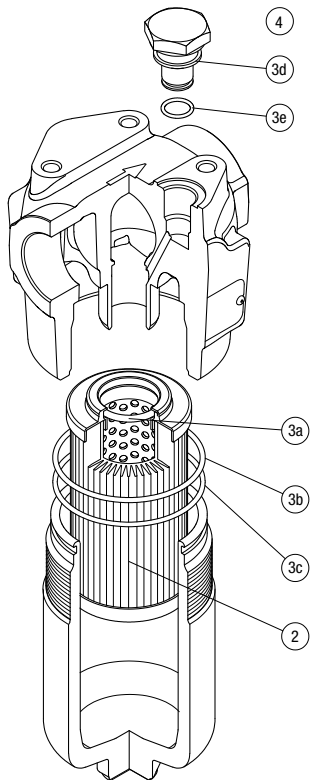
Order number for spare parts

FMM 050



Item:	Q.ty: 1 pc. 2	Q.ty: 1 pc. 3 (3a ÷ 3g)		Q.ty: 1 pc. 4	
Filter series	Filter element	Seal Kit code number		Indicator connection plug	
		NBR	FPM	NBR	FPM
FMM 050	See order table	02050314	02050315	T2H	T2V

FMM 150



Item:	Q.ty: 1 pc. 2	Q.ty: 1 pc. 3 (3a ÷ 3e)		Q.ty: 1 pc. 4	
Filter series	Filter element	Seal Kit code number		Indicator connection plug	
		NBR	FPM	NBR	FPM
FMM 150	See order table	02050731	02050732	T2H	T2V

FHA 051 series

Maximum working pressure up to 56 MPa (560 bar) - Flow rate up to 150 l/min



Description

Technical data

High Pressure filters

In-line

Maximum working pressure up to 56 MPa (560 bar)

Flow rate up to 150 l/min

FHA is a range of high pressure filter for protection of sensitive components in high pressure hydraulic systems in the mobile machines. They are directly connected to the lines of the system through the hydraulic fittings.

Available features:

- Female threaded connections up to 3/4", for a maximum flow rate of 150 l/min
- Fine filtration rating, to get a good cleanliness level into the system
- Bypass valve, to relieve excessive pressure drop across the filter media
- Check valve, to protect the system against reverse flow
- Reverse flow valve, to allow bidirectional flow through the filter housing. The back flow is not filtered
- Low collapse filter element "N", for use with filters provided with bypass valve
- Low collapse filter element with external support "R", for filter element protection against the back pressure caused by the check valve or the reverse flow in filters provided with the bypass valve
- High collapse filter element with external support "S", for filter element protection against the back pressure caused by the check valve or the reverse flow in filters not provided with the bypass valve
- Visual, electrical and electronic differential clogging indicators

Common applications:

Delivery lines, in any heavy duty industrial equipment or mobile machines

Filter housing materials

- Head: Steel (chemical heat treatment)
- Housing: Steel (chemical heat treatment)
- Bypass valve: Steel

Pressure

- Test pressure: 84 MPa (840 bar)
- Burst pressure: 168 MPa (1680 bar)
- Pulse pressure fatigue test: 1 00 000 cycles with pressure from 0 to 56 MPa (560 bar)

Bypass valve

- Opening pressure 600 kPa (6 bar) ±10%
- Other opening pressures on request.

Δp element type

- Microfibre filter elements - series N-R: 20 bar
- Microfibre filter elements - series S: 210 bar
- Wire mesh filter elements - series N: 20 bar
- Fluid flow through the filter element from OUT to IN

Seals

- Standard NBR series A
- Optional FPM series V

Temperature

From -25 °C to +110 °C

Connections

In-line Inlet/Outlet

Note

FHA filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]					Volumes [dm ³]						
	Length	1	2	3	4	5	Length	1	2	3	4	5
FHA 051		3.28	3.65	4.06	4.54	5.74		0.33	0.47	0.62	0.79	1.23

Filter series	Length	Filter element design - N Series						Filter element design - R Series					Filter element design - S Series				
		A03	A06	A10	A16	A25	M25	A03	A06	A10	A16	A25	A03	A06	A10	A16	A25
FHA 051	1	42	41	82	85	110	156	42	41	82	85	110	30	40	58	60	76
	2	53	58	87	100	127	158	53	58	87	100	127	45	50	78	91	120
	3	68	71	101	111	137	160	68	71	101	111	137	59	62	92	103	131
	4	86	92	118	121	142	162	86	92	118	121	142	77	83	110	113	137
	5	112	115	137	142	150	165	112	115	137	142	150	96	99	116	128	147

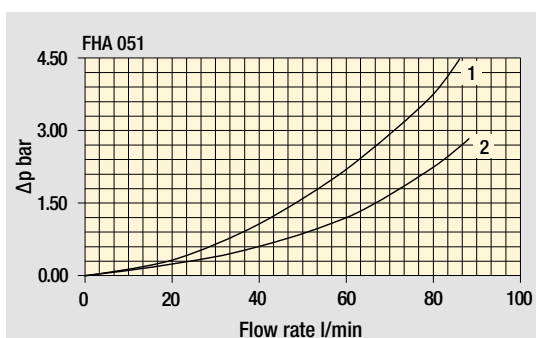
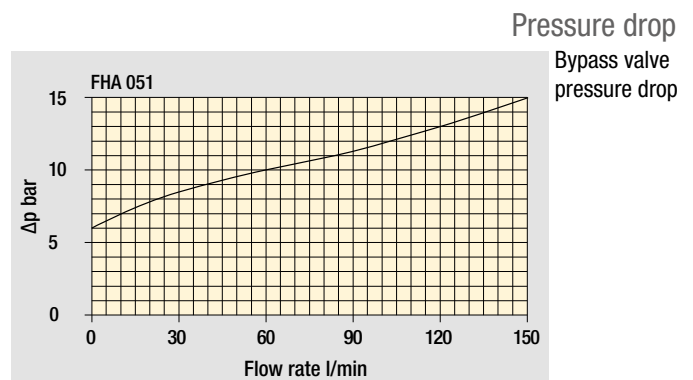
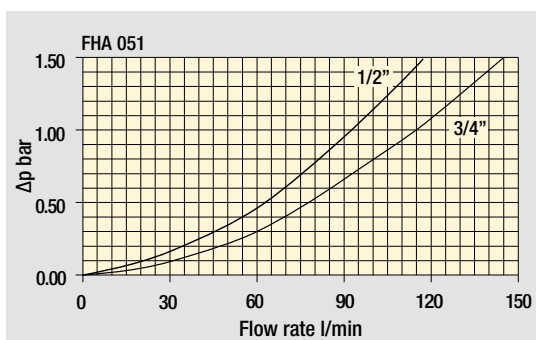
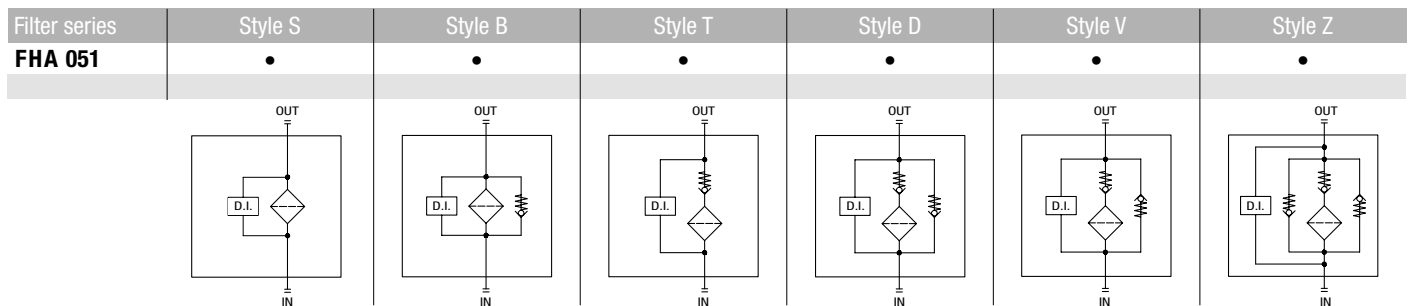
Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

Hydraulic symbols



Pressure drop in reverse flow valves

- 1 - Reverse flow
- 2 - In filter direction

The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968. Δp varies proportionally with density.

FHA 051

Designation & Ordering code

COMPLETE FILTER

Series and size **FHA051** Configuration example: **FHA051** | **3** | **B** | **A** | **G** | **A10** | **N** | **P01**

Length

1 | 2 | 3 | 4 | 5

Valves

- S** Without bypass
- B** With bypass 6 bar
- T** With check valve, without bypass
- D** With check valve, with bypass 6 bar
- V** With reverse flow, without bypass
- Z** With reverse flow, with bypass 6 bar

Seals

- A** NBR
- V** FPM

Connections

- | | |
|-----------------------------|-----------------------------------|
| A M18x1.5 - ISO 6149 | E 1/2" NPT |
| B M22x1.5 - ISO 6149 | F 3/4" NPT |
| C G 1/2" | G SAE 8 - 3/4" - 16 UNF |
| D G 3/4" | H SAE 12 - 1 1/16" - 12 UN |

Filtration rating (filter media)

- A03** Inorganic microfiber 3 µm
- A06** Inorganic microfiber 6 µm
- A10** Inorganic microfiber 10 µm
- A16** Inorganic microfiber 16 µm
- A25** Inorganic microfiber 25 µm
- M25** Wire mesh 25 µm

Valves

Element Δp	S	B	T	D	V	Z
N 20 bar	-	•	-	-	-	-
R 20 bar	-	-	-	•	-	•
S 210 bar	•	-	•	-	•	-

Execution

- P01** Upper connection for clogging indicator
- P02** Without connection for clogging indicator
- P03** Frontal connection for clogging indicator
- Pxx** Customized

FILTER ELEMENT

Element series and size **HP050** Configuration example: **HP050** | **3** | **A10** | **A** | **N** | **P01**

Element length

1 | 2 | 3 | 4 | 5

Filtration rating (filter media)

- A03** Inorganic microfiber 3 µm
- A06** Inorganic microfiber 6 µm
- A10** Inorganic microfiber 10 µm
- A16** Inorganic microfiber 16 µm
- A25** Inorganic microfiber 25 µm
- M25** Wire mesh 25 µm

Seals

- A** NBR
- V** FPM

Element Δp

- N** 20 bar
- R** 20 bar
- S** 210 bar

Execution

- P01** MP Filtri standard
- Pxx** Customized

CLOGGING INDICATORS

See page 687

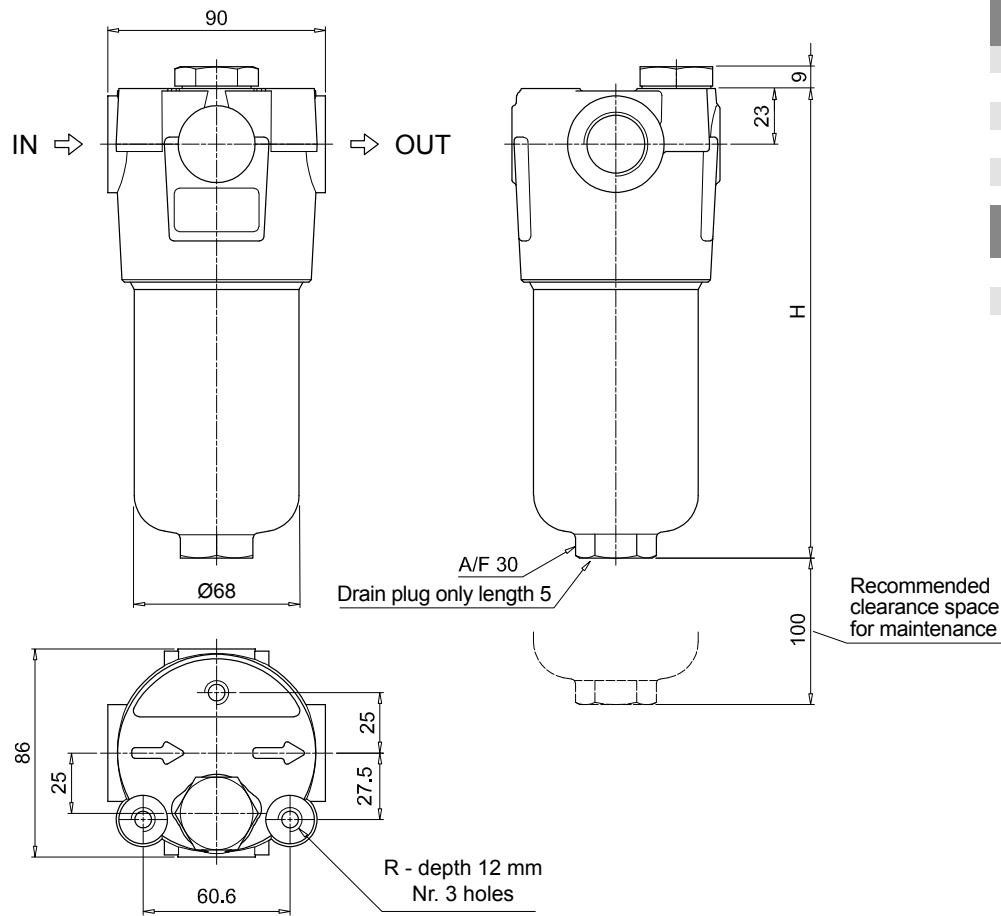
- DEA** Electrical differential indicator
- DEM** Electrical differential indicator
- DLA** Electrical / visual differential indicator
- DLE** Electrical / visual differential indicator

- DTA** Electrical differential indicator
- DVA** Visual differential indicator
- DVM** Visual differential indicator

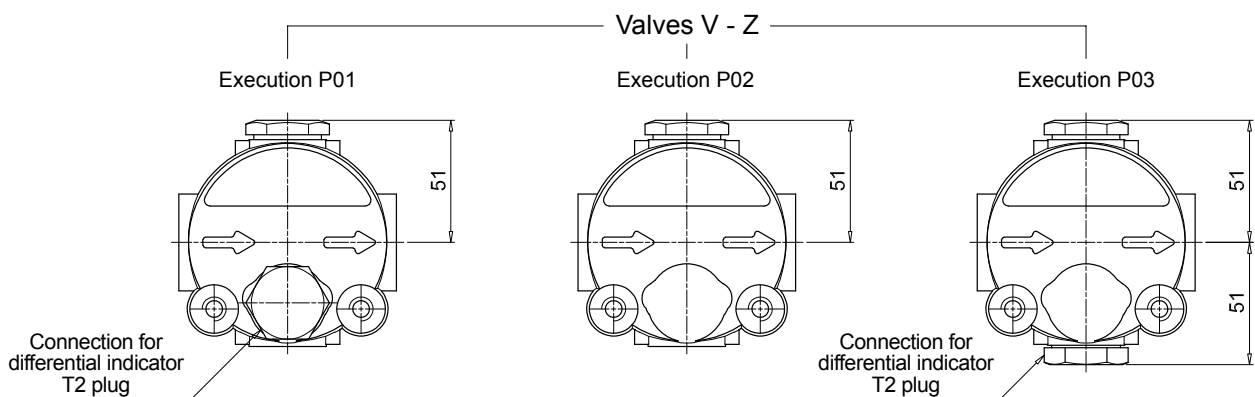
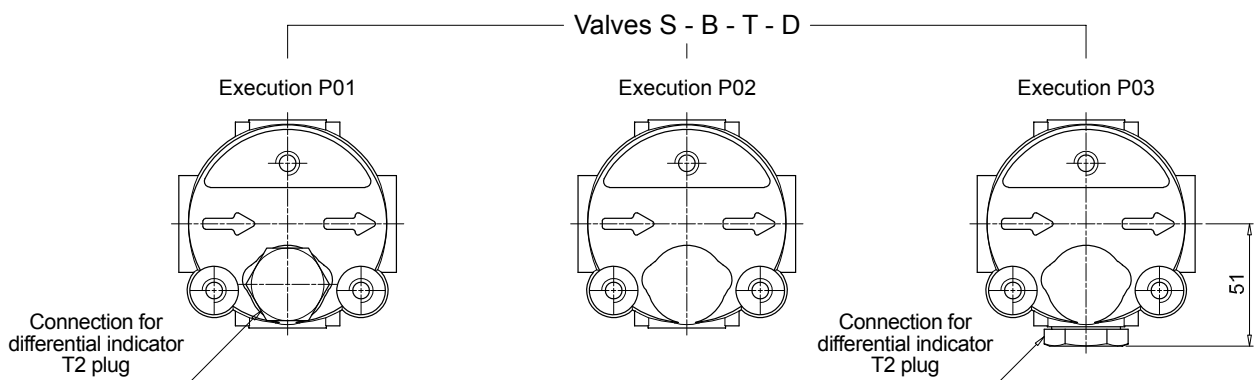
PLUGS

See page 706

- T2** Differential indicator plug



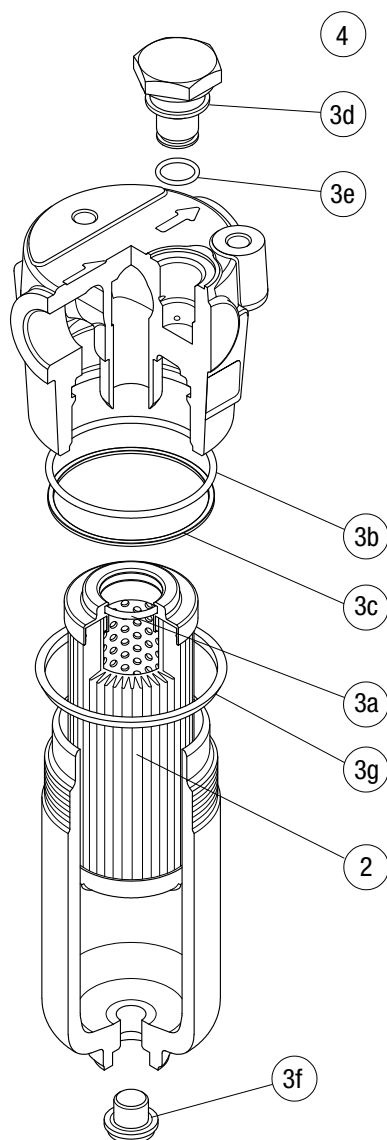
FHA051	
Filter length	H [mm]
1	158
2	195
3	237
4	285
5	407
Connections	R
A-B-C-D	M10
E-F-G-H	3/8" UNC



FHA 051 SPARE PARTS

Order number for spare parts

FHA 051



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.		Q.ty: 1 pc.	
Filter series	Filter element	Seal Kit code number		Indicator connection plug	
FHA 051	See order table	NBR	FPM	NBR	FPM
		02050288	02050305	T2H	T2V

FMP 039 series

Maximum working pressure up to 11 MPa (110 bar) - Flow rate up to 80 l/min



FMP 039 GENERAL INFORMATION

Description

Technical data

High Pressure filters

In-line

Maximum working pressure up to 11 MPa (110 bar)
Flow rate up to 80 l/min

FMP039 is a range of versatile medium pressure filter for transmission, protection of sensitive components in medium pressure hydraulic systems and filtration of the coolant into the machine tools. They are directly connected to the lines of the system through the hydraulic fittings.

Available features:

- 1/2" female threaded connections, for a maximum flow rate of 80 l/min
- Fine filtration rating, to get a good cleanliness level into the system
- Bypass valve, to relieve excessive pressure drop across the filter media
- Low collapse filter element "N"
- Visual, electrical and electronic differential clogging indicators

Common applications:

Delivery lines, in any medium pressure industrial equipment or mobile machines

Filter housing materials

- Head: Anodized aluminium
- Housing: Anodized aluminium
- Bypass valve: Steel

Pressure

- Test pressure: 17 MPa (170 bar)
- Burst pressure: 33 MPa (330 bar)
- Pulse pressure fatigue test: 1 000 000 cycles with pressure from 0 to 11 MPa (110 bar)

Bypass valve

- Opening pressure 600 kPa (6 bar) $\pm 10\%$
- Other opening pressures on request.

Δp element type

- Microfibre filter elements - series N: 20 bar
- Wire mesh filter elements - series N: 20 bar
- Fluid flow through the filter element from OUT to IN.

Seals

- Standard NBR series A
- Optional FPM series V

Temperature

From -25 °C to +110 °C

Connections

In-line Inlet/Outlet

Note

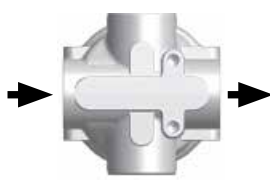
FMP 039 filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

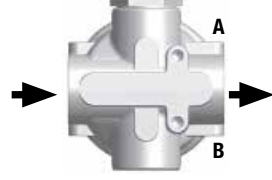
Filter series	Weights [kg]				Volumes [dm ³]			
	Length	2	3	4	Length	2	3	4
FMP 039		0.60	0.70	0.80		0.19	0.26	0.34

Executions

Execution 1:
without indicator connection



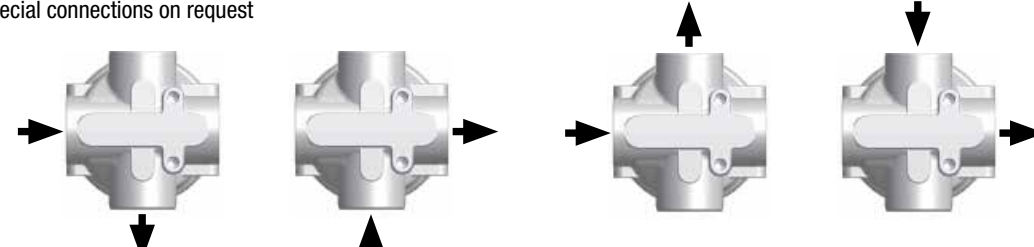
Execution 6:
double indicator connection (A - B)



A:
Closure cap with standard T2 steel. The position of the cap is reversible.

B:
Standard closure cap with plastic thread protection. If necessary, a second T2 plug is available, see ordering information.

Special connections on request



Filter series	Length	Filter element design - N Series					
		A03	A06	A10	A16	A25	M25
FMP 039	2	20	26	45	52	61	97
	3	35	39	56	64	76	98
	4	44	48	66	71	82	92

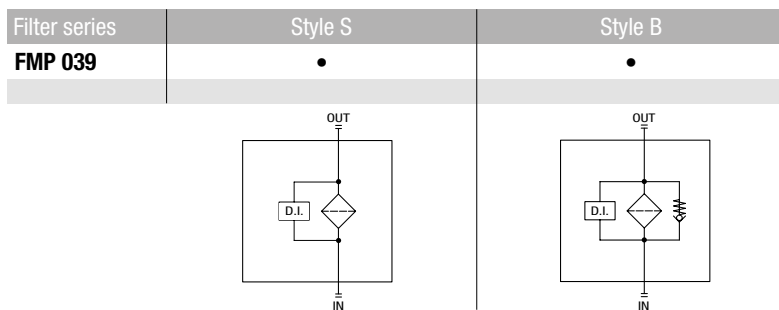
Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

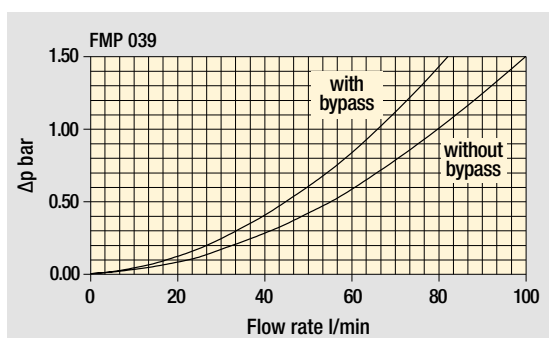
You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

Hydraulic symbols

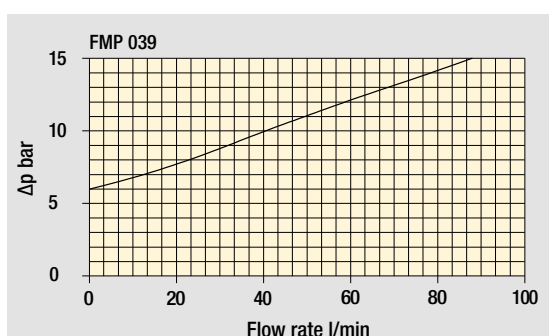


Pressure drop

Filter housings Δp pressure drop



Bypass valve pressure drop



The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968. Δp varies proportionally with density.

FMP 039

Designation & Ordering code

COMPLETE FILTER

Configuration example: **FMP039** | **3** | **B** | **A** | **B** | **6** | **A03** | **N** | **P01**

Series and size
FMP039

Length
2 | **3** | **4**

Valves
S Without bypass
B With bypass 6 bar

Seals
A NBR
V FPM

Connections
A G 1/2"
B 1/2" NPT
C SAE 8 - 3/4" - 16 UNF

Connection for differential indicator
1 Without connections
6 With two connections on both sides

Filtration rating (filter media)

A03 Inorganic microfiber 3 µm	A16 Inorganic microfiber 16 µm
A06 Inorganic microfiber 6 µm	A25 Inorganic microfiber 25 µm
A10 Inorganic microfiber 10 µm	M25 Wire mesh 25 µm

Element Δp
N 20 bar

Execution
P01 MP Filtri standard
Pxx Customized

FILTER ELEMENT

Configuration example: **HP039** | **3** | **A03** | **A** | **N** | **P01**

Element series and size
HP039

Element length
2 | **3** | **4**

Filtration rating (filter media)

A03 Inorganic microfiber 3 µm	A16 Inorganic microfiber 16 µm
A06 Inorganic microfiber 6 µm	A25 Inorganic microfiber 25 µm
A10 Inorganic microfiber 10 µm	M25 Wire mesh 25 µm

Seals
A NBR
V FPM

Element Δp
N 20 bar

Execution
P01 MP Filtri standard
Pxx Customized

CLOGGING INDICATORS

See page 687

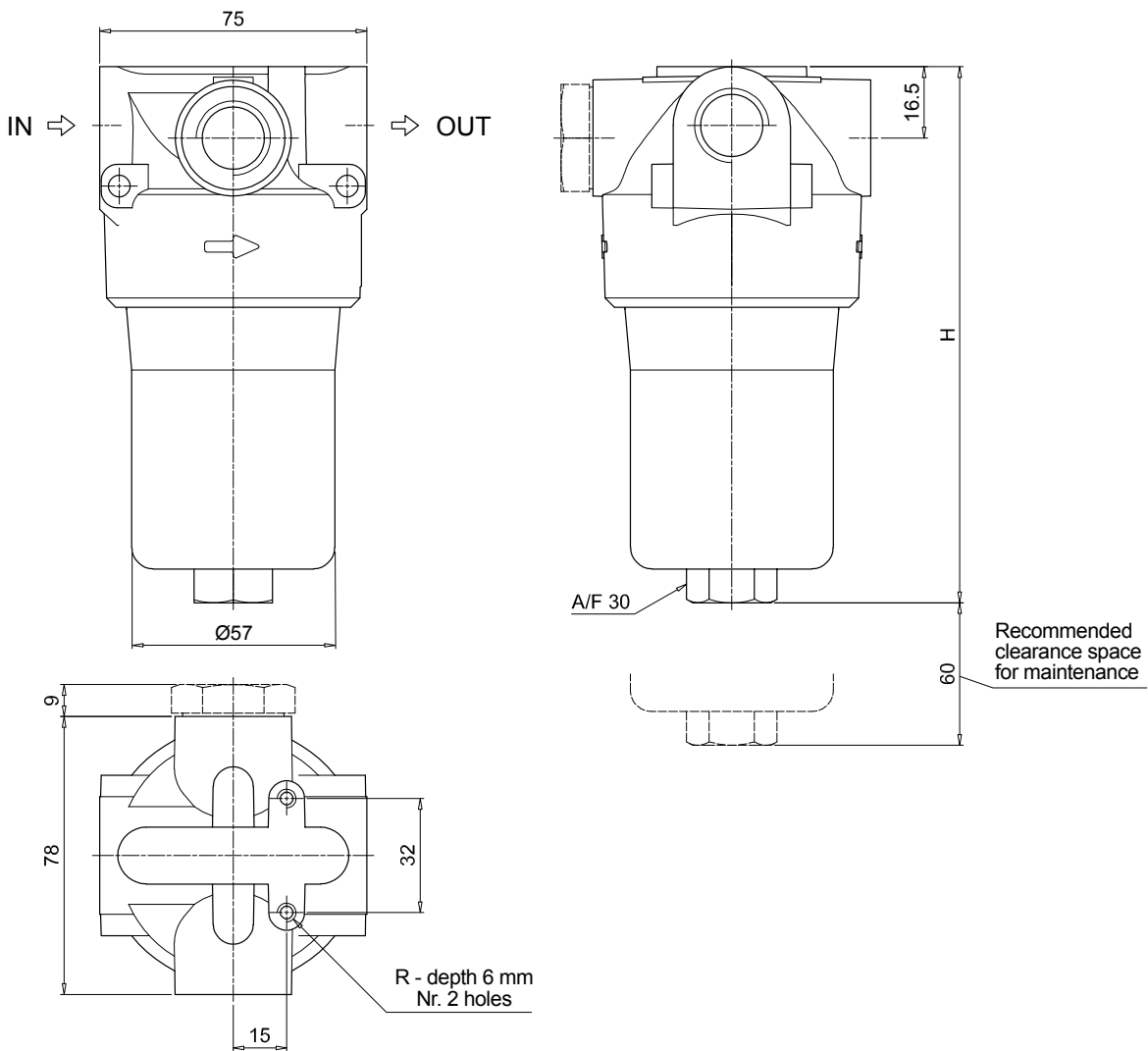
DEA Electrical differential indicator
DEM Electrical differential indicator
DLA Electrical / visual differential indicator
DLE Electrical / visual differential indicator

DTA Electrical differential indicator
DVA Visual differential indicator
DVM Visual differential indicator

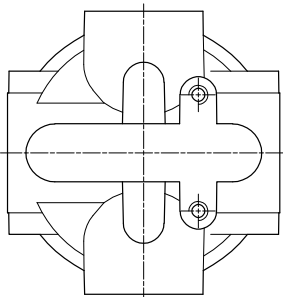
PLUGS

See page 706

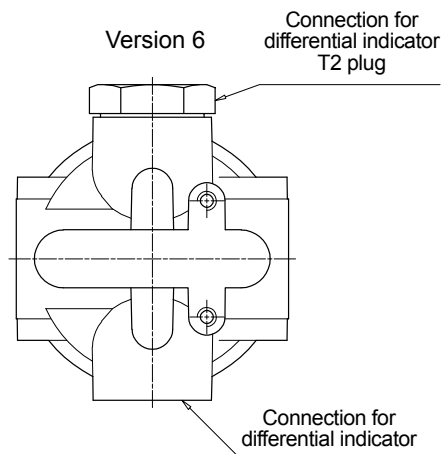
T2 Differential indicator plug



Version 1



Version 6



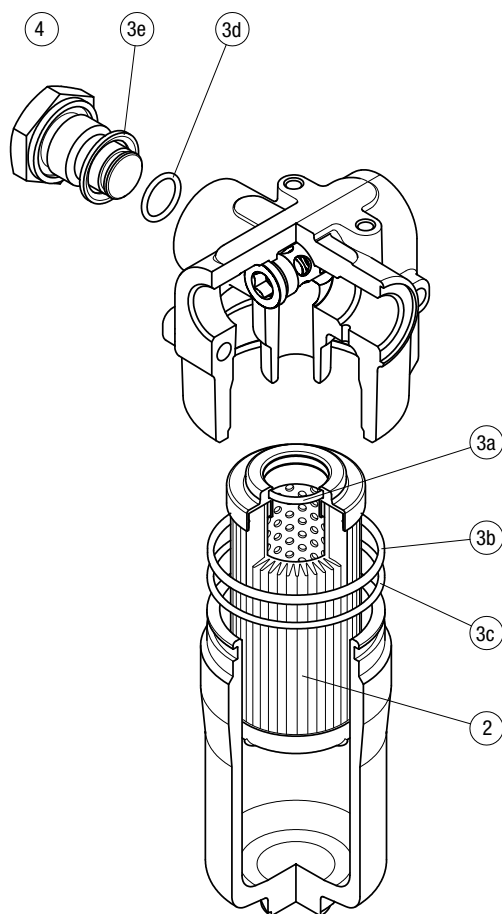
The position of the T2 plug is reversible

FMP039	
Filter length	H [mm]
2	151
3	194
4	238
Connections	R
A	M6
B - C	1/4" UNC

FMP 039 SPARE PARTS

Order number for spare parts

FMP 039



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.	
Filter series	Filter element	Seal Kit code number	
		NBR	FPM
FMP 039	See order table	02050509	02050510

FMP series

Maximum working pressure up to 32 MPa (320 bar) - Flow rate up to 500 l/min



High Pressure filters

In-line

Maximum working pressure up to 32 MPa (320 bar)

Flow rate up to 500 l/min

FMP is a range of versatile high pressure filter for protection of sensitive components in high pressure hydraulic systems in the industrial equipment.

They are directly connected to the lines of the system through the hydraulic fittings.

Available features:

- Female threaded connections up to 1 1/2" and flanged connections up to 1 1/2", for a maximum flow rate of 500 l/min
- Fine filtration rating, to get a good cleanliness level into the system
- Bypass valve, to relieve excessive pressure drop across the filter media
- Check valve, to protect the system against reverse flow
- Low collapse filter element "N", for use with filters provided with bypass valve
- High collapse filter element "H", for use with filters not provided with bypass valve
- Low collapse filter element with external support "R", for filter element protection against the back pressure caused by the check valve in filters provided with the bypass valve
- High collapse filter element with external support "S", for filter element protection against the back pressure caused by the check valve in filters not provided with the bypass valve
- Visual, electrical and electronic differential clogging indicators

Common applications:

Delivery lines, in any high pressure industrial equipment or mobile machines

Filter housing materials

- Head: Phosphatized cast iron
- Housing: Phosphatized steel
- Bypass valve: Brass
- Reverse Flow: Steel (only for series FMP 320)
- Check valve: Steel

Pressure

- Test pressure: 48 MPa (480 bar)
- Burst pressure: 96 MPa (960 bar)
- Pulse pressure fatigue test: 1 000 000 cycles with pressure from 0 to 32 MPa (320 bar)

Bypass valve

- Opening pressure 600 kPa (6 bar) ±10%
- Other opening pressures on request.

Δp element type

- Microfibre filter elements - series N-R: 20 bar
- Microfibre filter elements - series H-S: 210 bar
- Wire mesh filter elements - series N: 20 bar
- Fluid flow through the filter element from OUT to IN

Seals

- Standard NBR series A
- Optional FPM series V

Temperature

From -25 °C to +110 °C

Connections

In-line Inlet/Outlet

Note

FMP filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]					Volumes [dm ³]				
	Length	1	2	3	4	Length	1	2	3	4
FMP 065		3.26	3.62	4.83	-		0.36	0.47	0.84	-
FMP 135		5.61	7.21	8.27	-		0.45	0.78	1.00	-
FMP 320		10.95	13.08	15.37	17.85		1.03	1.75	2.52	3.35

Filter series	Length	Filter element design - N Series					
		A03	A06	A10	A16	A25	M25
FMP 065	1	23	30	48	54	72	105
	2	31	45	60	65	82	106
	3	52	60	80	84	94	108
FMP 135	1	69	73	120	129	171	201
	2	110	117	149	152	211	232
	3	151	152	192	195	212	233
FMP 320	1	130	144	244	296	361	477
	2	267	291	417	438	492	509
	3	348	390	476	493	503	519
	4	389	415	483	502	525	534

Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

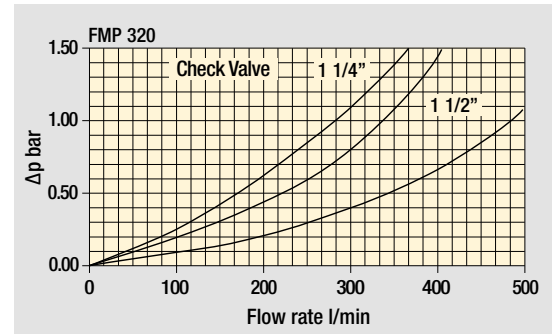
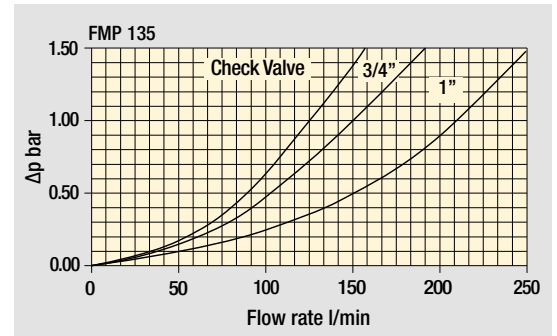
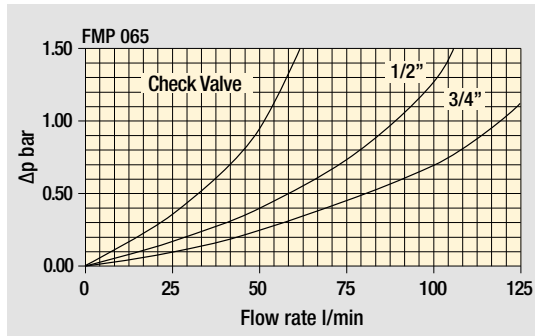
Hydraulic symbols

Filter series	Style S - E	Style B - C	Style T	Style D
FMP 065	•	•	•	•
FMP 135	•	•	•	•
FMP 320	•	•	•	•

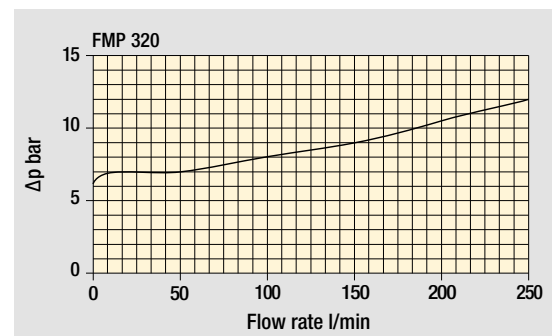
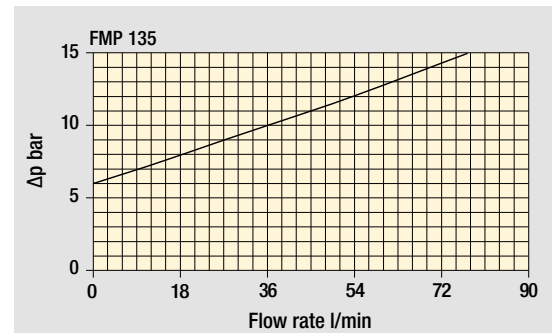
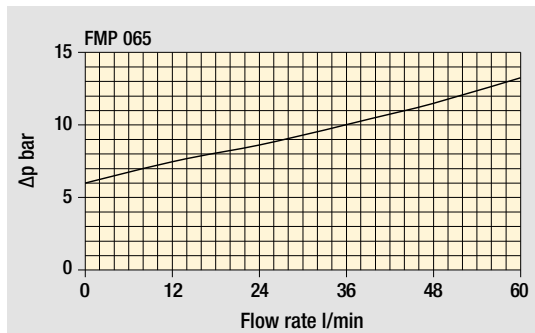
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Pressure drop

Filter housings Δp pressure drop



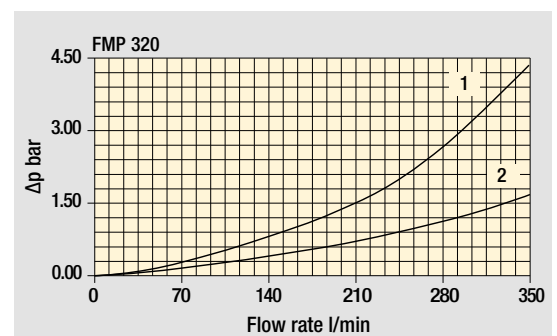
Bypass valve pressure drop



Valves

Filter housing with check valve

- 1 - Reverse flow
- 2 - In filter direction



The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968. Δp varies proportionally with density.

FMP FMP065 - FMP135 - FMP320

Designation & Ordering code

COMPLETE FILTER

Series and size Configuration example: **FMP065** | **3** | **T** | **A** | **G1** | **M25** | **S** | **P01**

FMP065 | **FMP135** | **FMP320**

Length	FMP065	FMP135	FMP320
1	•	•	•
2	•	•	•
3	•	•	•
4	-	-	•

Valves	
S Without bypass	C With bypass 6 bar, plug on the opposite side
E Without bypass, plug on the opposite side	T With check valve, without bypass
B With bypass 6 bar	D With check valve, with bypass

Seals	
A NBR	V FPM

Connections	FMP065	FMP135	FMP320
G1	G 1/2"	G 3/4"	G 1 1/4"
G2	G 3/4"	G 1"	G 1 1/2"
G3	1/2" NPT	3/4" NPT	1 1/4" NPT
G4	3/4" NPT	1" NPT	1 1/2" NPT
G5	SAE 8 - 3/4" - 16 UNF	SAE 12 - 1 1/16" - 12 UN	SAE 20 - 1 5/8" - 12 UN
G6	SAE 12 - 1 1/16" - 12 UN	SAE 16 - 1 5/16" - 12 UN	SAE 24 - 1 7/8" - 12 UN
F1	-	3/4" SAE 3000 psi/M	1 1/4" SAE 3000 psi/M
F2	-	1" SAE 3000 psi/M	1 1/2" SAE 3000 psi/M
F3	-	3/4" SAE 3000 psi/UNC	1 1/4" SAE 3000 psi/UNC
F4	-	1" SAE 3000 psi/UNC	1 1/2" SAE 3000 psi/UNC

Filtration rating (filter media)	
A03 Inorganic microfiber	3 µm
A06 Inorganic microfiber	6 µm
A10 Inorganic microfiber	10 µm
A16 Inorganic microfiber	16 µm
A25 Inorganic microfiber	25 µm
M25 Wire mesh	25 µm

Element Δp	Valves					
	S	E	B	C	T	D
N 20 bar	-	-	•	•	-	-
R 20 bar	-	-	-	-	-	•
H 210 bar	•	•	-	-	-	-
S 210 bar	-	-	-	-	•	-

Execution	Filter length			
	1	2	3	4
P01 MP Filtri standard	•	•	•	•
P02 Maintenance from the bottom of the housing	-	-	-	•
Pxx Customized	-	-	-	-

FILTER ELEMENT

Element series and size Configuration example: **HP065** | **3** | **M25** | **A** | **S** | **P01**

HP065 | **HP135** | **HP320**

Element length	HP065	HP135	HP320
1	•	•	•
2	•	•	•
3	•	•	•
4	-	-	•

Filtration rating (filter media)	
A03 Inorganic microfiber	3 µm
A06 Inorganic microfiber	6 µm
A10 Inorganic microfiber	10 µm
A16 Inorganic microfiber	16 µm
A25 Inorganic microfiber	25 µm
M25 Wire mesh	25 µm

Seals	
A NBR	
V FPM	

Element Δp	
N 20 bar	
R 20 bar	
H 210 bar	
S 210 bar	

Execution	
P01 MP Filtri standard	
Pxx Customized	

CLOGGING INDICATORS

See page 687

DEA Electrical differential indicator	
DEM Electrical differential indicator	
DLA Electrical / visual differential indicator	
DLE Electrical / visual differential indicator	

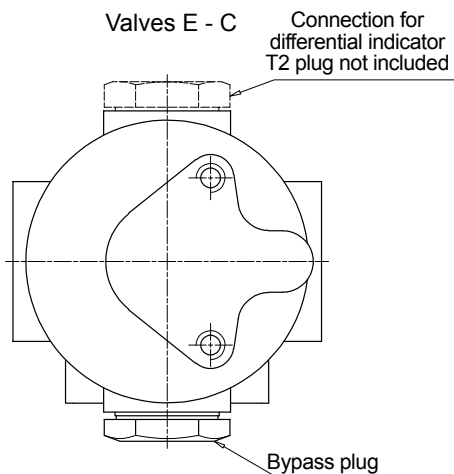
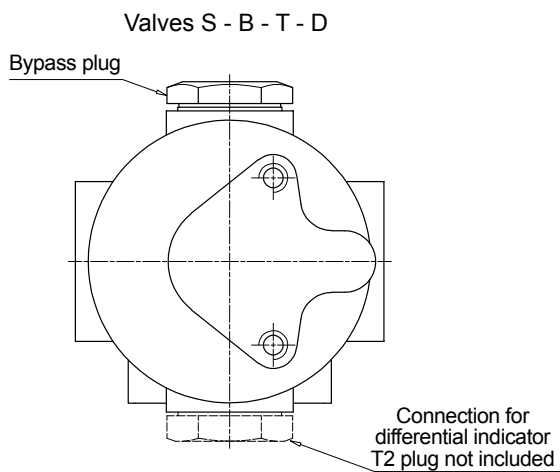
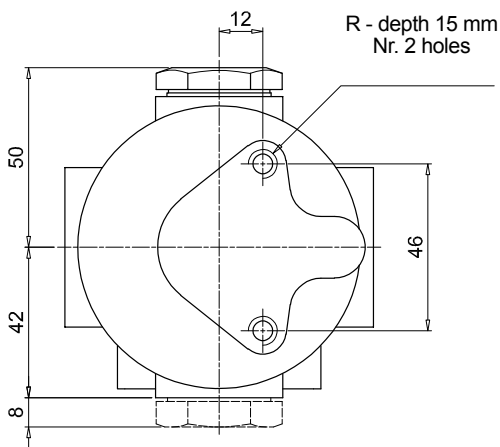
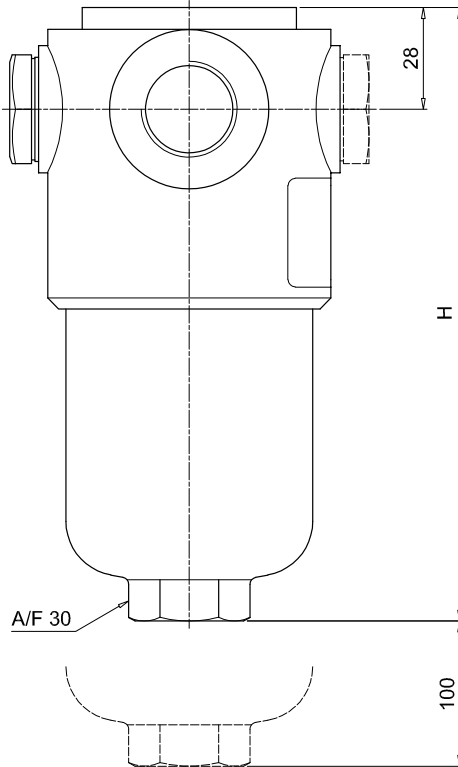
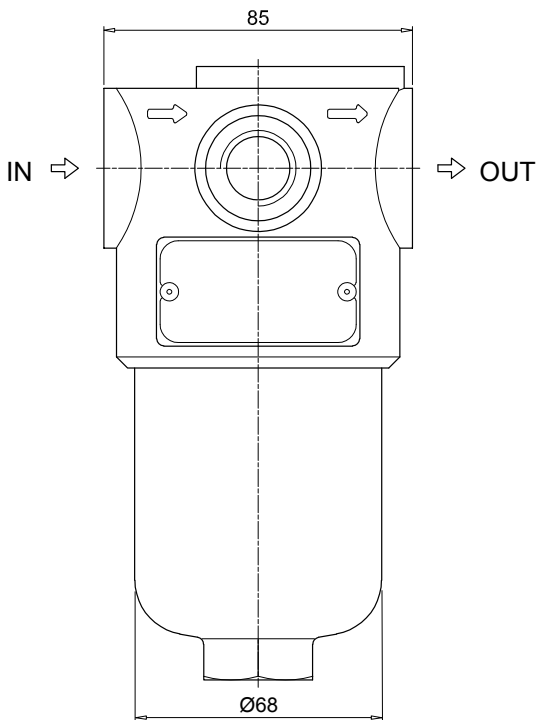
DTA Electrical differential indicator	
DVA Visual differential indicator	
DVM Visual differential indicator	

PLUGS

See page 706

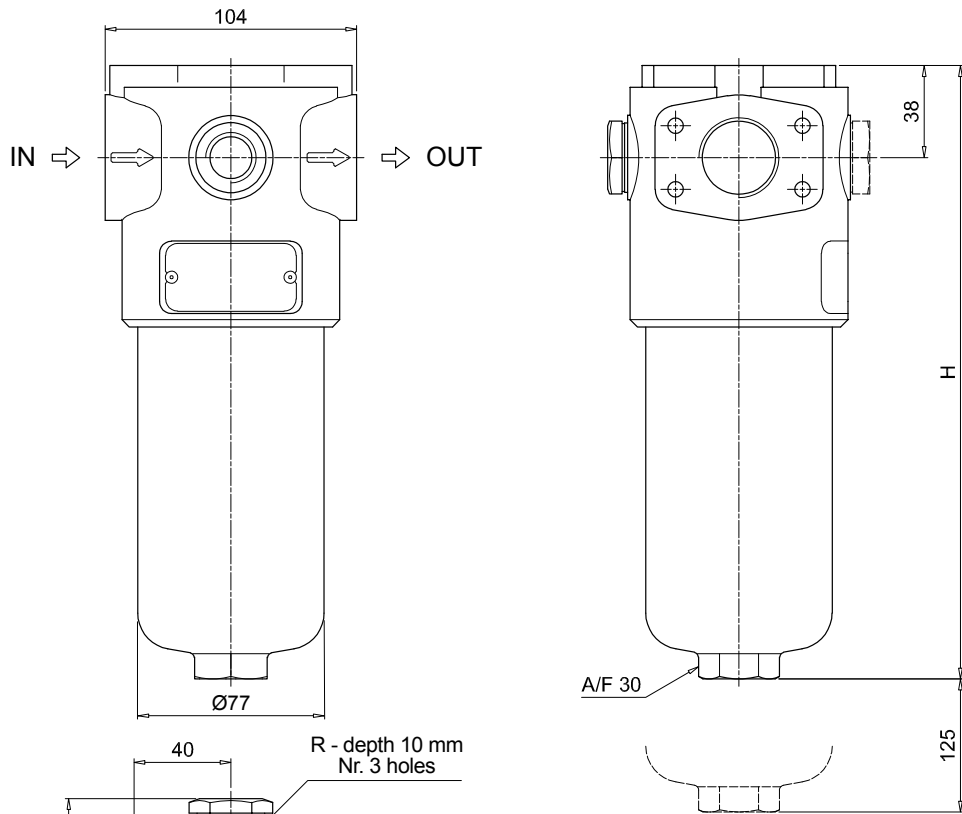
T2 Differential indicator plug (not included)	
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FMP065	
Filter length	H [mm]
1	169
2	200
3	302
Connections	R
G1-G2	M8
G3-G4-G5-G6	5/16" UNC

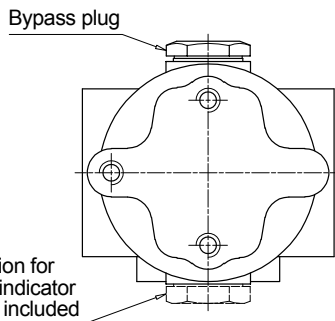


FMP FMP065 - FMP135 - FMP320

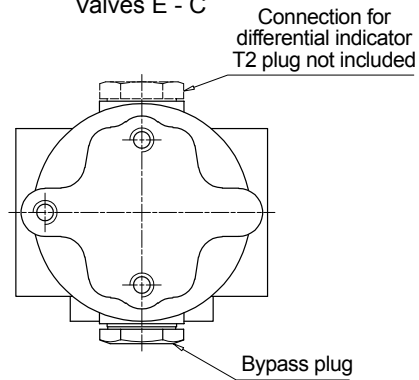
Dimensions



Valves S - B - T - D



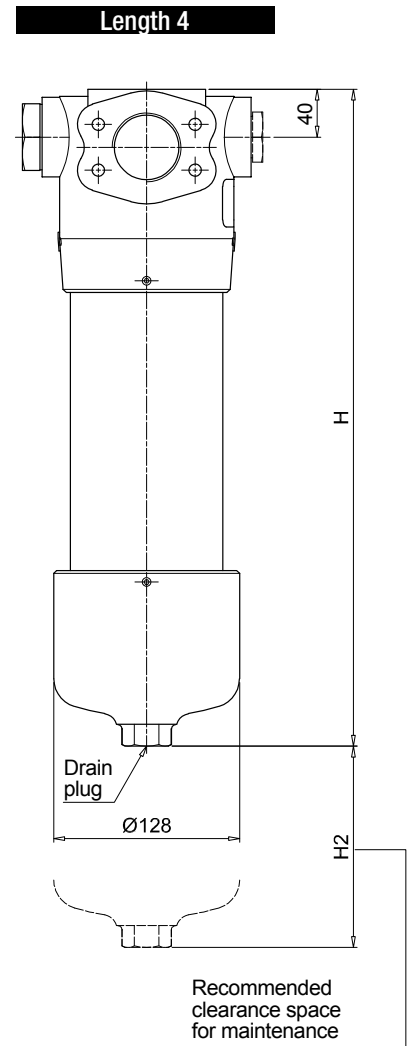
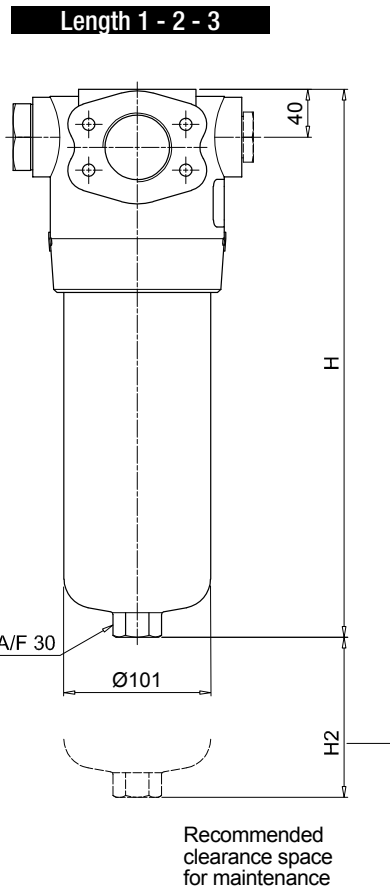
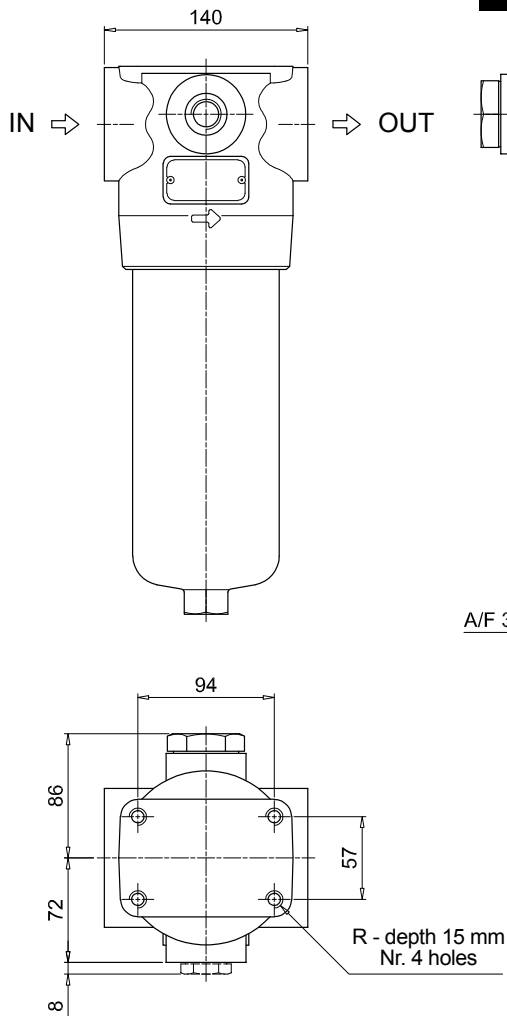
Valves E - C



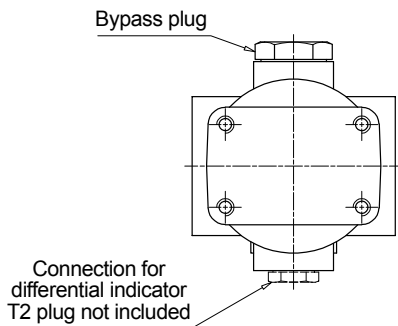
FMP135

Filter length	H [mm]
1	221
2	334
3	409

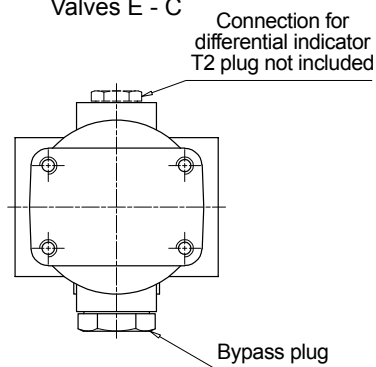
Connections	R
G1-G2	M10
G3-G4-G5-G6	3/8" UNC
F1-F2	M10
F3-F4	3/8" UNC



Valves S - B - T - D



Valves E - C



FMP320

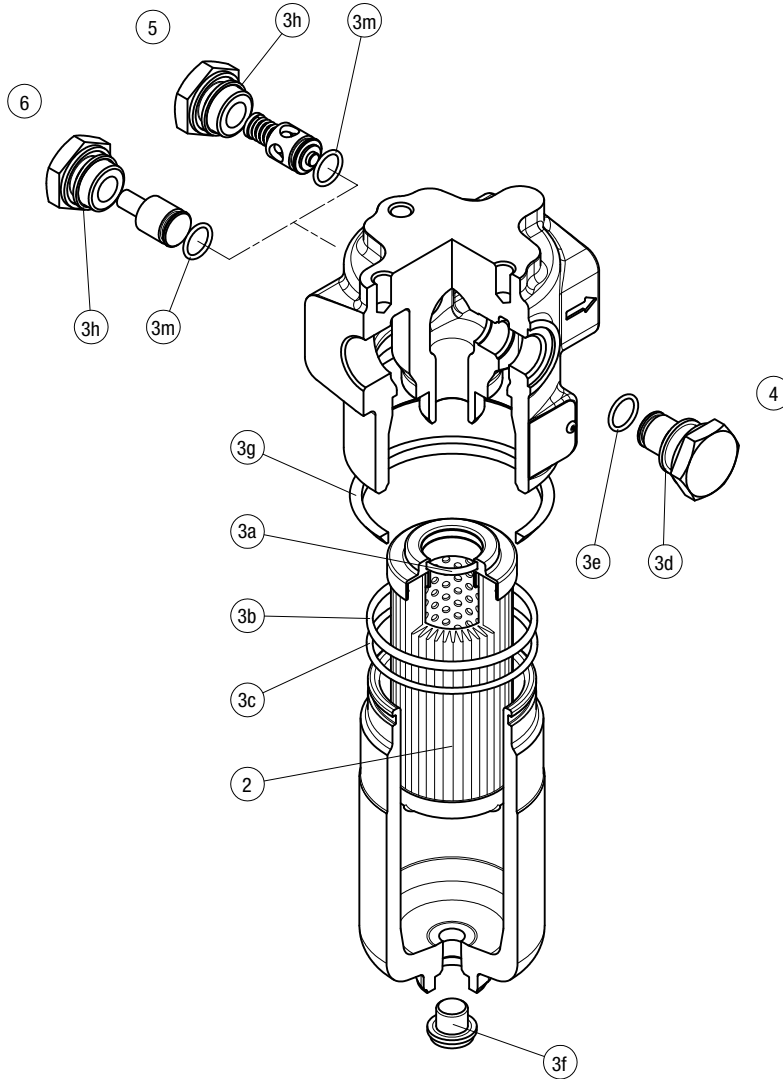
Filter length	H [mm]	H2 [mm]	
		Execution P01	Execution P02
1	263	150	-
2	386	150	-
3	518	150	-
4	671	150	550

Connections	R
G1-G2	M12
G3-G4-G5-G6	1/2" UNC
F1-F2	M12
F3-F4	1/2" UNC

FMP SPARE PARTS

Order number for spare parts

FMP 065 - 135 - 320



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.		Q.ty: 1 pc.		Q.ty: 1 pc.		Q.ty: 1 pc.	
Filter series	Filter element	Seal Kit code number		Indicator connection plug		Bypass assembly		Non-bypass assembly	
		NBR	FPM	NBR	FPM	NBR	FPM	NBR	FPM
FMP 065	See order table	02050267	02050278			02001312	02001385	02001314	02001386
FMP 135		02050293	02050294	T2H	T2V	02001312	02001385	02001314	02001386
FMP 320		02050274	02050285			02001396	02001397	02001398	02001399

FHP series

Maximum working pressure up to 42 MPa (420 bar) - Flow rate up to 630 l/min



Description

Technical data

High Pressure filters

In-line

Maximum working pressure up to 42 MPa (420 bar)

Flow rate up to 630 l/min

FHP is a range of versatile high pressure filter for protection of sensitive components in high pressure hydraulic systems in the industrial equipment.

They are directly connected to the lines of the system through the hydraulic fittings.

Available features:

- Female threaded connections up to 1 1/2" and flanged connections up to 2", for a maximum return flow rate of 630 l/min
- Fine filtration rating, to get a good cleanliness level into the system
- Bypass valve, to relieve excessive pressure drop across the filter media
- Check valve, to protect the system against reverse flow
- Reverse flow valve, to allow bidirectional flow through the filter housing. The back flow is not filtered. The filter requires the use of internal check valves to direct the flow through the element in one direction and around the element in the other
- Low collapse filter element "N", for use with filters provided with bypass valve
- High collapse filter element "H", for use with filters not provided with bypass valve
- Low collapse filter element with external support "R", for filter element protection against the back pressure caused by the check valve or the reverse flow in filters provided with the bypass valve
- High collapse filter element with external support "S", for filter element protection against the back pressure caused by the check valve or the reverse flow in filters not provided with the bypass valve
- Visual, electrical and electronic differential clogging indicators

Common applications:

Delivery lines, in any high pressure industrial equipment or mobile machines

Filter housing materials

- Head: Phosphatized cast iron

- Housing: Phosphatized steel

- Bypass valve

AISI 316L: FHP 010 - 011

Brass: FHP 065 - 135

Brass / AISI 304: FHP 350-351

Steel: FHP 500

- Reverse Flow

Steel: FHP 350 - FHP 500

- Check valve: Steel

Pressure

- Test pressure: 63 MPa (630 bar)

- Burst pressure: 126 MPa (1260 bar)

- Pulse pressure fatigue test: 1 000 000 cycles with pressure from 0 to 42 MPa (420 bar)

Bypass valve

- Opening pressure 600 kPa (6 bar) ±10%

- Other opening pressures on request.

Δp element type

- Microfibre filter elements - series N: 20 bar

- Microfibre filter elements - series R: 20 bar (not available for FHP 010-011 and FHP 500)

- Microfibre filter elements - series H: 210 bar

- Microfibre filter elements - series S: 210 bar (only for FHP 500)

- Wire mesh filter elements - series N: 20 bar

- Fluid flow through the filter element from OUT to IN

Seals

- Standard NBR series A

- Optional FPM series V

Temperature

From -25 °C to +110 °C

Connections

FHP 010 - 065 - 135 - 350 - 351 - 500:

In-line Inlet/Outlet

FHP 011:

90° Inlet/Outlet

Note

FHP filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]					Volumes [dm ³]						
	Length	1	2	3	4	5	Length	1	2	3	4	5
FHP 010 - 011		2.05	2.18	2.64	3.13	-		0.10	0.12	0.15	0.20	-
FHP 065		4.26	4.62	5.83	-	-		0.25	0.30	0.50	-	-
FHP 135		7.11	8.71	9.76	-	-		0.43	0.76	0.97	-	-
FHP 350 - 351		13.95	16.08	18.37	20.85	-		1.00	1.72	2.49	3.32	-
FHP 500		27.00	31.17	34.69	46.70	52.5		1.71	2.43	3.04	5.18	6.51

Filter series	Length	Filter element design - H Series					Filter element design - N Series					
		A03	A06	A10	A16	A25	A03	A06	A10	A16	A25	M25
FHP 010	1	3	5	6	7	8	4	6	8	9	10	37
	2	5	7	13	16	22	6	8	16	19	24	40
	3	10	13	22	25	30	11	14	23	26	31	41
	4	12	15	25	27	32	16	19	27	30	33	41
FHP 011	1	3	5	6	7	9	4	6	8	9	11	47
	2	5	7	14	17	24	7	9	17	21	28	52
	3	11	14	25	29	36	11	14	26	30	37	53
	4	12	16	28	32	38	17	21	32	36	40	54
FHP 065	1	24	25	50	59	84	25	33	56	63	90	142
	2	33	38	68	77	98	34	52	72	79	106	143
	3	61	70	100	107	123	61	73	101	108	125	147
FHP 135	1	49	55	95	98	147	67	72	115	122	159	184
	2	89	106	129	131	163	105	111	140	142	192	209
	3	120	132	158	166	180	141	143	176	179	193	211
FHP 350	1	108	115	188	197	301	127	140	234	282	343	451
	2	196	225	317	323	396	256	278	394	415	465	480
	3	266	310	384	392	440	331	370	450	466	475	490
	4	308	333	391	398	445	369	393	456	474	495	503
FHP 500	1	144	157	265	268	355	269	305	390	406	444	612
	2	232	262	350	363	398	321	357	433	441	484	619
	3	293	301	398	408	455	396	416	497	499	537	622
	4	336	377	452	455	507	430	475	516	524	545	626
	5	420	428	494	500	544	475	493	535	545	569	627

Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

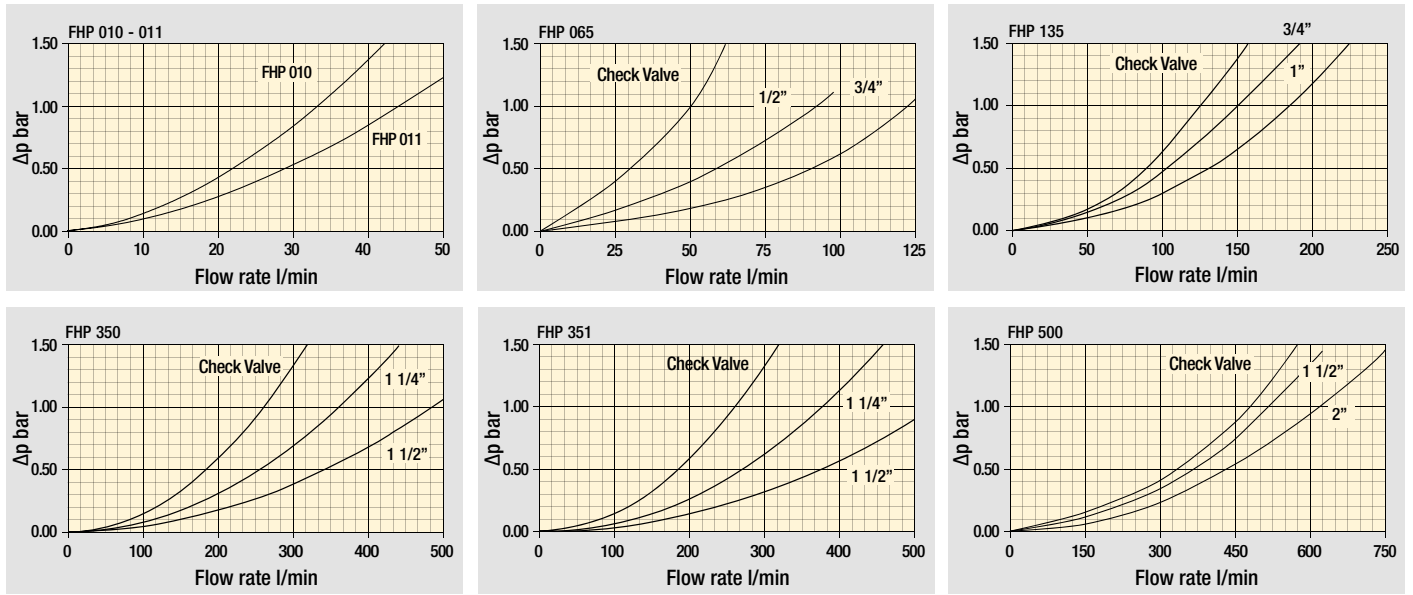
Hydraulic symbols

Filter series	Style S	Style B	Style T	Style D	Style V	Style Z
FHP 010 - 011	•	•	-	-	•	•
FHP 065	•	•	•	-	-	-
FHP 135	•	•	•	-	-	-
FHP 350-351	•	•	•	•	•	•
FHP 500	•	•	•	•	•	•

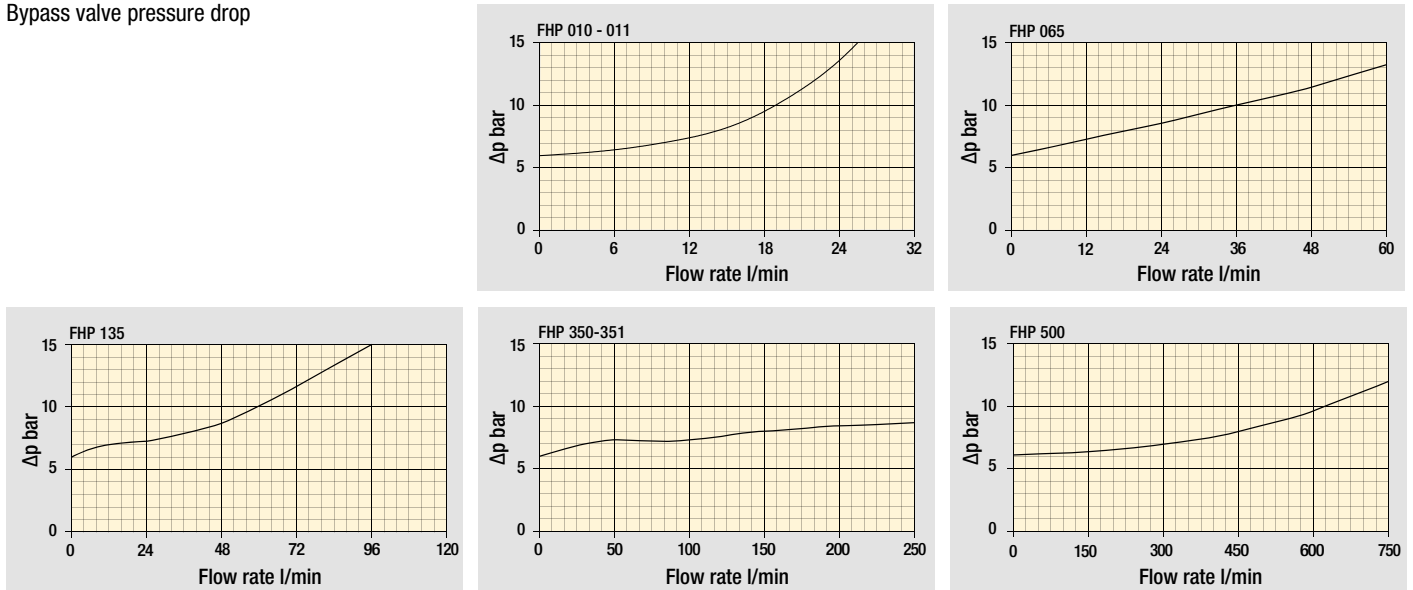
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Pressure drop

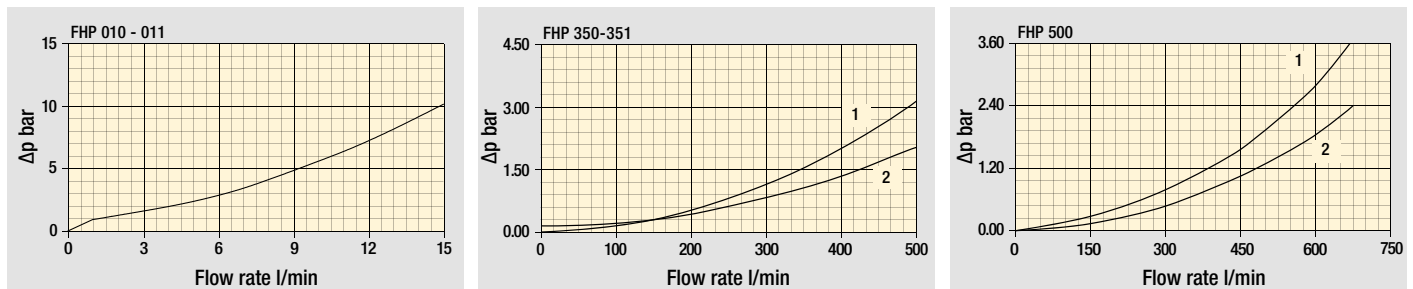
Filter housings Δp pressure drop



Bypass valve pressure drop



Valves



Filter housing with check valve

Pressure drop with reverse flow valve in
1 - Filtering direction
2 - Opposite direction

Pressure drop with reverse flow valve in
1 - Opposite direction
2 - Filtering direction

The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968. Δp varies proportionally with density.

Designation & Ordering code

COMPLETE FILTER

Configuration example: **FHP010** | **2** | **B** | **A** | **B** | **2** | **A03** | **N** | **P01**

Series and size
FHP010 | **FHP011**

Length
1 | **2** | **3** | **4**

Valves
S Without bypass
B With bypass 6 bar
V With reverse flow, without bypass
Z With reverse flow, with bypass 6 bar

Seals
A NBR
V FPM

Connections
A G 1/4"
B 1/4" NPT
C SAE 5 - 1/2" - 20 UNF
D G 3/8"
E 3/8" NPT
F SAE 6 - 9/16" - 18 UNF

Connection for differential indicator
1 Without
2 With connection

Filtration rating (filter media)

A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Element Δp	S	B	V	Z	Execution
N 20 bar	-	•	-	•	P01 MP Filtri standard
H 210 bar	•	-	•	-	Pxx Customized

FILTER ELEMENT

Configuration example: **HP011** | **2** | **A03** | **A** | **N** | **P01**

Element series and size
HP011

Element length
1 | **2** | **3** | **4**

Filtration rating (filter media)

A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Seals	Element Δp	Execution
A NBR	N 20 bar	P01 MP Filtri standard
V FPM	H 210 bar	Pxx Customized

CLOGGING INDICATORS

See page 687

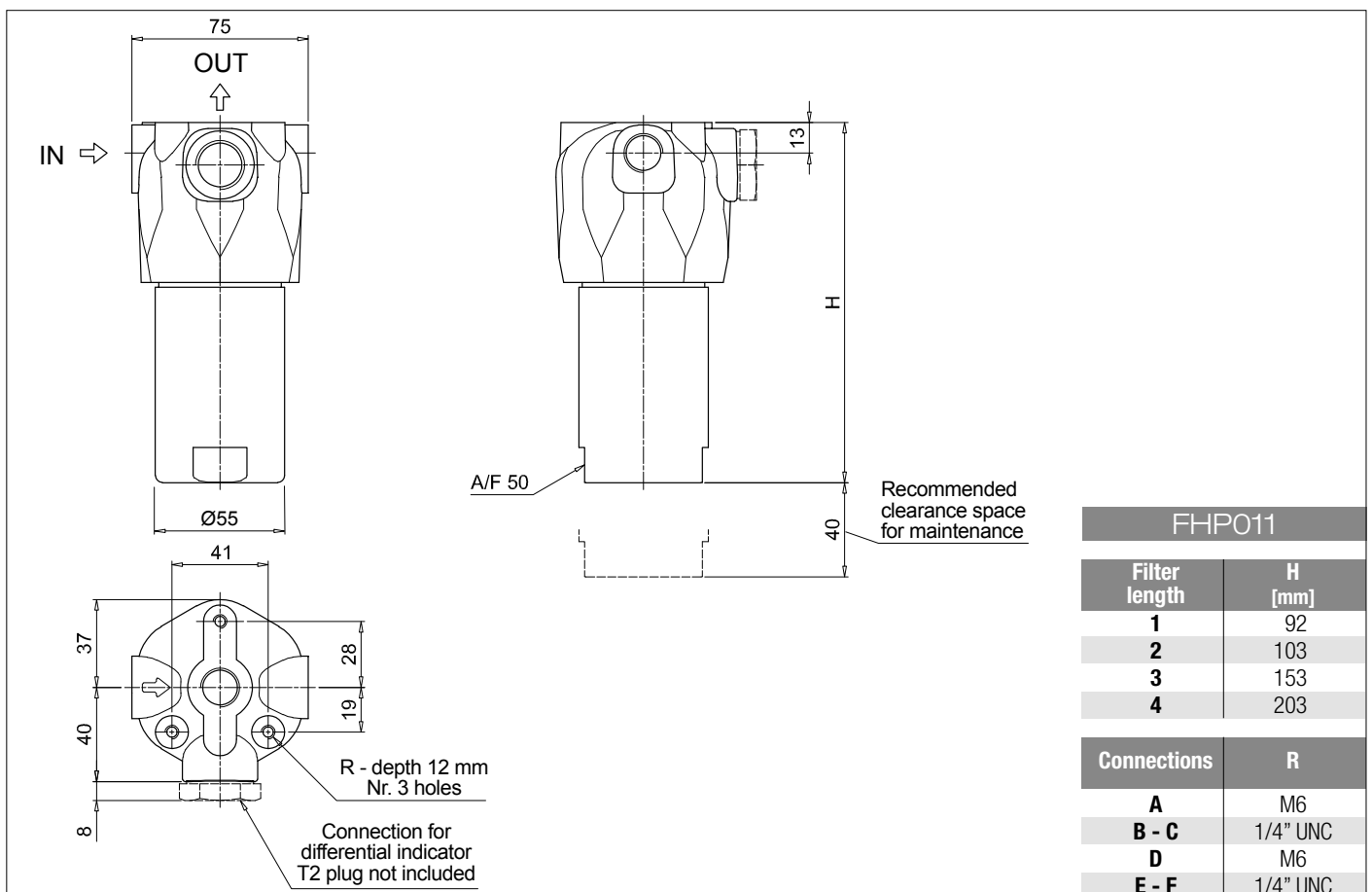
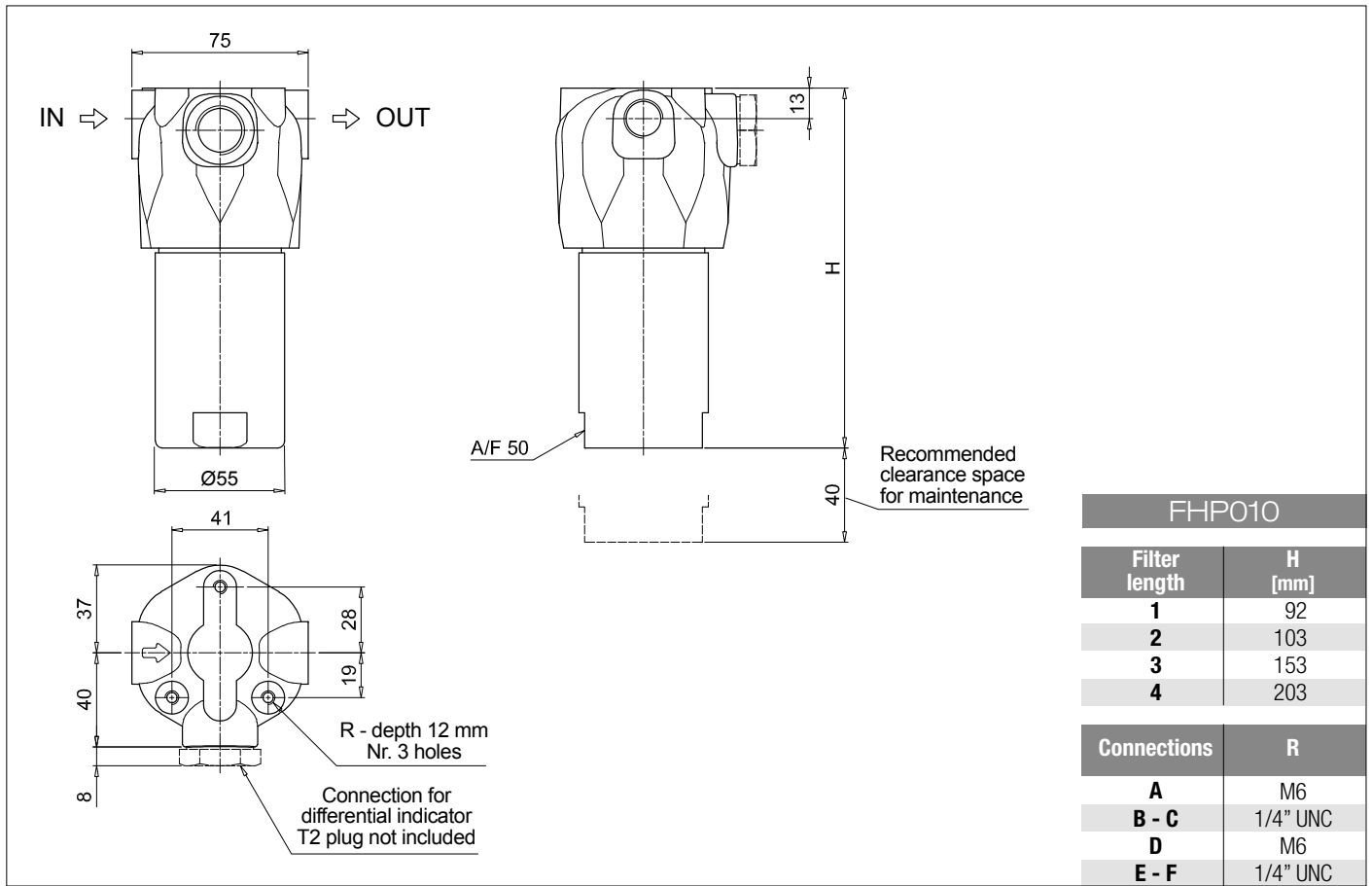
DEA Electrical differential indicator
DEM Electrical differential indicator
DLA Electrical / visual differential indicator
DLE Electrical / visual differential indicator

DTA Electrical differential indicator
DVA Visual differential indicator
DVM Visual differential indicator

PLUGS

See page 706

T2 Differential indicator plug (not included)



FHP FHP065 - FHP135

Designation & Ordering code

COMPLETE FILTER

Series and size Configuration example: **FHP135** **2** **B** **A** **G3** **A06** **S** **P01**

FHP065 | **FHP135**

Length **1** | **2** | **3**

Valves
S Without bypass
B With bypass 6 bar
T With check valve, without bypass

Seals
A NBR
V FPM

Connections	FHP065	FHP135
G1	G 1/2"	G 3/4"
G2	G 3/4"	G 1"
G3	1/2" NPT	3/4" NPT
G4	3/4" NPT	1" NPT
G5	SAE 8 - 3/4" - 16 UNF	SAE 12 - 1 1/16" - 12 UN
G6	SAE 12 - 1 1/16" - 12 UN	SAE 16 - 1 5/16" - 12 UN
F1	-	3/4" SAE 3000 psi/M
F2	-	1" SAE 3000 psi/M
F3	-	3/4" SAE 3000 psi/UNC
F4	-	1" SAE 3000 psi/UNC
F5	-	3/4" SAE 6000 psi/M
F6	-	3/4" SAE 6000 psi/UNC

Filtration rating (filter media)		
A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Element Δp	Valves			Execution
	S	B	T	
N 20 bar	-	•	-	P01 MP Filtri standard
H 210 bar	•	-	-	Pxx Customized
S 210 bar	-	-	•	

FILTER ELEMENT

Element series and size Configuration example: **HP135** **2** **A06** **A** **S** **P01**

HP065 | **HP135**

Element length **1** | **2** | **3**

Filtration rating (filter media)		
A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Seals	Element Δp	Execution
A NBR	N 20 bar	P01 MP Filtri standard
V FPM	H 210 bar	Pxx Customized
	S 210 bar	

CLOGGING INDICATORS

See page 687

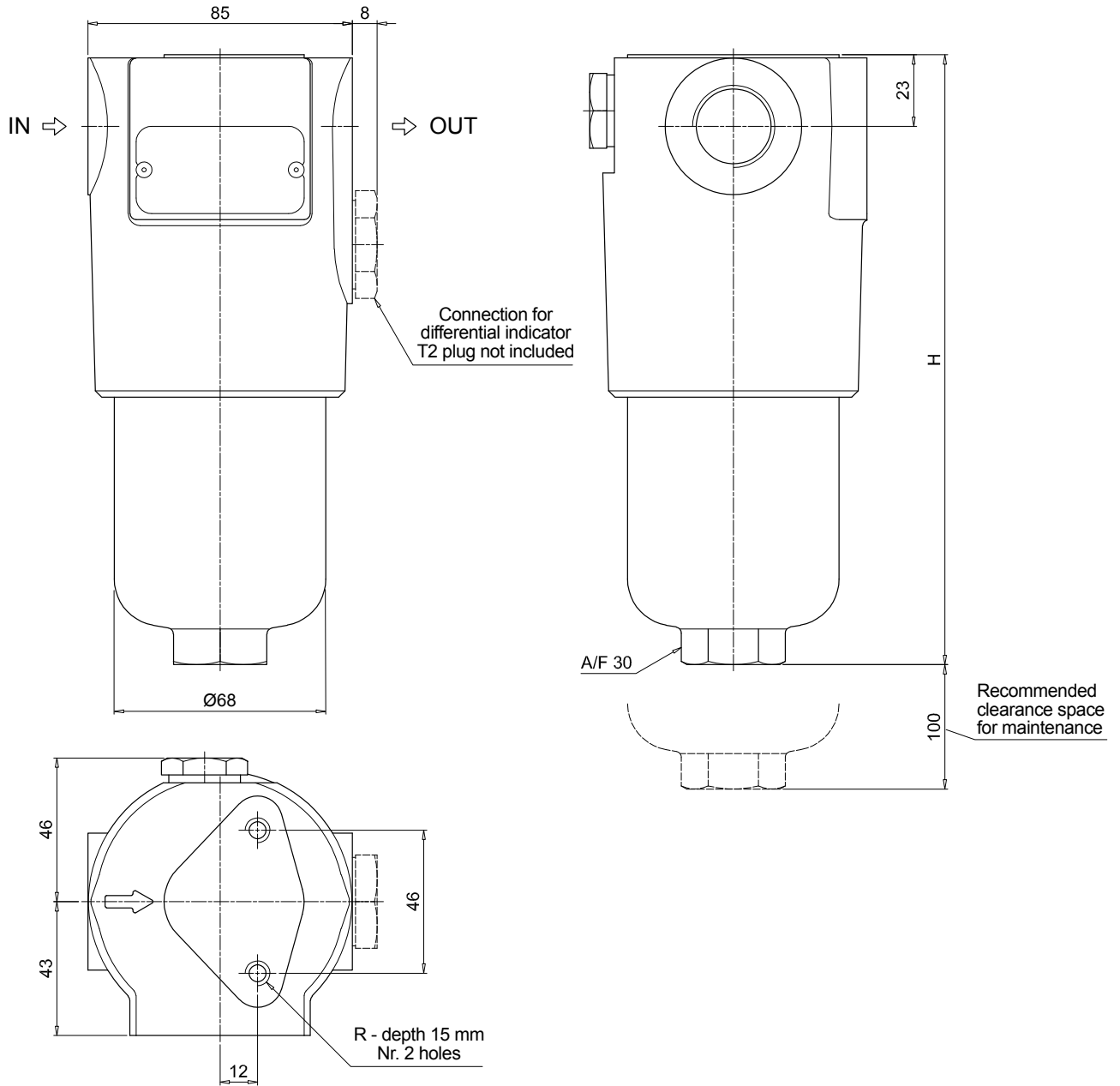
DEA Electrical differential indicator
DEM Electrical differential indicator
DLA Electrical / visual differential indicator
DLE Electrical / visual differential indicator

DTA Electrical differential indicator
DVA Visual differential indicator
DVM Visual differential indicator

PLUGS

See page 706

T2 Differential indicator plug (not included)

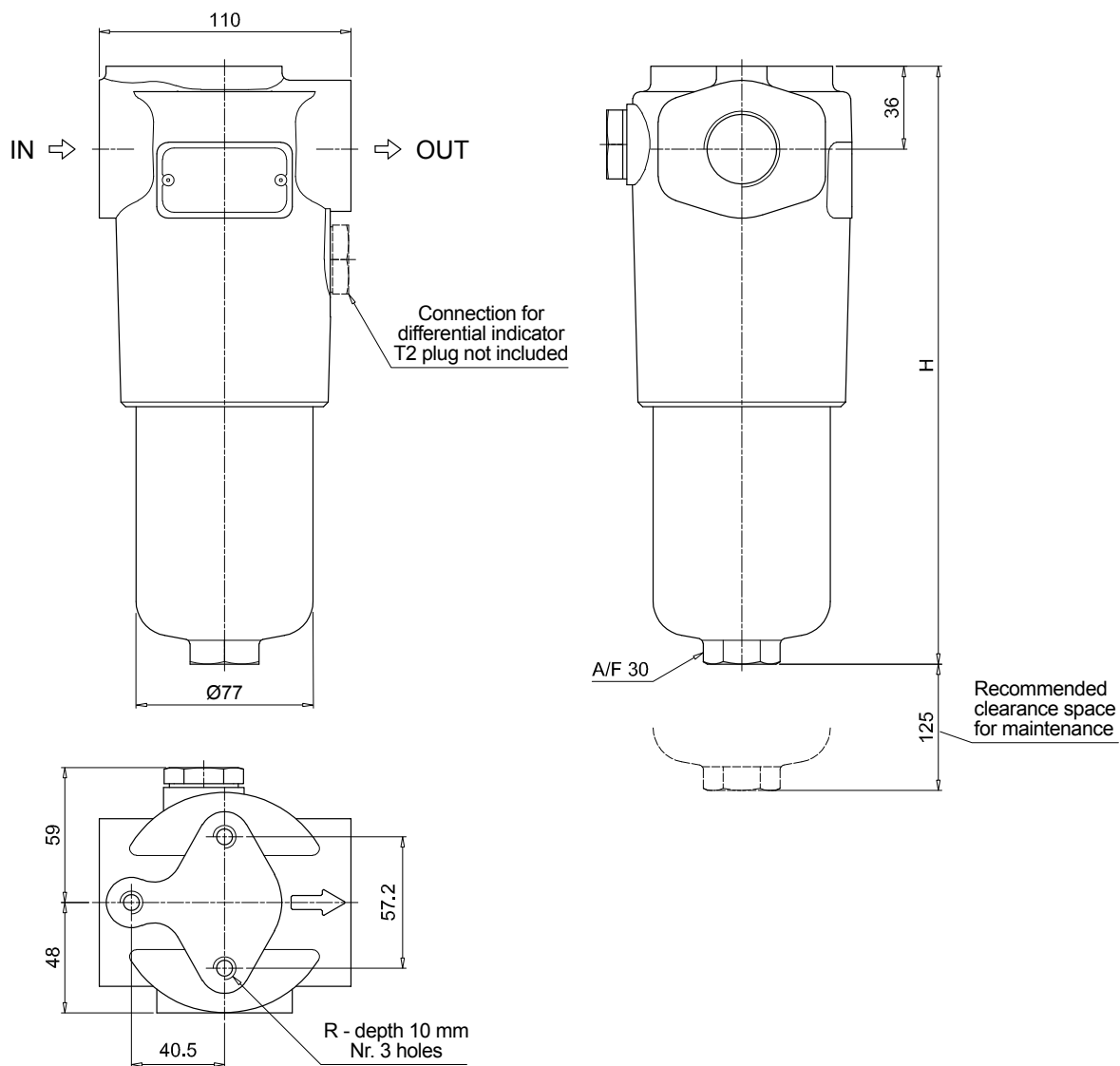


FHP065

Filter length	H [mm]
1	196
2	227
3	329
Connections	R
G1-G2	M8
G3-G4-G5-G6	5/16" UNC

FHP FHP065 - FHP135

Dimensions



FHP135

Filter length	H [mm]
1	260
2	373
3	448

Connections	R
G1-G2	M10
G3-G4-G5-G6	3/8" UNC
F1-F2	M10
F3-F4	3/8" UNC
F5	M10
F6	3/8" UNC

FHP FHP350 - FHP351

Designation & Ordering code

COMPLETE FILTER

Series and size Configuration example: **FHP350** **4** **B** **A** **D** **2** **A06** **N** **P01**

FHP350
FHP351

Length
1 | **2** | **3** | **4** |

Valves
S Without bypass
B With bypass 6 bar
T With check valve, without bypass
D With check valve, with bypass 6 bar
V With reverse flow, without bypass
Z With reverse flow, with bypass 6 bar

Seals
A NBR
V FPM

Connections
A G 1 1/2" **F** 1 1/2" SAE 3000 psi/UNC + SAE 20 - 1 5/8" - 12 UN
B 1 1/2" NPT **G** 1 1/4" SAE 3000 psi/M
C SAE 24 - 1 7/8" - 12 UN **H** 1 1/4" SAE 3000 psi/UNC
D 1 1/2" SAE 3000 psi/M + G 1 1/4" **I** 1 1/4" SAE 6000 psi/M (bolts M12, IAW ISO 6162-2:2018)
E 1 1/2" SAE 3000 psi/UNC + 1 1/4" NPT **L** 1 1/4" SAE 6000 psi/UNC

Connection for differential indicator
2 With connection

Filtration rating (filter media)		Valves						Filter length				
Code	Media	Element Δp	S	B	T	D	V	Z	1	2	3	4
A03	Inorganic microfiber	3 μm	-	•	-	-	-	-	•	•	•	•
A06	Inorganic microfiber	6 μm	-	-	-	•	-	•	-	-	-	•
A10	Inorganic microfiber	10 μm	•	-	-	-	-	-	-	-	-	-
A16	Inorganic microfiber	16 μm	-	-	-	-	-	-	-	-	-	-
A25	Inorganic microfiber	25 μm	-	-	•	-	-	-	-	-	-	-
M25	Wire mesh	25 μm	-	-	-	-	•	-	-	-	-	-

FILTER ELEMENT

Element series and size Configuration example: **HP320** **4** **A06** **A** **N** **P01**

HP320

Element length
1 | **2** | **3** | **4** |

Filtration rating (filter media)		Seals		Element Δp		Execution	
Code	Media	A	V	N	R	H	S
A03	Inorganic microfiber	3 μm	NBR	20 bar	MP Filtri standard	210 bar	MP Filtri standard
A06	Inorganic microfiber	6 μm	FPM	20 bar	Customized	210 bar	Customized
A10	Inorganic microfiber	10 μm		210 bar		210 bar	
A16	Inorganic microfiber	16 μm		210 bar		210 bar	
A25	Inorganic microfiber	25 μm		210 bar		210 bar	
M25	Wire mesh	25 μm		210 bar		210 bar	

CLOGGING INDICATORS

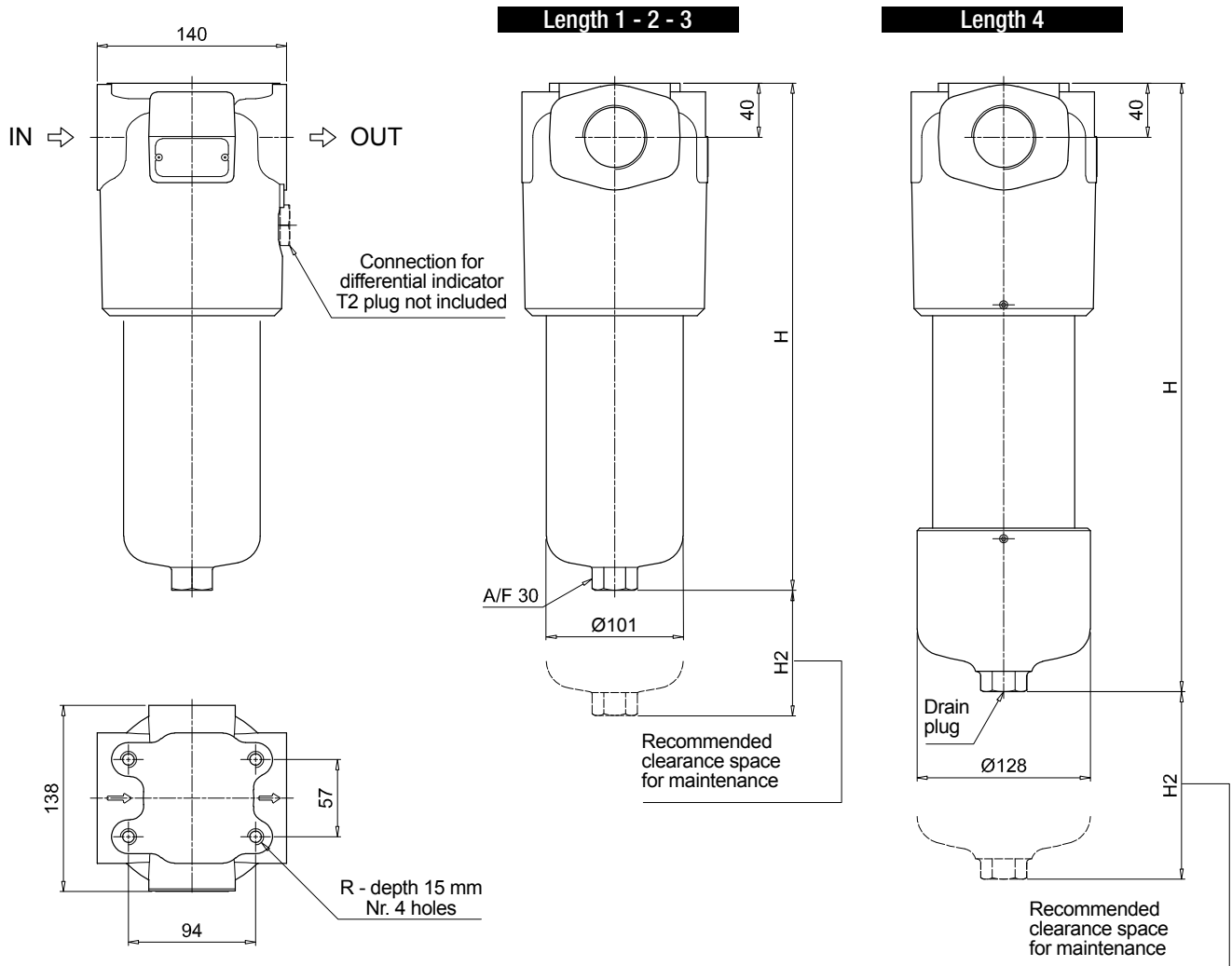
See page 687

DEA Electrical differential indicator	DTA Electrical differential indicator
DEM Electrical differential indicator	DVA Visual differential indicator
DLA Electrical / visual differential indicator	DVM Visual differential indicator
DLE Electrical / visual differential indicator	

PLUGS

See page 706

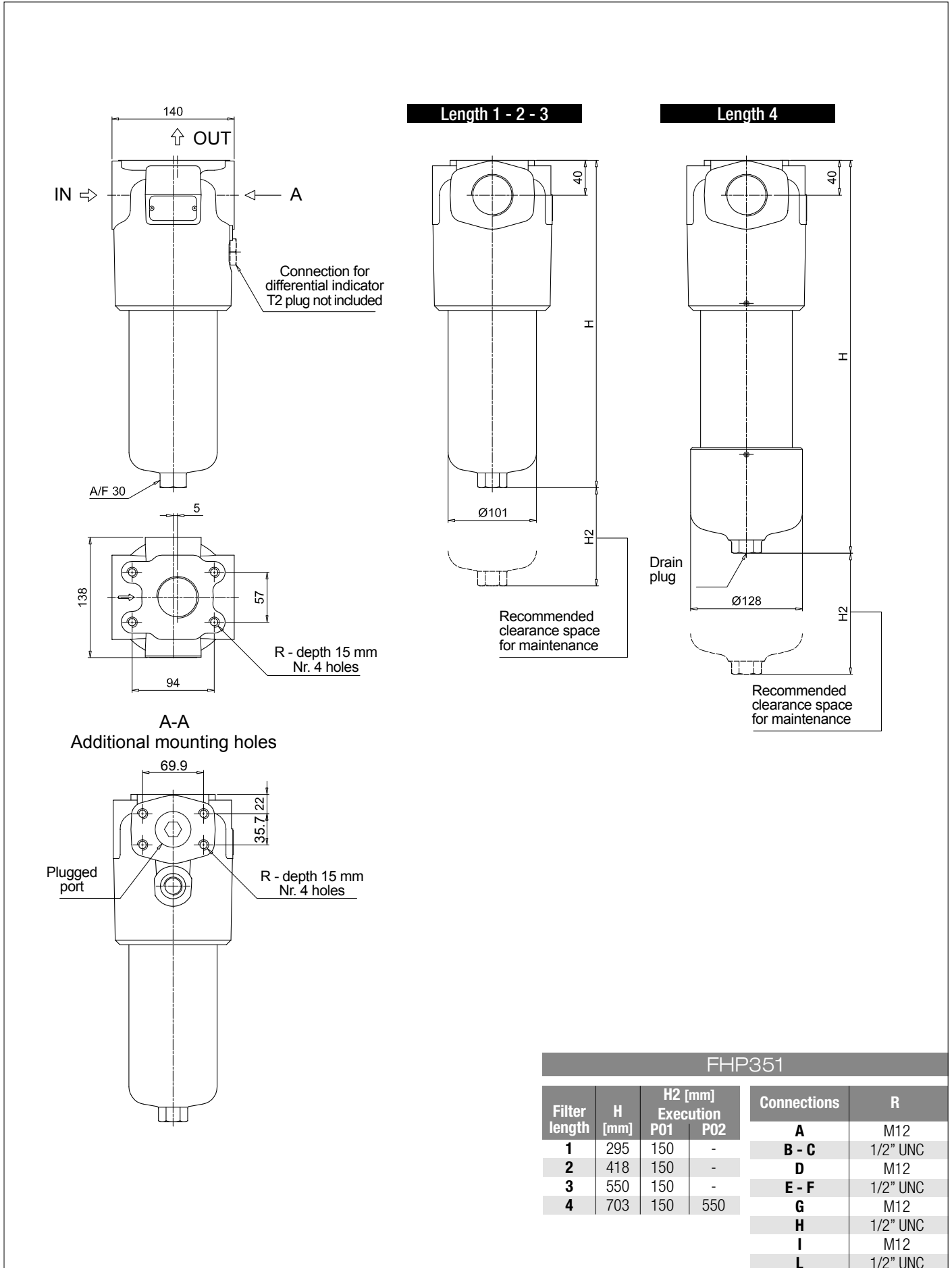
T2 Differential indicator plug (not included)



FHP350

Filter length	H [mm]	H2 [mm] Execution		Connections	R
		P01	P02		
1	295	150	-	A	M12
2	418	150	-	B - C	1/2" UNC
3	550	150	-	D	M12
4	703	150	550	E - F	1/2" UNC
				G	M12
				H	1/2" UNC
				I	M12
				L	1/2" UNC

Dimensions



Designation & Ordering code

COMPLETE FILTER

Series and size **FHP500** Configuration example: **FHP500** | **4** | **V** | **A** | **F1** | **A06** | **S** | **P01**

Length

1 | 2 | 3 | 4 | 5

Valves

- S** Without bypass
- B** With bypass 6 bar
- T** With check valve, without bypass
- D** With check valve, with bypass 6 bar
- V** With reverse flow, without bypass
- Z** With reverse flow, with bypass 6 bar

Seals

- A** NBR
- V** FPM

Connections

- F1** 1 1/2" SAE 3000 psi/M
- F2** 1 1/2" SAE 3000 psi/UNC
- F3** 2" SAE 3000 psi/M
- F4** 2" SAE 3000 psi/UNC + 1 1/2" NPT
- F5** 1 1/2" SAE 6000 psi/M
- F6** 1 1/2" SAE 6000 psi/UNC
- F7** 2" SAE 6000 psi/M + G 1 1/2"
- F8** 2" SAE 6000 psi/UNC + SAE 24 - 1 7/8" - 12 UN

Filtration rating (filter media)

- A03** Inorganic microfiber 3 µm
- A06** Inorganic microfiber 6 µm
- A10** Inorganic microfiber 10 µm
- A16** Inorganic microfiber 16 µm
- A25** Inorganic microfiber 25 µm
- M25** Wire mesh 25 µm

Element Δp	Valves					
	S	B	T	D	V	Z
N 20 bar	-	•	-	-	-	-
R 20 bar	-	-	-	•	-	•
S 210 bar	•	-	•	-	•	-

Execution	Filter length				
	1	2	3	4	5
P01 MP Filtri standard	•	•	•	•	•
P02 Maintenance from the bottom of the housing	-	-	-	•	•
P03 Drain plug	•	•	-	-	-
Pxx Customized	•	•	•	•	•

FILTER ELEMENT

Element series and size **HP500** Configuration example: **HP500** | **4** | **A06** | **A** | **S** | **P01**

Element length

1 | 2 | 3 | 4 | 5

Filtration rating (filter media)

- A03** Inorganic microfiber 3 µm
- A06** Inorganic microfiber 6 µm
- A10** Inorganic microfiber 10 µm
- A16** Inorganic microfiber 16 µm
- A25** Inorganic microfiber 25 µm
- M25** Wire mesh 25 µm

Seals	
A	NBR
V	FPM

Element Δp	
N	20 bar
R	20 bar
S	210 bar

Execution	
P01	MP Filtri standard
Pxx	Customized

CLOGGING INDICATORS

See page 687

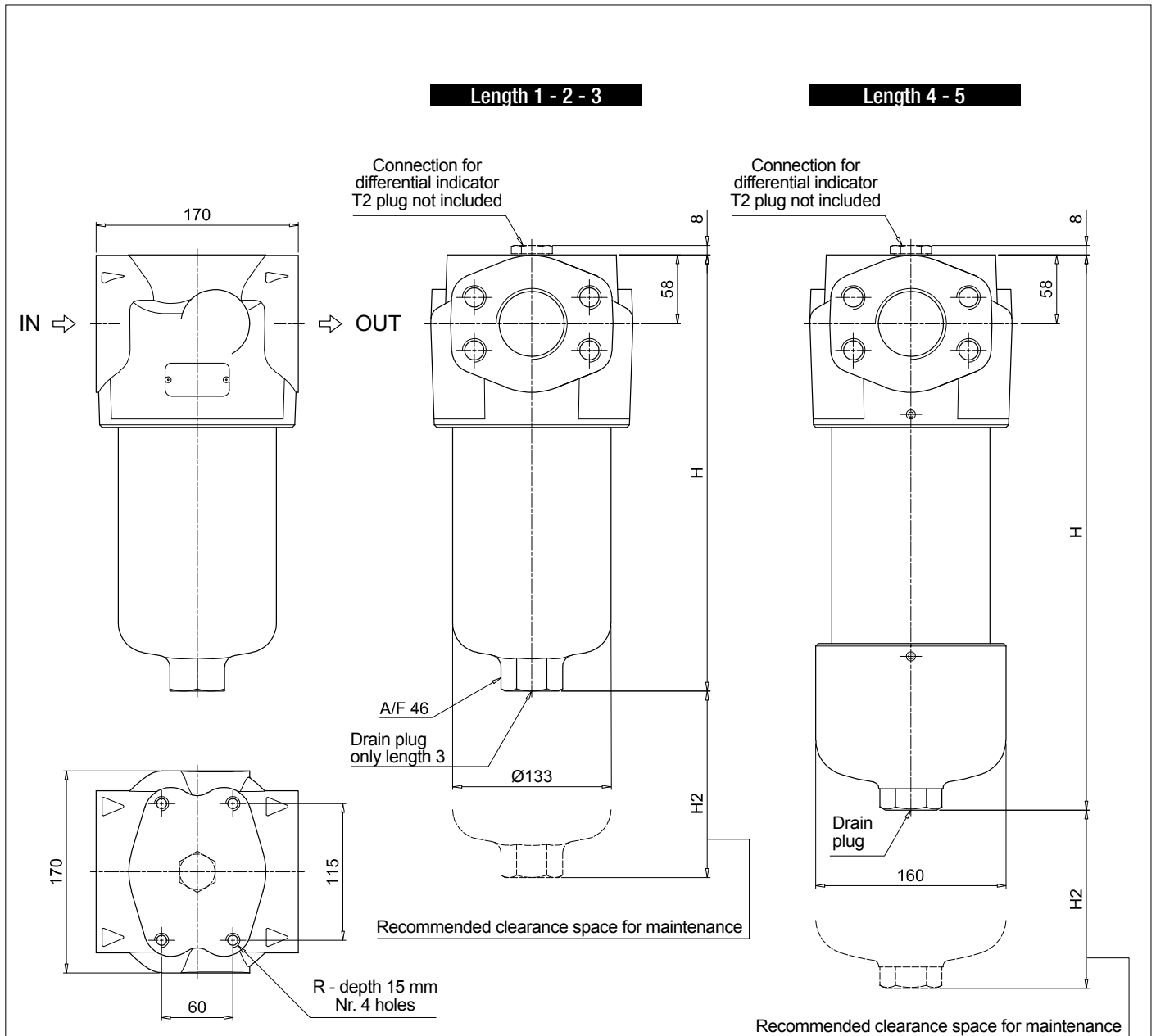
- DEA** Electrical differential indicator
- DEM** Electrical differential indicator
- DLA** Electrical / visual differential indicator
- DLE** Electrical / visual differential indicator

- DTA** Electrical differential indicator
- DVA** Visual differential indicator
- DVM** Visual differential indicator

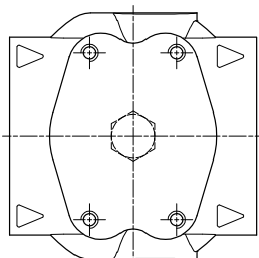
PLUGS

See page 706

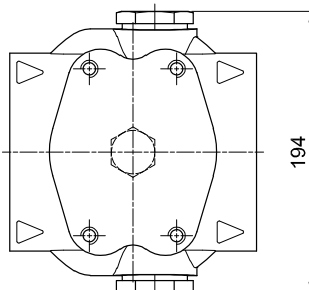
- T2** Differential indicator plug (not included)



Valves S - B - T - D



Valves V - Z



FHP500

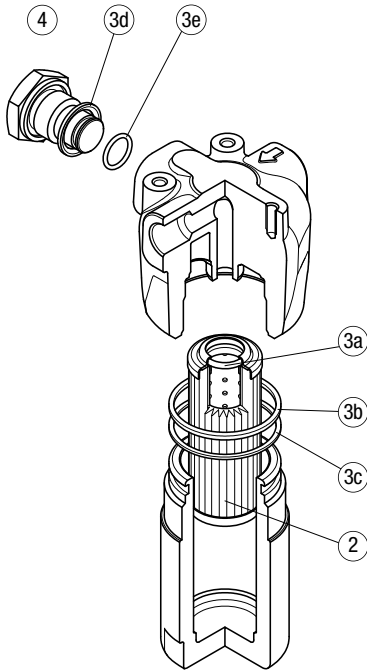
Filter length	H [mm]	H2 [mm]	
		Execution P01	P02
1	330	150	-
2	420	150	-
3	496	150	-
4	654	150	480
5	820	150	650

Connections	R
F1	M12
F2	1/2" UNC
F3	M12
F4	1/2" UNC
F5	M12
F6	1/2" UNC
F7	M12
F8	1/2" UNC

FHP SPARE PARTS

Order number for spare parts

FHP 010 - 011

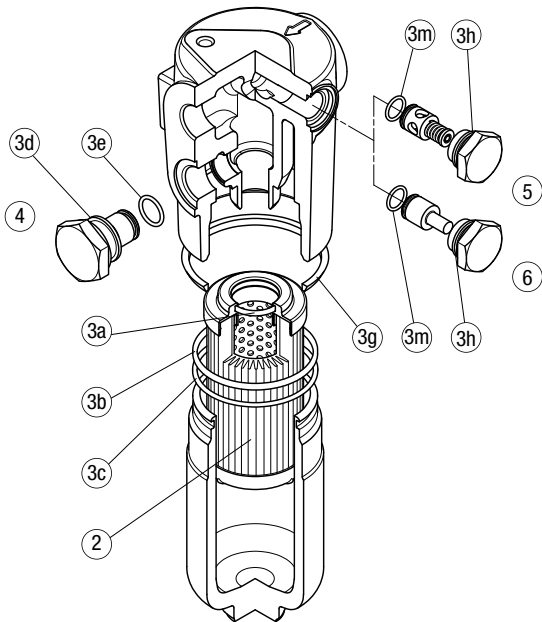


Q.ty:
nr. 0 pcs. for version 1
(without indicator port)

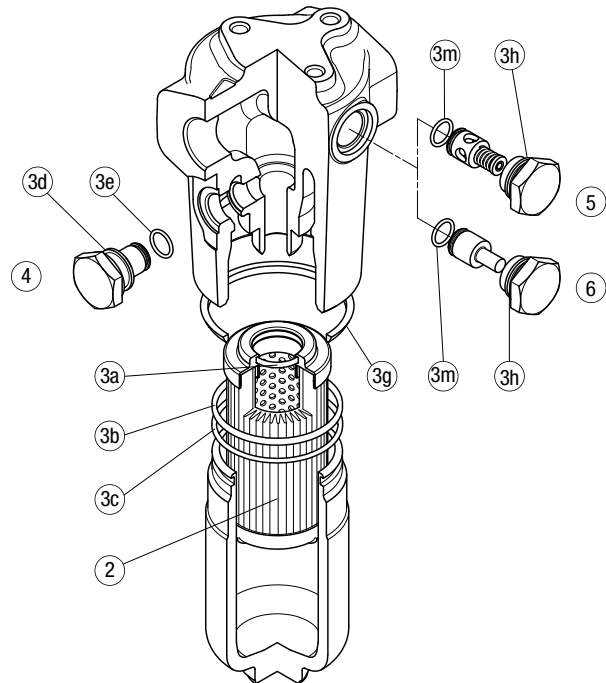
nr. 1 pc. for version 2
(with indicator port)

Item:	Q.ty: 1 pc. 2	Q.ty: 1 pc. 3 (3a ÷ 3e)		Q.ty: 1 pc. 4	
Filter series	Filter element	Seal Kit code number		Indicator connection plug	
		NBR	FPM	NBR	FPM
FHP 010-011	See order table	02050501	02050492	T2H	T2V

FHP 065



FHP 135

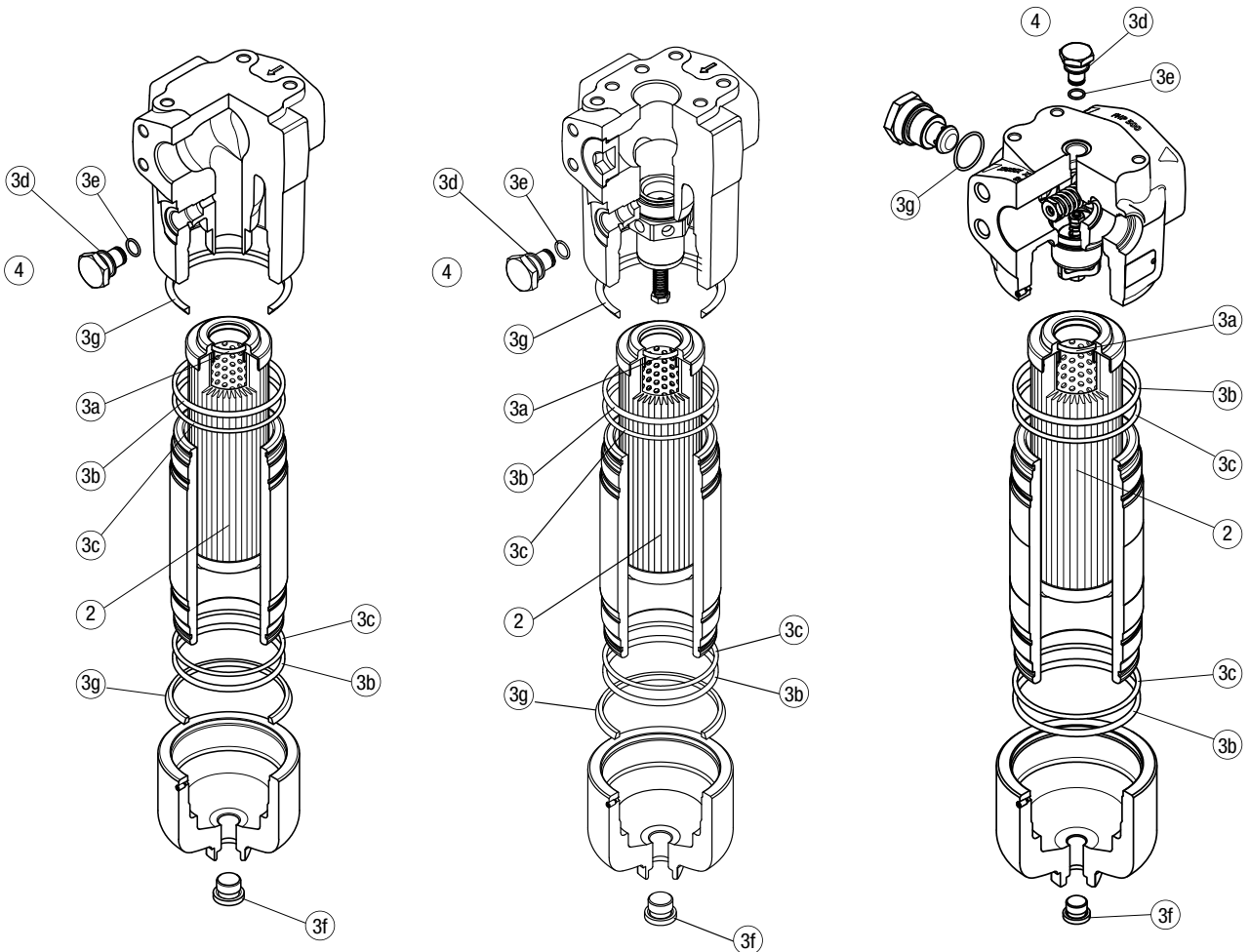


Item:	Q.ty: 1 pc. 2	Q.ty: 1 pc. 3 (3a ÷ 3m)		Q.ty: 1 pc. 4		Q.ty: 1 pc. 5		Q.ty: 1 pc. 6	
Filter series	Filter element	Seal Kit code number		Indicator connection plug		Bypass assembly		Non-bypass assembly	
		NBR	FPM	NBR	FPM	NBR	FPM	NBR	FPM
FHP 065	See order table	02050265	02050276	T2H	T2V	02001116	02001136	02001142	02001139
FHP 135	See order table	02050269	02050280			02001117	02001137	02001143	02001392

FHP 350

FHP 351

FHP 500



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.		Q.ty: 1 pc.	
Filter series	Filter element	Seal Kit code number		Indicator connection plug	
		NBR	FPM	NBR	FPM
FHP 350 - 351	See order table	02050272	02050283	T2H	T2V
FHP 500		02050330	02050331		

FHM series

Maximum working pressure up to 32 MPa (320 bar) - Flow rate up to 400 l/min



Description

Technical data

High Pressure filters

Manifold

Maximum working pressure up to 32 MPa (320 bar)

Flow rate up to 400 l/min

FHM is a range of high pressure filter for protection of sensitive components in high pressure hydraulic systems in the mobile machines. They are directly connected to the top of the manifold, through the proper flanged interface.

Available features:

Available features:

- Manifold connections up to Ø30 mm, for a maximum flow rate of 400 l/min
- ISO 4401 CETOP 3 and CETOP 5 interface, for direct mounting on the CETOP valves
- Fine filtration rating, to get a good cleanliness level into the system
- Bypass valve, to relieve excessive pressure drop across the filter media
- Check valve, to protect the system against reverse flow
- Low collapse filter element "N", for use with filters provided with bypass valve
- High collapse filter element "H", for use with filters not provided with bypass valve
- High collapse filter element with external support "S", for filter element protection against the back pressure caused by the check valve in filters not provided with the bypass valve
- Visual, electrical and electronic differential clogging indicators

Common applications:

Delivery lines, in any high pressure industrial equipment

Filter housing materials

- Head
Phosphatized cast iron: FHM 006-007-010
Phosphatized steel: FHM 050-065-135-320-500
- Housing: Phosphatized steel
- Bypass valve: Steel
- Check valve: Steel

Pressure

- Test pressure: 48 MPa (480 bar)
- Burst pressure: 96 MPa (960 bar)
- Pulse pressure fatigue test: 1 000 000 cycles with pressure from 0 to 32 MPa (320 bar)

Bypass valve

- Opening pressure 600 kPa (6 bar) ±10%
- Other opening pressures on request.

Δp element type

- Microfibre filter elements - series N: 20 bar (not available for FHM 006, FHM 007 and FHM 010)
- Microfibre filter elements - series H: 210 bar (not available for FHM 050 and FHM 500)
- Microfibre filter elements - series S: 210 bar (only for FHM 050 and FHM 500)
- Wire mesh filter elements - series N: 20 bar (not available for FHM 006)
- Wire mesh filter elements - series H: 210 bar (not available for FHM 050 and FHM 500)
- Fluid flow through the filter element from OUT to IN

Seals

- Standard NBR series A
- Optional FPM series V

Temperature

From -25 °C to +110 °C

Connections

Manifold mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]					Volumes [dm ³]						
	Length	1	2	3	4	5	Length	1	2	3	4	5
FHM 006		2.17	-	-	-	-		0.12	-	-	-	-
FHM 007		-	4.74	5.95	-	-		-	0.30	0.50	-	-
FHM 010		-	4.74	5.95	-	-		-	0.30	0.50	-	-
FHM 050		5.31	5.68	6.09	6.56	7.74		0.29	0.38	0.48	0.60	0.89
FHM 065		5.47	5.83	7.04	-	-		0.27	0.34	0.56	-	-
FHM 135		8.78	10.38	11.43	-	-		0.49	0.82	1.03	-	-
FHM 320		19.80	21.93	24.22	26.70	-		1.04	1.76	2.53	3.36	-
FHM 500		35.00	39.17	42.69	54.70	60.50		1.63	2.35	2.96	5.11	6.44

Filter series	Length	Filter element design - H Series					
		A03	A06	A10	A16	A25	M25
FHM 006	1	9	10	13	14	15	16
	2	13	13	15	16	16	16
FHM 007	3	15	15	16	16	17	17
	2	23	25	32	34	37	38
FHM 010	3	31	33	37	38	39	40

Filter series	Length	Filter element design - N Series						Filter element design - S Series				
		A03	A06	A10	A16	A25	M25	A03	A06	A10	A16	A25
FHM 050	1	38	37	65	67	81	101	28	36	50	52	62
	2	46	50	69	75	89	102	41	44	63	71	85
	3	57	59	76	81	93	103	51	53	71	77	90
	4	68	71	84	86	95	103	62	66	81	82	93
	5	82	83	93	95	98	105	73	75	83	89	97

Filter series	Length	Filter element design - N Series						Filter element design - H Series				
		A03	A06	A10	A16	A25	M25	A03	A06	A10	A16	A25
FHM 065	1	23	30	48	53	71	102	22	23	43	50	67
	2	30	45	59	64	81	103	30	34	56	62	76
	3	52	60	78	82	92	105	51	58	77	81	91
FHM 135	1	61	65	99	104	131	149	46	51	83	86	122
	2	91	96	118	119	155	167	79	92	109	111	134
	3	118	119	144	146	156	168	103	112	130	137	146
FHM 320	1	112	121	187	217	252	312	97	102	156	162	228
	2	200	214	281	293	320	328	161	181	237	241	282
	3	245	267	312	320	325	333	207	233	275	280	306
	4	267	281	315	325	336	341	232	247	279	283	309

Filter series	Length	Filter element design - N Series						Filter element design - S Series				
		A03	A06	A10	A16	A25	M25	A03	A06	A10	A16	A25
FHM 500	1	211	232	281	289	309	394	126	135	208	210	261
	2	242	262	303	308	330	397	187	206	258	266	285
	3	284	294	336	338	357	399	226	230	285	290	315
	4	302	325	346	350	361	401	251	273	314	315	341
	5	325	334	356	361	373	401	296	301	335	338	360

Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure.

Please, contact our Sales Department for further additional information.

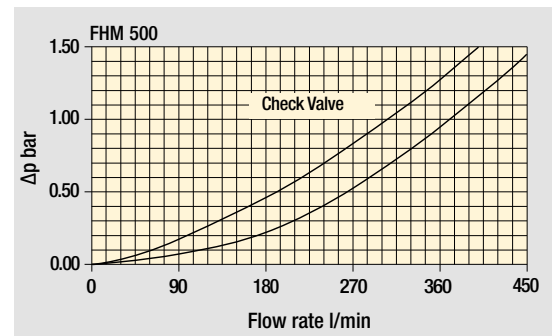
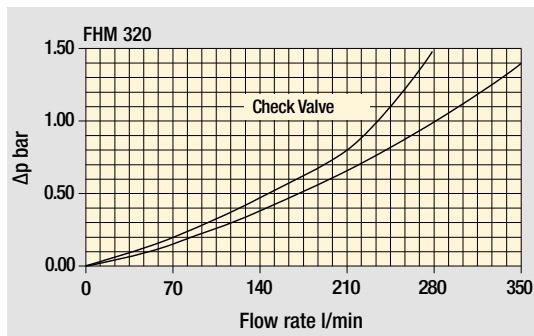
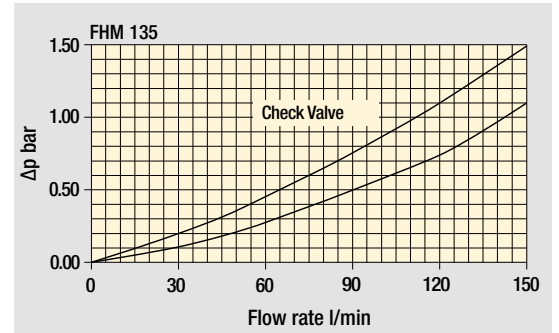
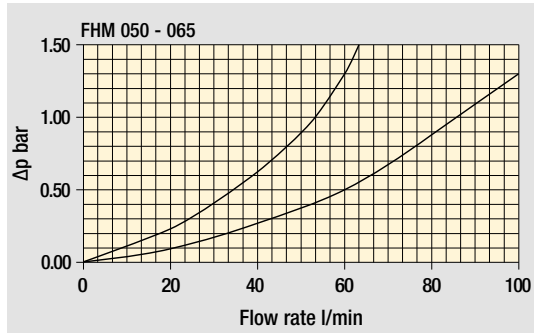
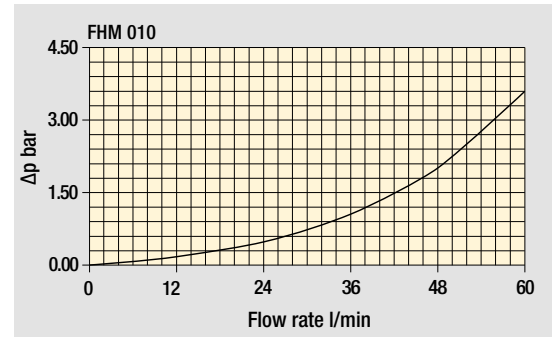
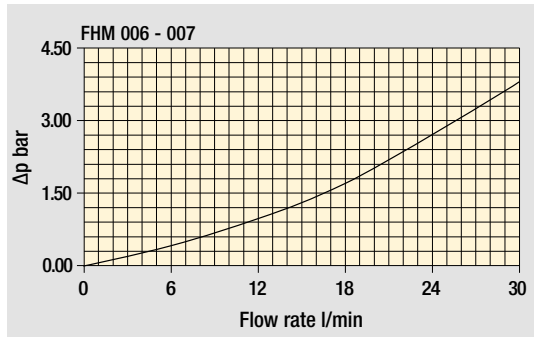
Hydraulic symbols

Filter series	Stile S	Stile S	Stile S	Stile B	Stile T	Stile D
FHM 006	●	-	-	-	-	-
FHM 007	●	-	-	-	-	-
FHM 010	-	●	-	-	-	-
FHM 050	-	-	●	●	●	●
FHM 065	-	-	●	●	●	●
FHM 135	-	-	●	●	●	●
FHM 320	-	-	●	●	●	●
FHM 500	-	-	●	●	●	●

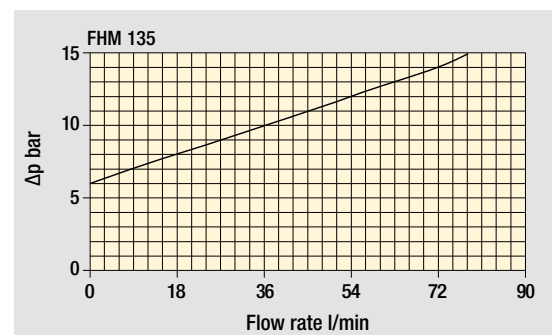
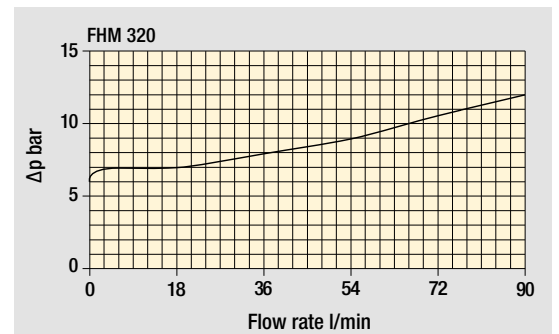
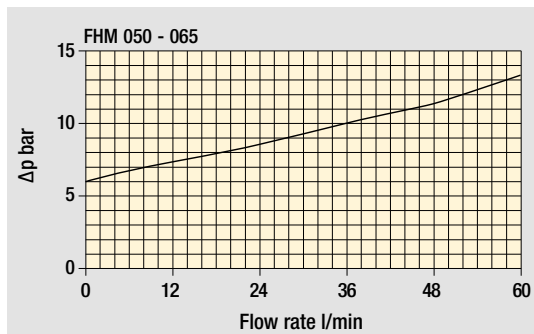
FHM GENERAL INFORMATION

Pressure drop

Filter housings Δp pressure drop



Bypass valve pressure drop



The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968. Δp varies proportionally with density.

Designation & Ordering code

COMPLETE FILTER

Series and size				Configuration example: FHM010 2 S V G1 A03 H P01						
FHM006 FHM007 FHM010										
Length	FHM006	FHM007	FHM010							
1	•	-	-							
2	-	•	•							
3	-	•	•							
Valves										
S Without bypass										
Seals										
A NBR										
V FPM										
Connections										
G1 Manifold side "A"										
G2 Manifold side "B"										
Filtration rating (filter media)										
A03	Inorganic microfiber	3 µm	A16	Inorganic microfiber	16 µm					
A06	Inorganic microfiber	6 µm	A25	Inorganic microfiber	25 µm					
A10	Inorganic microfiber	10 µm	M25	Wire mesh	25 µm					
				Element Δp		Execution				
				H 210 bar		P01 MP Filtri standard				
						Pxx Customized				

FILTER ELEMENT

Element series and size				Configuration example: HP065 2 A03 A H P01						
FHM006 FHM007 FHM010										
Element length	FHM006	FHM007	FHM010							
2	-	•	•							
3	•	•	•							
Filtration rating (filter media)										
A03	Inorganic microfiber	3 µm								
A06	Inorganic microfiber	6 µm								
A10	Inorganic microfiber	10 µm								
A16	Inorganic microfiber	16 µm								
A25	Inorganic microfiber	25 µm								
M25	Wire mesh	25 µm								
				Seals		Element Δp		Execution		
				A NBR		H 210 bar		P01 MP Filtri standard		
				V FPM				Pxx Customized		

CLOGGING INDICATORS

See page 687

DEA	Electrical differential indicator
DEM	Electrical differential indicator
DLA	Electrical / visual differential indicator
DLE	Electrical / visual differential indicator

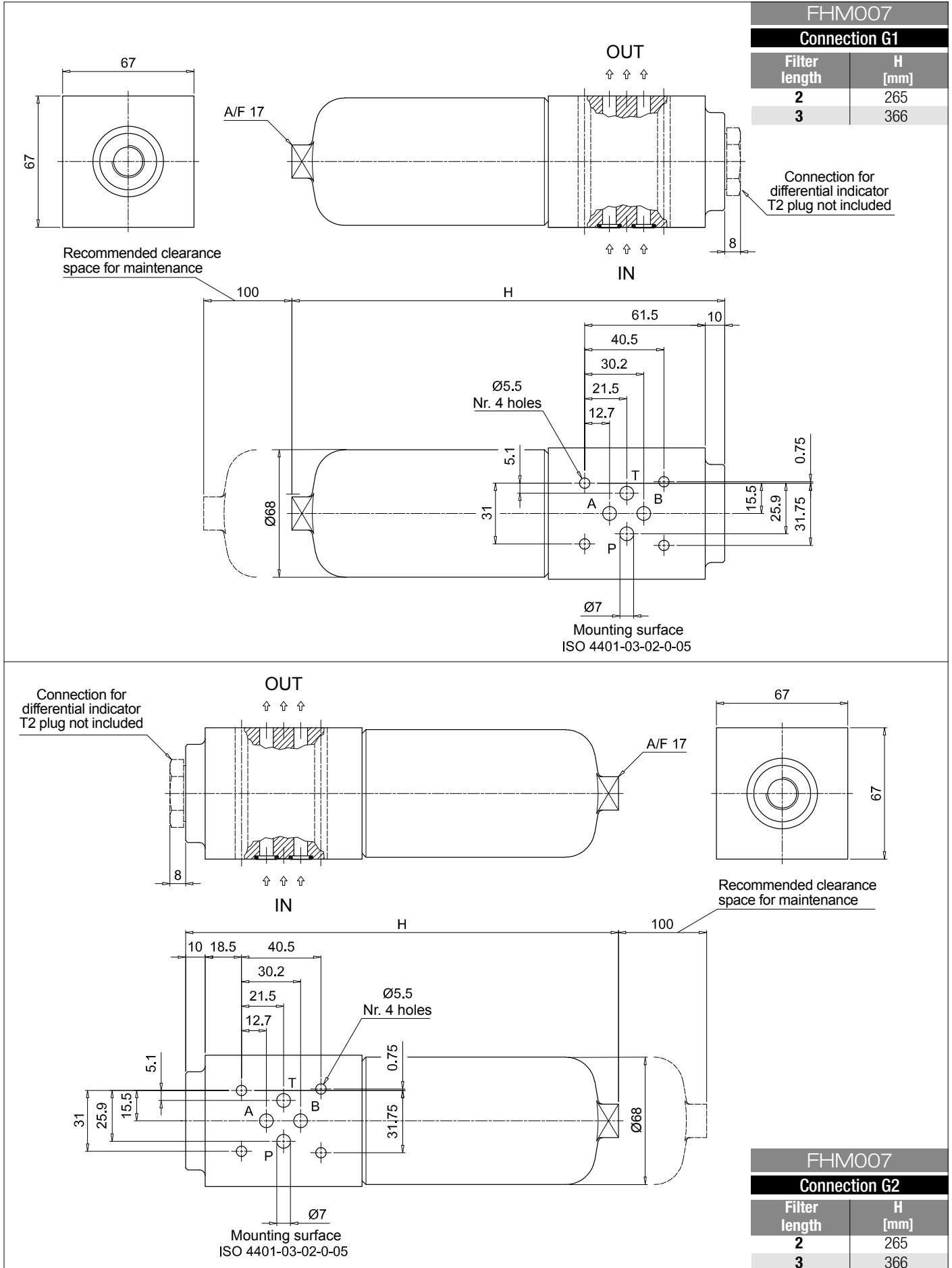
DTA	Electrical differential indicator
DVA	Visual differential indicator
DVM	Visual differential indicator

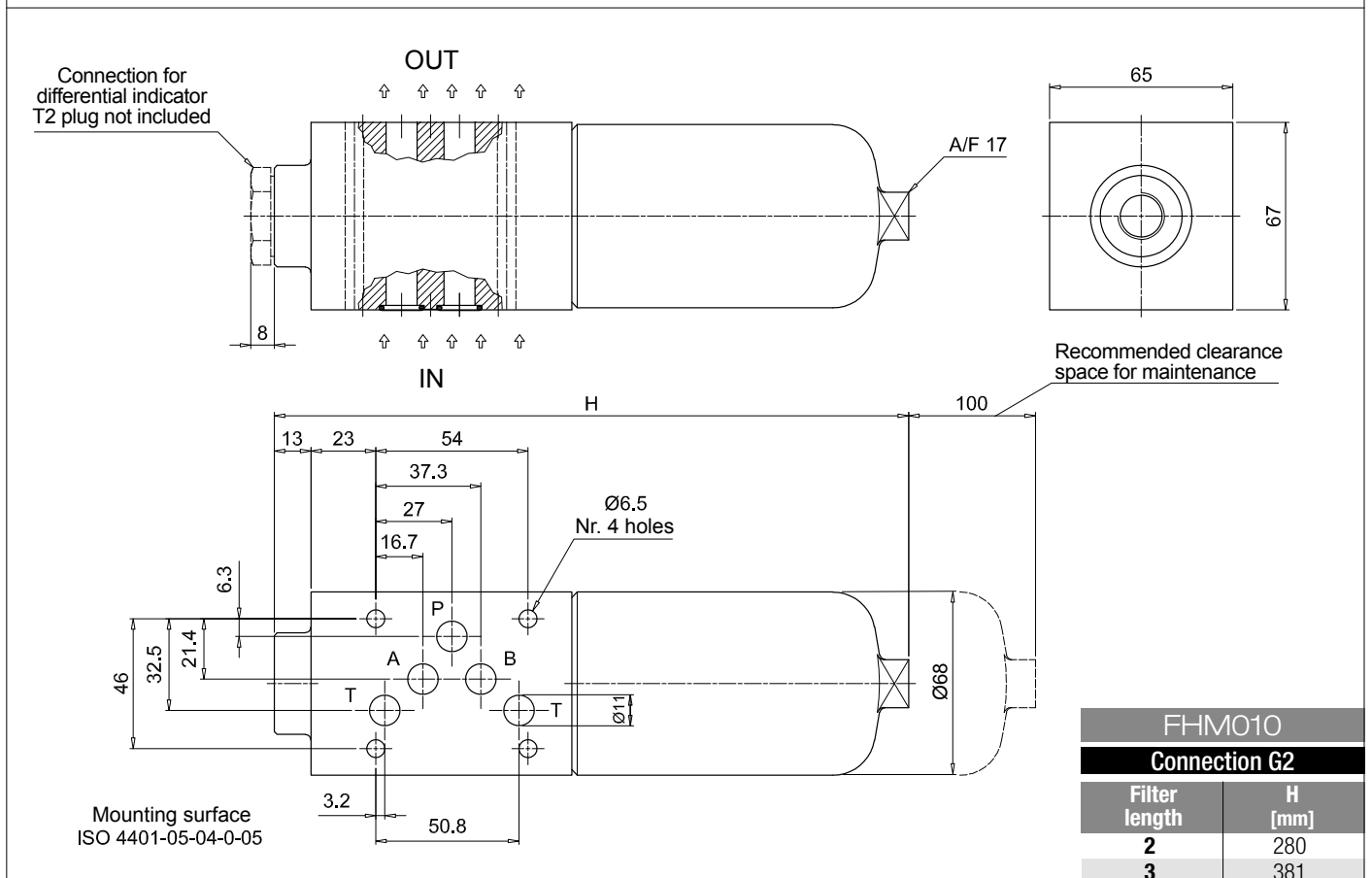
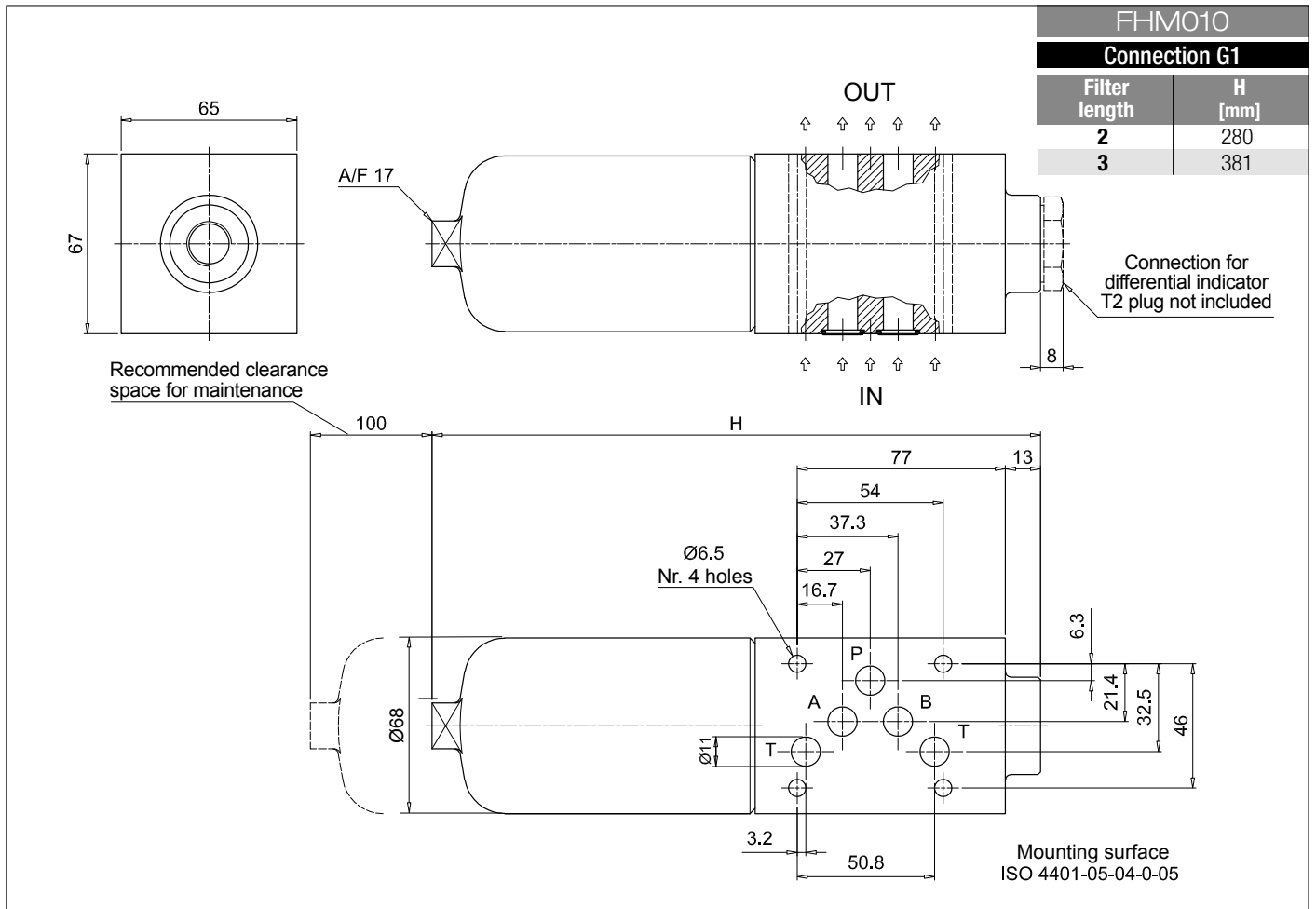
PLUGS

See page 706

T2	Differential indicator plug (not included)
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Dimensions





FHM FHM050 - FHM065 - FHM135

Designation & Ordering code

COMPLETE FILTER

Series and size Configuration example: **FHM135** | **3** | **S** | **A** | **F1** | **A10** | **H** | **P01**

FHM050 | **FHM065** | **FHM135**

Length	FHM050	FHM065	FHM135
1	•	•	•
2	•	•	•
3	•	•	•
4	•	-	-
5	•	-	-

Valves

S	Without bypass
B	With bypass 6 bar
T	With check valve, without bypass
D	With check valve, with bypass 6 bar

Seals

A	NBR
V	FPM

Connections

F1	Manifold
-----------	----------

Filtration rating (filter media)

A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Element Δp	Valves: FHM050				FHM065-135			
	S	B	T	D	S	B	T	D
N 20 bar	-	•	-	•	-	•	-	•
H 210 bar	-	-	-	-	•	-	•	-
S 210 bar	•	-	•	-	-	-	-	-

Execution

P01	MP Filtri standard
Pxx	Customized

FILTER ELEMENT

Element series and size Configuration example: **HP135** | **3** | **A10** | **A** | **H** | **P01**

HP050 | **HP065** | **HP135**

Element length	HP050	HP065	HP135
1	•	•	•
2	•	•	•
3	•	•	•
4	•	-	-
5	•	-	-

Filtration rating (filter media)

A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Element Δp	Seals		
	HP050	HP065	HP135
N 20 bar	•	•	•
H 210 bar	-	•	•
S 210 bar	•	-	-

Execution

P01	MP Filtri standard
Pxx	Customized

CLOGGING INDICATORS

See page 687

DEA	Electrical differential indicator
DEM	Electrical differential indicator
DLA	Electrical / visual differential indicator
DLE	Electrical / visual differential indicator

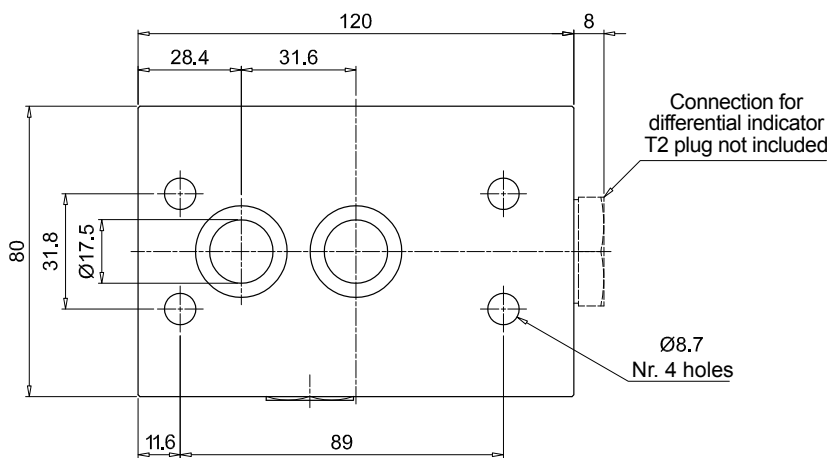
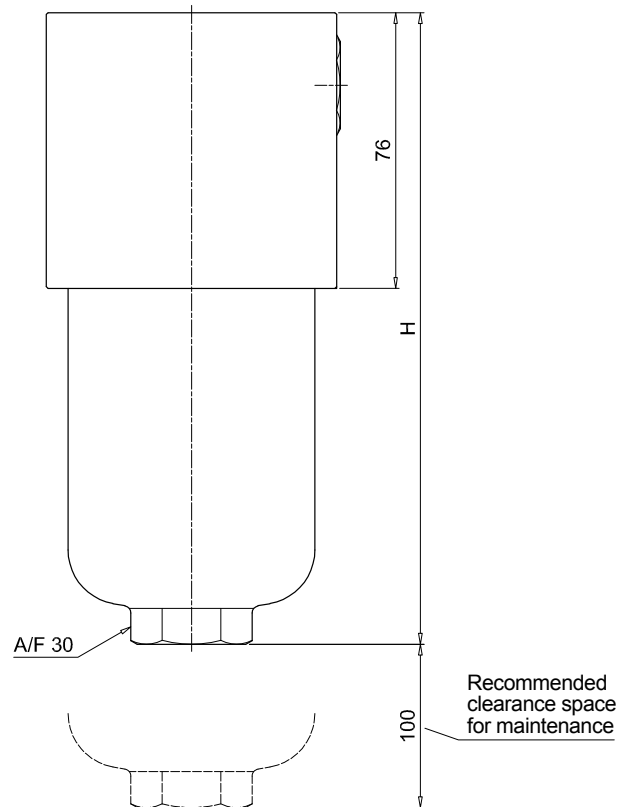
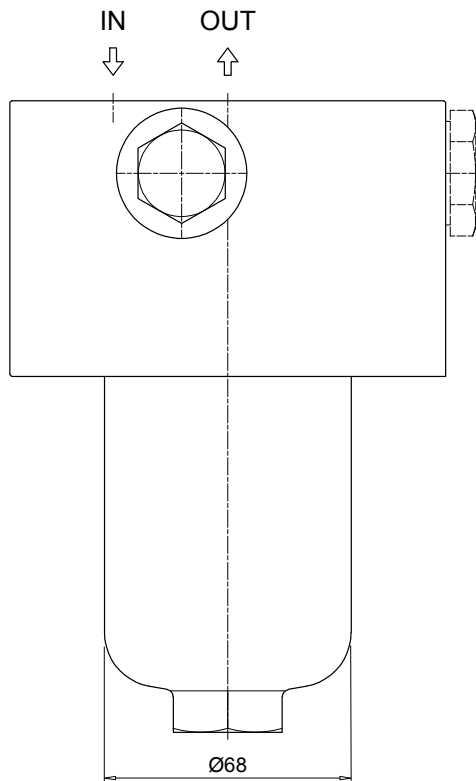
DTA	Electrical differential indicator
DVA	Visual differential indicator
DVM	Visual differential indicator

PLUGS

See page 706

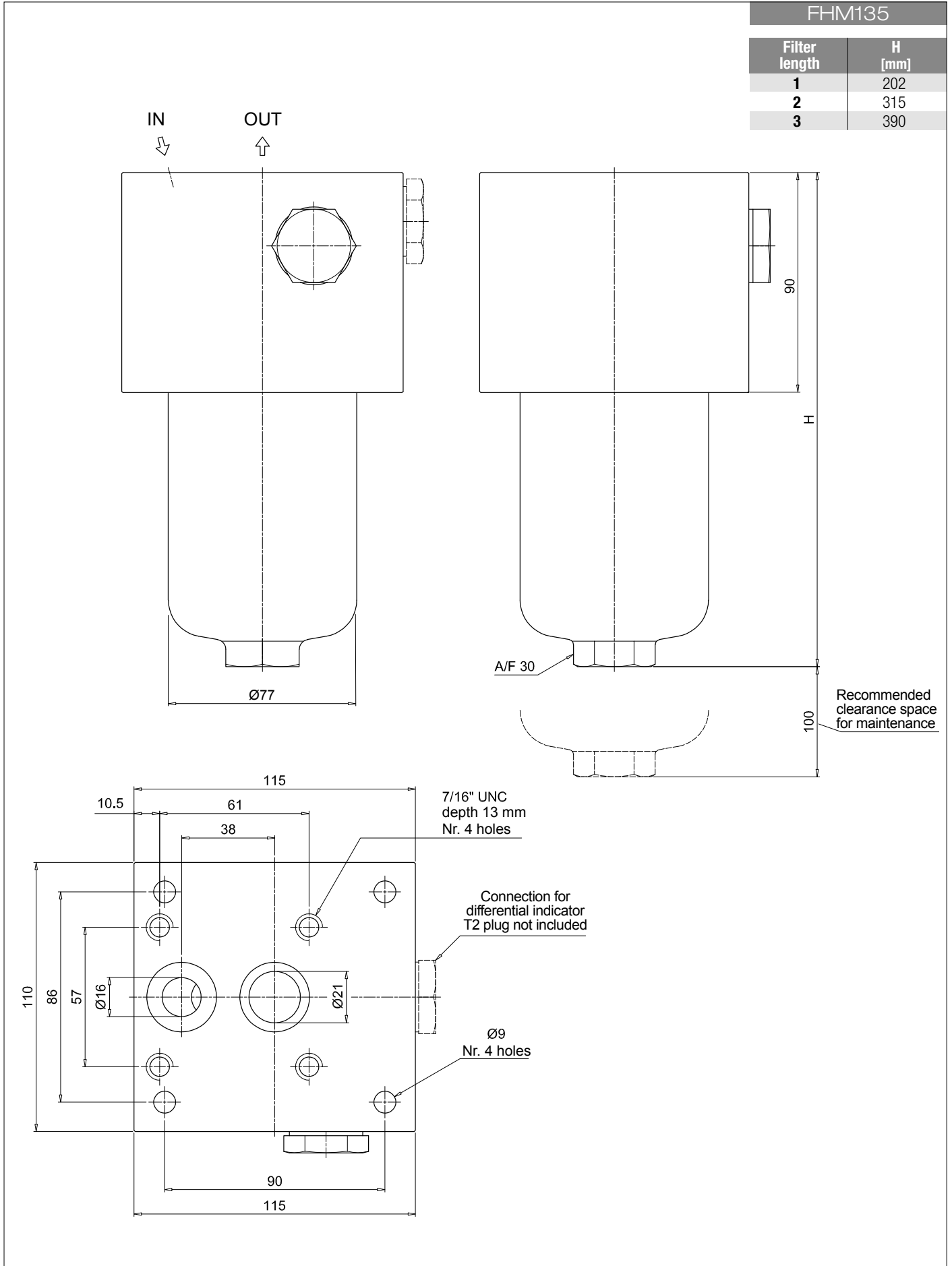
T2	Differential indicator plug (not included)
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FHM050		FHM065	
Filter length	H [mm]	Filter length	H [mm]
1	154	1	162
2	191	2	193
3	233	3	295
4	281		
5	403		



FHM FHM050 - FHM065 - FHM135

Dimensions



FHM FHM320 - FHM500

Designation & Ordering code

COMPLETE FILTER

Series and size FHM320 FHM500			Configuration example: FHM320 4 D A F1 A06 N P01							
Length	FHM320	FHM500								
1	•	•								
2	•	•								
3	•	•								
4	•	•								
5	-	•								
Valves										
S	Without bypass									
B	With bypass 6 bar									
T	With check valve, without bypass									
D	With check valve, with bypass 6 bar									
Seals										
A	NBR									
V	FPM									
Connections										
F1	Manifold									
Filtration rating (filter media)										
A03	Inorganic microfiber	3 µm	A16	Inorganic microfiber	16 µm					
A06	Inorganic microfiber	6 µm	A25	Inorganic microfiber	25 µm					
A10	Inorganic microfiber	10 µm	M25	Wire mesh	25 µm					

Element	Δp	Valves:								Filter length				
		FHM320				FHM500				1	2	3	4	5
N	20 bar	-	•	-	•	-	•	-	•	•	•	•	•	•
H	210 bar	•	-	•	-	-	-	-	-	-	-	-	•	•
S	210 bar	-	-	-	-	•	-	•	-	-	-	-	-	-

Execution	1	2	3	4	5
P01 MP Filtri standard	•	•	•	•	•
P02 Maintenance from the bottom of the housing	-	-	-	•	•
Pxx Customized	-	-	-	-	-

FILTER ELEMENT

Element series and size HP320 HP500			Configuration example: HP320 4 A06 A N P01					
Element length	HP320	HP500						
1	•	•						
2	•	•						
3	•	•						
4	•	•						
5	-	•						
Filtration rating (filter media)								
A03	Inorganic microfiber	3 µm						
A06	Inorganic microfiber	6 µm						
A10	Inorganic microfiber	10 µm						
A16	Inorganic microfiber	16 µm						
A25	Inorganic microfiber	25 µm						
M25	Wire mesh	25 µm						
Seals			Element Δp			Execution		
A	NBR		N	20 bar	•	•	P01	MP Filtri standard
V	FPM		H	210 bar	•	-	Pxx	Customized
			S	210 bar	-	•		

CLOGGING INDICATORS

See page 687

DEA	Electrical differential indicator
DEM	Electrical differential indicator
DLA	Electrical / visual differential indicator
DLE	Electrical / visual differential indicator

DTA	Electrical differential indicator
DVA	Visual differential indicator
DVM	Visual differential indicator

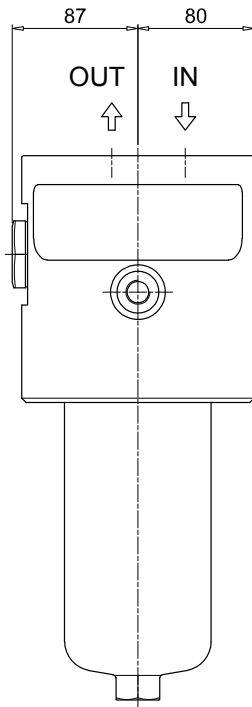
PLUGS

See page 706

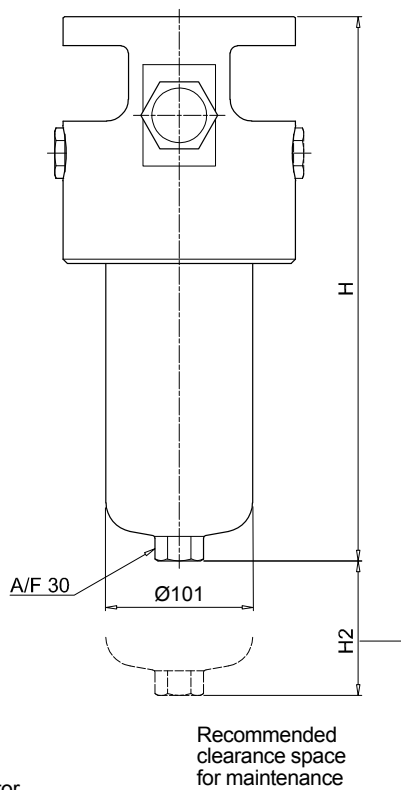
T2	Differential indicator plug (not included)
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FHM320

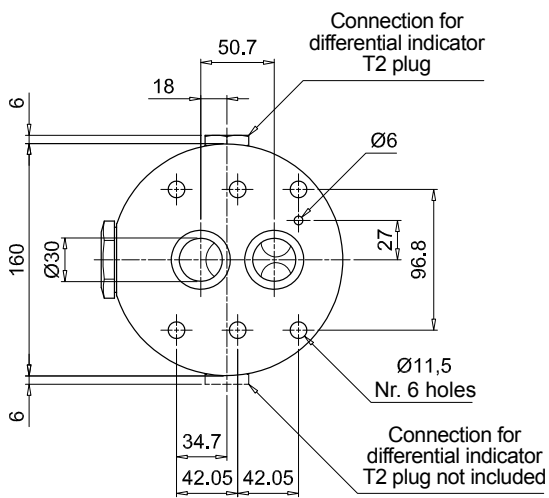
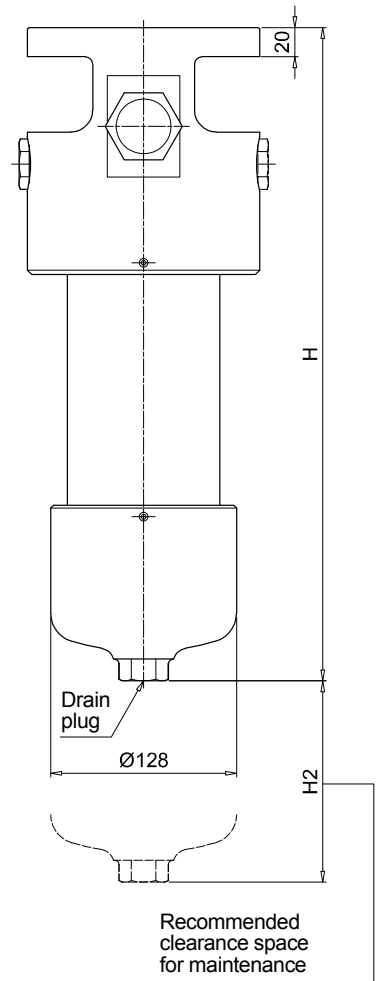
Filter length	H [mm]	H2 [mm]	
		Execution P01	Execution P02
1	293	150	-
2	416	150	-
3	548	150	-
4	702	150	550



Length 1 - 2 - 3



Length 4

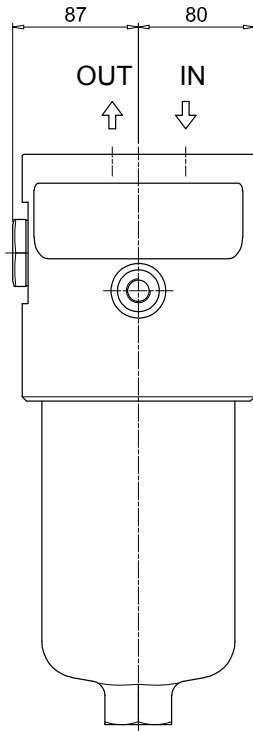


FHM FHM320 - FHM500

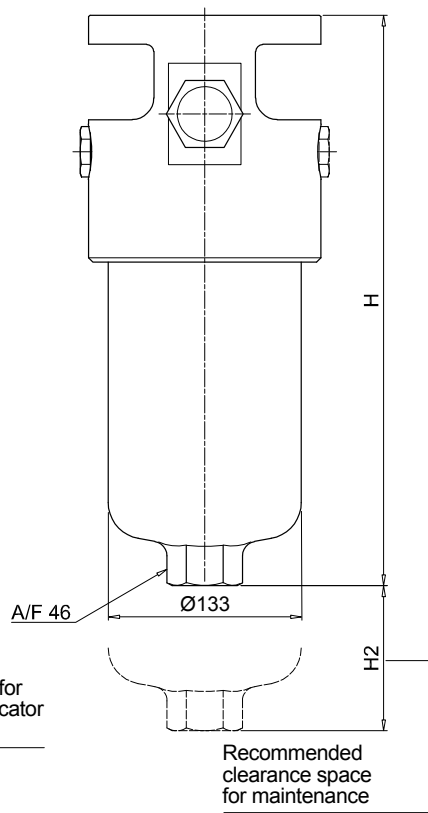
Dimensions

FHM500

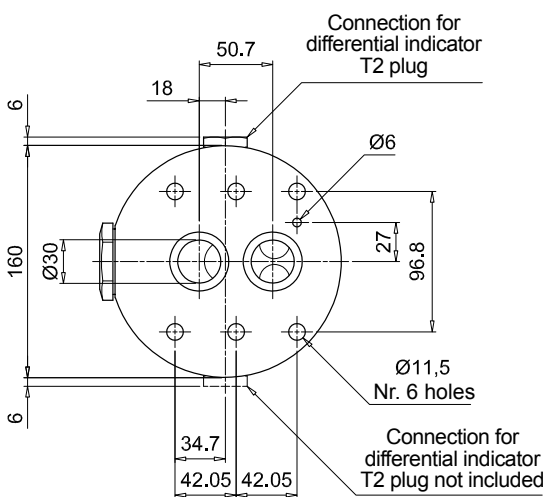
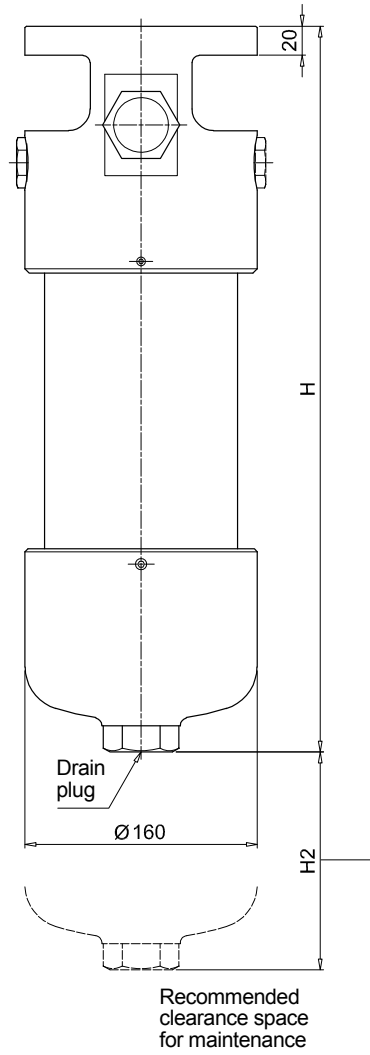
Filter length	H [mm]	H2 [mm]	
		Execution P01	Execution P02
1	355	150	-
2	445	150	-
3	521	150	-
4	679	150	480
5	845	150	650



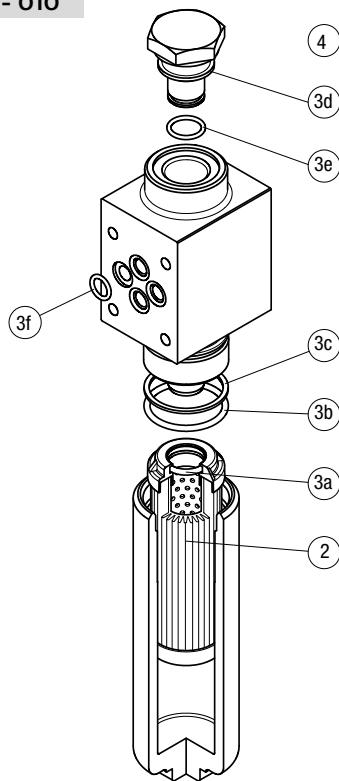
Length 1 - 2 - 3



Length 4 - 5

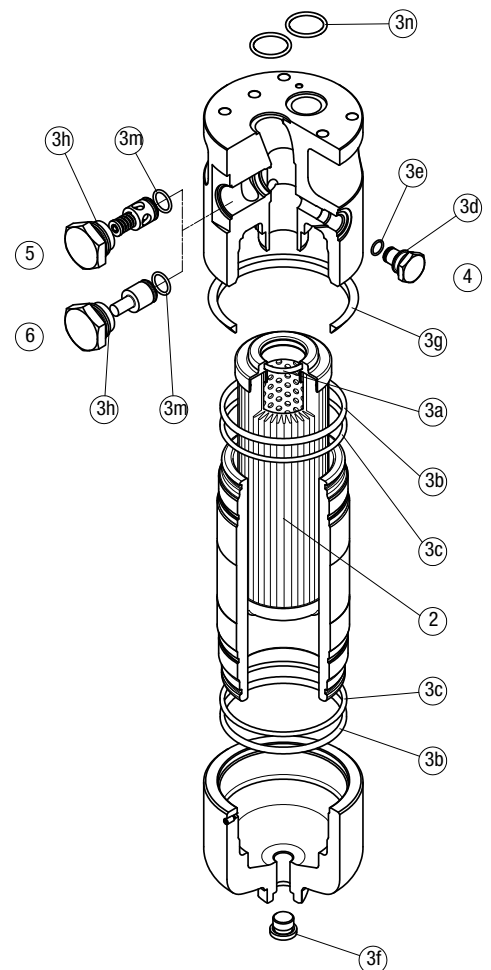


FHM 006 - 007 - 010



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.		Q.ty: 1 pc.	
Filter series	Filter element	Seal Kit code number		Indicator connection plug	
FHM 006	See order table	NBR	FPM	NBR	FPM
FHM 006	See order table	02050324	02050325		
FHM 007	See order table	02050600	02050601	T2H	T2V
FHM 010	See order table	02050320	02050321		

FHM 050 - 065 - 135 - 320 - 500



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.		Q.ty: 1 pc.		Q.ty: 1 pc.		Q.ty: 1 pc.	
Filter series	Filter element	Seal Kit code number		Indicator connection plug		Bypass assembly		Non-bypass assembly	
FHM 050	See order table	NBR	FPM	NBR	FPM	NBR	FPM	NBR	FPM
FHM 050	See order table	02050410	02050411			02001400	02001401	02001402	02001403
FHM 065	See order table	02050268	02050279			02001400	02001401	02001402	02001403
FHM 135	See order table	02050271	02050282	T2H	T2V	02001404	02001405	02001406	02001407
FHM 320	See order table	02050275	02050286			02001408	02001409	02001410	02001411
FHM 500	See order table	02050332	02050333			02001408	02001409	02001410	02001411

FHB series

Maximum working pressure up to 32 MPa (320 bar) - Flow rate up to 485 l/min



Description

Technical data

High Pressure filters

Manifold

Maximum working pressure up to 32 MPa (320 bar)

Flow rate up to 485 l/min

FHB is a range of high pressure filter for protection of sensitive components in high pressure hydraulic systems in the mobile machines. They are directly connected to the side of the manifold, through the proper flanged interface.

Available features:

- Manifold connections up to Ø30 mm, for a maximum flow rate of 485 l/min
- Fine filtration rating, to get a good cleanliness level into the system
- Bypass valve, to relieve excessive pressure drop across the filter media
- Check valve, to protect the system against reverse flow
- Low collapse filter element "N", for use with filters provided with bypass valve
- High collapse filter element "H", for use with filters not provided with bypass valve
- High collapse filter element with external support "S", for filter element protection against the back pressure caused by the check valve in filters not provided with the bypass valve
- Visual, electrical and electronic differential clogging indicators

Common applications:

Delivery lines, in any high pressure industrial equipment or mobile machines

Filter housing materials

- Head: Phosphatized cast iron
- Housing: Phosphatized steel
- Bypass valve: Steel
- Check valve: Steel

Pressure

- Working pressure: 32 MPa (320 bar)
- Test pressure: 48 MPa (480 bar)
- Burst pressure: 96 MPa (960 bar)
- Pulse pressure fatigue test: 1 000 000 cycles with pressure from 0 to 32 MPa (320 bar)

Bypass valve

- Opening pressure 600 kPa (6 bar) ±10%
- Other opening pressures on request.

Δp element type

- Microfibre filter elements - series N: 20 bar
- Microfibre filter elements - series H: 210 bar (not available for FHB050)
- Microfibre filter elements - series S: 210 bar (only for FHB050)
- Wire mesh filter elements - series N: 20 bar
- Fluid flow through the filter element from OUT to IN

Seals

- Standard NBR series A
- Optional FPM series V

Temperature

From -25 °C to +110 °C

Connections

Manifold mounting

Note

FHB filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]					Volumes [dm ³]						
	Length	1	2	3	4	5	Length	1	2	3	4	5
FHB 050		2.61	2.98	3.39	3.86	5.04		0.21	0.30	0.40	0.52	0.81
FHB 065		3.33	3.69	4.90	-	-		0.20	0.27	0.49	-	-
FHB 135		6.61	8.21	9.21	-	-		0.40	0.73	0.94	-	-
FHB 320		12.95	15.08	17.37	26.77	-		0.91	1.63	2.40	3.59	-

Filter series	Length	Filter element design - N Series						Filter element design - S Series				
		A03	A06	A10	A16	A25	M25	A03	A06	A10	A16	A25
FHB 050	1	43	42	79	81	101	131	30	40	58	60	74
	2	53	58	84	93	112	132	46	50	76	86	108
	3	67	70	94	101	119	133	59	62	87	95	115
	4	82	87	106	108	122	134	74	80	101	103	119
	5	102	104	119	122	127	136	90	92	105	113	126

Filter series	Length	Filter element design - N Series						Filter element design - H Series				
		A03	A06	A10	A16	A25	M25	A03	A06	A10	A16	A25
FHB 065	1	25	33	55	62	87	133	23	25	49	58	81
	2	33	51	70	76	101	134	33	38	66	75	94
	3	60	71	97	103	118	138	60	68	95	102	116
FHB 135	1	67	72	120	129	177	212	49	55	97	100	160
	2	109	116	152	154	224	250	90	110	137	140	182
	3	153	155	201	205	226	253	126	142	175	187	207
FHB 320	1	130	143	238	286	343	442	110	117	192	201	304
	2	259	281	391	409	454	468	200	230	319	325	392
	3	332	368	441	455	463	476	269	312	381	389	432
	4	368	390	446	462	481	488	311	334	388	394	437

Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

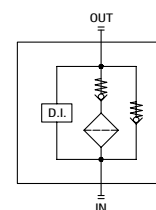
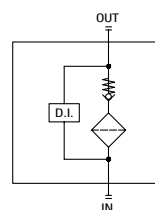
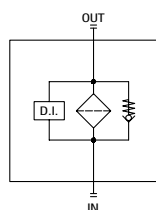
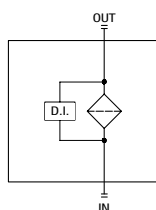
For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure.

Please, contact our Sales Department for further additional information.

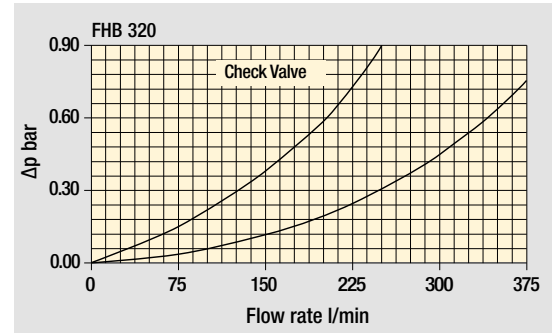
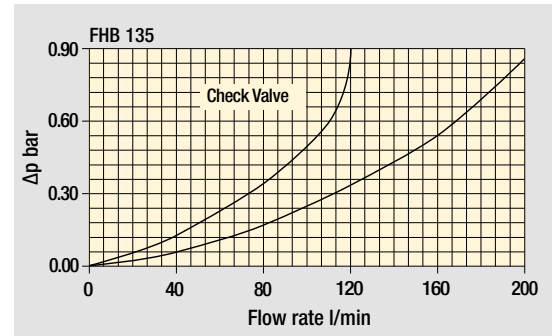
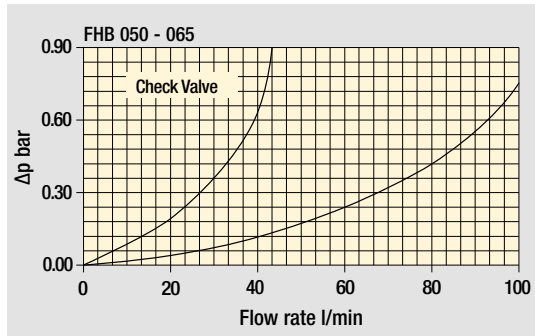
Hydraulic symbols

Filter series	Style S	Style B	Style T	Style D
FHB 050	•	•	•	•
FHB 065	•	•	•	•
FHB 135	•	•	•	•
FHB 320	•	•	•	•

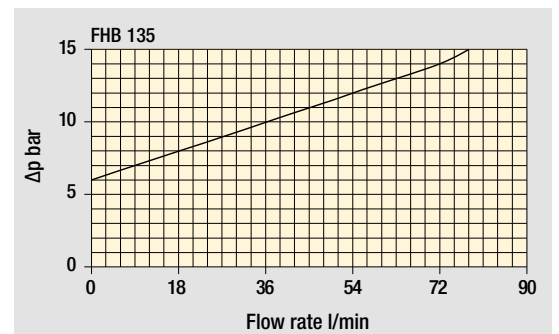
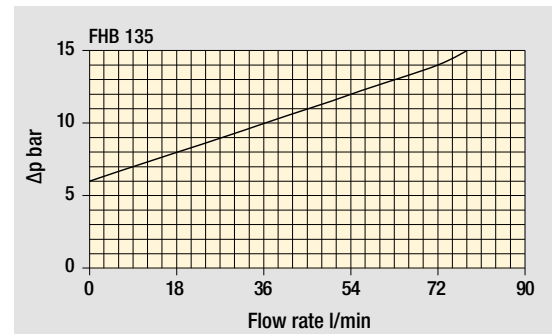
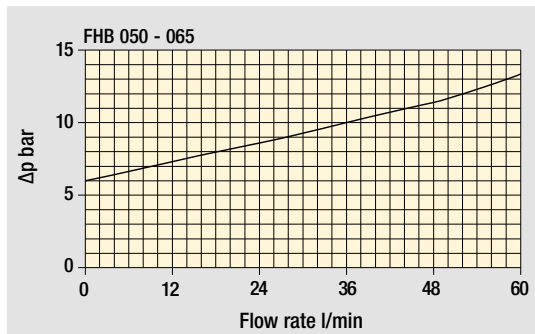


Pressure drop

Filter housings Δp pressure drop

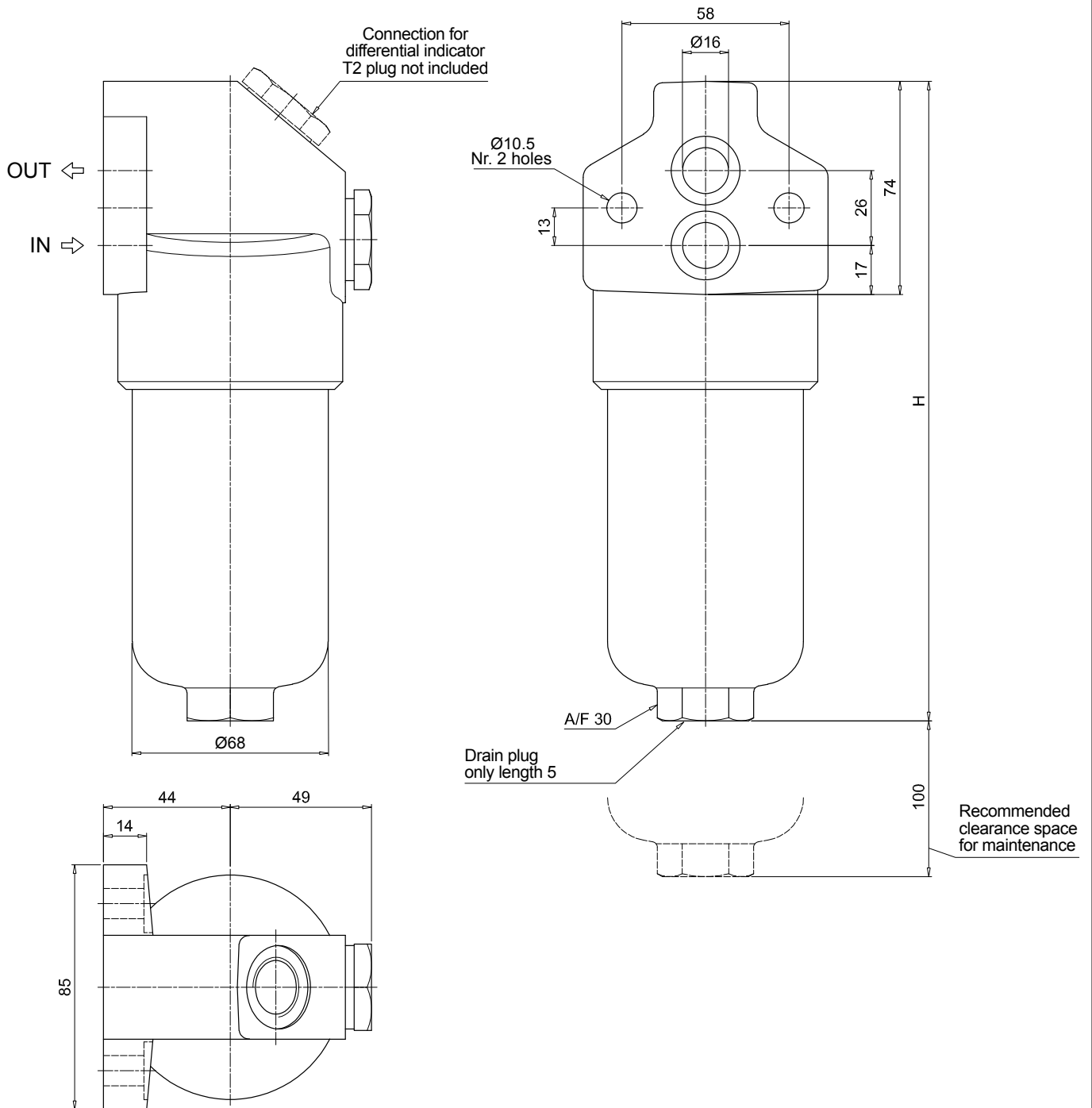


Bypass valve pressure drop



The curves are plotted using mineral oil with density of 0.86 kg/dm^3 in compliance with ISO 3968. Δp varies proportionally with density.

FHB050	
Filter length	H [mm]
1	185
2	222
3	264
4	312
5	434



FHB FHB065 - FHB135 - FHB320

Designation & Ordering code

COMPLETE FILTER

Configuration example: **FHB320** **4** **S** **A** **F1** **A06** **H** **P01**

Series and size			
Length	FHB065	FHB135	FHB320
1	•	•	•
2	•	•	•
3	•	•	•
4	-	-	•

Valves				
Valves	S	B	T	D
S Without bypass	-	•	-	•
B With bypass 6 bar	•	-	•	-
T With check valve, without bypass	-	-	-	-
D With check valve, with bypass 6 bar	-	-	-	-

Seals	
Seals	A
A NBR	•
V FPM	-

Connections	
Connections	F1
F1 Manifold	•

Filtration rating (filter media)	
Filtration rating (filter media)	Element Δp
A03 Inorganic microfiber	3 μm
A06 Inorganic microfiber	6 μm
A10 Inorganic microfiber	10 μm
A16 Inorganic microfiber	16 μm
A25 Inorganic microfiber	25 μm
M25 Wire mesh	25 μm

Execution				
Execution	1	2	3	4
P01 MP Filtri standard	•	•	•	•
P02 Maintenance from the bottom of the housing	-	-	-	•
Pxx Customized	•	•	•	•

FILTER ELEMENT

Configuration example: **HP320** **4** **A06** **A** **H** **P01**

Element series and size			
Element length	HP065	HP135	HP320
1	•	•	•
2	•	•	•
3	•	•	•
4	-	-	•

Filtration rating (filter media)	
Filtration rating (filter media)	Element Δp
A03 Inorganic microfiber	3 μm
A06 Inorganic microfiber	6 μm
A10 Inorganic microfiber	10 μm
A16 Inorganic microfiber	16 μm
A25 Inorganic microfiber	25 μm
M25 Wire mesh	25 μm

Seals	
Seals	A
A NBR	•
V FPM	-

Element Δp	
Element Δp	N
N 20 bar	•
H 210 bar	-

Execution	
Execution	P01
P01 MP Filtri standard	•
Pxx Customized	-

CLOGGING INDICATORS

See page 622

DEA Electrical differential indicator	_____
DEM Electrical differential indicator	_____
DLA Electrical / visual differential indicator	_____
DLE Electrical / visual differential indicator	_____

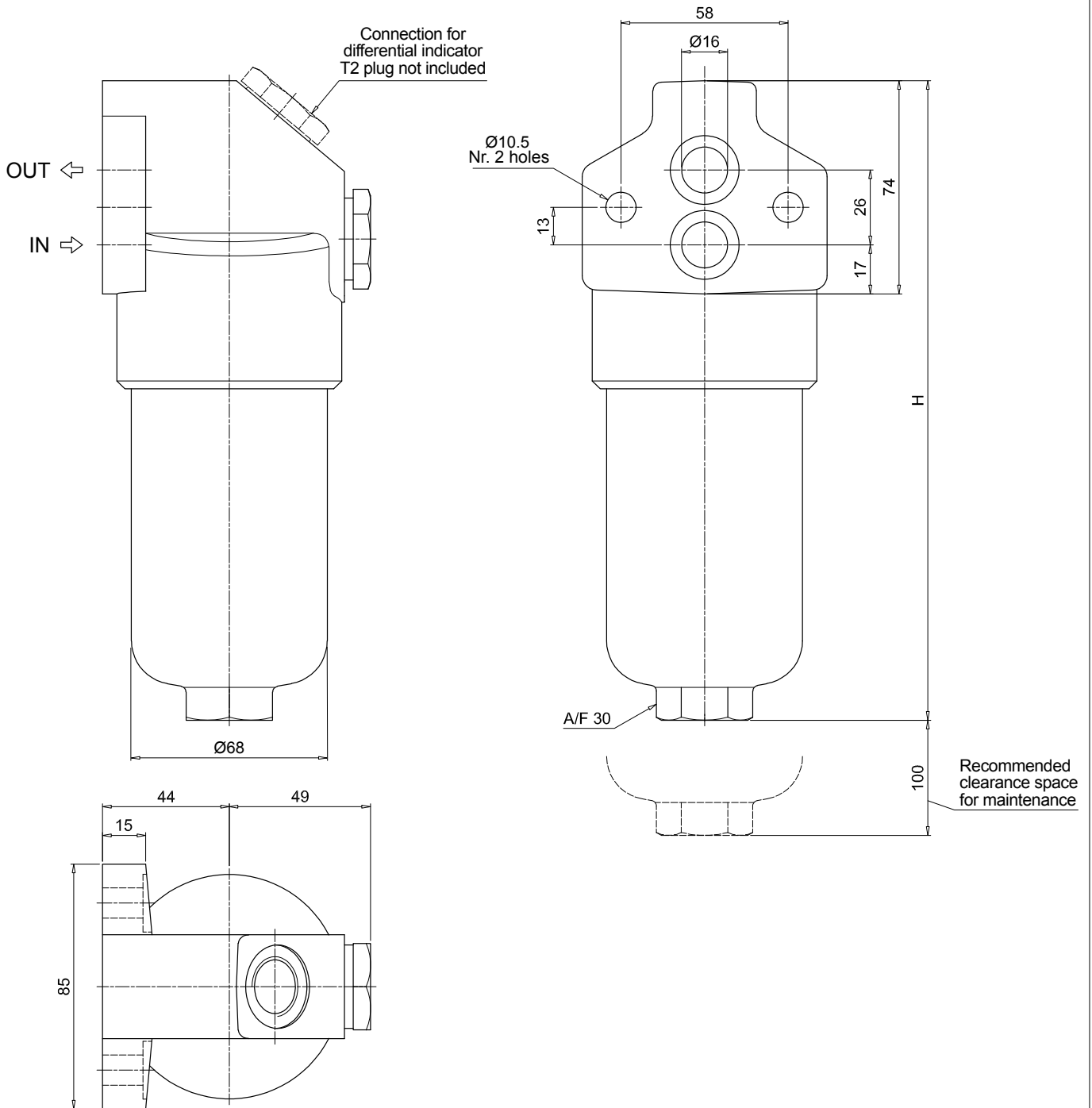
DTA Electrical differential indicator	_____
DVA Visual differential indicator	_____
DVM Visual differential indicator	_____

PLUGS

See page 706

T2 Differential indicator plug (not included)	_____
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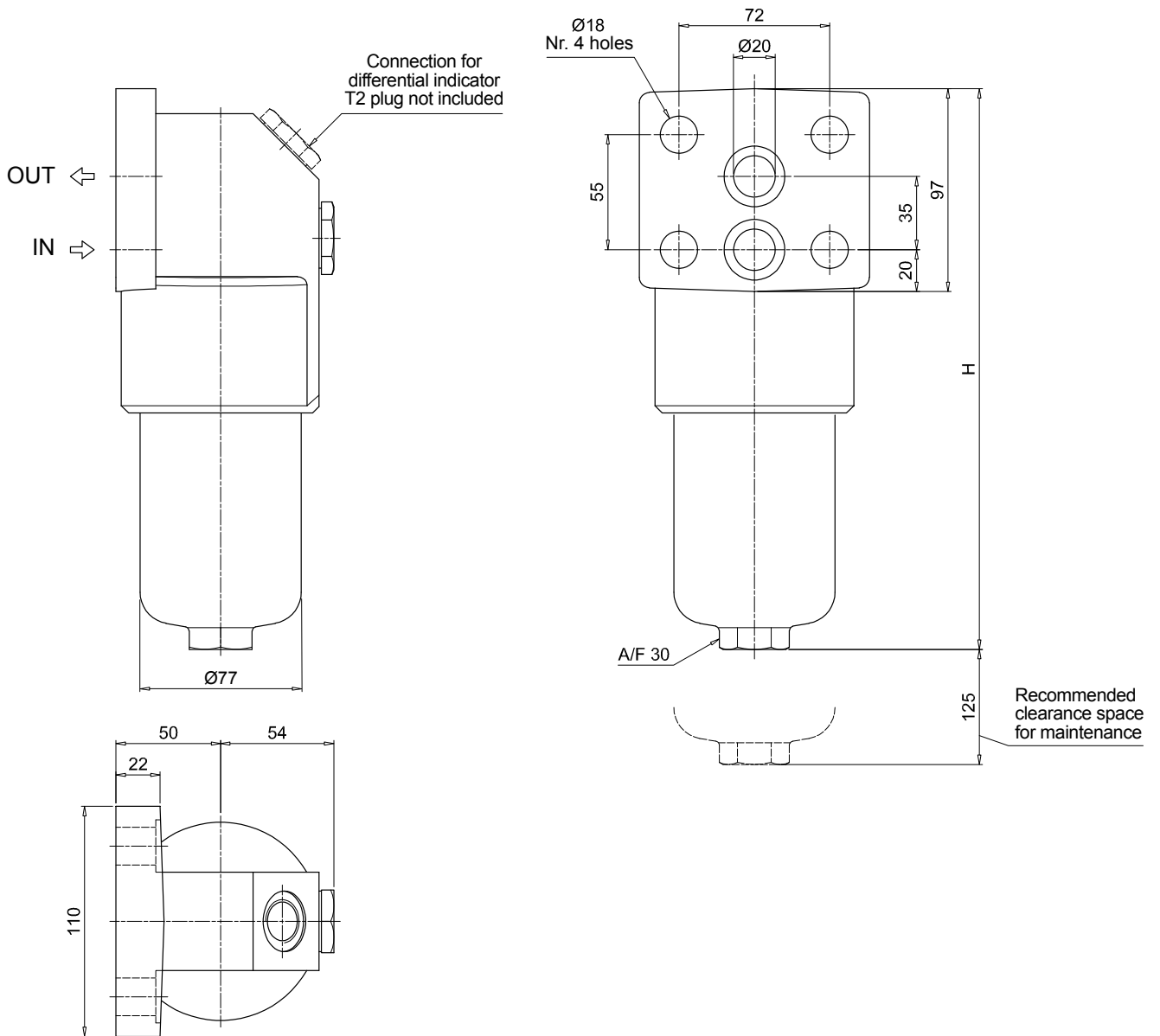
FHB065	
Filter length	H [mm]
1	194
2	225
3	327



Dimensions

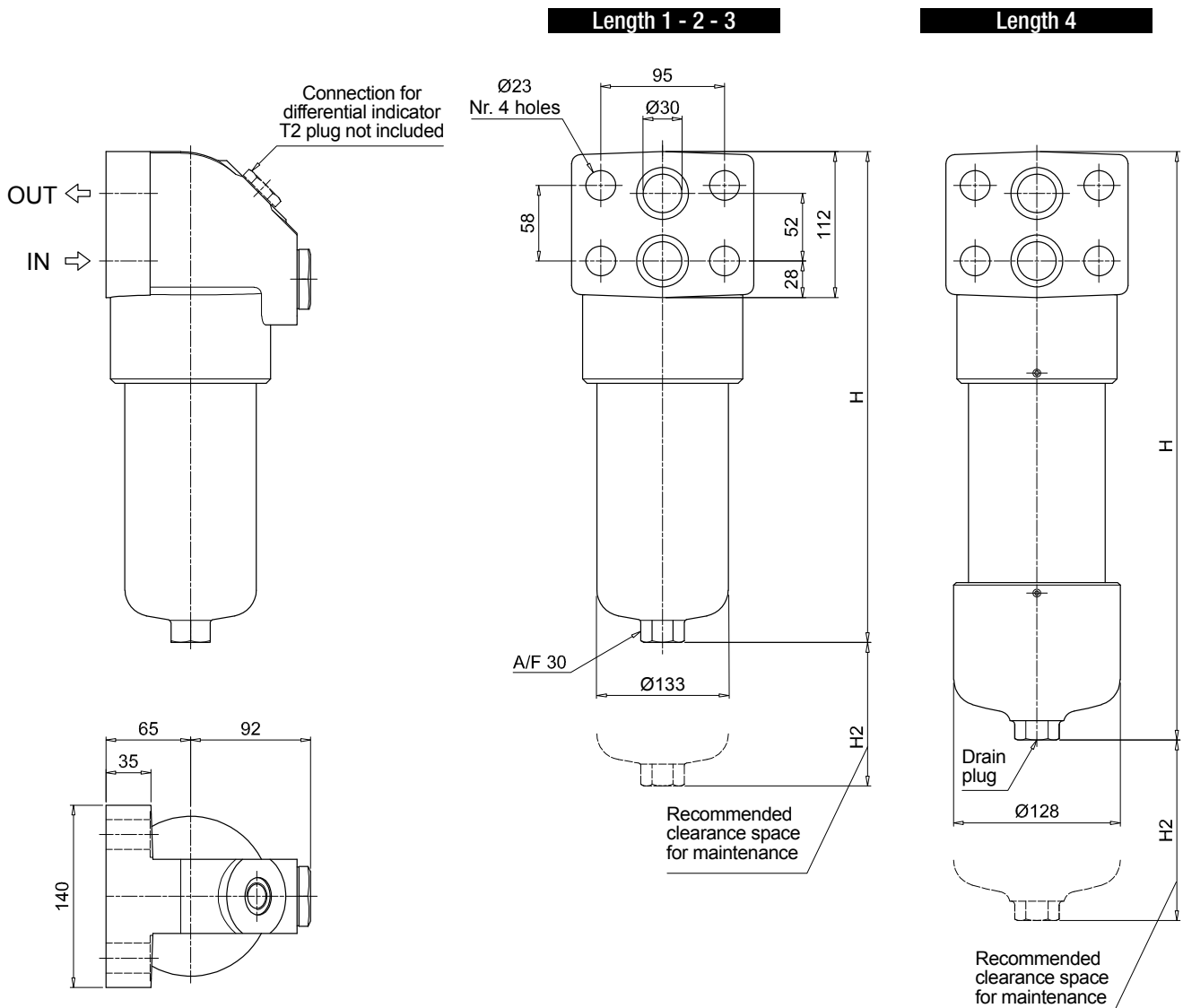
FHB135

Filter length	H [mm]
1	268
2	381
3	456



FHB320

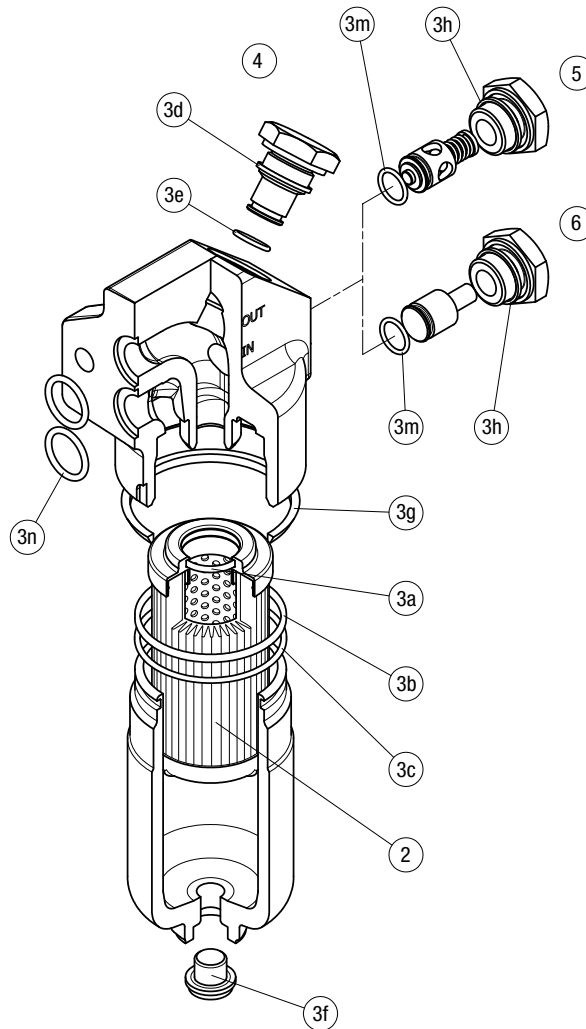
Filter length	H [mm]	H2 [mm]	
		Execution P01	Execution P02
1	301	150	-
2	424	150	-
3	556	150	-
4	709	150	550



FHB SPARE PARTS

Order number for spare parts

FHB 050 - 065 - 135 - 320



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.		Q.ty: 1 pc.		Q.ty: 1 pc.		Q.ty: 1 pc.	
Filter series	Filter element	Seal Kit code number		Indicator connection plug		Bypass assembly		Non-bypass assembly	
		NBR	FPM	NBR	FPM	NBR	FPM	NBR	FPM
FHB 050	See order table	02050412	02050413	T2H	T2V	02001312	02001385	02001314	02001386
FHB 065		02050266	02050277			02001312	02001385	02001314	02001386
FHB 135		02050270	02050281			02001312	02001385	02001314	02001386
FHB 320		02050273	02050284			02001381	02001382	02001383	02001384

FHF 325 series

Maximum working pressure up to 35 MPa (350 bar) - Flow rate up to 550 l/min

Filter housing according to SAE J2066 for HF4 filter elements



FHF 325 GENERAL INFORMATION

Filter housing according to SAE J2066 for HF4 filter elements

Description

High Pressure filters

Manifold

Maximum working pressure up to 35 MPa (350 bar)

Flow rate up to 550 l/min

FHF is a range of high pressure filter for protection of sensitive components in high pressure hydraulic systems in the mobile machines. They are directly connected to the lines of the system through the hydraulic fittings or the proper flanged interface.

Available features:

- 1 1/2" female threaded connections, 1 1/2" flanged connections and manifold connections up to 1 1/2", for a maximum flow rate of 550 l/min
- Base-mounting design, for ease of the replacement of the filter element
- Filter element designed in accordance with SAE J2066 HF4 regulation
- Fine filtration rating, to get a good cleanliness level into the system
- Bypass valve, to relieve excessive pressure drop across the filter media
- Low collapse filter element "N", for use with filters provided with bypass valve
- Visual, electrical and electronic differential clogging indicators

Common applications:

Delivery lines, in any high pressure industrial equipment

Technical data

Filter housing materials

- Head: Phosphatized cast iron
- Housing: Phosphatized steel
- Cover: Cast iron (chemical heat treatment)
- Bypass valve: Brass - Steel

Pressure

- Working pressure: 35 MPa (350 bar)
- Test pressure: 52.5 MPa (525 bar)
- Burst pressure: 105 MPa (1050 bar)
- Pulse pressure fatigue test: 1 000 000 cycles with pressure from 0 to 35 MPa (350 bar)

Bypass valve

- Opening pressure 600 kPa (6 bar) $\pm 10\%$
- Other opening pressures on request.

Δp element type

- Microfibre filter elements - series N: 20 bar
- Wire mesh filter elements - series N: 20 bar
- Fluid flow through the filter element from OUT to IN

Seals

- Standard NBR series A
- Optional FPM series V

Temperature

From -25 °C to +110 °C

Connections

- FHF 325: In-line threaded connection
- FHF 325: In-line flanged connection
- FHF 325: Manifold mounting

Note

FHF filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]			Volumes [dm ³]				
	Length	1	2	3	Length	1	2	3
FHF 325		23.90	32.68	41.47		3.50	5.80	8.11

GENERAL INFORMATION FHF 325

Filter housing according to SAE J2066 for HF4 filter elements

FILTER ASSEMBLY SIZING
Flow rates [l/min]

Filter series	Length	Filter element design - N Series					
		A03	A06	A10	A16	A25	M25
FHF 325	1	302	339	348	419	500	556
	2	401	424	434	457	505	557
	3	416	451	460	469	510	559

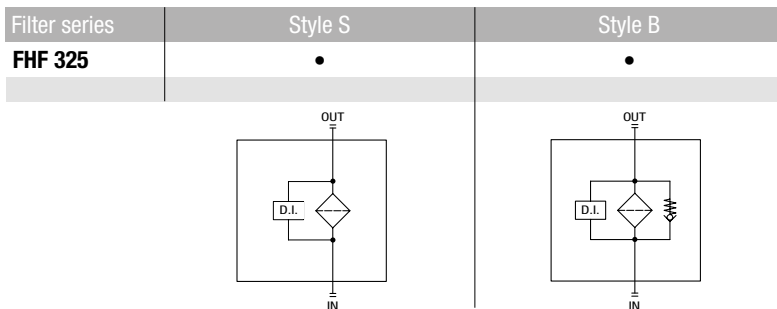
Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

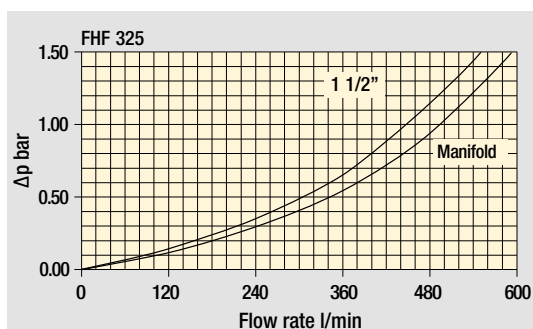
For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

Hydraulic symbols



Pressure drop Filter housings Δp pressure drop



The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968. Δp varies proportionally with density.

FHF 325

Designation & Ordering code

COMPLETE FILTER

Configuration example: **FHF325** | **2** | **S** | **A** | **H** | **7** | **A10** | **N** | **P01**

Series and size
FHF325

Length
1 | **2** | **3**

Valves
S Without bypass
B With bypass 6 bar

Seals
A NBR
V FPM

Connections
A G 1 1/2"
B 1 1/2" NPT
C SAE 24 - 1 7/8" - 12 UN
G 1 1/2" SAE 6000 psi/M
H 1 1/2" SAE 6000 psi/UNC
M Manifold ø1.38"
N Manifold ø1.50"

Connection for differential indicator
7 With two connections plugged on both sides

Filtration rating (filter media)

A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Element Δp
N 20 bar

Execution
P01 MP Filtri standard
Pxx Customized

FILTER ELEMENT

Configuration example: **HF325** | **2** | **A10** | **A** | **N** | **P01**

Element series and size
HF325

Element length
1 | **2** | **3**

Filtration rating (filter media)

A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Seals
A NBR
V FPM

Element Δp
N 20 bar

Execution
P01 MP Filtri standard
Pxx Customized

CLOGGING INDICATORS

See page 622

DEA Electrical differential indicator
DEM Electrical differential indicator
DLA Electrical / visual differential indicator
DLE Electrical / visual differential indicator

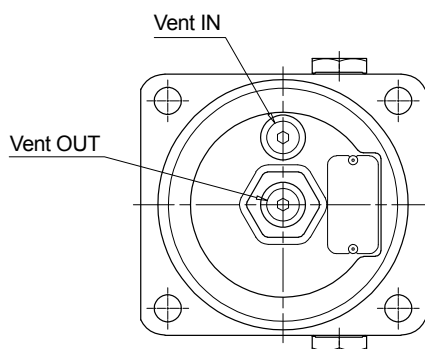
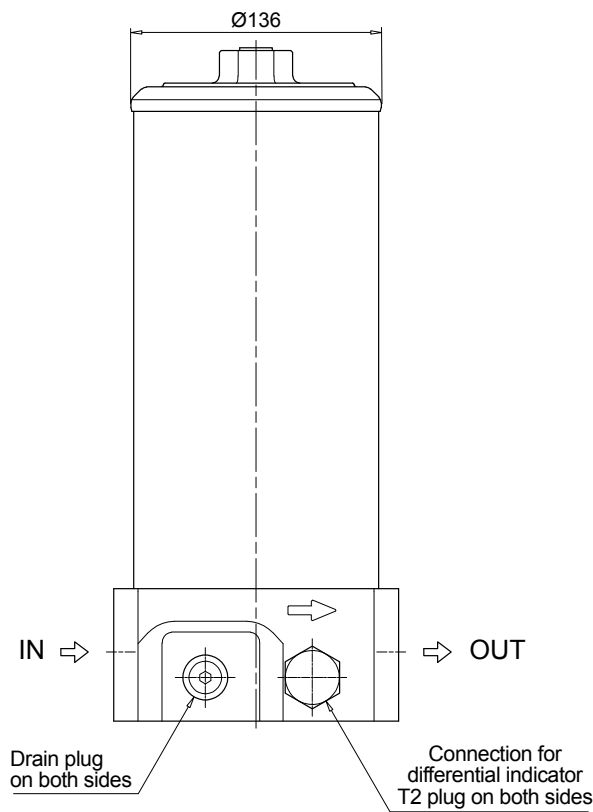
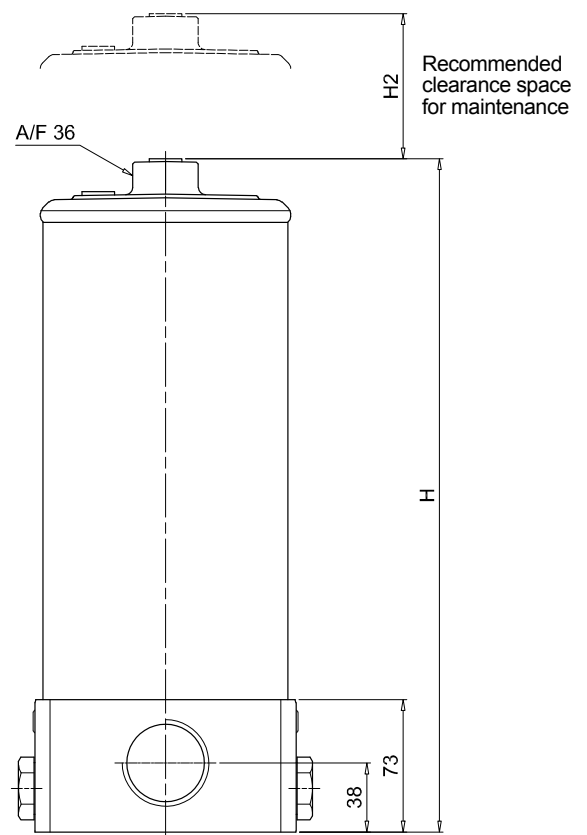
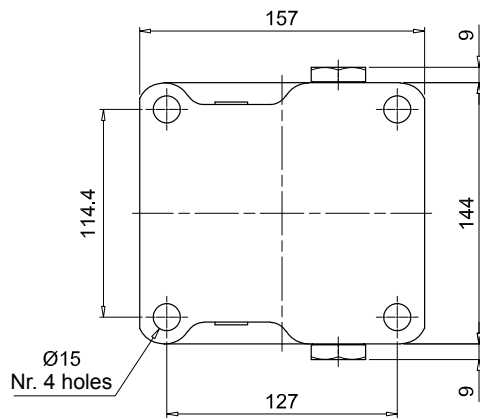
DTA Electrical differential indicator
DVA Visual differential indicator
DVM Visual differential indicator

PLUGS

See page 706

T2 Differential indicator plug

FHF325		
Connection A - B - C		
Filter length	H [mm]	H2 [mm]
1	452	250
2	690	485
3	928	725



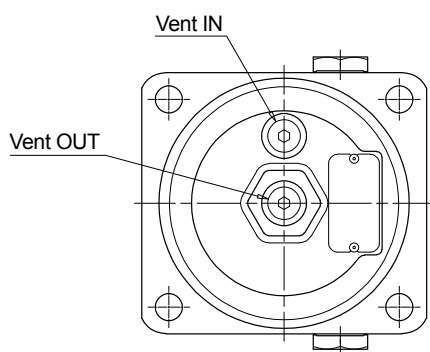
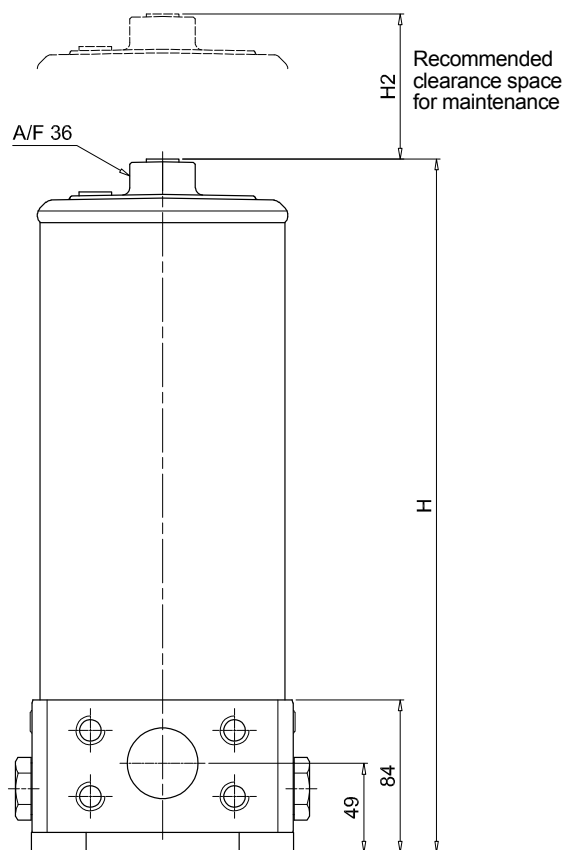
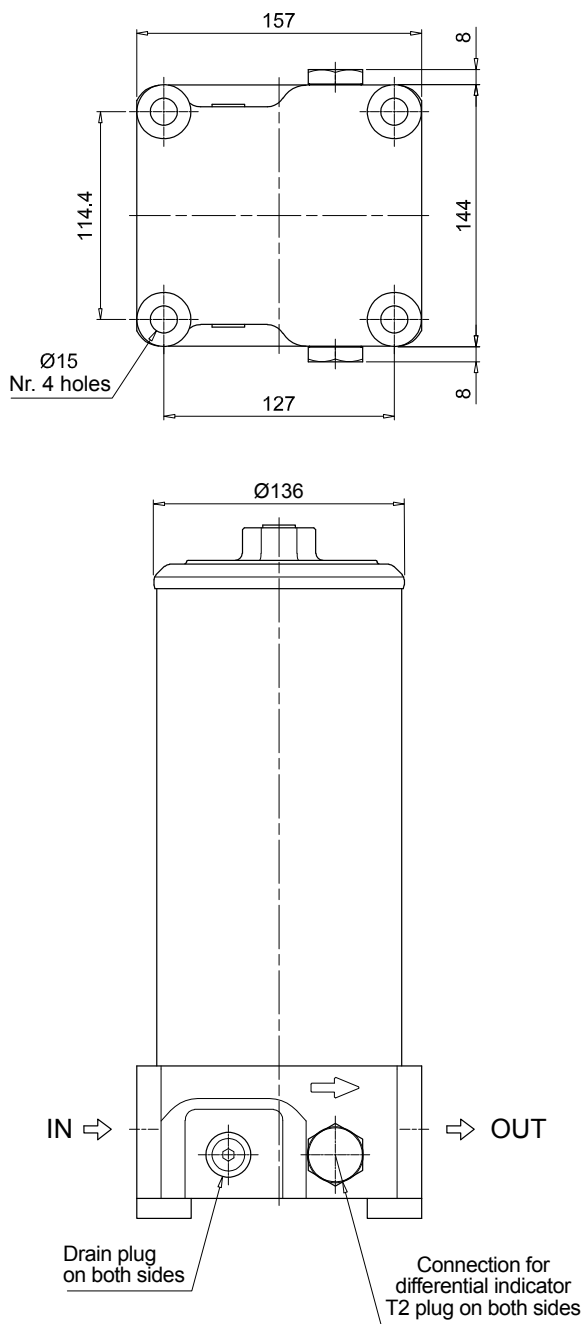
FHF 325

Dimensions

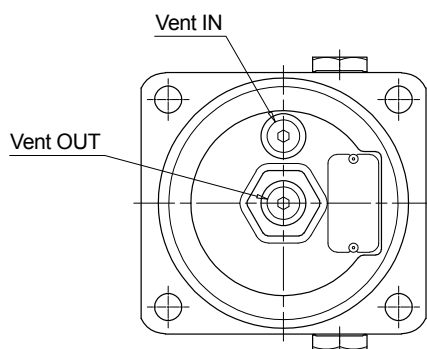
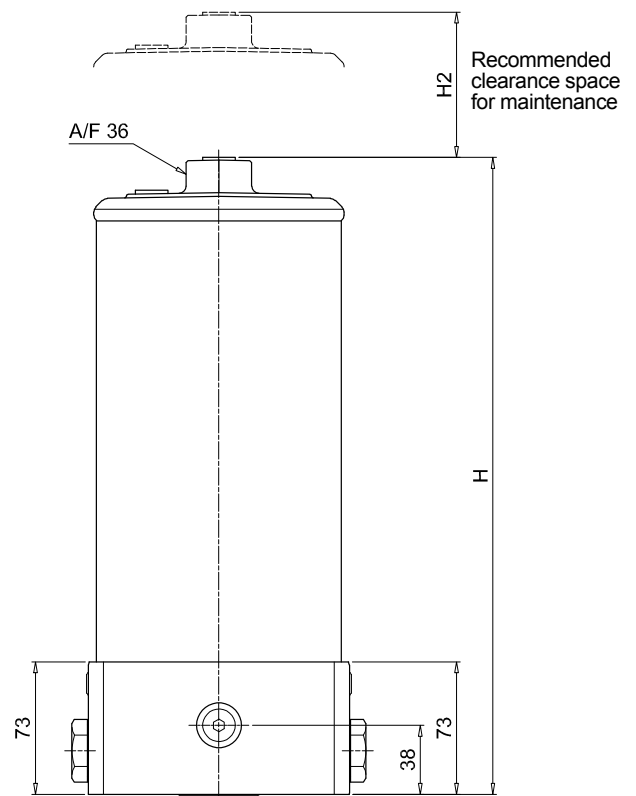
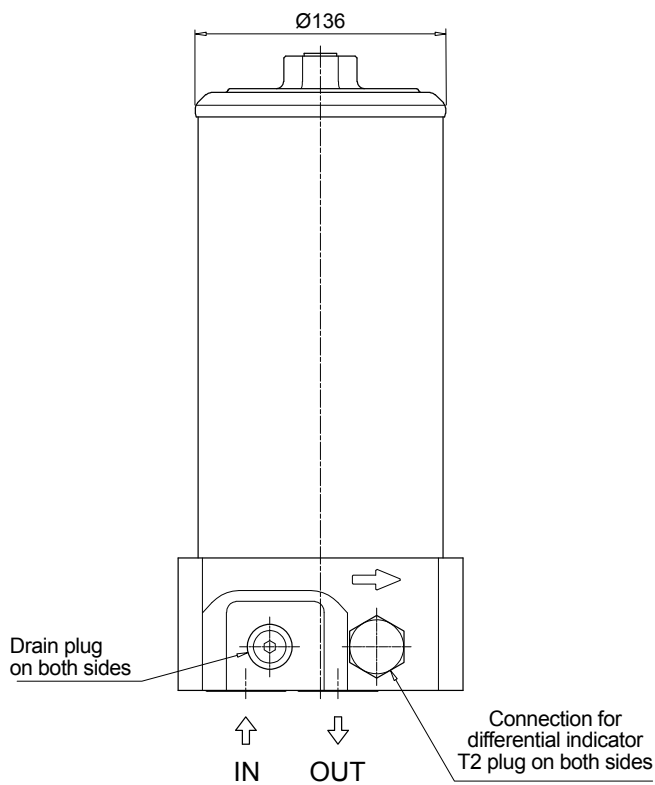
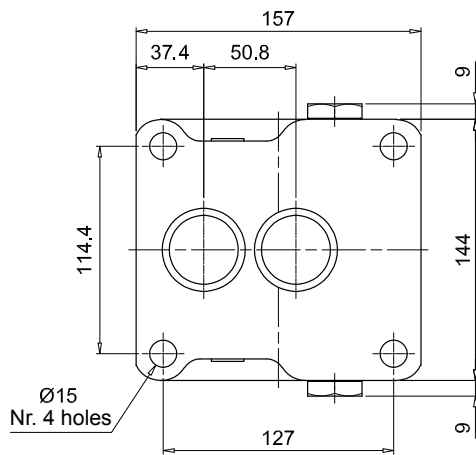
FHF325

Connection G - H

Filter length	H [mm]	H2 [mm]
1	463	250
2	701	485
3	939	725



FHF325		
Connection M - N		
Filter length	H [mm]	H2 [mm]
1	452	250
2	690	485
3	928	725

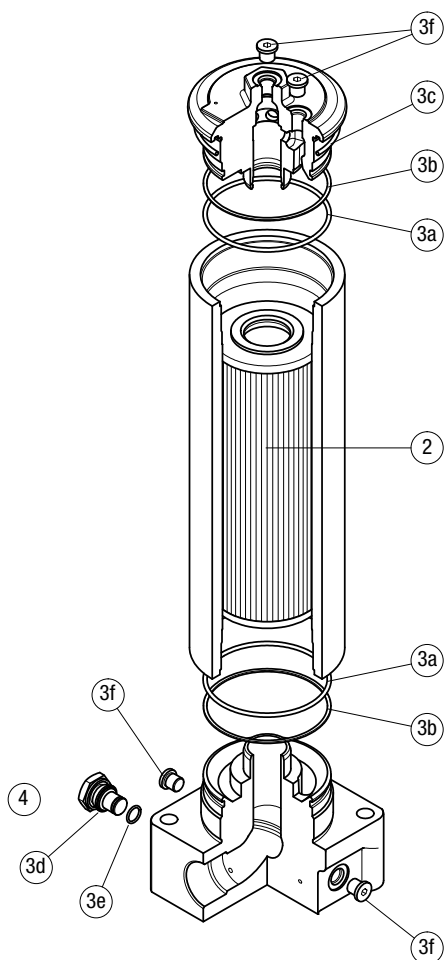


FHF 325 SPARE PARTS

Filter housing according to SAE J2066 for HF4 filter elements

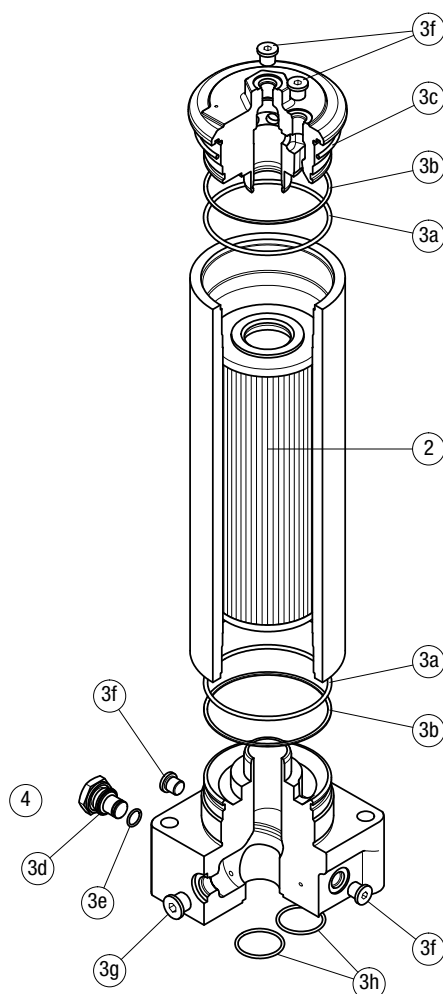
Order number for spare parts

FHF 325
Connections
A - B - C - G - H



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.	Q.ty: 2 pc.		
Filter series	Filter element	Seal Kit code number NBR	Seal Kit code number FPM	Indicator connection plug NBR	Indicator connection plug FPM
FHF 325 A-B-C-G-H	See order table	02050588	02050589	T2H	T2V

FHF 325
Connections
M - N



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.	Q.ty: 2 pc.		
Filter series	Filter element	Seal Kit code number NBR	Seal Kit code number FPM	Indicator connection plug NBR	Indicator connection plug FPM
FHF 325 M-N	See order table	02050590	02050591	T2H	T2V

FHD series

Maximum working pressure up to 35 MPa (350 bar) - Flow rate up to 250 l/min



High Pressure filters

Duplex

Maximum working pressure up to 35 MPa (350 bar)

Flow rate up to 250 l/min

FHD is a range of high pressure duplex filter with integrated changeover function to allow the filter element replacement without the system shut-down.

They are directly connected to the lines of the system through the hydraulic fittings.

Available features:

- Female threaded connections up to 1 1/4" and flanged connections up to 1 1/2", for a maximum flow rate of 345 l/min
- Fine filtration rating, to get a good cleanliness level into the system
- Balancing valve, available for FHD051, FHD326 and FHD333, to equalize the housing pressure before the switch.
- Bypass valve, to relieve excessive pressure drop across the filter media
- Vent ports, to avoid air trapped into the filter going into the system
- Drain ports, to remove the fluid from the housing prior the maintenance work
- Low collapse filter element "N", for use with filters provided with M25 wire mesh
- High collapse filter element "H", for use with filters not provided with bypass valve
- Low collapse filter element with external support "R", for filter element protection against the back pressure caused by the check valve or the reverse flow in filters provided with the bypass valve
- High collapse filter element with external support "S", for filter element protection against the back pressure caused by the check valve or the reverse flow in filters not provided with the bypass valve
- Visual, electrical and electronic differential clogging indicators

Common applications:

- System where shut-down causes high costs
- System where shut-down causes safety issues

Filter housing materials

- Head: Phosphatized cast iron
- Housing: Phosphatized steel
- Bypass valve: Steel

Pressure

- Test pressure: 52.5 MPa (525 bar)
- Burst pressure: 105 MPa (1050 bar)
- Pulse pressure fatigue test: 1 000 000 cycles with pressure from 0 to 35 MPa (350 bar)

Bypass valve

- Opening pressure 600 kPa (6 bar) ±10%
- Other opening pressures on request.

Δp element type

- Microfibre filter elements - series R: 20 bar (not available for FHD 021)
- Microfibre filter elements - series H: 210 bar (only for FHD 021)
- Microfibre filter elements - series S: 210 bar (not available for FHD 021)
- Wire mesh filter elements - series N: 20 bar
- Fluid flow through the filter element from OUT to IN

Seals

- Standard NBR series A
- Optional FPM series V

Temperature

From -25 °C to +110 °C

Connections

In-line Inlet/Outlet 90°

Note

FHD filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]						Volumes [dm ³]					
	Length	1	2	3	4	5	Length	1	2	3	4	5
FHD 021	-	8.0	9.0	9.9	-	-	-	0.06	0.12	0.22	-	-
FHD 051	-	16.9	17.5	18.5	19.8	-	-	0.31	0.41	0.53	0.83	-
FHD 326	43.0	50.0	54.0	-	-	-	0.88	1.60	2.37	-	-	-
FHD 333	-	74.0	79.0	98.0	-	-	-	1.75	2.52	3.35	-	-

Filter series	Length	Filter element design - H Series					
		A03	A06	A10	A16	A25	M25
FHD 021	2	6	8	14	16	19	26
	3	10	12	18	20	22	27
	4	13	16	21	22	24	27

Filter series	Length	Filter element design - R Series					N Series	Filter element design - S Series				
		A03	A06	A10	A16	A25		M25	A03	A06	A10	A16
FHD 051	2	39	41	51	54	59	64	35	37	48	51	58
	3	45	46	54	56	61	65	41	43	52	54	60
	4	50	52	58	58	62	65	47	49	56	56	61
	5	56	57	61	62	63	65	53	53	57	59	63
FHD 326	1	93	99	131	142	154	171	83	87	117	120	146
	2	136	141	163	166	173	176	119	128	149	151	163
	3	152	159	171	174	175	177	139	148	161	163	170
FHD 333	2	175	184	224	230	245	249	147	162	199	201	225
	3	204	217	241	245	247	252	179	196	221	224	238
	4	216	224	242	247	253	255	196	204	223	225	239

Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

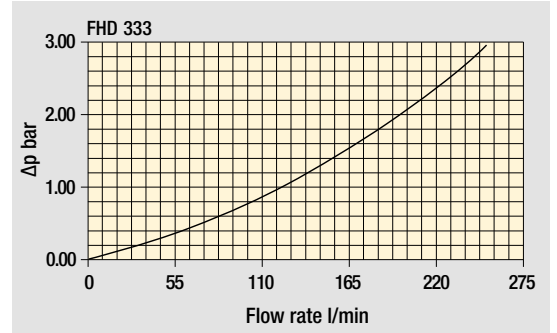
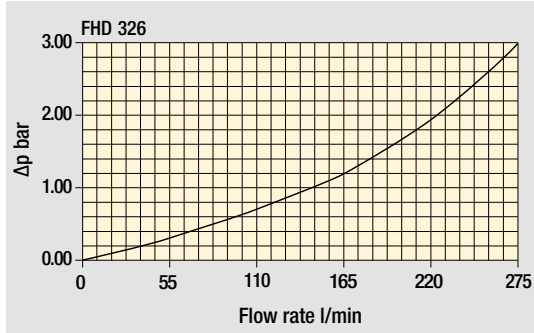
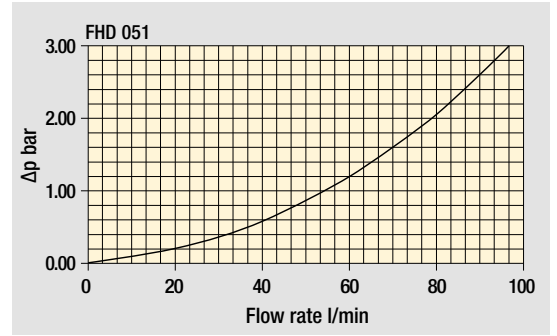
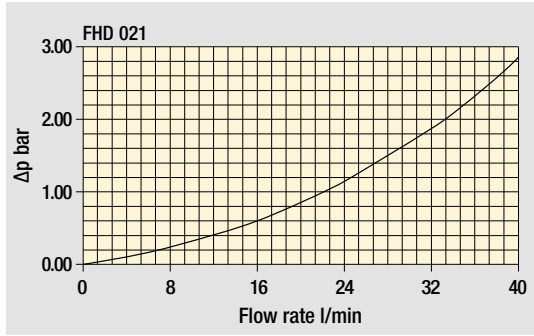
Hydraulic symbols

Filter series	Style S	Style B	Style B
FHD 021	•	-	-
FHD 051	•	-	-
FHD 326	•	-	•
FHD 333	•	-	•

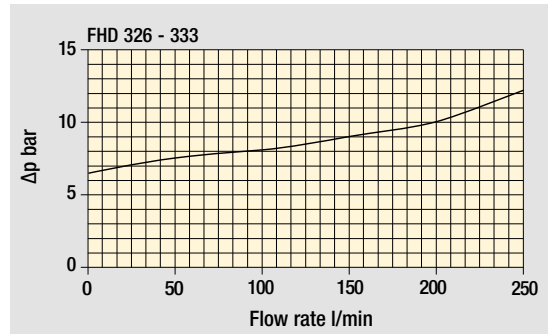
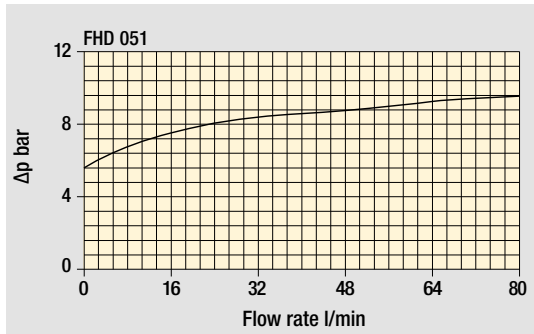
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Pressure drop

Filter housings Δp pressure drop



Bypass valve pressure drop



The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968. Δp varies proportionally with density.

Designation & Ordering code

COMPLETE FILTER

Series and size	Configuration example: FHD021 4 S A G1 A06 H P01							
FHD021								
Length								
2 3 4								
Bypass valve								
S Without bypass								
Seals								
A NBR								
V FPM								
Connections								
G1 G 1/2"								
G2 1/2" NPT								
G3 SAE 8 - 3/4" - 16 UNF								
Filtration rating (filter media)								
A03 Inorganic microfiber 3 µm								
A06 Inorganic microfiber 6 µm								
A10 Inorganic microfiber 10 µm								
A16 Inorganic microfiber 16 µm								
A25 Inorganic microfiber 25 µm								
M25 Wire mesh 25 µm								
	Filtration rating							
	Element Δp	Axx	M25	Execution				
	N 20 bar	-	•	P01 MP Filtri standard				
	H 210 bar	•	•	Pxx Customized				

FILTER ELEMENT

Element series and size	Configuration example: HP011 4 A06 A H P01					
HP011						
Element length						
2 3 4						
Filtration rating (filter media)						
A03 Inorganic microfiber 3 µm						
A06 Inorganic microfiber 6 µm						
A10 Inorganic microfiber 10 µm						
A16 Inorganic microfiber 16 µm						
A25 Inorganic microfiber 25 µm						
M25 Wire mesh 25 µm						
	Filtration rating					
	Seals	Element Δp	Axx	M25	Execution	
	A NBR	N 20 bar	-	•	P01 MP Filtri standard	
	V FPM	H 210 bar	•	•	Pxx Customized	

CLOGGING INDICATORS

See page 687

DEA Electrical differential indicator
DEM Electrical differential indicator
DLA Electrical / visual differential indicator
DLE Electrical / visual differential indicator

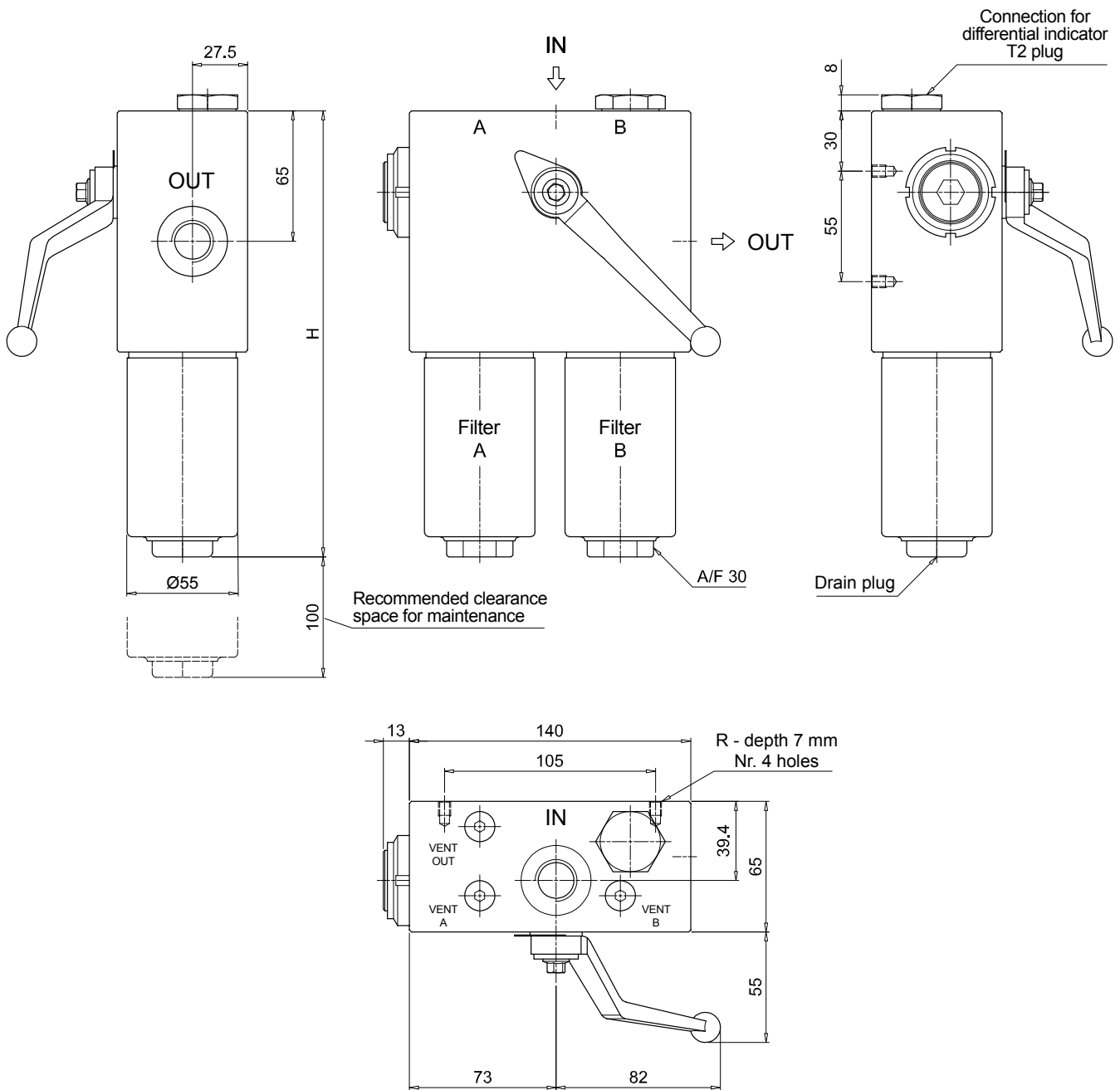
DTA Electrical differential indicator
DVA Visual differential indicator
DVM Visual differential indicator

PLUGS

See page 706

T2 Differential indicator plug

FHDO21	
Filter length	H [mm]
2	172
3	222
4	272
Connections	R
G1	M6
G2 - G3	1/4" UNC



FHD FHD051 - FHD326 - FHD333

Designation & Ordering code

COMPLETE FILTER

Series and size Configuration example: **FHD326** **3** **S** **A** **G1** **M25** **N** **P01**

FHD051 | **FHD326** | **FHD333**

Length	FHD051	FHD326	FHD333
1	-	•	-
2	•	•	•
3	•	•	•
4	•	-	•
5	•	-	-

Valves

S Without bypass
B With bypass 6 bar

Seals

A NBR
V FPM

Connections	FHD051	FHD326	FHD333
G1	G 3/4"	G 1 1/4"	-
G2	3/4" NPT	-	-
G3	G 1/2"	1 1/4" NPT	-
G4	1/2" NPT	SAE 20 - 1 5/8" - 12 UN	-
G5	SAE 8 - 3/4" - 16 UNF	-	-
G6	SAE 12 - 1 1/16" - 12 UN	-	-
F1	-	-	1 1/2" SAE 6000 psi/M
F2	-	-	1 1/2" SAE 6000 psi/UNC

Filtration rating (filter media)

A03 Inorganic microfiber	3 µm
A06 Inorganic microfiber	6 µm
A10 Inorganic microfiber	10 µm
A16 Inorganic microfiber	16 µm
A25 Inorganic microfiber	25 µm
M25 Wire mesh	25 µm

Element Δp	Filtration rating		Execution
	Axx	M25	
N 20 bar	-	•	P01 MP Filtri standard
R 20 bar	•	-	Pxx Customized
S 210 bar	•	-	

FILTER ELEMENT

Element series and size Configuration example: **HP320** **3** **M25** **A** **N** **P01**

	FHD051	FHD326	FHD333
HP050	•	-	-
HP320	-	•	•

Element length	HP050	HP320
1	-	•
2	•	•
3	•	•
4	•	•
5	•	-

Filtration rating (filter media)

A03 Inorganic microfiber	3 µm
A06 Inorganic microfiber	6 µm
A10 Inorganic microfiber	10 µm
A16 Inorganic microfiber	16 µm
A25 Inorganic microfiber	25 µm
M25 Wire mesh	25 µm

Seals	Element Δp	Filtration rating		Execution
		Axx	M25	
A NBR	N 20 bar	-	•	P01 MP Filtri standard
V FPM	R 20 bar	•	-	Pxx Customized
	S 210 bar	•	-	

CLOGGING INDICATORS

See page 687

DEA Electrical differential indicator
DEM Electrical differential indicator
DLA Electrical / visual differential indicator
DLE Electrical / visual differential indicator

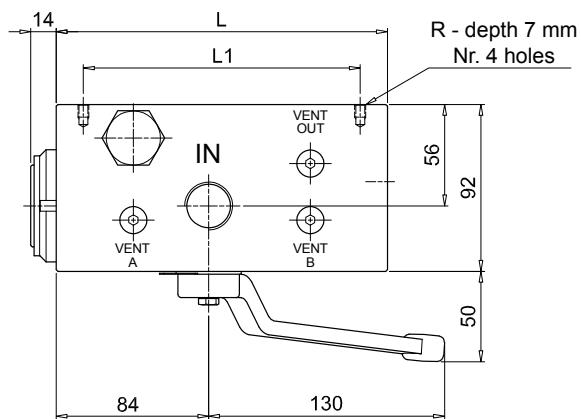
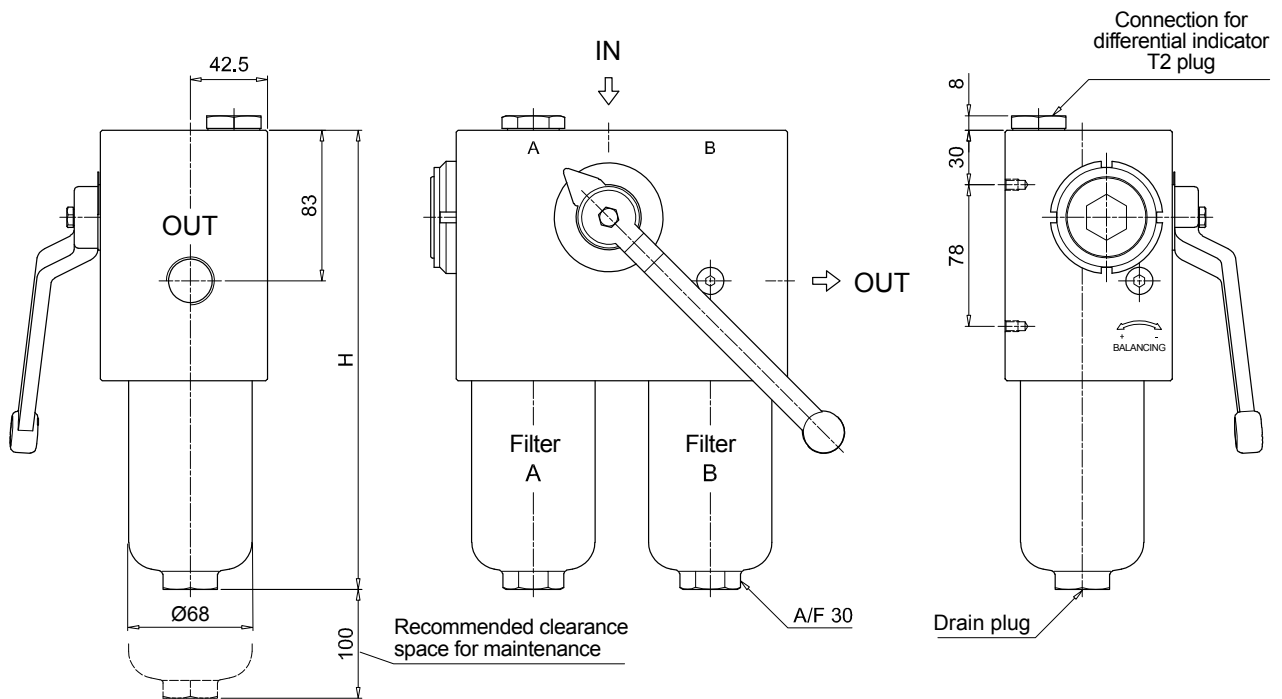
DTA Electrical differential indicator
DVA Visual differential indicator
DVM Visual differential indicator

PLUGS

See page 706

T2 Differential indicator plug

FHD051		
Filter length	H [mm]	
2	253	
3	295	
4	343	
5	465	
Connections	R	
G1	M6	
G2	1/4" UNC	
G3	M6	
G4-G5-G6	1/4" UNC	
Valves	L [mm]	L1 [mm]
S	168	138
B	182.5	152.5



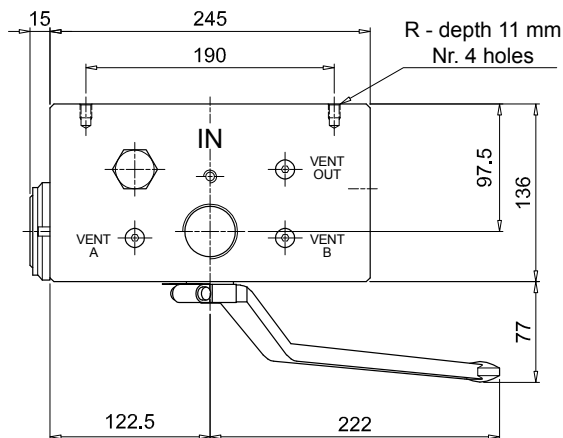
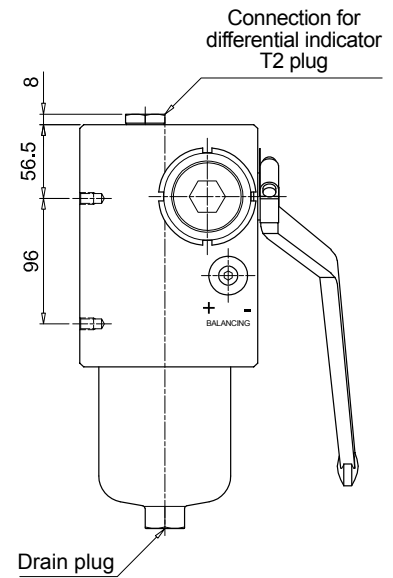
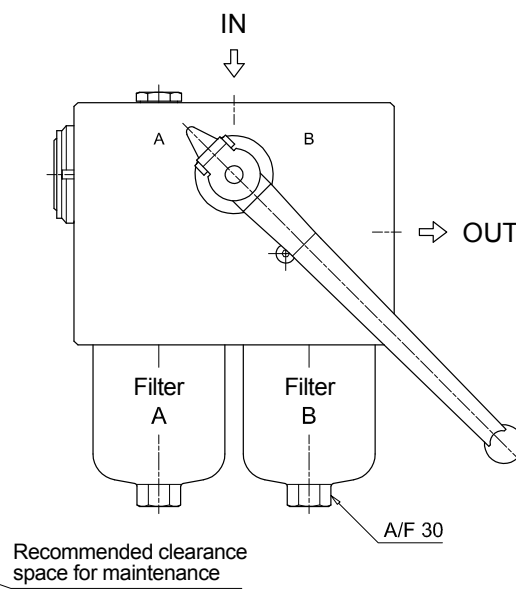
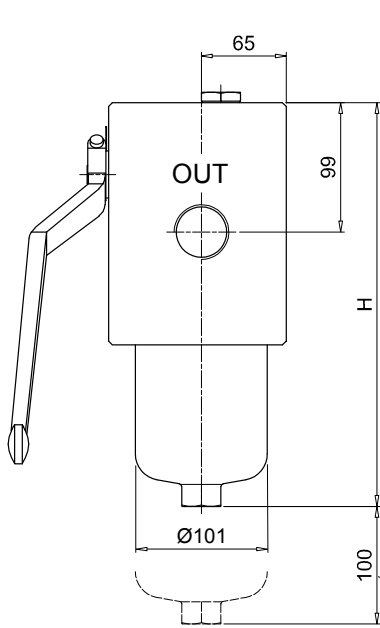
FHD FHD051 - FHD326 - FHD333

Dimensions

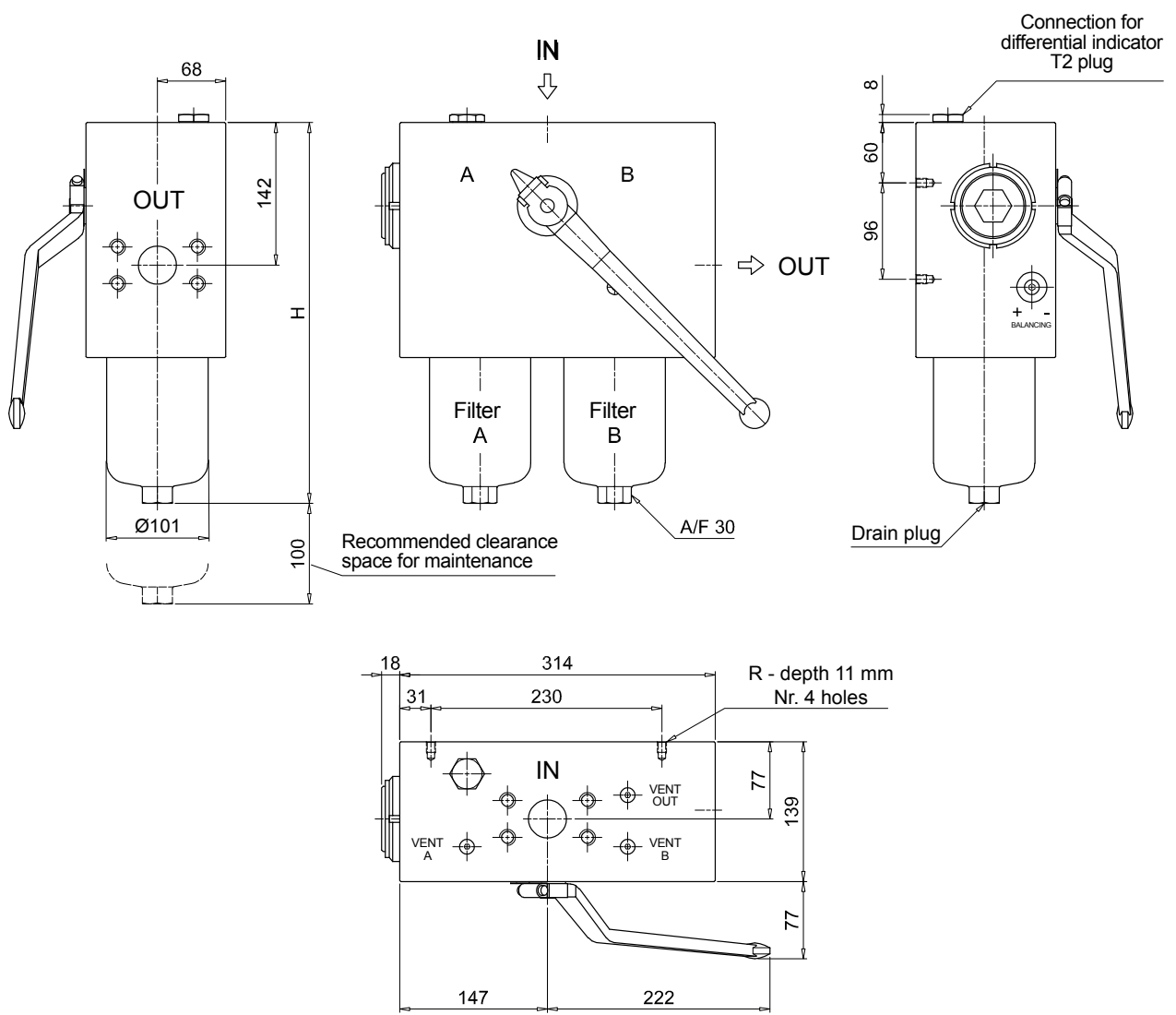
FHD326

Filter length	H [mm]
1	309
2	432
3	564

Connections	R
G1	M10
G2 - G3	3/8" UNC



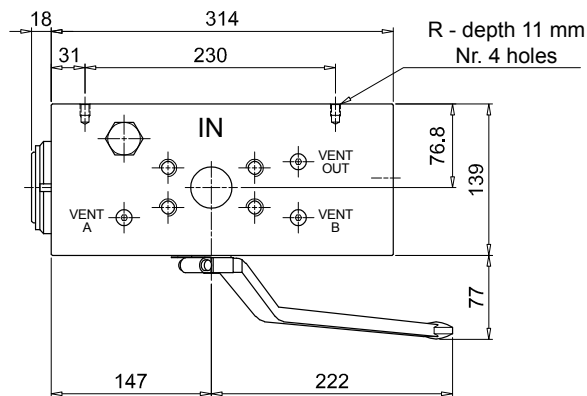
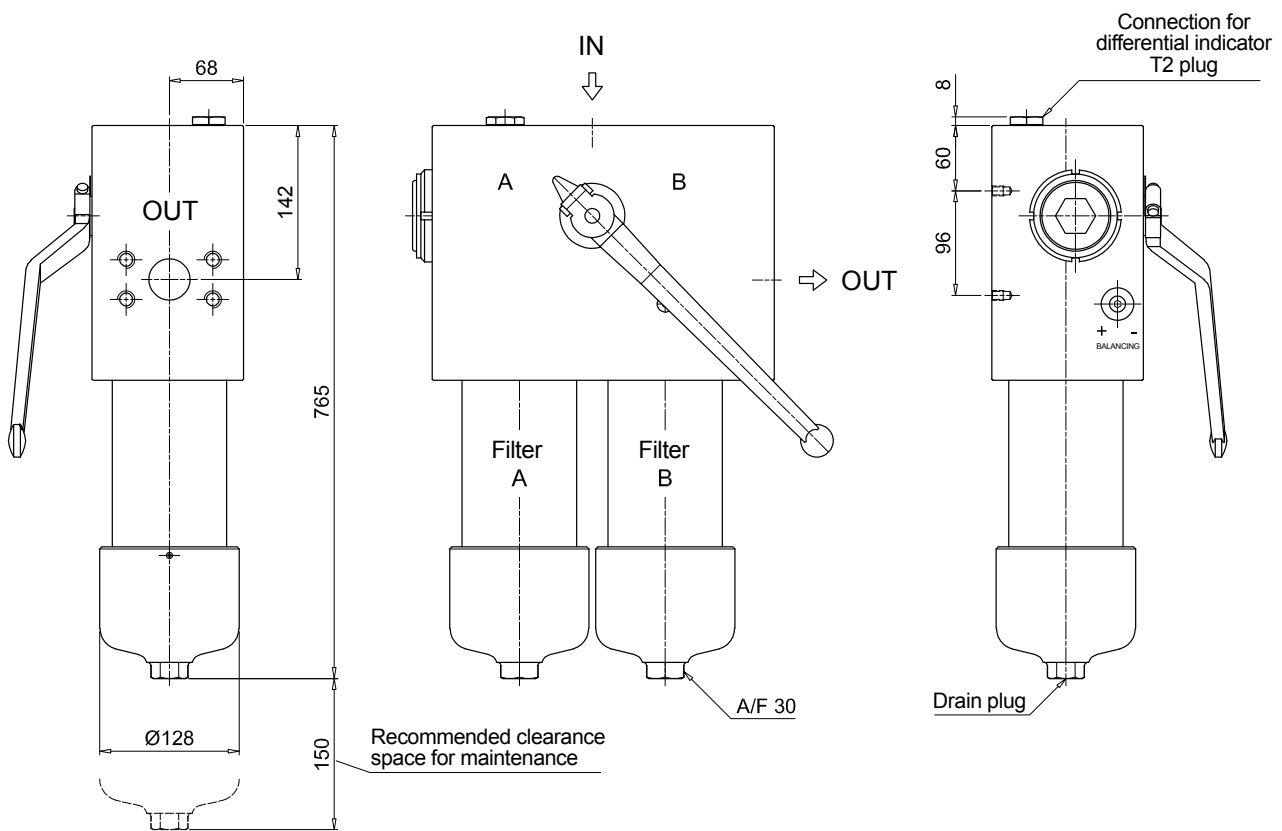
FHD333	
Length 2 - 3	
Filter length	H [mm]
2	479
3	612
Connections	R
F1	M10
F2	3/8" UNC



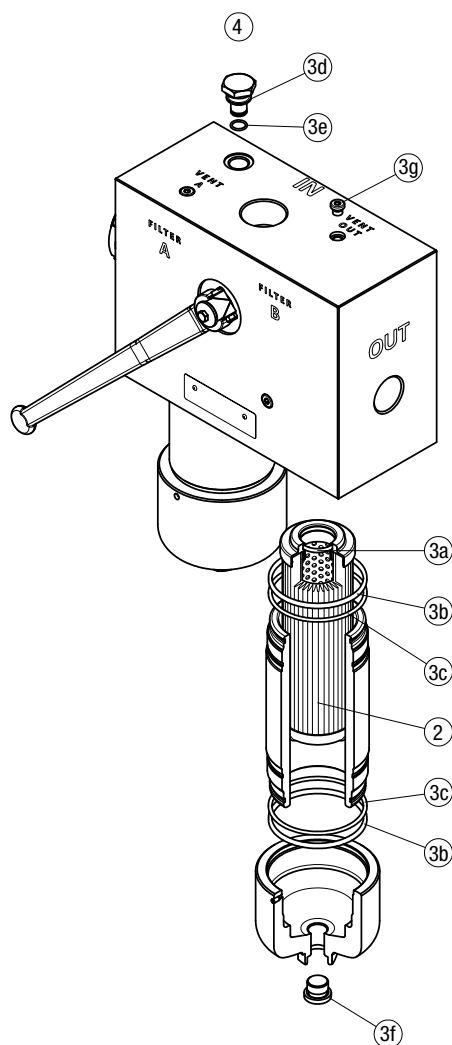
FHD FHD051 - FHD326 - FHD333

Dimensions

FHD333	
Length 4	
Connections	R
F1	M10
F2	3/8" UNC



FHD 021 - 051 - 326 - 333



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.		Q.ty: 1 pc.	
Filter series	Filter element	Seal Kit code number		Indicator connection plug	
FHD 021	See order table	NBR	FPM	NBR	FPM
FHD 051	See order table	02050511	02050512	T2H	T2V
FHD 326-333	See order table	02050420	02050421		
		02050377	02050378		

HPB series

BOWL KIT

Maximum working pressure up to 42 MPa (420 bar) - Flow rate up to 300 l/min



Description

Technical data

High Pressure Bowl Kit

Maximum working pressure up to 42 MPa (420 bar)

Flow rate up to 300 l/min

HPB is a range of high pressure bowl kits for protection of sensitive components in high pressure hydraulic systems in the mobile machines. They are directly integrated in the control blocks.

Available features:

- Fine filtration rating, to get a good cleanliness level into the system
- Low collapse filter element "N", for use with blocks provided with bypass valve
- High collapse filter element with external support "S", for use with blocks not provided with the bypass valve

Filter housing materials

- Housing: Phosphatized steel

Pressure

- Test pressure: 63 MPa (630 bar)
- Burst pressure: 126 MPa (1260 bar)
- Pulse pressure fatigue test: 1 000 000 cycles with pressure from 0 to 42 MPa (420 bar)

Δp element type

- Microfibre / Wire mesh filter elements - series N: 20 bar
- Microfibre / Wire mesh filter elements - series S: 210 bar
- Fluid flow through the filter element from OUT to IN

Seals

- Standard NBR series A
- Optional FPM series V

Temperature

From -25 °C to +110 °C

Note

HPB filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]					Volumes [dm ³]						
	Length	1	2	3	4	5	Length	1	2	3	4	5
HPB 050		1.10	1.50	1.90	2.40	3.50		0.30	0.45	0.60	0.80	1.20
HPB 150		2.90	4.90	6.30	-	-		0.45	0.85	1.10	-	-

FILTER ASSEMBLY SIZING Flow rates [l/min]

Filter series	Length	Filter element design - N Series						Filter element design - S Series				
		A03	A06	A10	A16	A25	M25	A03	A06	A10	A16	A25
HPB 050	1	42	43	79	82	106	147	29	39	57	59	74
	2	52	57	85	96	121	149	45	49	76	88	114
	3	66	69	97	106	130	150	58	61	89	99	125
	4	83	89	113	115	134	152	74	80	106	108	129
	5	107	110	130	134	141	154	93	95	111	121	139
HPB 150	1	81	88	156	163	179	295					
	2	142	145	227	230	236	312					
	3	170	180	242	245	263	315					

Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

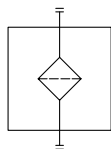
The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

Filter series	Style S
HPB 050	•
HPB 150	•

Hydraulic symbols



Designation & Ordering code

COMPLETE FILTER

Series and size **HPB050** Configuration example: **HPB050** **3** **A** **A10** **N** **P01**

Length
1 | **2** | **3** | **4** | **5** |

Seals
A NBR
V FPM

Filtration rating (filter media)		
A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Element Δp	
N	20 bar
S	210 bar

Execution	
P01	MP Filtri standard
Pxx	Customized

FILTER ELEMENT

Element series and size **HP050** Configuration example: **HP050** **3** **A10** **A** **N** **P01**

Element length
1 | **2** | **3** | **4** | **5** |

Seals
A NBR
V FPM

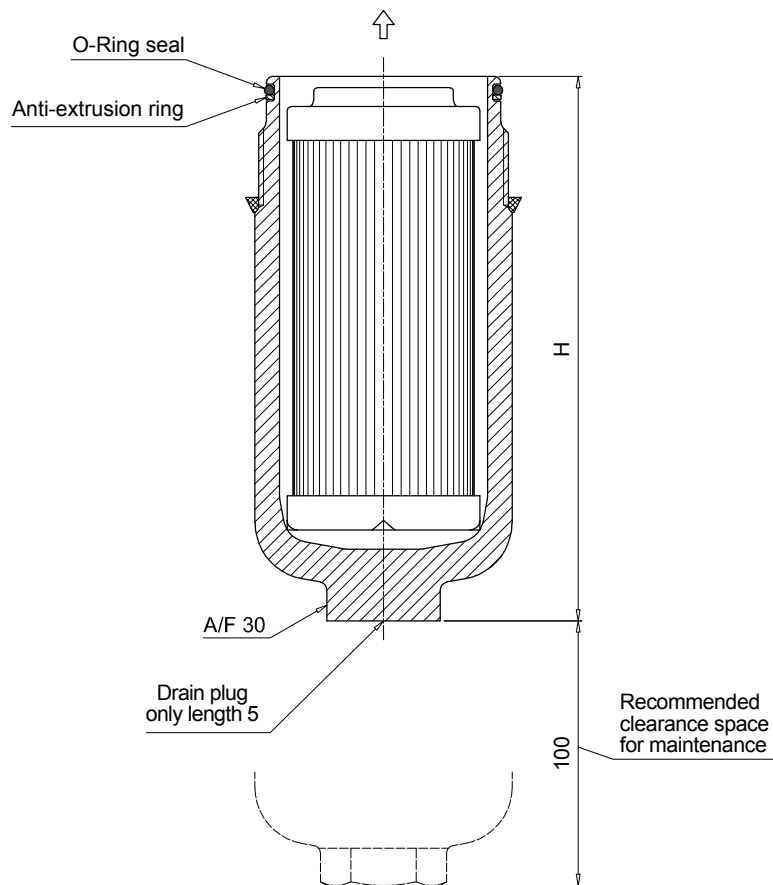
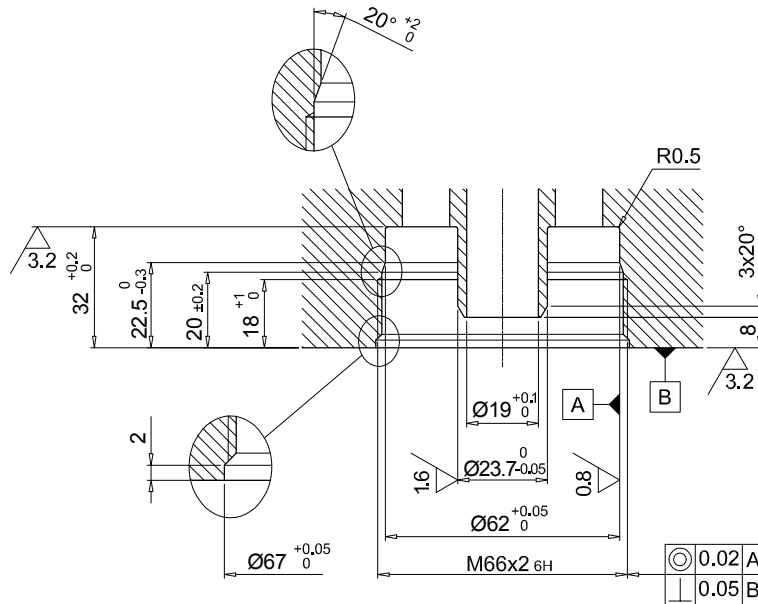
Filtration rating (filter media)		
A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Seals	
A	NBR
V	FPM

Element Δp	
N	20 bar
S	210 bar

Execution	
P01	MP Filtri standard
Pxx	Customized

HPB050	
Filter length	H [mm]
1	107
2	144
3	186
4	234
5	356



Designation & Ordering code

COMPLETE FILTER

Series and size **HPB150** Configuration example: **HPB150** | **3** | **A** | **A10** | **N** | **P01**

Length **1** | **2** | **3** |

Seals **A** NBR
V FPM

Filtration rating (filter media)		
A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Element Δp	
N	20 bar

Execution	
P01	MP Filtri standard
Pxx	Customized

FILTER ELEMENT

Element series and size **HP150** Configuration example: **HP150** | **3** | **A10** | **A** | **N** | **P01**

Element length **1** | **2** | **3** |

Seals **A** NBR
V FPM

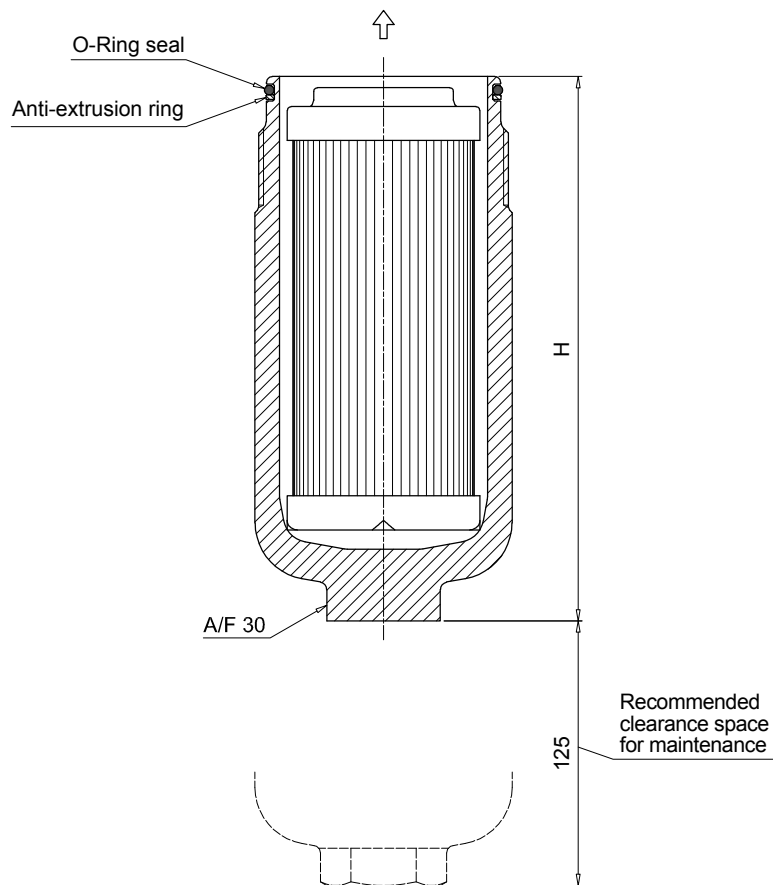
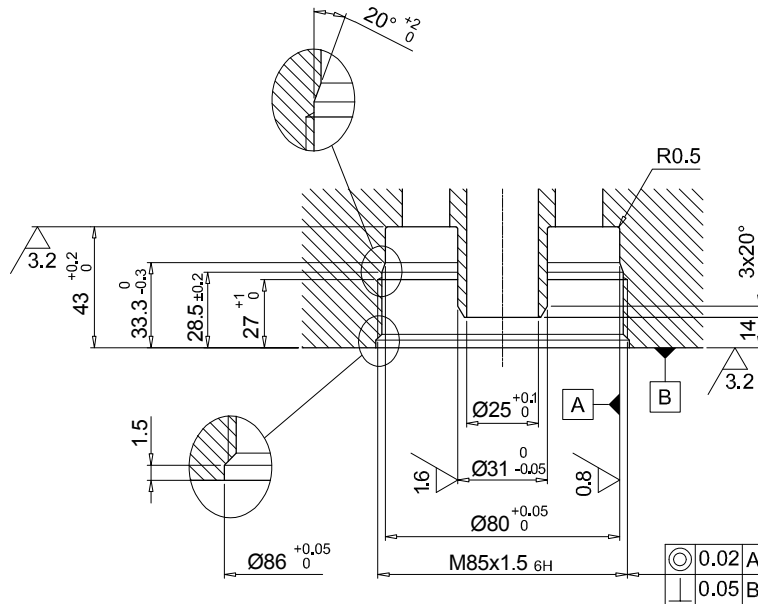
Filtration rating (filter media)		
A03	Inorganic microfiber	3 µm
A06	Inorganic microfiber	6 µm
A10	Inorganic microfiber	10 µm
A16	Inorganic microfiber	16 µm
A25	Inorganic microfiber	25 µm
M25	Wire mesh	25 µm

Seals	
A	NBR
V	FPM

Element Δp	
N	20 bar

Execution	
P01	MP Filtri standard
Pxx	Customized

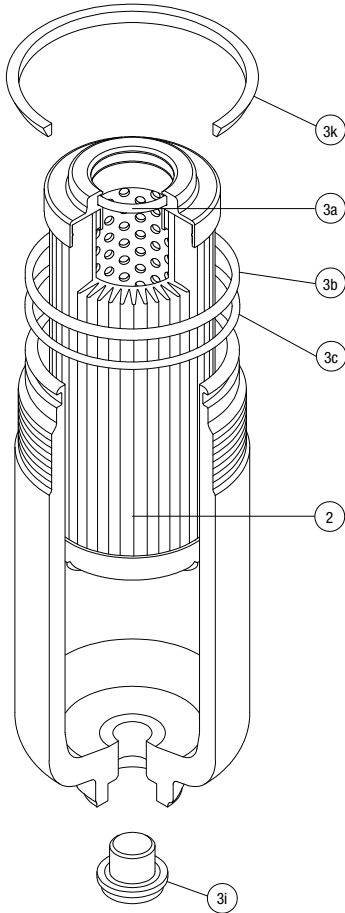
HPB150	
Filter length	H [mm]
1	161
2	271
3	346



HPB SPARE PARTS

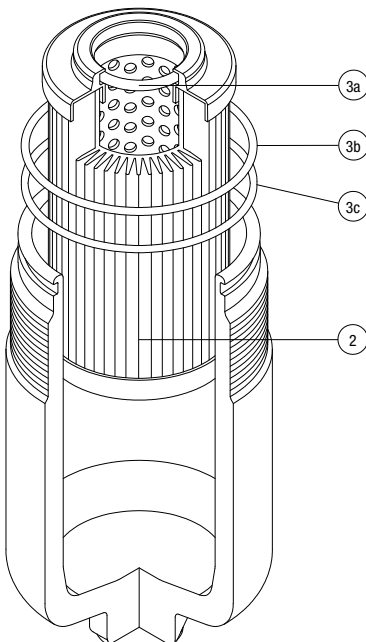
Order number for spare parts

HPB 050

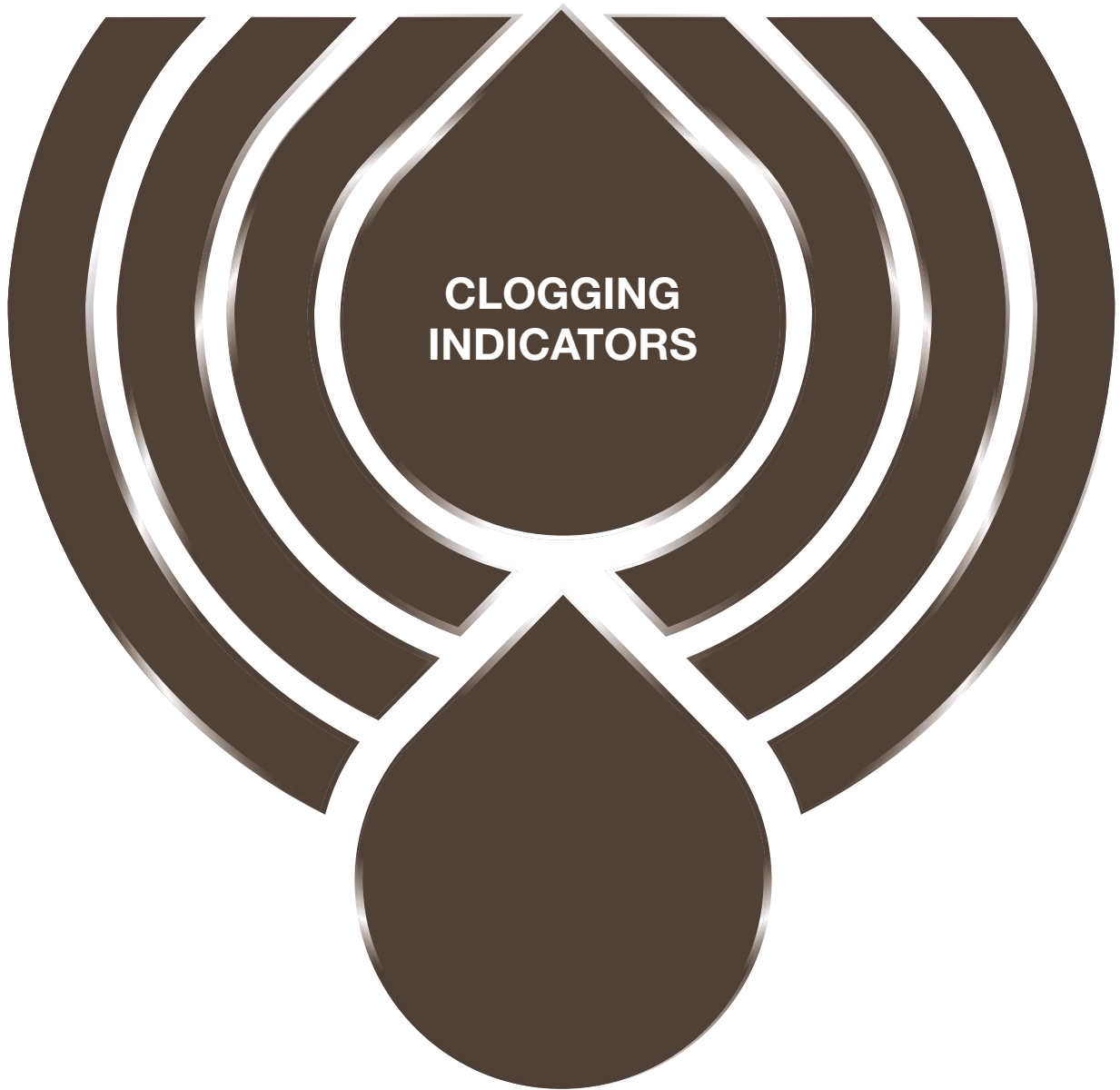


Item:	Q.ty: 1 pc. 2	Q.ty: 1 pc. 3 (3a ÷ 3i)
Filter series	Filter element	Seal Kit code number
		NBR FPM
HPB 050	See order table	02050813 02050823

HPB 150



Item:	Q.ty: 1 pc. 2	Q.ty: 1 pc. 3 (3a ÷ 3c)
Filter series	Filter element	Seal Kit code number
		NBR FPM
HPB 150	See order table	02050816 02050826



**CLOGGING
INDICATORS**

Clogging indicators are devices that check the life time of the filter elements. They measure the pressure drop through the filter element directly connected to the filter housing.

These devices trip when the clogging of the filter element causes a pressure drop increasing across the filter element.

Filter elements are efficient only if their Dirt Holding Capacity is fully exploited. This is achieved by using filter housings equipped with clogging indicators.

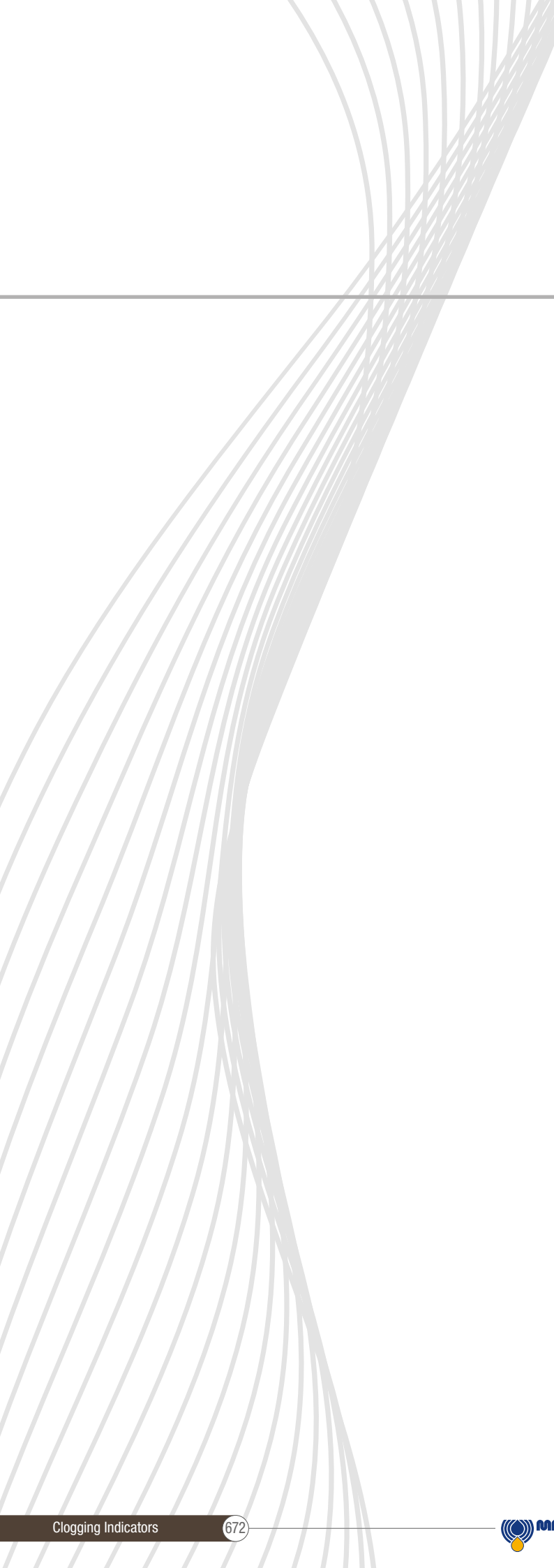
The indicator is set to alarm before the element becomes fully clogged.

MP Filtri can supply indicators of the following designs:

- Vacuum switches and gauges
- Pressure switches and gauges
- Differential pressure indicators

These type of devices can be provided with a visual, electrical or both signals. The electronic differential pressure clogging indicator is also available. It provides both analogical 4-20 mA output and digital warning (75% of clogging) and alarm (clogging) outputs.

In the following pages you can find a reference guide about the types of clogging indicators available in the different families of MP Filtri's Hydraulic Filtration range of products.



DESIGNATION, ORDERING CODES & TECHNICAL DATA

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QUICK REFERENCE GUIDE

Ordering codes

Filter family	Filter series	Visual indicators	Electrical indicators	Electronic / Electrical-Visual indicators		
SUCTION FILTERS	ELIXIR® SFEX060-080-110-160	VVB20P01 VVS20P01	VEB21AA50P01	VLB21AA51P01 VLB21AA52P01 VLB21AA53P01 VLB21AA71P01		
	With bypass valve 0.3 bar	<hr/> SF2 250 - 350 SF2 500 - 501 - 503 - 504 - 505 SF2 510 - 535 - 540	VVA20P01 VVR20P01	VEA21xA50P01	VLA21xA51P01 VLA21xA52P01 VLA21xA53P01 VLA21xA71P01	
RETURN FILTERS	ELIXIR® RFEX060-080-110-160	BVA14P01 BVR14P01 BVP15HP01 BVQ15HP01	BEA15HA50P01 BEM15HA41P01	BLA15HA51P01 BLA15HA52P01 BLA15HA53P01 BLA15HA71P01		
	With bypass 1.75 bar	<hr/> ELIXIR® RFEX060-080-110-160	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01	BEA20HA50P01 BEM20HA41P01	BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01	
	Without bypass	<hr/> MDH 250	BVA14P01 BVR14P01 BVP15HP01 BVQ15HP01 DVS12HP01	BEA15HA50P01 BEM15HA41P01 DES12HA10P01 DES12HA30P01 DES12HA80P01	BLA15HA51P01 BLA15HA52P01 BLA15HA53P01 BLA15HA71P01	
	With bypass 1.75 bar	<hr/> MDH 250	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01 DVS25HP01	BEA20HA50P01 BEM20HA41P01 DES25HA10P01 DES25HA30P01 DES25HA80P01	BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01	
	With bypass 3 bar	<hr/> MPFX MPTX MPF MPT MPH	BVA14P01 BVR14P01 BVP15HP01 BVQ15HP01	BEA15HA50P01 BEM15HA41P01	BLA15HA51P01 BLA15HA52P01 BLA15HA53P01 BLA15HA71P01	
	With bypass 1.75 bar	<hr/> MPFX MPTX MPF MPT	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01	BEA20HA50P01 BEM20HA41P01	BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01	
	With bypass 3 bar	<hr/> MPH	<hr/> MPLX	DVA20xP01 DVM20xP01	DEA20xA50P01 DEM20XX10P01 DEM20XX20P01 DEM20XX30P01 DEM20XX35P01	DLA20xA51P01 DLA20xA52P01 DLA20xA71P01 DLE20xA50P01 DLE20xF50P01 DTA20xF70P01
	With bypass 2.5 bar	<hr/> MPH	<hr/> FRI	<hr/> FRI	<hr/> FRI	
	With bypass 4.5 bar	<hr/> MPLX	<hr/> FRI	<hr/> FRI	<hr/> FRI	
	With bypass 2.4 bar	<hr/> FRI	<hr/> FRI	<hr/> FRI	<hr/> FRI	

Filter family	Filter series	Visual indicators	Electrical indicators	Electronic / Electrical-Visual indicators	
RETURN / SUCTION FILTERS	MRSX 116 - 165 - 166 Suction line	VVB20P01 VVS20P01	VEB21AA50P01	VLB21AA51P01 VLB21AA52P01 VLB21AA53P01 VLB21AA71P01	
	With bypass valve 2.5 bar	BVA25P01	BEA20HA50P01		
	MRSX 116 - 165 - 166 Return line	BVR25P01 BVP20HP01 BVQ20HP01	BEM20HA41P01 BET25HF10P01 BET25HF30P01 BET25HF50P01	BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01	
	With bypass valve 2.5 bar	LMP 124 MULTIPORT	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01 DVA20xP01 DVM20xP01	BEA20HA50P01 BEM20HA41P01 BET25HF10P01 BET25HF30P01 BET25HF50P01 DEA20xA50P01 DEM20XX10P01 DEM20XX20P01 DEM20XX30P01 DEM20XX35P01 DLA20xA51P01 DLA20xA52P01 DLA20xA71P01 DLE20xA50P01 DLE20xF50P01 DTA20xF70P01	
	Suction line	MPS 050 - 070 - 100 - 150 MPS 200 - 250 - 300 - 350	WB20P01 VVS20P01	VEB21AA50P01	VLB21AA51P01 VLB21AA52P01 VLB21AA53P01 VLB21AA71P01
	Return line	MPS 050 - 070 - 100 - 150 MPS 200 - 250 - 300 - 350 MST 050 - 070 - 100 - 150	BVA14P01 BVR14P01 BVP15HP01 BVQ15HP01	BEA15HA50P01 BEM15HA41P01	BLA15HA51P01 BLA15HA52P01 BLA15HA53P01 BLA15HA71P01
	In-line	MPS 051 - 071 - 101 - 151 MPS 301 - 351 MSH 050 - 070 - 100 - 150	DVA12xP01 DVM12xP01	DEA12xA50P01 DEM12xAxxP01	DLA12xA51P01 DLA12xA52P01 DLA12xA71P01 DLE12xA50P01 DLE12xF50P01 DLE20xF50P01 DLE20xF50P01 DTA12xA70P01 DTA12xF70P01 DTA20xA70P01 DTA20xF70P01

QUICK REFERENCE GUIDE

Ordering codes

Filter family	Filter series	Visual indicators	Electrical indicators	Electronic / Electrical-Visual indicators
LOW & MEDIUM PRESSURE FILTERS	ELIXIR® LFEX060-080-110-160	DVS25HP01	DES25HA10P01 DES25HA30P01 DES25HA80P01	
	With bypass valve 3.5 bar LMP 110 - 112 - 116 - 118 - 119 MULTIPORT LMP 120 - 122 - 123 MULTIPORT LMP 210 - 211 - LDP LMP 400 - 401 & 430 - 431 LMP 900 - 901 LMP 902 - 903 LMP 950 - 951 LMP 952 - 953 - 954 LMD 211 - 400 - 401 - 431 - 951 - LDD	DVA20xP01 DVM20xP01	DEA20xA50P01 DEM20xx10P01 DEM20xx20P01 DEM20xx30P01 DEM20xx35P01	DLA20xA51P01 DLA20xA52P01 DLA20xA71P01 DLE20xA50P01 DLE20xF50P01 DTA20xF70P01
HIGH PRESSURE FILTERS	ELIXIR® LFEX060-080-110-160	DVS40HP01	DES40HA10P01 DES40HA30P01 DES40HA80P01	
	Without bypass valve LMP 110 - 112 - 116 - 118 - 119 MULTIPORT LMP 120 - 122 - 123 MULTIPORT LMP 210 - 211 - LDP LMP 400 - 401 & 430 - 431 LMP 900 - 901 LMP 902 - 903 LMP 950 - 951 LMP 952 - 953 - 954 LMD 211 - 400 - 401 - 431 - 951 - LDD	DVA50xP01 DVM50xP01	DEA50xA50P01 DEM50xx10P01 DEM50xx20P01 DEM50xx30P01 DEM50xx35P01	DLA50xA51P01 DLA50xA52P01 DLA50xA71P01 DLE50xA50P01 DLE50xF50P01 DTA50xF70P01
HIGH PRESSURE FILTERS	FMP 039 - 065 - 135 - 320 FHP 010 - 011 - 065 - 135 - 350 - 351 - 500 FMMX 050 FMM 050 - 150 FHA 051 FHM 006 - 007 - 010 - 050 - 065 - 135 - 320 - 500 FHB 050 - 135 - 320 FHF 325 FHD 021 - 051 - 326 - 333	DVA50xP01 DVM50xP01	DEA50xA50P01 DEM50xx10P01 DEM50xx20P01 DEM50xx30P01 DEM50xx35P01	DLA50xA51P01 DLA50xA52P01 DLA50xA71P01 DLE50xA50P01 DLE50xF50P01
	FMP 039 - 065 - 135 - 320 FHP 010 - 011 - 065 - 135 - 350 - 351 - 500 FMMX 050 FMM 050 - 150 FHA 051 FHM 006 - 007 - 010 - 050 - 065 - 135 - 320 - 500 FHB 050 - 135 - 320 FHF 325 FHD 021 - 051 - 326 - 333	DVA70xP01 DVA95xP01 DVM70xP01 DVM95xP01	DEA70xA50P01 DEA95xA50P01 DEM70xx10P01 DEM70xx20P01 DEM70xx30P01 DEM70xx35P01 DEM95xx10P01 DEM95xx20P01 DEM95xx30P01 DEM95xx35P01	DLA70xA51P01 DLA70xA52P01 DLA70xA71P01 DLA95xA51P01 DLA95xA52P01 DLA95xA71P01 DLE70xA50P01 DLE70xF50P01 DLE95xA50P01 DLE95xF50P01 DTA70xF70P01 DTA95xF70P01

Filter family	Filter series	Visual indicators	Electrical indicators	Electronic / Electrical-Visual indicators
STAINLESS STEEL HIGH PRESSURE FILTERS	With bypass valve 6 bar	FZH 012 - 040	DVZ50xP01	DEZ50xA50P01 DLZ50xA50P01 DLZ70xA50P01 DLZ95xA50P01
	Without bypass valve	FZH 012 - 040	DVZ70xP01 DVZ95xP01	DEZ70xA50P01 DEZ95xA50P01
	With bypass valve 6 bar	FZP 039 - 136 FZB 039 FZM 039 FZD 051	DVX50xP01 DZY50xP01	DEX50xA50P01 DLX50xA51P01 DLX50xA52P01
	Without bypass valve	FZP 039 - 136 FZB 039 FZM 039 FZD 010 - 021 - 051	DVX70xP01 DVX95xP01 DZY70xP01 DZY95xP01	DEX70xA50P01 DEX95xA50P01 DLX70xA51P01 DLX70xA52P01 DLX95xA51P01 DLX95xA52P01
FILTERS FOR POTENTIALLY EXPLOSIVE ATMOSPHERE	With bypass valve 6 bar	FMMX 050 FMM 050 - 150	DVA50xP01 DVM50xP01	DEH50xA48P01 DEH50xA49P01 DEH50xA70P01
	Without bypass valve	FMMX 050 FMM 050 - 150	DVA70xP01 DVA95xP01 DVM70xP01 DVM95xP01	DEH70xA48P01 DEH70xA49P01 DEH70xA70P01 DEH95xA48P01 DEH95xA49P01 DEH95xA70P01
	With bypass valve 6 bar	FZP 039 - 136	DVX50xP01 DZY50xP01	DEH50xA48P01 DEH50xA49P01 DEH50xA70P01
	Without bypass valve	FZP 039 - 136	DVX70xP01 DVX95xP01 DZY70xP01 DZY95xP01	DEH70xA48P01 DEH70xA49P01 DEH70xA70P01 DEH95xA48P01 DEH95xA49P01 DEH95xA70P01
	With bypass valve 6 bar	FZH 012 - 040	DVZ50xP01	
	Without bypass valve	FZH 012 - 040	DVZ70xP01 DVZ95xP01	

Suitable indicator types

V ACUUM INDICATORS

Vacuum indicators are used on the Suction line to check the efficiency of the filter element.

They measure the pressure downstream of the filter element.

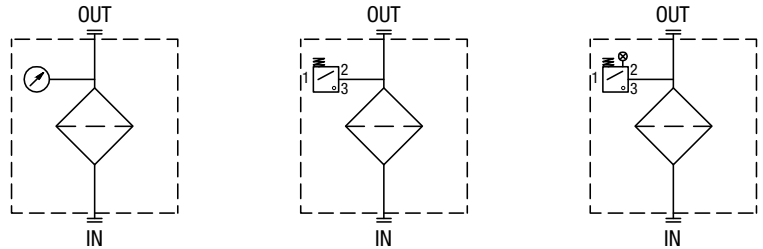
Standard items are produced with R 1/4" EN 10226 connection.

Available products with R 1/8" EN 10226 to be fitted on MPS series.

Vacuum indicators are identified in the Hydraulic Filtration catalogue and in the Quick Reference Guide table by the letter "V".

Example:

V VVB20P01



B BAROMETRIC INDICATORS

Pressure indicators are used on the Return line to check the efficiency of the filter element.

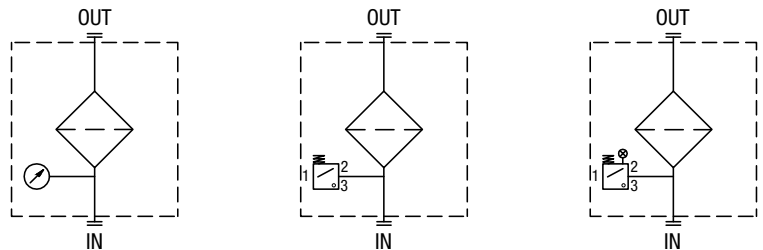
They measure the pressure upstream of the filter element.

Standard items are produced with R 1/8" EN 10226 connection.

Barometric indicators are identified in the Hydraulic Filtration catalogue and in the Quick Reference Guide table by the letter "B".

Example:

B BVA14P01



D DIFFERENTIAL INDICATORS

Differential indicators are used on the Pressure line to check the efficiency of the filter element.

They measure the pressure upstream and downstream of the filter element (differential pressure).

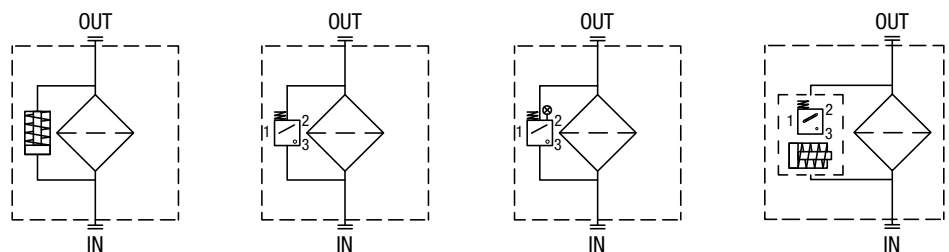
Standard items are produced with special connection G 1/2" size.

Also available in Stainless Steel models.

Differential indicators are identified in the Hydraulic Filtration catalogue and in the Quick Reference Guide table by the letter "D".

Example:

D DVA20xP01



DIFFERENTIAL INDICATORS

Series		Configuration example 1:						
DE Electrical differential indicator		DE	M	12	H	F	50	P01
DL Electrical/Visual differential indicator		Configuration example 2:						
		DL	E	20	V	A	71	P01
DT Electronic differential indicator		Configuration example 3:						
		DT	A	12	H	F	70	P01
DV Visual differential indicator		Configuration example 4:						
		DV	M	20	V			P01

Type	DE	DL	DT	DV
A Standard type	•	•	•	A With automatic reset
M With wired electrical connection	•	-	-	M With manual reset
E For high power supply	-	•	-	

Pressure setting	
12	1.2 bar
20	2.0 bar
50	5.0 bar
70	7.0 bar
95	9.5 bar

Seals	
H	HNBR
V	FPM

Thermostat	DEA	DEM	DLA	DLE	DT
A Without	•	•	•	•	-
F With thermostat	-	•	-	•	•

Electrical connections	DEA	DEM	DLA	DLE	DT
10 Connection AMP Superseal series 1.5	-	•	-	-	-
20 Connection AMP Timer Junior	-	•	-	-	-
30 Connection Deutsch DT-04-2-P	-	•	-	-	-
35 Connection Deutsch DT-04-3-P	-	•	-	-	-
50 Connection EN 175301-803	•	-	-	•	-
51 Connection EN 175301-803, transparent base with lamps 24 Vdc	-	-	•	-	-
52 Connection EN 175301-803, transparent base with lamps 110 Vdc	-	-	•	-	-
70 Connection IEC 61076-2-101 D (M12)	-	-	-	-	•
71 Connection IEC 61076-2-101 D (M12), black base with lamps 24 Vdc	-	-	•	-	-

Option	
P01	MP Filtri standard
Pxx	Customized

DIFFERENTIAL INDICATOR PLUG

Series	Configuration example
T2 Differential indicator plug	T2 H

Seals	
H	HNBR
V	FPM

DIFFERENTIAL INDICATORS

Dimensions

DEA*50	
Electrical Differential Indicator Connection: EN 175301-803	
Settings	Ordering code
1.2 bar ±10%	DE A 12 x A 50 P01
2.0 bar ±10%	DE A 20 x A 50 P01
5.0 bar ±10%	DE A 50 x A 50 P01
7.0 bar ±10%	DE A 70 x A 50 P01
9.5 bar ±10%	DE A 95 x A 50 P01

A/F 30
Max tightening torque: 65 N·m

Hydraulic symbol

Electrical symbol

Materials

- Body: Brass
- Base: Black polyamide
- Contacts: Silver
- Seal: HNBR - FPM

Technical data

- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids
HFA, HFB, HFC according to ISO 2943
- Degree protection: IP66 according to EN 60529
IP69K according to ISO 20653

Electrical data

- Electrical connection: EN 175301-803
- Resistive load: 0.2 A / 115 Vdc

DEH*48	
Hazardous Area Electrical Differential Indicator Connection via three-core cable - fitting M20x1.5	
Settings	Ordering code
2.0 bar ±10%	DE H 20 x A 48 P01
5.0 bar ±10%	DE H 50 x A 48 P01
7.0 bar ±10%	DE H 70 x A 48 P01

A/F 25
Max tightening torque: 100 N·m

flexible cable ≈ 5000 to A

Hydraulic symbol

Electrical symbol

Materials

- Body: AISI 316L
- Contacts: Rhodium
- Seal: FPM - MFQ

Technical data

- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Working temperature: From -60 °C to +125 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids
HFA, HFB, HFC according to ISO 2943
- Temperature class: T4 (135 °C) and T6 (85 °C)
- Degree of protection: IP 66/67/68 according to EN 60529
- Connection type: Three-core cable, fitting M20x1.5
- Contact type: SPCO/SPDT (Hermetically sealed - Volt-free contacts)

Electrical data

- Connection via three-core cable - fitting M20x1.5
- Resistive Load: 830 mA / 24 Vdc - 180 mA / 110 Vac
- Electrical Ratings: $U_i = 30 \text{ Vdc} / I_i = 250 \text{ mA} / P_i = 1.3 \text{ W}$
- Available ATEX product: II 1 GD Ex ia IIC T6 Ga -60°C ≤ Ta ≤ 80°C
Ex ia IIC T4 Ga -60°C ≤ Ta ≤ 125°C
II 2 GD Ex db IIC T6* Gb Ex tb IIIC T85°C* Db
(Tamb : = -60°C to +70°C)* IP66/67
* alternative T/Class and ambients T4, T135°C
(Tamb = -60°C to +120°C)

Certification / Approvals:
ATEX, IECEx, EAC TR CU, INMETRO
- Certification included as standard

DEH*49	
Hazardous Area Electrical Differential Indicator Connection via four-core cable - fitting 1/2" NPT	
Settings	Ordering code
2.0 bar ±10%	DE H 20 x A 49 P01
5.0 bar ±10%	DE H 50 x A 49 P01
7.0 bar ±10%	DE H 70 x A 49 P01

A/F 25
Max tightening torque: 100 N·m

flexible cable ≈ 5000 to A

Hydraulic symbol

Electrical symbol

Materials

- Body: AISI 316L
- Contacts: Rhodium
- Seal: FPM - MFQ

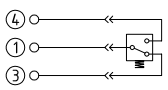
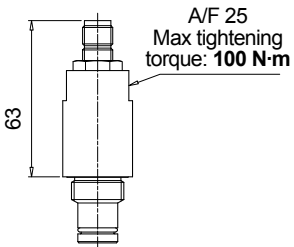

Technical data

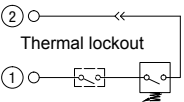
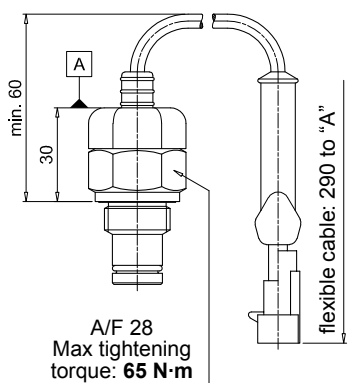
- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Working temperature: From -60 °C to +120 °C : ATEX, IECEx, EAC TR CU, INMETRO
From -60 °C to +105 °C : UL/CSA
- Compatibility with fluids: Mineral oils, Synthetic fluids
HFA, HFB, HFC according to ISO 2943
- Temperature class: T4 (135 °C) and T6 (85 °C)
- Degree of protection: IP 66/67/68 according to EN 60529
- Connection type: Four-core cable, fitting 1/2" NPT
- Contact type: SPCO/SPDT (Hermetically sealed - Volt-free contacts)

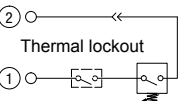
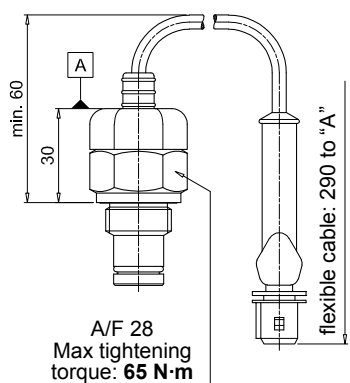
Electrical data

- Connection via four-core cable - fitting 1/2" NPT
- Resistive Load: 830 mA / 24 Vdc - 180 mA / 110 Vac
- Max voltage: 150 Vac/dc
- Power: 20 W
- Available ATEX product: II 1 GD Ex ia IIC T6 Ga -60°C ≤ Ta ≤ 80°C
Ex ia IIC T4 Ga -60°C ≤ Ta ≤ 125°C
II 2 GD Ex db IIC T6* Gb Ex tb IIIC T85°C* Db
(Tamb : = -60°C to +70°C)* IP66/67
* alternative T/Class and ambients T4, T135°C
(Tamb = -60°C to +120°C)

Certification / Approvals:
ATEX, IECEx, EAC TR CU, INMETRO, UL/CSA Class I Division 1 Groups A-D, UL/CSA Class II Division 1 Groups E-G
- Certification included as standard

DEH*70		Hydraulic symbol	Materials
Hazardous Area Electrical Differential Indicator Connection IEC 61076-2-101 D (M12)			
Settings	Ordering code		
2.0 bar ±10%	DE H 20 x A 70 P01	Electrical symbol 	Technical data - Max working pressure: 420 bar - Proof pressure: 630 bar - Burst pressure: 1260 bar - Working temperature: From -60 °C to +80 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943 - Temperature class: T6 (85 °C) - Degree of protection: IP 66/67 according to EN 60529 - Connection type: IEC 61076-2-101 D (M12) - Contact type: SPCO/SPDT (Hermetically sealed - Volt-free contacts)
5.0 bar ±10%	DE H 50 x A 70 P01		
7.0 bar ±10%	DE H 70 x A 70 P01		
			Electrical data - Connection IEC 61076-2-101 D (M12) - Resistive Load: 830 mA / 24 Vdc - 180 mA / 110 Vdc - Electrical Ratings: <i>I</i> _i = 30 Vdc <i>I</i> _l = 250 mA <i>P</i> _i = 1.3 W - Available ATEX product: II 1 GD Ex ia IIC T6 Ga -60°C ≤ Ta ≤ 80°C Ex ia IIC T4 Ga -60°C ≤ Ta ≤ 125°C II 2 GD Ex db IIC T6* Gb Ex tb III C T85°C* Db (Tamb = -60°C to +70°C)* IP66/67 * alternative T/Class and ambients T4, T135°C (Tamb = -60°C to +120°C)

DEM*10		Hydraulic symbol	Materials
Electrical Differential Indicator Connection: AMP Superseal series 1.5			
Settings	Ordering code		
1.2 bar ±10%	DE M 12 x x 10 P01	Electrical symbol 	Technical data - Max working pressure: 420 bar - Proof pressure: 630 bar - Burst pressure: 1260 bar - Working temperature: From -25 °C to +110 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943 - Degree protection: IP66 according to EN 60529
2.0 bar ±10%	DE M 20 x x 10 P01		
5.0 bar ±10%	DE M 50 x x 10 P01		
7.0 bar ±10%	DE M 70 x x 10 P01		
9.5 bar ±10%	DE M 95 x x 10 P01		
		Electrical data - Electrical connection: AMP Superseal series 1.5 - Resistive load: 0.2 A / 115 Vdc - Switching type: Normally open contacts (NC on request) - Thermal lockout: Normally open up to 30 °C (option "F")	

DEM*20		Hydraulic symbol	Materials
Electrical Differential Indicator AMP Time junior			
Settings	Ordering code		
1.2 bar ±10%	DE M 12 x x 20 P01	Electrical symbol 	Technical data - Max working pressure: 420 bar - Proof pressure: 630 bar - Burst pressure: 1260 bar - Working temperature: From -25 °C to +110 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943 - Degree protection: IP66 according to EN 60529
2.0 bar ±10%	DE M 20 x x 20 P01		
5.0 bar ±10%	DE M 50 x x 20 P01		
7.0 bar ±10%	DE M 70 x x 20 P01		
9.5 bar ±10%	DE M 95 x x 20 P01		
		Electrical data - Electrical connection: AMP Time junior - Resistive load: 0.2 A / 115 Vdc - Switching type: Normally open contacts (NC on request) - Thermal lockout: Normally open up to 30 °C (option "F")	

DIFFERENTIAL INDICATORS

Dimensions

DEM*30	
Electrical Differential Indicator Deutsch DT-04-2-P	
Settings	Ordering code
1.2 bar ±10%	DE M 12 x x 30 P01
2.0 bar ±10%	DE M 20 x x 30 P01
5.0 bar ±10%	DE M 50 x x 30 P01
7.0 bar ±10%	DE M 70 x x 30 P01
9.5 bar ±10%	DE M 95 x x 30 P01

A/F 28
Max tightening torque: 65 N·m

Hydraulic symbol

Electrical symbol

Materials

- Body: Brass
- Base: Black polyamide
- Contacts: Silver
- Seal: HNBR - FPM

Technical data

- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids
HFA, HFB, HFC according to ISO 2943
- Degree protection: IP66 according to EN 60529

Electrical data

- Electrical connection: Deutsch DT-04-2-P
- Resistive load: 0.2 A / 115 Vdc
- Switching type: Normally open contacts (NC on request)
- Thermal lockout: Normally open up to 30 °C (option "F")

DEM*35	
Electrical Differential Indicator Deutsch DT-04-3-P	
Settings	Ordering code
1.2 bar ±10%	DE M 12 x x 35 P01
2.0 bar ±10%	DE M 20 x x 35 P01
5.0 bar ±10%	DE M 50 x x 35 P01
7.0 bar ±10%	DE M 70 x x 35 P01
9.5 bar ±10%	DE M 95 x x 35 P01

A/F 28
Max tightening torque: 65 N·m

Hydraulic symbol

Electrical symbol

Materials

- Body: Brass
- Base: Black polyamide
- Contacts: Silver
- Seal: HNBR - FPM

Technical data

- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids
HFA, HFB, HFC according to ISO 2943
- Degree protection: IP66 according to EN 60529

Electrical data

- Electrical connection: Deutsch DT-04-3-P
- Resistive load: 0.2 A / 115 Vdc
- Switching type: SPDT contact
- Thermal lockout: Normally open up to 30 °C (option "F")

DES*10	
Electrical Differential Indicator AMP Superseal series 1.5	
Settings	Ordering code
1.2 bar ±10%	DE S 12 H A 10 P01
2.5 bar ±10%	DE S 25 H A 10 P01
4.0 bar ±10%	DE S 40 H A 10 P01

A/F 19
Max tightening torque: 20 N·m

Hydraulic symbol

Electrical symbol

Materials

- Body: Brass
- Internal parts: Brass - Polyamide
- Contacts: Silver
- Seal: HNBR

Technical data

- Max working pressure: 16 bar
- Proof pressure: 24 bar
- Burst pressure: 48 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids
HFA, HFB, HFC according to ISO 2943
- Degree protection: IP67 according to EN 60529

Electrical data

- Electrical connection: AMP Superseal series 1.5
- Resistive load: 0.2 A / 24 Vdc
- Switching type: Normally open contacts (NC on request)

DES*30	
Electrical Differential Indicator Deutsch DT-04-2-P	
Settings	Ordering code
1.2 bar ±10%	DE S 12 HA 30 P01
2.5 bar ±10%	DE S 25 HA 30 P01
4.0 bar ±10%	DE S 40 HA 30 P01

Hydraulic symbol

Electrical symbol

Materials

- Body: Brass
- Internal parts: Brass - Polyamide
- Contacts: Silver
- Seal: HNBR

Technical data

- Max working pressure: 16 bar
- Proof pressure: 24 bar
- Burst pressure: 48 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids
HFA, HFB, HFC according to ISO 2943
- Degree protection: IP67 according to EN 60529

Electrical data

- Electrical connection: Deutsch DT-04-2-P
- Resistive load: 0.2 A / 24 Vdc
- Switching type: Normally open contacts (NC on request)

DES*80	
Electrical Differential Indicator Stud #10-32 UNF	
Settings	Ordering code
1.2 bar ±10%	DE S 12 HA 80 P01
2.5 bar ±10%	DE S 25 HA 80 P01
4.0 bar ±10%	DE S 40 HA 80 P01

Hydraulic symbol

Electrical symbol

Materials

- Body: Brass
- Internal parts: Brass - Polyamide
- Contacts: Silver
- Seal: HNBR

Technical data

- Max working pressure: 16 bar
- Proof pressure: 24 bar
- Burst pressure: 48 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids
HFA, HFB, HFC according to ISO 2943
- Degree protection: IP67 according to EN 60529

Electrical data

- Electrical connection: Stud #10-32 UNF
- Resistive load: 0.2 A / 24 Vdc
- Switching type: Normally open contacts (NC on request)

DEX*50	
Electrical Differential Indicator Connection: EN 175301-803	
Settings	Ordering code
1.2 bar ±10%	DE X 12 x A 50 P01
2.0 bar ±10%	DE X 20 x A 50 P01
5.0 bar ±10%	DE X 50 x A 50 P01
7.0 bar ±10%	DE X 70 x A 50 P01
9.5 bar ±10%	DE X 95 x A 50 P01

Hydraulic symbol

Electrical symbol

Materials

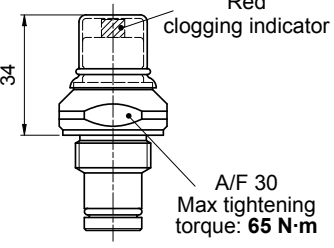
- Body: AISI 316L
- Base: Black polyamide
- Contacts: Silver
- Seal: HNBR - MFQ

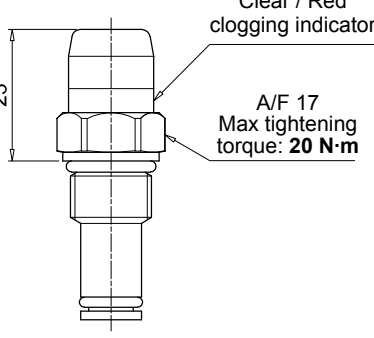
Technical data

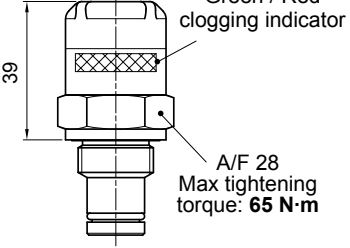
- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids
HFA, HFB, HFC according to ISO 2943
- Degree protection: IP66 according to EN 60529
IP69K according to ISO 20653

Electrical data

- Electrical connection: EN 175301-803
- Resistive load: 0.2 A / 115 Vdc

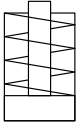
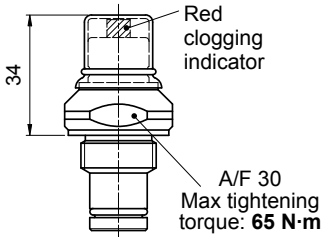
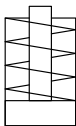
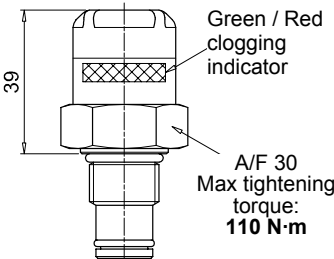
DVM		Hydraulic symbol	Materials
Visual Differential Indicator			
Settings	Ordering code		
1.2 bar ±10%	DV M 12 x P01		Technical data - Reset: Manual reset - Max working pressure: 420 bar - Proof pressure: 630 bar - Burst pressure: 1260 bar - Working temperature: From -25 °C to +110 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943 - Degree protection: IP65 according to EN 60529
2.0 bar ±10%	DV M 20 x P01		
5.0 bar ±10%	DV M 50 x P01		
7.0 bar ±10%	DV M 70 x P01		
9.5 bar ±10%	DV M 95 x P01		
			

DVS		Hydraulic symbol	Materials
Visual Differential Indicator			
Settings	Ordering code		
1.2 bar ±10%	DV S 12 H P01		Technical data - Reset: Automatic reset - Max working pressure: 16 bar - Proof pressure: 24 bar - Burst pressure: 48 bar - Working temperature: From -25 °C to +110 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943 - Degree protection: IP67 according to EN 60529
2.5 bar ±10%	DV S 25 H P01		
4.0 bar ±10%	DV S 40 H P01		
			

DVX		Hydraulic symbol	Materials
Visual Differential Indicator			
Settings	Ordering code		
1.2 bar ±10%	DV X 12 x P01		Technical data - Reset: Automatic reset - Max working pressure: 420 bar - Proof pressure: 630 bar - Burst pressure: 1260 bar - Working temperature: From -25 °C to +110 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943 - Degree protection: IP65 according to EN 60529
2.0 bar ±10%	DV X 20 x P01		
5.0 bar ±10%	DV X 50 x P01		
7.0 bar ±10%	DV X 70 x P01		
9.5 bar ±10%	DV X 95 x P01		
			

DIFFERENTIAL INDICATORS

Dimensions

DVY		Hydraulic symbol 	Materials - Body: AISI 316L - Internal parts: AISI 316L - Polyamide - Contacts: Silver - Seal: HNBR - MFQ Technical data - Reset: Manual reset - Max working pressure: 420 bar - Proof pressure: 630 bar - Burst pressure: 1260 bar - Working temperature: From -25 °C to +110 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943 - Degree protection: IP65 according to EN 60529
Visual Differential Indicator			
Settings	Ordering code		
1.2 bar ±10%	DV Y 12 x P01		
2.0 bar ±10%	DV Y 20 x P01		
5.0 bar ±10%	DV Y 50 x P01		
7.0 bar ±10%	DV Y 70 x P01		
9.5 bar ±10%	DV Y 95 x P01		
			
DVZ		Hydraulic symbol 	Materials - Body: AISI 316L - Internal parts: AISI 316L - Polyamide - Contacts: Silver - Seal: HNBR - MFQ Technical data - Reset: Automatic reset - Max working pressure: 700 bar - Proof pressure: 1050 bar - Burst pressure: 2100 bar - Working temperature: From -25 °C to +110 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943 - Degree protection: IP65 according to EN 60529
Visual Differential Indicator			
Settings	Ordering code		
1.2 bar ±10%	DV Z 12 x P01		
2.0 bar ±10%	DV Z 20 x P01		
5.0 bar ±10%	DV Z 50 x P01		
7.0 bar ±10%	DV Z 70 x P01		
9.5 bar ±10%	DV Z 95 x P01		
			

PLUGS

Dimensions

T2	
Differential Indicator plug	
Seal	Ordering code
HNBR	T2 H
FPM	T2 V

Materials

- Body: Phosphatized steel
- Seal: HNBR / FPM

A/F 30
Max tightening torque: 50 N·m

T4	
Differential Indicator plug	
Seal	Ordering code
NBR	T4 A

Materials

- Body: Anodized aluminium
- Seal: NBR

A/F 19
Max tightening torque: 20 N·m

X2	
Differential Indicator plug 420 bar	
Seal	Ordering code
HNBR	X2 H
FPM	X2 F
MFQ	X2 Q

Materials

- Body: AISI 316L
- Seal: HNBR / FPM / MFQ

A/F 30
Max tightening torque: 50 N·m

X3	
Differential Indicator plug 700 bar (only for FZH)	
Seal	Ordering code
HNBR	X3 H
FPM	X3 F
MFQ	X3 Q

Materials

- Body: AISI 316L
- Seal: HNBR / FPM / MFQ

A/F 30
Max tightening torque: 110 N·m

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