

# HYDRAULIC FILTRATION PRODUCTS

HIGH PRESSURE FILTERS



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.

## 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 **8** business branches



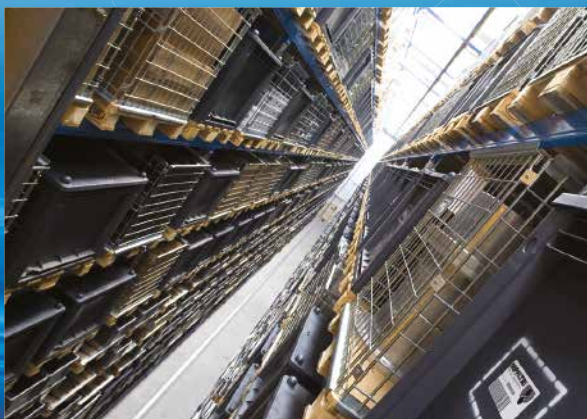
## TECHNOLOGY

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) 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

### CONTAMINATION MONITORING PRODUCTS

- Online, 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

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

### ACCESSORIES

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

# HYDRAULIC FILTRATION PRODUCTS

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<b>28</b>	<b>page</b>	<b>SUCTION FILTERS</b>			<b>up to <math>Q_{max}</math></b>
					<b>l/min</b>   <b>gpm</b>
31	STR & MPA - MPM	Submerged suction filter, with bypass or magnetic column			875   231
39	SF2 250 - 350	Semi-submerged positive head suction filter, low flow rate			160   42
47	SF2 500	Semi-submerged positive head suction filter, high flow rate			800   211
57	CLOGGING INDICATORS				

<b>60</b>	<b>page</b>	<b>RETURN FILTERS</b>		<b>up to <math>P_{max}</math></b>	<b>up to <math>Q_{max}</math></b>
			<b>bar</b>   <b>psi</b>	<b>l/min</b>   <b>gpm</b>	
63	MPFX	Tank top semi-immersed filter, standard filter element disassembly	8   116	750   198	
91	MPLX	Tank top semi-immersed filter, standard filter element disassembly	10   145	1800   476	
99	MPTX	Tank top semi-immersed filter, easy filter element disassembly	8   116	300   79	
117	MFBX	Bowl assembly	8   116	500   132	
125	MPF	Tank top semi-immersed filter, standard filter element disassembly	8   116	750   198	
153	MPT	Tank top semi-immersed filter, easy filter element disassembly	8   116	300   79	
171	MFB	Bowl assembly	8   116	500   132	
179	MPH	Tank top semi-immersed filter, standard filter element disassembly	10   145	3000   793	
203	MPI	Tank top semi-immersed filter, standard filter element disassembly	10   145	3000   793	
215	FRI	Tank top semi-immersed filter, easy filter element disassembly, it can be used also as in-line filter	20   290	1500   396	
231	RF2	Semi-immersed under-head filter, easy filter element disassembly	20   290	350   92	
238	CLOGGING INDICATORS				
248	ACCESSORIES				

<b>250</b>	<b>page</b>	<b>RETURN / SUCTION FILTERS</b>		<b>up to <math>P_{max}</math></b>	<b>up to <math>Q_{max}</math></b>
			<b>bar</b>   <b>psi</b>	<b>l/min</b>   <b>gpm</b>	
253	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	300   79	
265	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	200   53	
273	CLOGGING INDICATORS				

<b>286</b>	<b>page</b>	<b>SPIN-ON FILTERS</b>		<b>up to <math>P_{max}</math></b>	<b>up to <math>Q_{max}</math></b>
			<b>bar</b>   <b>psi</b>	<b>l/min</b>   <b>gpm</b>	
289	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	
305	MSH	In-line low and medium pressure filter available with single cartridge (CH)	35   508	195   52	
311	CLOGGING INDICATORS				

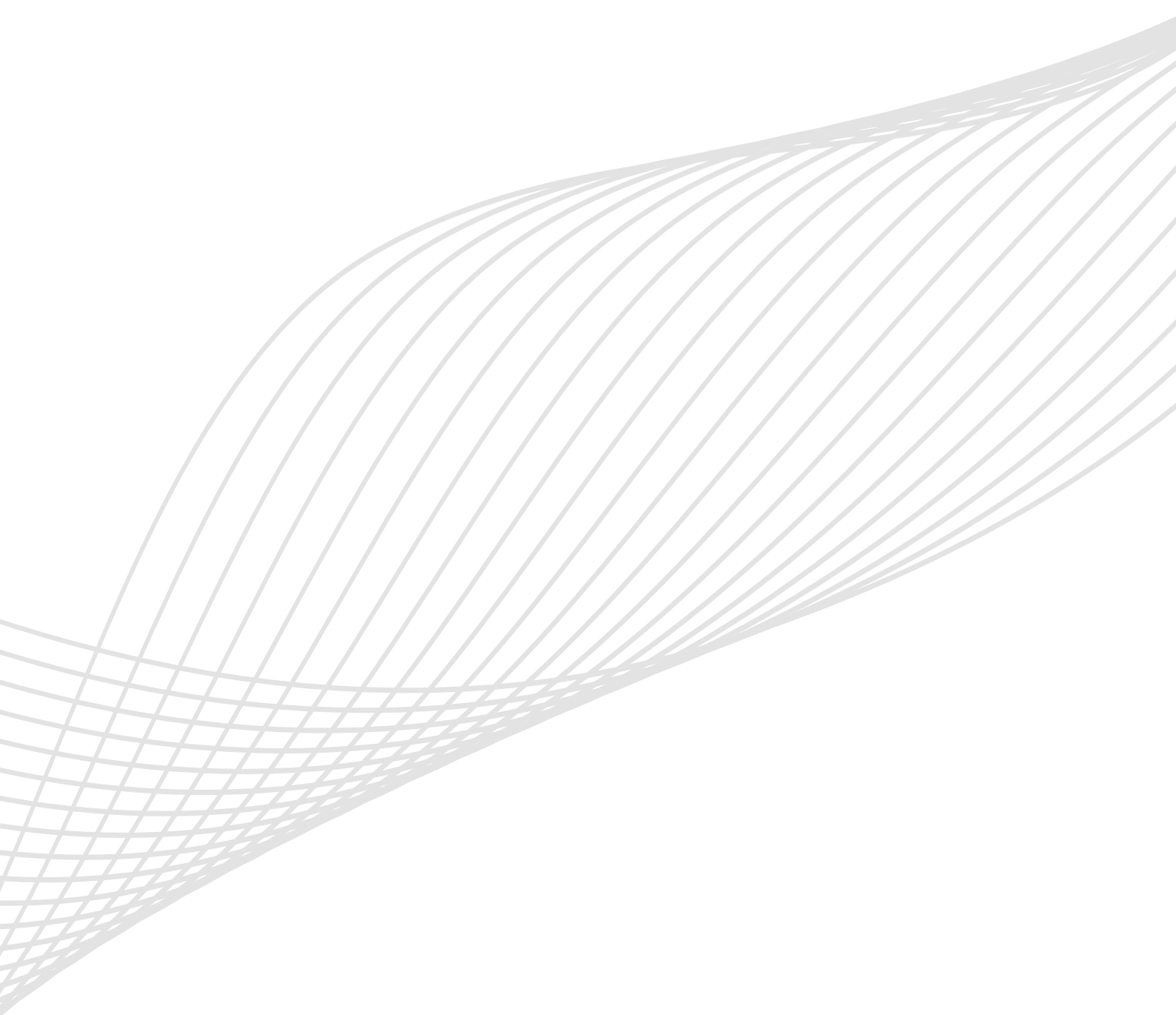
page	LOW & MEDIUM PRESSURE FILTERS	up to P <sub>max</sub>		up to Q <sub>max</sub>		
		bar	psi	l/min	gpm	
325	LMP 110 - 120 - 123 MULTIPORT	In-line filter with Multiport design for multiple choice connection	80	1160	200	53
341	LMP 210 - 211	In-line low & medium pressure filter, low flow rate	60	870	330	87
351	LMP 400 - 401 & 430 - 431	In-line low & medium pressure filter, high flow rate	60	870	740	195
363	LMP 950 - 951	In-line filter, available with 2 and up to 6 different heads	30	435	2400	634
371	LMP 952 - 953 - 954	In-line low pressure filter specifically designed to be mounted in series	25	363	3000	793
383	LMD 211	In-line duplex medium pressure filter	60	870	330	87
391	LMD 400 - 401 & 431	In-line duplex low pressure filter	16	232	590	156
407	LMD 951	In-line duplex filter, available with 2 up to 6 different heads	16	232	1200	317
415	<b>Filter elements designed according to DIN 24550</b>					
417	LDP - LDD	In-line and duplex medium pressure filter	60	870	330	87
427	LMP 900 - 901	In-line low pressure filter	30	435	2000	528
435	LMP 902 - 903	In-line filter specifically designed to be mounted in series	20	290	3000	793
444	CLOGGING INDICATORS					

page	HIGH PRESSURE FILTERS	up to P <sub>max</sub>		up to Q <sub>max</sub>		
		bar	psi	l/min	gpm	
453	FMP 039	Filter high pressure, low flow rate applications	110	1595	80	21
461	FMP	Filter high pressure, high flow rate applications	320	4641	475	125
473	FHP	Typical high pressure filter for mobile applications, high flow rate	420	6092	750	198
489	FMM	Typical high pressure filter for mobile applications, low flow rate	420	6092	250	66
499	FHA 051	Filter optimized for use in high pressure operating systems, low flow rate	560	8122	140	37
507	FHM	High pressure filter with intermediate manifold construction	320	4641	450	119
525	FHB	High pressure for block mounting	320	4641	485	128
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549	FHD	In-line duplex high pressure filter	350	5076	345	91
562	CLOGGING INDICATORS					

page	STAINLESS STEEL HIGH PRESSURE FILTERS	up to P <sub>max</sub>		up to Q <sub>max</sub>		
		bar	psi	l/min	gpm	
573	FZP	In-line pressure filter with threaded mount	420	6092	150	40
583	FZH	In-line pressure filter with threaded mount for higher pressure	700	10153	50	13
593	FZX	In-line pressure filter with threaded mount up to 1000 bar	1000	14504	10	3
601	FZM	Manifold top mounting	320	4641	70	18
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627	CLOGGING INDICATORS					

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# 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.

- CINEMATIC 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.

Cinematic 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



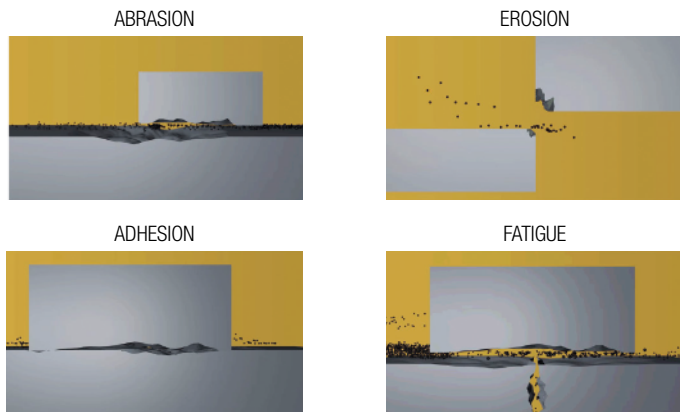
Solid contamination mainly causes surface damage and component wear.

- 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 stem performance, failures.

- 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  
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.

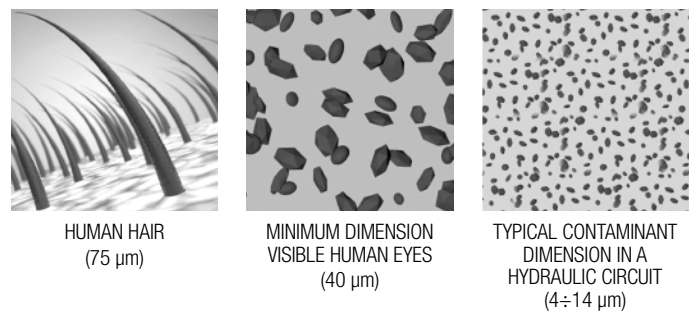
## 4 MEASURING THE SOLID CONTAMINATION LEVEL

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?



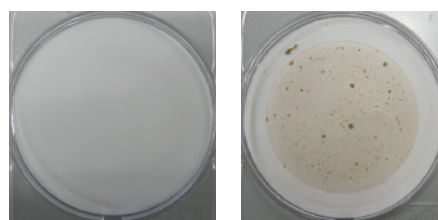
Contamination level analysis is significant only if performed with a uniform and repeatable method, conducted with standard test methods and suitably calibrated equipment.

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 Counters (APC).

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 code refers to the number of particles of the same size or greater than 4, 6 or 14  $\mu\text{m}$  in a 1 ml fluid.

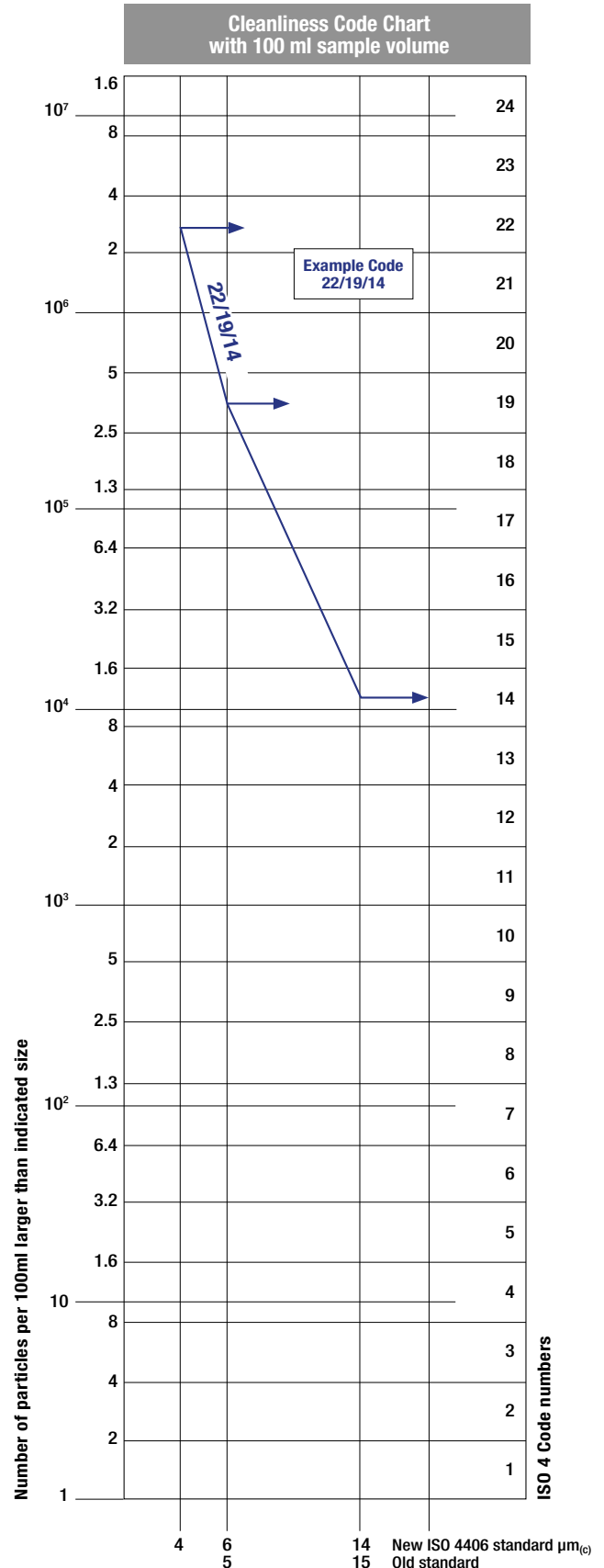
Class	Number of particles per ml	
	Over	Up to
28	1 300 000	2 500 000
27	640 000	1 300 000
26	320 000	640 000
25	160 000	320 000
24	80 000	160 000
23	40 000	80 000
22	20 000	40 000
21	10 000	20 000
20	5 000	10 000
19	2 500	5 000
18	1 300	2 500
17	640	1 300
16	320	640
15	160	320
14	80	160
13	40	80
12	20	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 4406:2017 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  $\mu\text{m}$  and 15  $\mu\text{m}$  equivalent to the 6  $\mu\text{m}_{(c)}$  and 14  $\mu\text{m}_{(c)}$  of APCs.



- CUMULATIVE DISTRIBUTION OF THE PARTICLES SIZE - SAE AS 4059-1 and SAE AS 4059-2

**Classification example according to SAE AS 4059-1 and SAE AS 4059-2**

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).

It can be made a differential measurement (Table 1) or a cumulative measurement (Table 2)

Table 1 - Class for differential measurement

Class	Dimension of contaminant				
	6÷14 µm <sub>(c)</sub>	14÷21 µm <sub>(c)</sub>	21÷38 µm <sub>(c)</sub>	38÷70 µm <sub>(c)</sub>	>70 µm <sub>(c)</sub>
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<sub>(c)</sub> = 15 000 particles
  - 14÷21 µm<sub>(c)</sub> = 2 200 particles
  - 21÷38 µm<sub>(c)</sub> = 200 particles
  - 38÷70 µm<sub>(c)</sub> = 35 particles
  - > 70 µm<sub>(c)</sub> = 3 particles
- Class 6

Table 2 - Class for cumulative measurement

Class	Dimension of contaminant					
	>4 µm <sub>(c)</sub> A	>6 µm <sub>(c)</sub> B	>14 µm <sub>(c)</sub> C	>21 µm <sub>(c)</sub> D	>38 µm <sub>(c)</sub> E	>70 µm <sub>(c)</sub> F
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<sub>(c)</sub> = 45 000 particles
  - > 6 µm<sub>(c)</sub> = 15 000 particles
  - > 14 µm<sub>(c)</sub> = 1 500 particles
  - > 21 µm<sub>(c)</sub> = 250 particles
  - > 38 µm<sub>(c)</sub> = 15 particles
  - > 70 µm<sub>(c)</sub> = 3 particle
- Class from 2F to 4E

- 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 100ml volume at various size intervals (differential counts) rather than using cumulative counts as in ISO 4406:1999. 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)

Maximum Contamination Limits per 100 ml					
Class	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<sub>(c)</sub> = 42 000 particles
  - 15÷25 µm<sub>(c)</sub> = 2 200 particles
  - 25÷50 µm<sub>(c)</sub> = 150 particles
  - 50÷100 µm<sub>(c)</sub> = 18 particles
  - > 100 µm<sub>(c)</sub> = 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



COMPARISON PHOTOGRAPHS

1 graduation = 10µm



ISO 4406:1999	Class 16/14/11	Class 22/20/17
SAE AS4059E Table 1	Class 5	Class 11
NAS 1638	Class 5	Class 11
SAE AS4059E Table 2	Class 6A/5B/5C	Class 12A/11B/11C

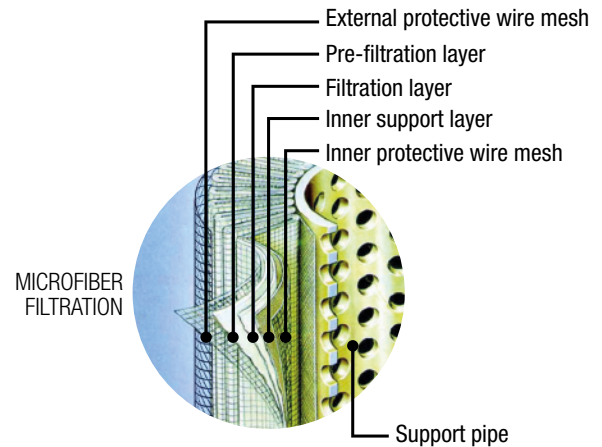


# CONTAMINATION MANAGEMENT

## - CLEANLINESS CODE COMPARISON

Although ISO 4406:2017 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 4406:2017	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



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.

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

## 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.



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 ( $\beta$  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 $\mu\text{m}$	A03
7 $\mu\text{m}_{(c)}$	6 $\mu\text{m}$	A06
10 $\mu\text{m}_{(c)}$	10 $\mu\text{m}$	A10
16 $\mu\text{m}_{(c)}$	18 $\mu\text{m}$	A16
21 $\mu\text{m}_{(c)}$	25 $\mu\text{m}$	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 $\beta_{x(c)} \geq 1.000$	$\beta_{20(c)} > 1000$	$\beta_{15(c)} > 1000$	$\beta_{10(c)} > 1000$	$\beta_{7(c)} > 1000$	$\beta_{7(c)} > 1000$	$\beta_{5(c)} > 1000$

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 ÷ 125  $\mu\text{m}$ .

They can be equipped with a magnetic column 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 ÷ 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 ( $\Delta P$ )**

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.

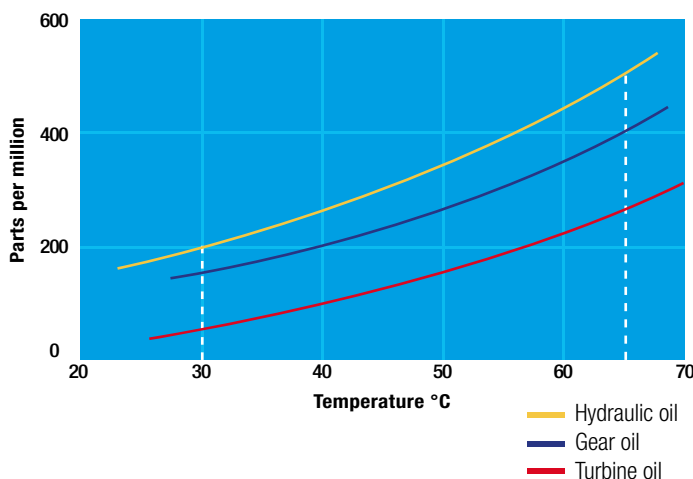
## 10 WATER IN HYDRAULIC AND LUBRICATING FLUIDS

### 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.

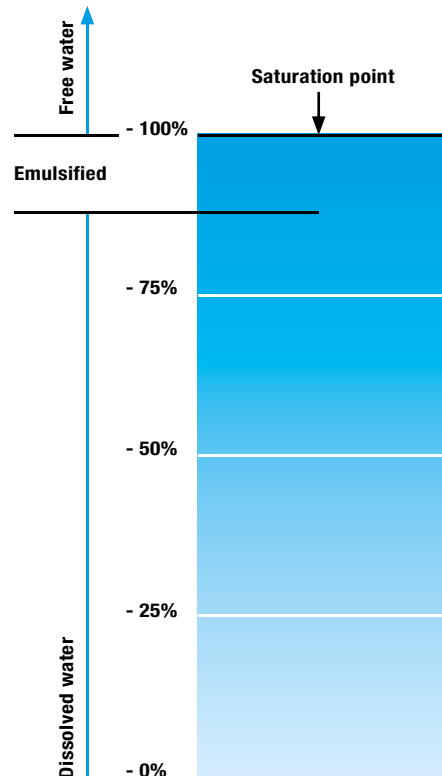
However, even water in solution can cause damage and therefore every reasonable effort should be made to keep saturation levels as low as possible. There is no such thing as too little water. As a guideline, we recommend maintaining saturation levels below 50% in all equipment.

### TYPICAL WATER SATURATION LEVEL FOR NEW OILS

Examples:

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

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



# CONTAMINATION MANAGEMENT

## Water absorber

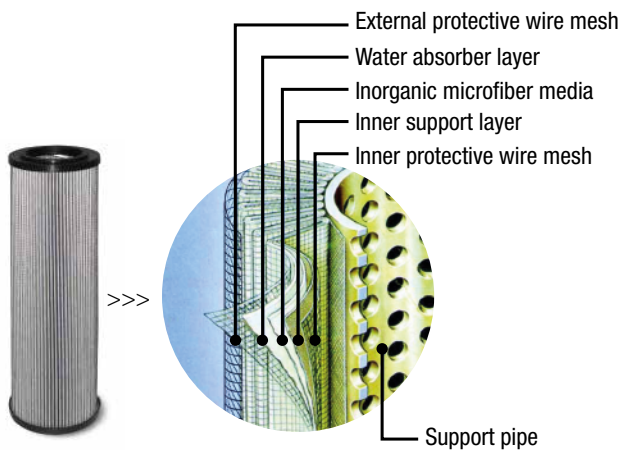
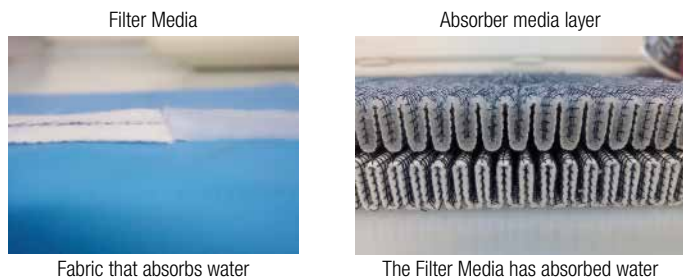
Water is present everywhere, during storage, handling and servicing.

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  $\mu\text{m}$  (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
LMP 431	LMP 951



# FILTER SIZING

## INDEX

	Page
CALCULATION	23
CORRECTIVE FACTOR	24

**THE CORRECT FILTER SIZING HAVE 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.

The pressure drop calculation is performed by adding together the value of the housing with the value of the filter element. The pressure drop  $\Delta pc$  of the housing is proportional to the fluid density ( $kg/dm^3$ ); all the graphs in the catalogue are referred to mineral oil with density of  $0.86 kg/dm^3$ .

The filter element pressure drop  $\Delta pe$  is proportional to its viscosity ( $mm^2/s$ ), the corrective factor Y have to be used in case of an oil viscosity different than  $30 mm^2/s$  (cSt).

**Sizing data for single filter element, head at top**

$\Delta pc$  = Filter housing pressure drop [bar]

$\Delta pe$  = Filter element pressure drop [bar]

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)

V1 reference oil viscosity =  $30 mm^2/s$  (cSt)

V2 = operating oil viscosity in  $mm^2/s$  (cSt)

**Filter element pressure drop calculation with an oil viscosity different than  $30 mm^2/s$  (cSt)**

$\Delta pe = Y : 1000 \times Q \times (V2:V1)$

$\Delta p Tot. = \Delta pc + \Delta pe$

**Verification formula**

$\Delta p Tot. \leq \Delta p max allowed$

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

Application	Range (bar)
Suction filters	0.08 ÷ 0.10
Return filters	0.4 ÷ 0.6
	0.4 ÷ 0.6 return lines
	0.3 ÷ 0.5 lubrication lines
Low & Medium Pressure filters	0.3 ÷ 0.4 off-line in power systems
	0.1 ÷ 0.3 off-line in test benches
	0.4 ÷ 0.6 over-boost
High Pressure filters	0.8 ÷ 1.5
Stainless Steel filters	0.8 ÷ 1.5

**Generic filter calculation example**

Application data:

Tank top return filter

Pressure Pmax = 10 bar

Flow rate Q = 120 l/min

Viscosity V2 =  $46 mm^2/s$  (cSt)

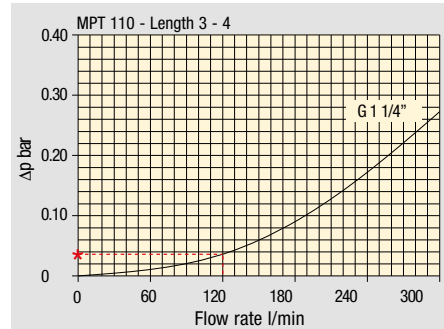
Oil density =  $0.86 kg/dm^3$

Required filtration efficiency =  $25 \mu m$  with absolute filtration

With bypass valve and G 1 1/4" inlet connection

Calculation:

$\Delta pc = 0.03 bar$  (see graphic below)



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

$\Delta pe = (2.00 : 1000) \times 120 \times (46 : 30) = 0.37 bar$

Filter element	Absolute filtration H Series					Nominal filtration N Series			
	A03	A06	A10	A16	A25	P10	P25	M25 M60 M90	
Type									
Return filters									
MF 020	2	74.00	50.08	20.00	16.00	9.00	6.43	5.51	4.40
	3	29.20	24.12	8.00	7.22	5.00	3.33	2.85	2.00
MF 030 MFX 030	1	22.00	19.00	6.56	5.33	4.33	1.68	1.44	1.30
	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

$\Delta p Tot. = 0.03 + 0.37 = 0.4 bar$

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 mm<sup>2</sup>/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
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	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 mm<sup>2</sup>/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					Nominal filtration N Series
Type		A03	A06	A10	A16	A25	M25
HF 320	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
SF 250	65	21

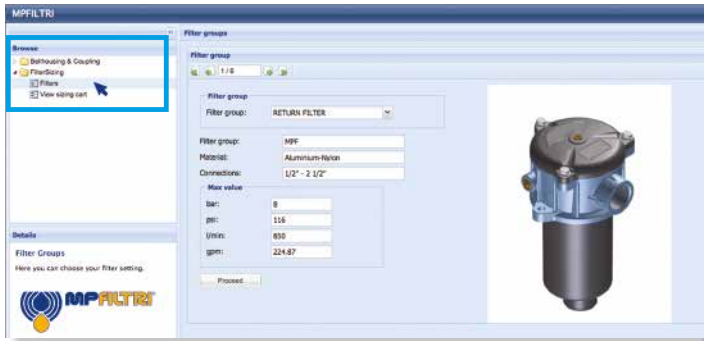
## Stainless steel high pressure filters

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	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

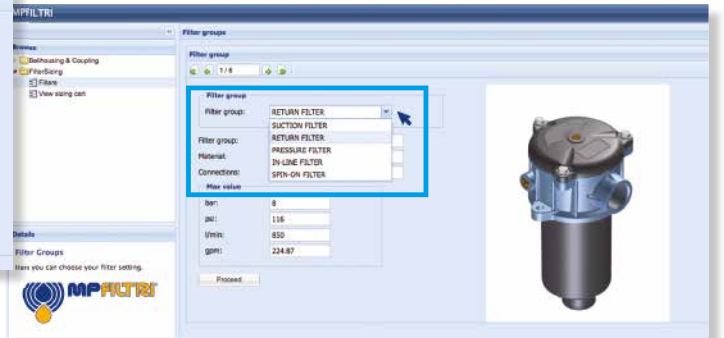
Filter element		Absolute filtration H - U Series				
Type		A03	A06	A10	A16	A25
HP 011	1	424.58	319.74	235.17	194.44	163.78
	2	281.06	211.25	94.53	75.45	47.26
	3	130.14	97.50	43.63	34.82	21.81
	4	109.39	82.25	36.79	29.37	18.40
HP 039	2	70.66	53.20	25.77	20.57	14.67
	3	36.57	32.28	18.00	13.38	8.00
	4	26.57	23.27	12.46	8.80	5.58
HP 050	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

# FILTER SIZING Selection Software

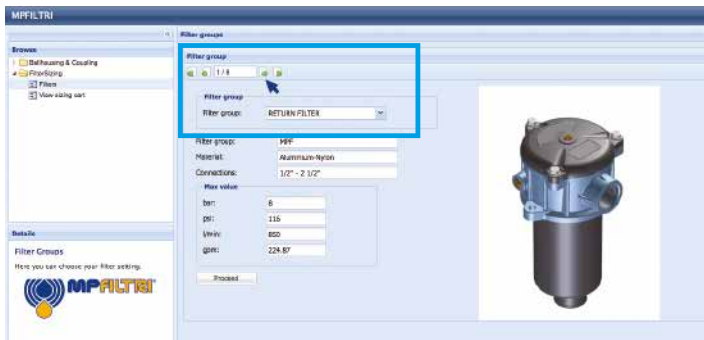
## Step 1 Select "FILTERS"



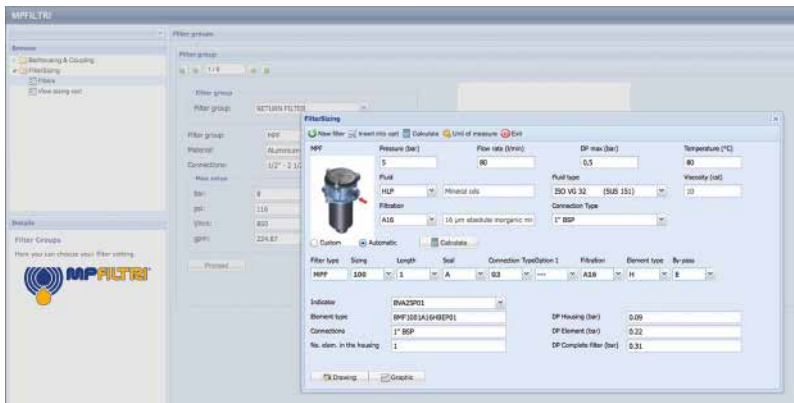
## Step 2 Choose filter group (Return Filter, Pressure Filter, etc.)



## Step 3 Choose filter type (MPF, MPT, etc.) in function of the max working pressure and the max flow rate



## Step 4 Push "PROCEED"



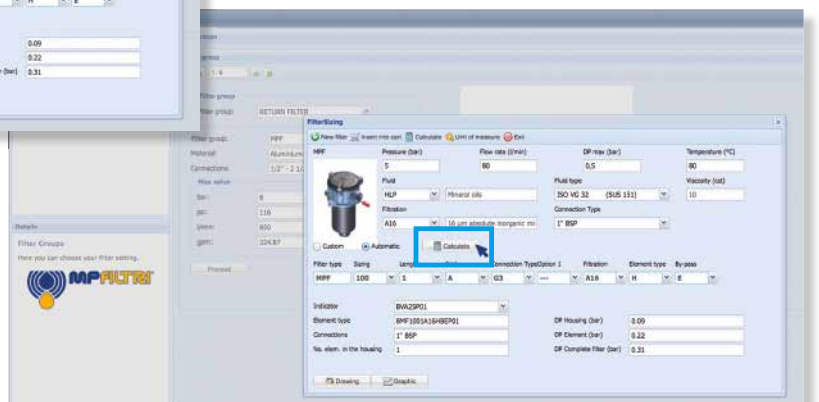
## Step 5

Insert all application data to calculate the filter size following the sequence:


- working pressure
- working flow rate
- working pressure drop
- working temperature
- fluid material and fluid type
- filtration media
- connection type

## Step 6

Push "CALCULATE" to have result; in case of any mistake, the system will advice which parameter is out of range to allow to modify/adjust the selection



## Step 7

Download PDF  Datasheet "Report.aspx" pushing the button "Drawing"



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

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

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

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



FMP 039	page 453
FMP	461
FHP	473
FMM	489
FHA 051	499

FHM	page 507
FHB	525
FHF 325	539
FHD	549
INDICATORS	562





# 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", for use with filters provided with bypass valve
- 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.

#### $\Delta p$ 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 [dm<sup>3</sup>]

Filter series	Weights [kg]				Volumes [dm <sup>3</sup> ]			
	Length	2	3	4	Length	2	3	4
<b>FMP 039</b>		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)

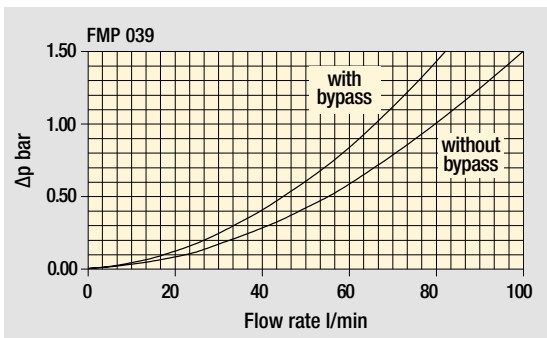
**A:** Closure cap with standard T2 steel. The position of the cap is reversible.

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

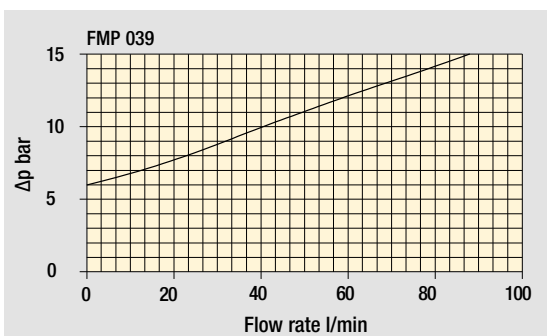
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Special connections on request

Filter housings  $\Delta p$  pressure drop



Bypass valve pressure drop



The curves are plotted using mineral oil with density of 0.86 kg/dm<sup>3</sup> in compliance with ISO 3968.  $\Delta p$  varies proportionally with density.

Flow rates [l/min]

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

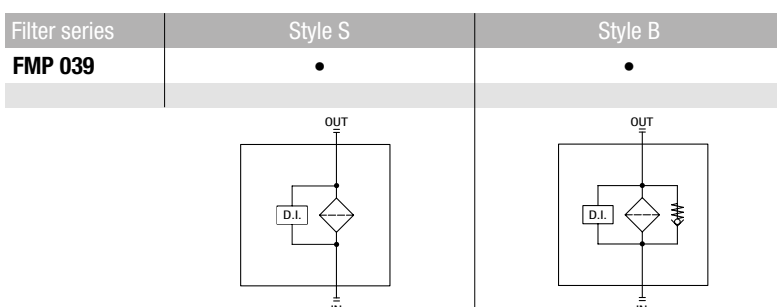
### Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5$ bar.

The reference fluid has a kinematic viscosity of 30 mm<sup>2</sup>/s (cSt) and a density of 0.86 kg/dm<sup>3</sup>.

For different pressure drop or fluid viscosity we recommend to use our selection software available on [www.mpfiltri.com](http://www.mpfiltri.com).

Please, contact our Sales Department for further additional information.

Hydraulic symbols



# FMP 039

## Designation & Ordering code

### COMPLETE FILTER

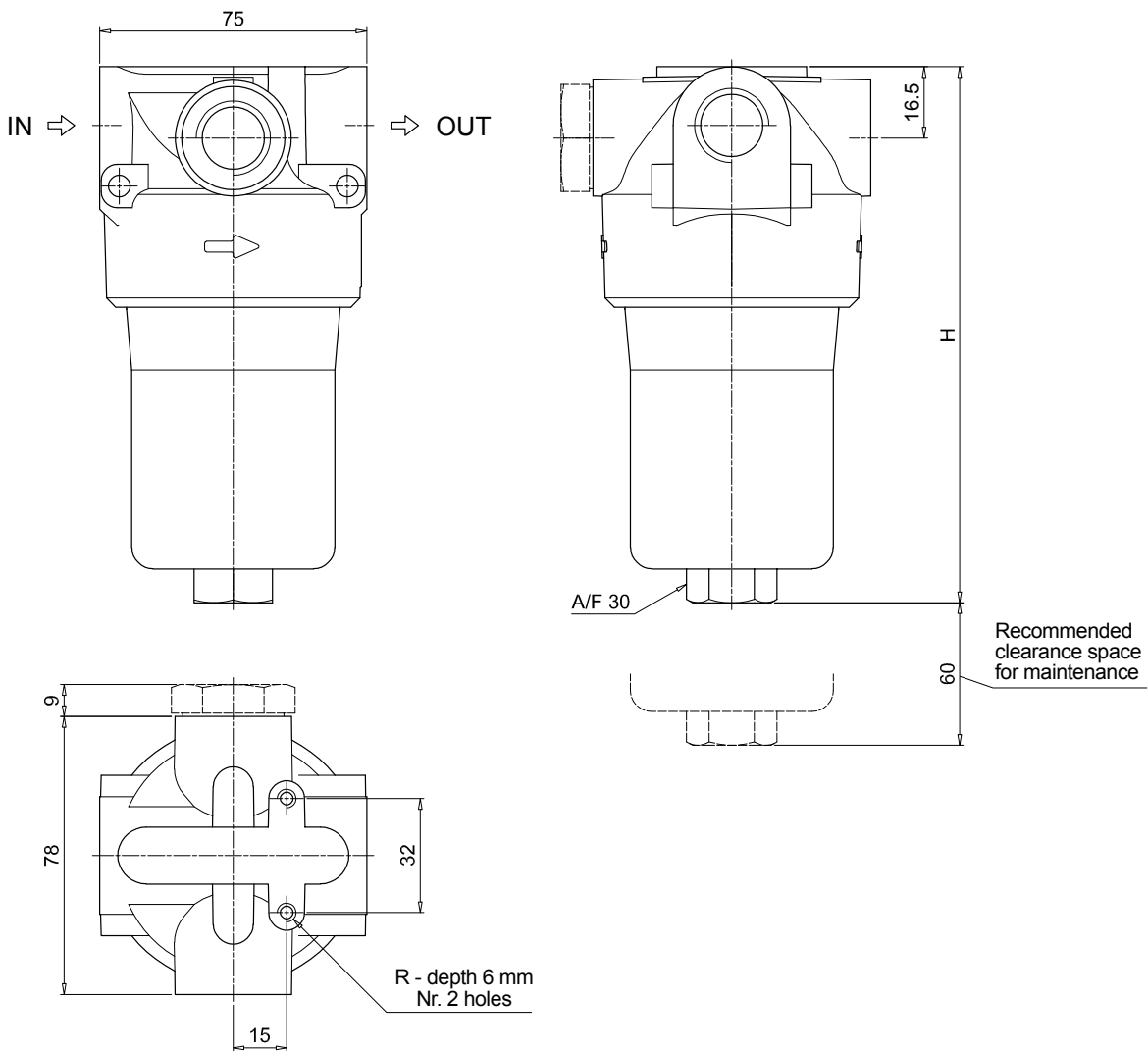
<b>Series and size</b>	Configuration example: <b>FMP039</b>   <b>3</b>   <b>B</b>   <b>A</b>   <b>B</b>   <b>6</b>   <b>A03</b>   <b>N</b>   <b>P01</b>															
<b>FMP039</b>																
<b>Length</b>	2   3   4															
<b>Valves</b>	S Without bypass B 6 bar															
<b>Seals</b>	A NBR V FPM															
<b>Connections</b>	A G 1/2" B 1/2" NPT C SAE 8 - 3/4" - 16 UNF															
<b>Connection for differential indicator</b>	1 Without 6 With two connections on both sides															
<b>Filtration rating (filter media)</b>	<table border="0"> <tr> <td><b>A03</b> Inorganic microfiber 3 µm</td> <td><b>A16</b> Inorganic microfiber 16 µm</td> </tr> <tr> <td><b>A06</b> Inorganic microfiber 6 µm</td> <td><b>A25</b> Inorganic microfiber 25 µm</td> </tr> <tr> <td><b>A10</b> Inorganic microfiber 10 µm</td> <td><b>M25</b> Wire mesh 25 µm</td> </tr> </table>										<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm	<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm	<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm
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<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm															
	<b>Element Δp</b>					<b>Execution</b>										
	N 20 bar					P01 MP Filtri standard Pxx Customized										

### FILTER ELEMENT

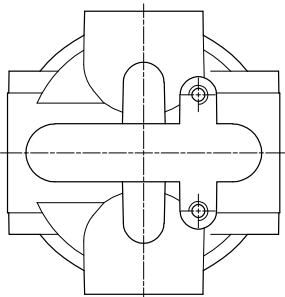
<b>Element series and size</b>	Configuration example: <b>HP039</b>   <b>3</b>   <b>A03</b>   <b>A</b>   <b>N</b>   <b>P01</b>												
<b>HP039</b>													
<b>Element length</b>	2   3   4												
<b>Filtration rating (filter media)</b>	<table border="0"> <tr> <td><b>A03</b> Inorganic microfiber 3 µm</td> <td><b>A16</b> Inorganic microfiber 16 µm</td> </tr> <tr> <td><b>A06</b> Inorganic microfiber 6 µm</td> <td><b>A25</b> Inorganic microfiber 25 µm</td> </tr> <tr> <td><b>A10</b> Inorganic microfiber 10 µm</td> <td><b>M25</b> Wire mesh 25 µm</td> </tr> </table>							<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm	<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm	<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm
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<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm												
<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm												
<b>Seals</b>	A NBR V FPM												
	<b>Element Δp</b>			<b>Execution</b>									
	N 20 bar			P01 MP Filtri standard Pxx Customized									

### ACCESSORIES

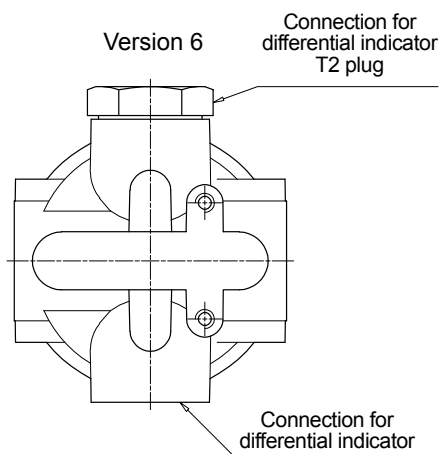
Differential indicators		page			page
<b>DEA</b>	Electrical differential indicator	563	<b>DLE</b>	Electrical / visual differential indicator	566
<b>DEH</b>	Hazardous area electronic differential indicator	563-564	<b>DTA</b>	Electronic differential indicator	567
<b>DEM</b>	Electrical differential indicator	564-565	<b>DVA</b>	Visual differential indicator	567
<b>DLA</b>	Electrical / visual differential indicator	565-566	<b>DVM</b>	Visual differential indicator	567
Additional features		page			
<b>T2</b>	Plug	568			



Version 1



Version 6



### FMP039

Filter length	H [mm]
2	151
3	194
4	238

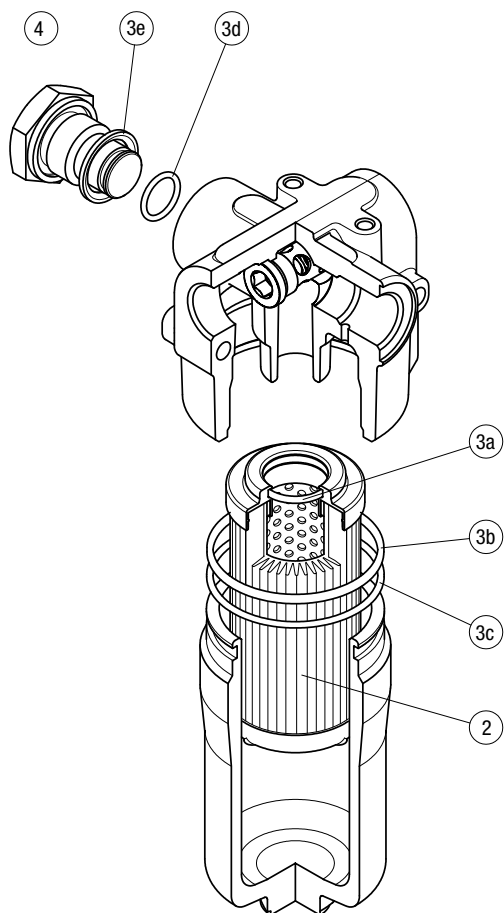
  

Connections	R
A	M6
B - C	1/4" UNC

# 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
<b>FMP 039</b>	See order table	02050509	02050510







# FMP series

Maximum working pressure up to 32 MPa (320 bar) - Flow rate up to 475 l/min



## Description

## Technical data

### High Pressure filters

#### In-line

**Maximum working pressure up to 32 MPa (320 bar)**

**Flow rate up to 475 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 475 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)  $\pm$ 10%
- Other opening pressures on request.

#### $\Delta p$ 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

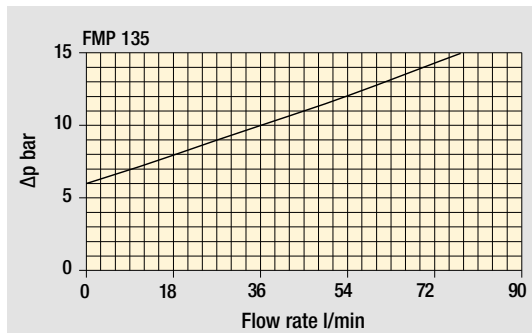
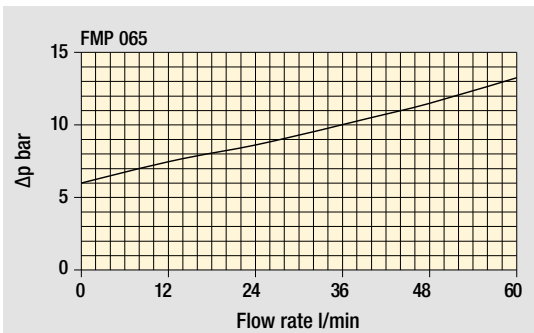
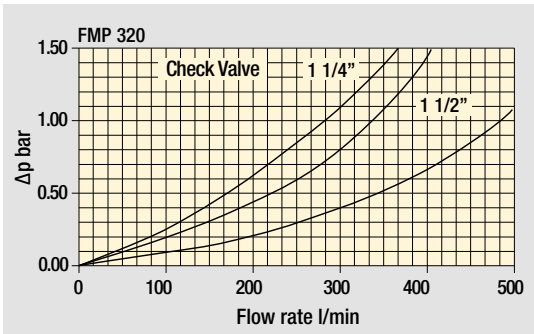
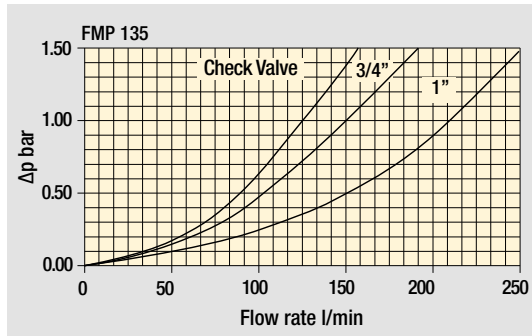
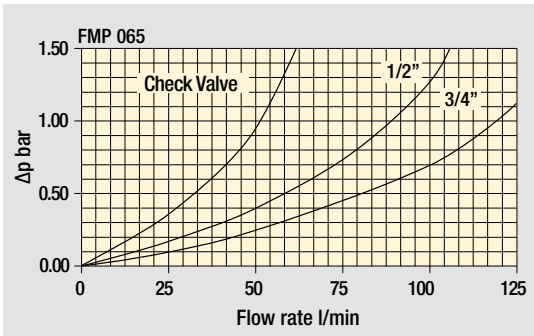
FMP filters are provided for vertical mounting



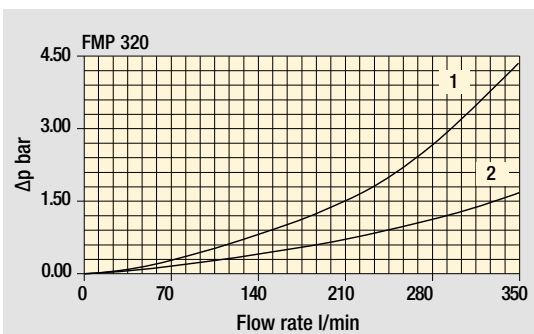
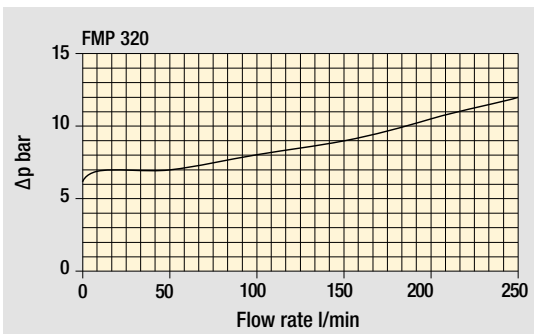
## Weights [kg] and volumes [dm<sup>3</sup>]

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

### Filter housings $\Delta p$ pressure drop



### Bypass valve pressure drop



### Filter housing with check valve

- 1 - Reverse flow
- 2 - In filter direction

### Valves

The curves are plotted using mineral oil with density of 0.86 kg/dm<sup>3</sup> in compliance with ISO 3968.  
 $\Delta p$  varies proportionally with density.

# FMP GENERAL INFORMATION

## Flow rates [l/min]

Filter series	Length	Filter element design - N Series					
		A03	A06	A10	A16	A25	M25
<b>FMP 065</b>	<b>1</b>	23	30	48	54	72	105
	<b>2</b>	31	45	60	65	82	106
	<b>3</b>	52	60	80	84	94	108
<b>FMP 135</b>	<b>1</b>	69	73	120	129	171	201
	<b>2</b>	110	117	149	152	211	232
	<b>3</b>	151	152	192	195	212	233
<b>FMP 320</b>	<b>1</b>	130	144	244	296	361	477
	<b>2</b>	267	291	417	438	492	509
	<b>3</b>	348	390	476	493	503	519
	<b>4</b>	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 mm<sup>2</sup>/s (cSt) and a density of 0.86 kg/dm<sup>3</sup>.

For different pressure drop or fluid viscosity we recommend to use our selection software available on [www.mpfiltri.com](http://www.mpfiltri.com).

Please, contact our Sales Department for further additional information.

## Hydraulic symbols

Filter series	Style S - E	Style B - C	Style T	Style D
<b>FMP 065</b>	•	•	•	•
<b>FMP 135</b>	•	•	•	•
<b>FMP 320</b>	•	•	•	•

--	--	--	--





# 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	
<b>S</b> Without bypass	<b>C</b> With bypass 6 bar, plug on the opposite side
<b>E</b> Without bypass, plug on the opposite side	<b>T</b> With check valve, without bypass
<b>B</b> With bypass 6 bar	<b>D</b> With check valve, with bypass

Seals	
<b>A</b> NBR	<b>V</b> FPM

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

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

Element Δp	Valves					
	S	E	B	C	T	D
<b>N</b> 20 bar			•	•		
<b>R</b> 20 bar					•	
<b>H</b> 210 bar	•	•				
<b>S</b> 210 bar					•	

Execution	Filter length			
	1	2	3	4
<b>P01</b> MP Filtri standard	•	•	•	•
<b>P02</b> Maintenance from the bottom of the housing				•
<b>Pxx</b> 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)	
<b>A03</b> Inorganic microfiber	3 µm
<b>A06</b> Inorganic microfiber	6 µm
<b>A10</b> Inorganic microfiber	10 µm
<b>A16</b> Inorganic microfiber	16 µm
<b>A25</b> Inorganic microfiber	25 µm
<b>M25</b> Wire mesh	25 µm

Seals	
<b>A</b> NBR	
<b>V</b> FPM	

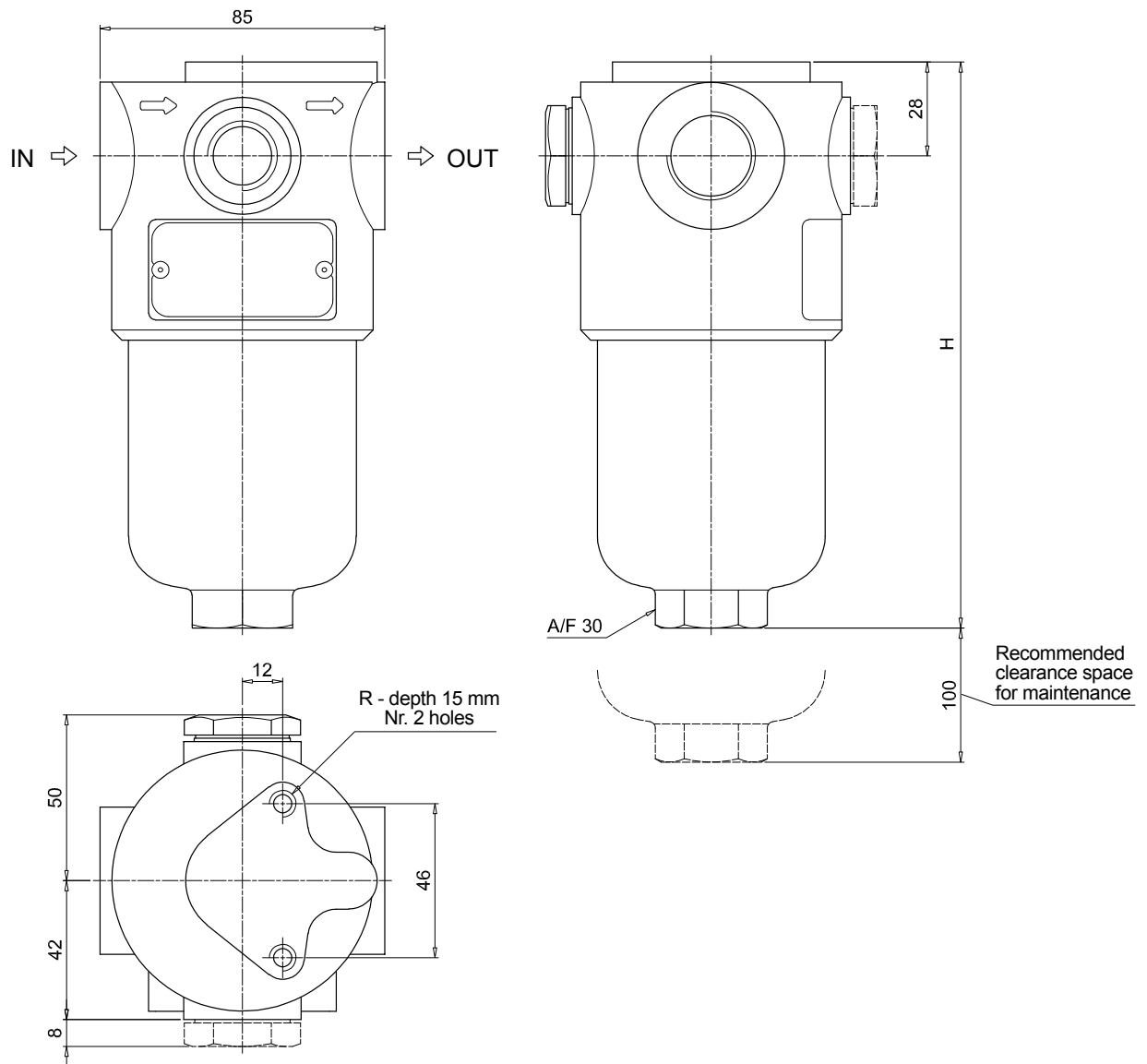
Element Δp	
<b>N</b> 20 bar	
<b>R</b> 20 bar	
<b>H</b> 210 bar	
<b>S</b> 210 bar	

Execution	
<b>P01</b> MP Filtri standard	
<b>Pxx</b> Customized	

### ACCESSORIES

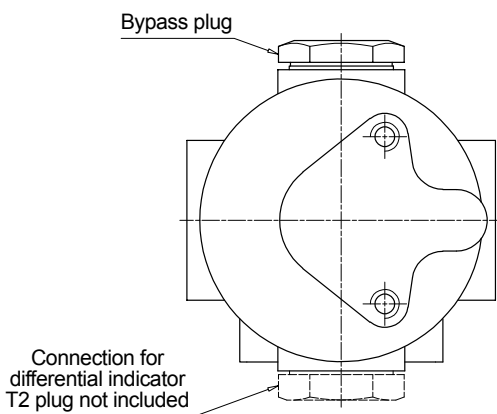
Differential indicators	page	Differential indicators	page
<b>DEA</b> Electrical differential indicator	563	<b>DLE</b> Electrical / visual differential indicator	566
<b>DEH</b> Hazardous area electronic differential indicator	563-564	<b>DTA</b> Electronic differential indicator	567
<b>DEM</b> Electrical differential indicator	564-565	<b>DVA</b> Visual differential indicator	567
<b>DLA</b> Electrical / visual differential indicator	565-566	<b>DVM</b> Visual differential indicator	567

Additional features	page
<b>T2</b> Plug	568

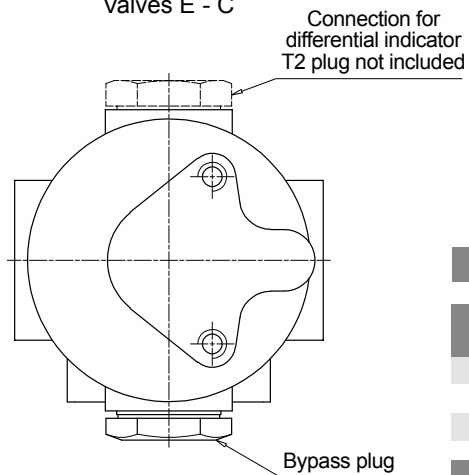


Recommended clearance space for maintenance

Valves S - B - T - D



Valves E - C



### FMP065

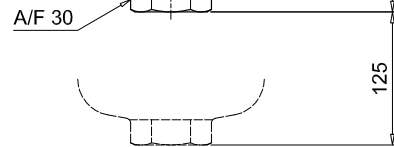
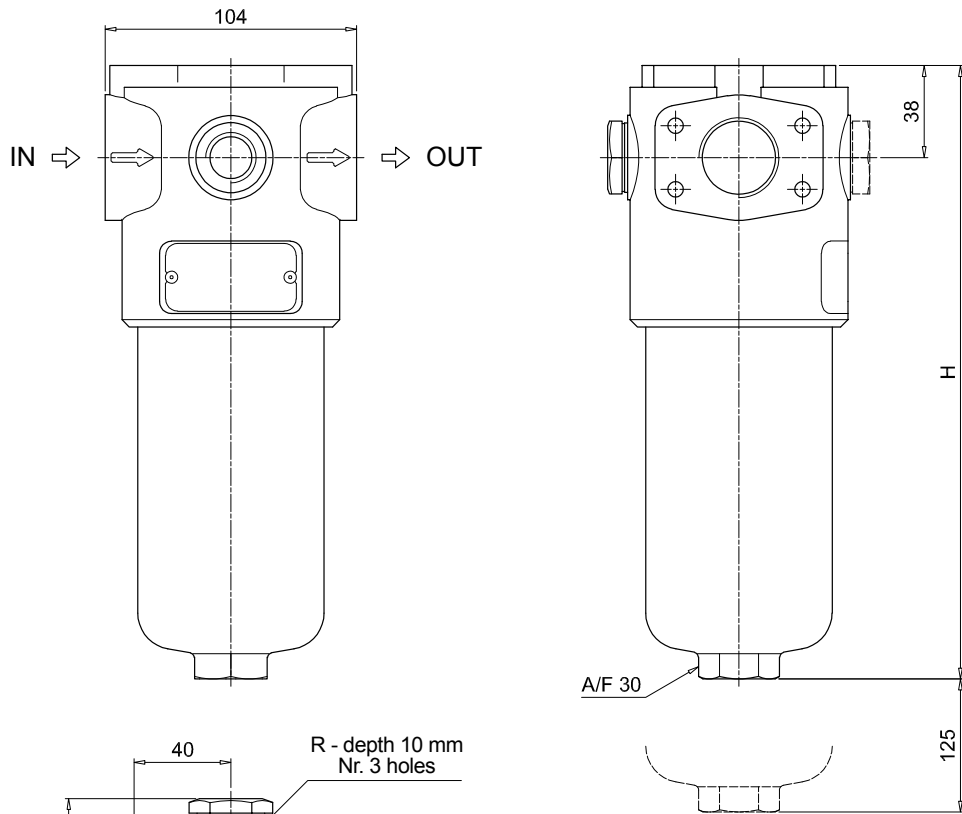
Filter length	H [mm]
1	169
2	200
3	302

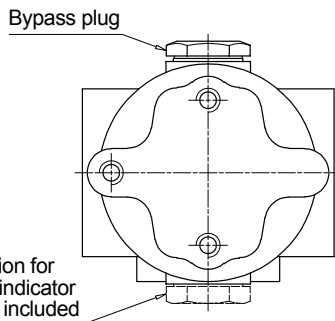
Connections	R
G1-G2	M8
G3-G4-G5-G6	5/16" UNC

# FMP FMP065 - FMP135 - FMP320

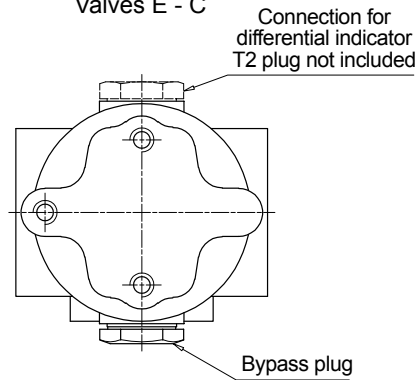
## Dimensions



Valves S - B - T - D



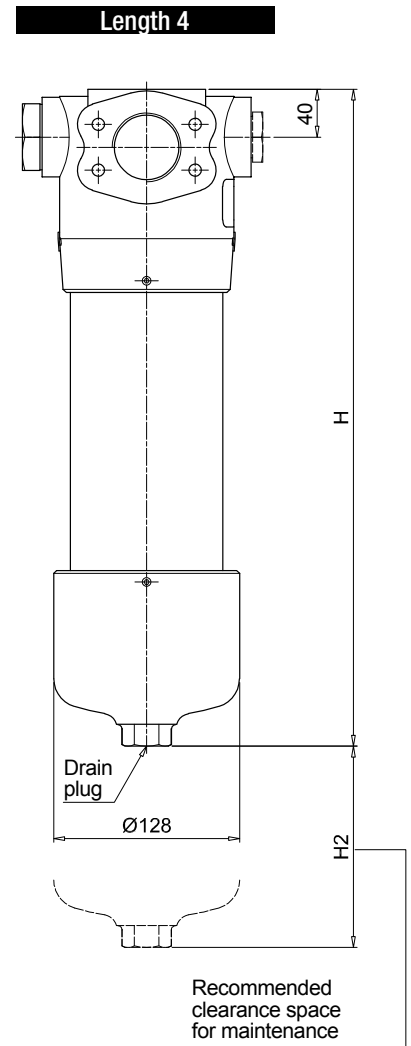
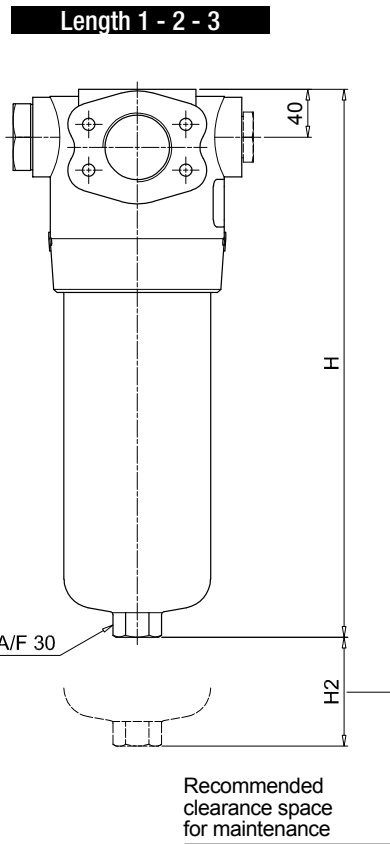
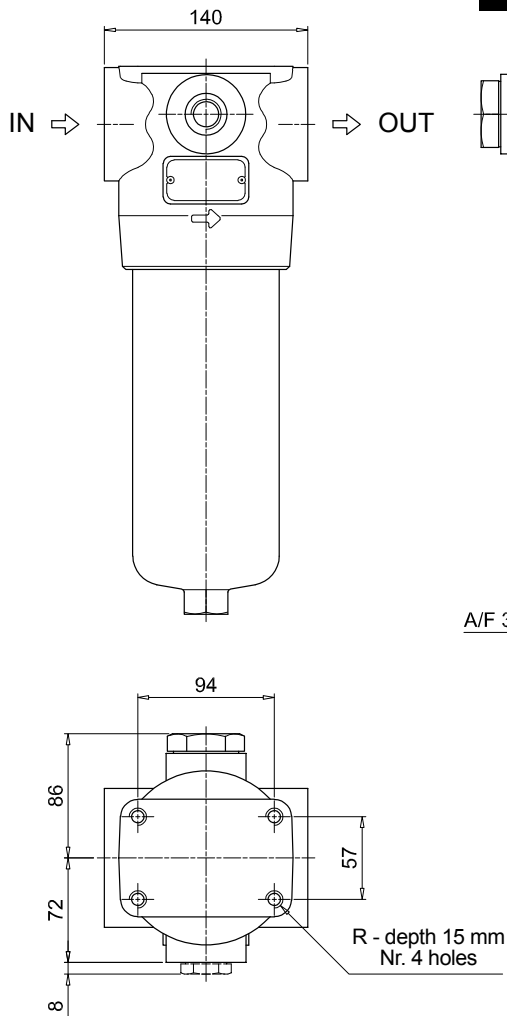
Valves E - C



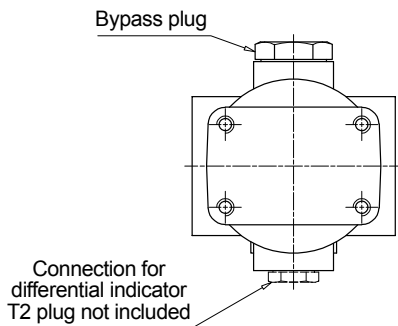
### FMP135

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

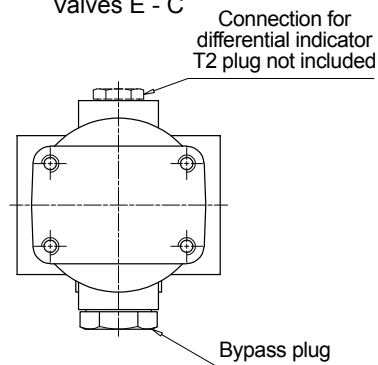
Connections	R
G1-G2	M10
G3-G4-G5-G6	3/8" UNC
F1-F2	M10
F3-F4	3/8" UNC



Valves S - B - T - D



Valves E - C



### FMP320

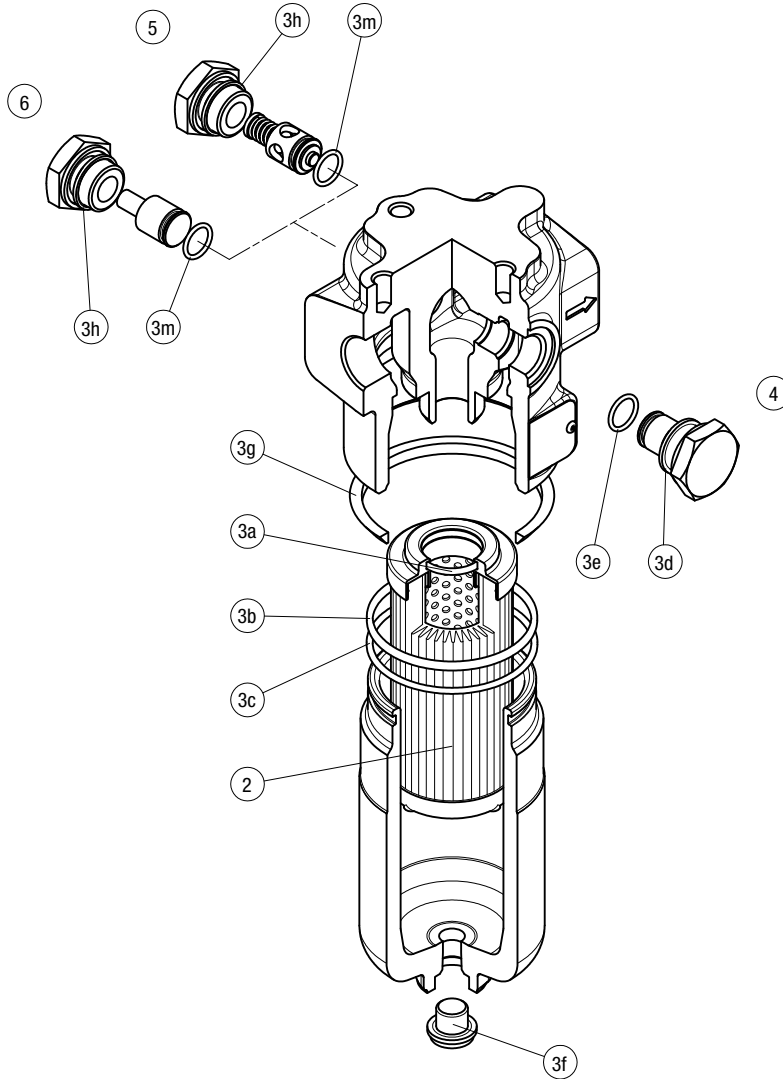
Filter length	H [mm]	H2 [mm]	
		Execution P01	Execution P02
1	263	150	-
2	386	150	-
3	518	150	-
4	671	150	550

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
<b>FMP 065</b>	See order table	02050267	02050278			02001312	02001385	02001314	02001386
<b>FMP 135</b>	See order table	02050293	02050294	T2H	T2V	02001312	02001385	02001314	02001386
<b>FMP 320</b>	See order table	02050274	02050285			02001396	02001397	02001398	02001399







# FHP series

Maximum working pressure up to 42 MPa (420 bar) - Flow rate up to 750 l/min



## Description

## Technical data

### High Pressure filters

#### In-line

**Maximum working pressure up to 42 MPa (420 bar)**

**Flow rate up to 750 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 750 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 - 320  
Steel: FHP 500
- Reverse Flow  
Steel: FHP 320 - 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 - 500:

In-line Inlet/Outlet

FHP 011 - 320:

90° Inlet/Outlet

#### Note

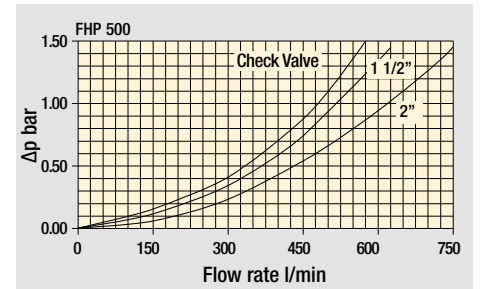
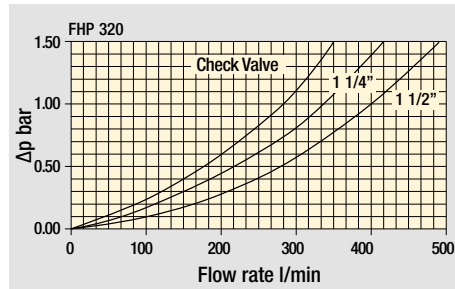
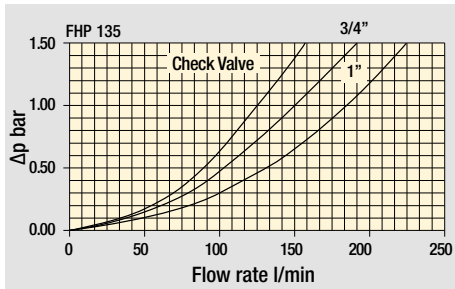
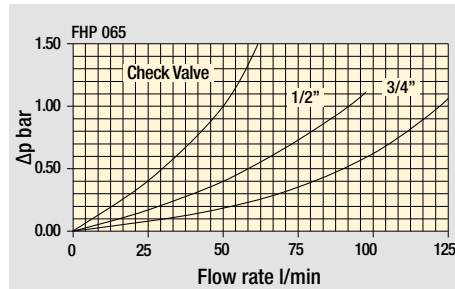
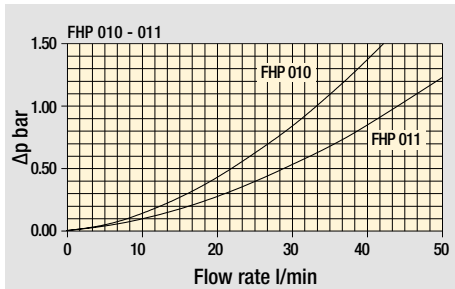
FHP filters are provided for vertical mounting



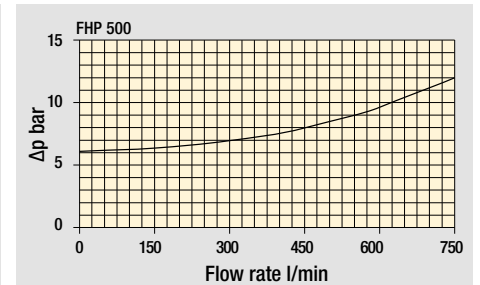
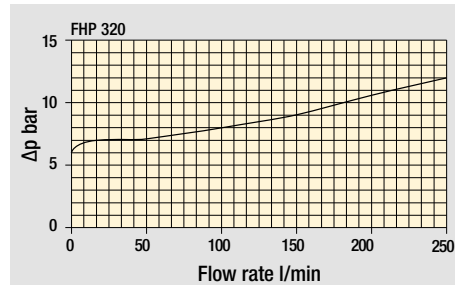
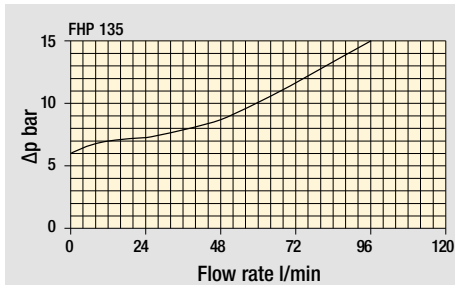
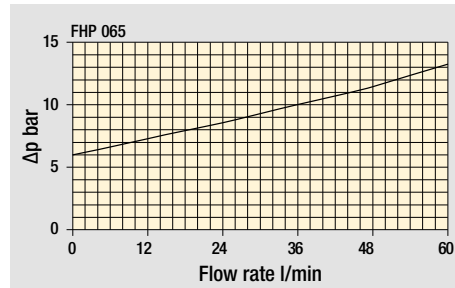
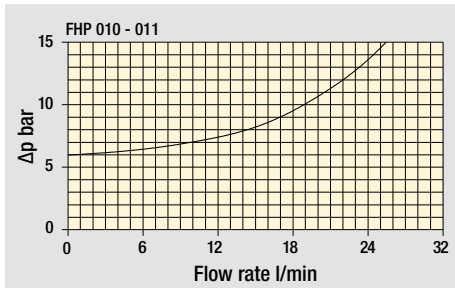
## Weights [kg] and volumes [dm<sup>3</sup>]

Filter series	Weights [kg]					Volumes [dm <sup>3</sup> ]						
	Length	1	2	3	4	5	Length	1	2	3	4	5
<b>FHP 010 - 011</b>		2.05	2.18	2.64	3.13	-		0.10	0.12	0.15	0.20	-
<b>FHP 065</b>		4.26	4.62	5.83	-	-		0.25	0.30	0.50	-	-
<b>FHP 135</b>		7.11	8.71	9.76	-	-		0.43	0.76	0.97	-	-
<b>FHP 320</b>		13.95	16.08	18.37	20.85	-		1.00	1.72	2.49	3.32	-
<b>FHP 500</b>		27.00	31.17	34.69	46.70	52.5		1.71	2.43	3.04	5.18	6.51

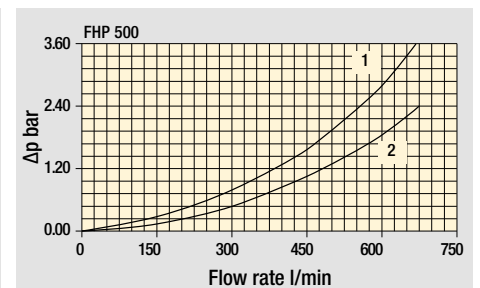
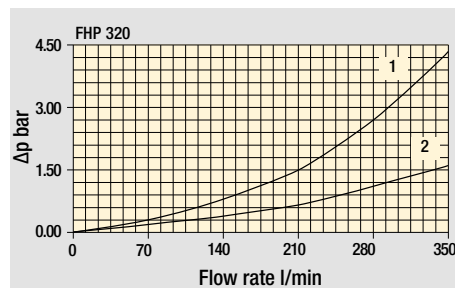
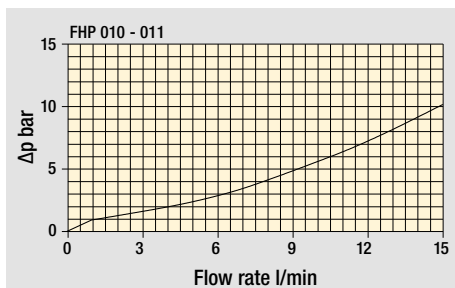
### Filter housings $\Delta p$ pressure drop



### Bypass valve pressure drop



### Valves



Filter housing with check valve

Pressure drop in reverse flow valves

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/dm<sup>3</sup> in compliance with ISO 3968.  $\Delta p$  varies proportionally with density.

# FHP GENERAL INFORMATION

Flow rates [l/min]

Filter series	Length	Filter element design - H Series					Filter element design - N Series					
		A03	A06	A10	A16	A25	A03	A06	A10	A16	A25	M25
<b>FHP 010</b>	<b>1</b>	3	5	6	7	8	4	6	8	9	10	37
	<b>2</b>	5	7	13	16	22	6	8	16	19	24	40
	<b>3</b>	10	13	22	25	30	11	14	23	26	31	41
	<b>4</b>	12	15	25	27	32	16	19	27	30	33	41
<b>FHP 011</b>	<b>1</b>	3	5	6	7	9	4	6	8	9	11	47
	<b>2</b>	5	7	14	17	24	7	9	17	21	28	52
	<b>3</b>	11	14	25	29	36	11	14	26	30	37	53
	<b>4</b>	12	16	28	32	38	17	21	32	36	40	54
<b>FHP 065</b>	<b>1</b>	24	25	50	59	84	25	33	56	63	90	142
	<b>2</b>	33	38	68	77	98	34	52	72	79	106	143
	<b>3</b>	61	70	100	107	123	61	73	101	108	125	147
<b>FHP 135</b>	<b>1</b>	49	55	95	98	147	67	72	115	122	159	184
	<b>2</b>	89	106	129	131	163	105	111	140	142	192	209
	<b>3</b>	120	132	158	166	180	141	143	176	179	193	211
<b>FHP 320</b>	<b>1</b>	97	102	156	162	228	112	121	187	217	253	313
	<b>2</b>	161	181	238	241	283	200	214	282	294	321	330
	<b>3</b>	207	234	276	281	307	246	268	313	322	327	335
	<b>4</b>	233	247	280	284	311	268	281	316	326	338	342
<b>FHP 500</b>	<b>1</b>	144	157	265	268	355	269	305	390	406	444	612
	<b>2</b>	232	262	350	363	398	321	357	433	441	484	619
	<b>3</b>	293	301	398	408	455	396	416	497	499	537	622
	<b>4</b>	336	377	452	455	507	430	475	516	524	545	626
	<b>5</b>	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 mm<sup>2</sup>/s (cSt) and a density of 0.86 kg/dm<sup>3</sup>.

For different pressure drop or fluid viscosity we recommend to use our selection software available on [www.mpfiltri.com](http://www.mpfiltri.com).

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
<b>FHP 010 - 011</b>	•	•			•	•
<b>FHP 065</b>	•	•	•			
<b>FHP 135</b>	•	•	•			
<b>FHP 320</b>	•	•	•	•	•	•
<b>FHP 500</b>	•	•	•	•	•	•



# FHP FHP010 - FHP011

## 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)**

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

Element Δp	Valves				Execution
	S	B	V	Z	
<b>N</b> 20 bar		•		•	<b>P01</b> MP Filtri standard
<b>H</b> 210 bar	•		•		<b>Pxx</b> 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)**

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

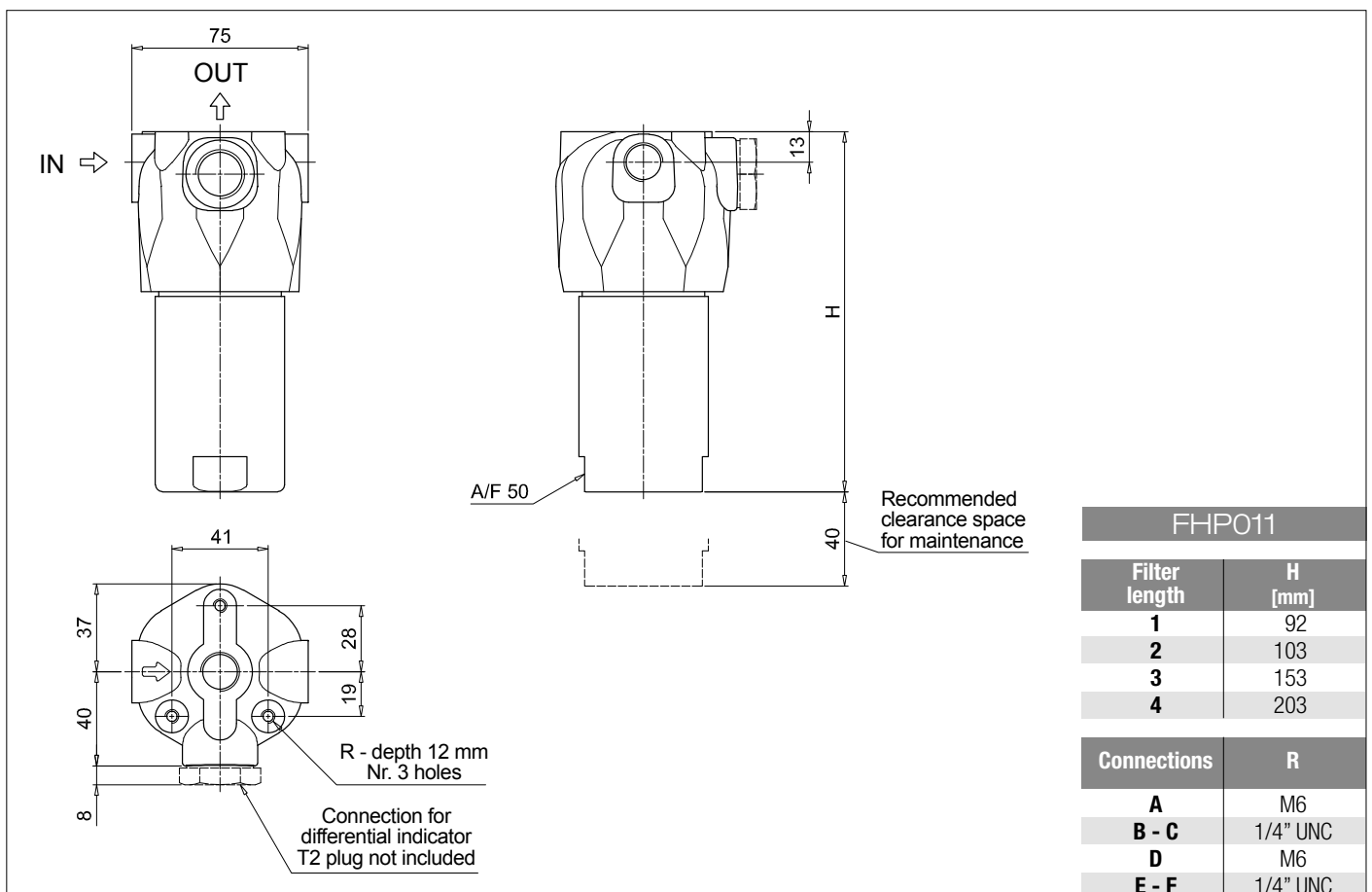
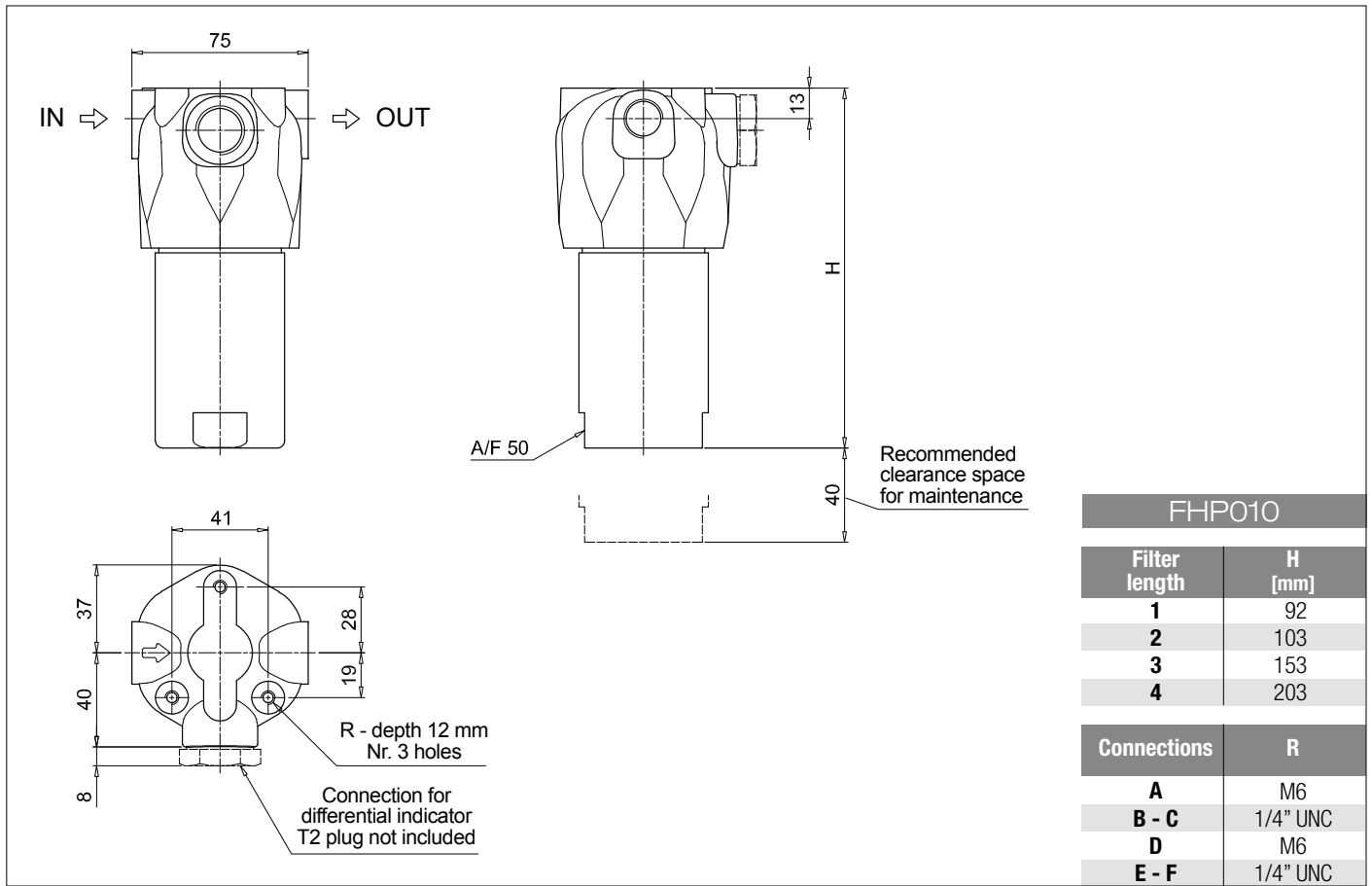
**Seals**  
**A** NBR  
**V** FPM

Element Δp	Execution	
	<b>N</b> 20 bar	<b>P01</b> MP Filtri standard
<b>H</b> 210 bar	<b>Pxx</b> Customized	

### ACCESSORIES

Differential indicators		page			page
<b>DEA</b> Electrical differential indicator		563	<b>DLE</b> Electrical / visual differential indicator		566
<b>DEH</b> Hazardous area electronic differential indicator	563-564		<b>DTA</b> Electronic differential indicator		567
<b>DEM</b> Electrical differential indicator	564-565		<b>DVA</b> Visual differential indicator		567
<b>DLA</b> Electrical / visual differential indicator	565-566		<b>DVM</b> Visual differential indicator		567
Additional features		page			
<b>T2</b> Plug		568			





# FHP FHP065 - FHP135 - FHP320

## Designation & Ordering code

### COMPLETE FILTER

Series and size Configuration example: **FHP320** **4** **V** **A** **G1** **A06** **S** **P01**

**FHP065** | **FHP135** | **FHP320**

Length	FHP065	FHP135	FHP320
<b>1</b>	•	•	•
<b>2</b>	•	•	•
<b>3</b>	•	•	•
<b>4</b>			•

Valves	FHP065	FHP135	FHP320
<b>S</b> Without bypass	•	•	•
<b>B</b> With bypass 6 bar	•	•	•
<b>T</b> With check valve, without bypass	•	•	•
<b>D</b> With check valve, with bypass 6 bar			•
<b>V</b> With reverse flow, without bypass			•
<b>Z</b> With reverse flow, with bypass 6 bar			•

Seals	FHP065	FHP135	FHP320
<b>A</b> NBR			•
<b>V</b> FPM			•

Connections	FHP065	FHP135	FHP320
<b>G1</b>	G 1/2"	G 3/4"	G 1 1/4"
<b>G2</b>	G 3/4"	G 1"	G 1 1/2"
<b>G3</b>	1/2" NPT	3/4" NPT	1 1/4" NPT
<b>G4</b>	3/4" NPT	1" NPT	1 1/2" NPT
<b>G5</b>	SAE 8 - 3/4" - 16 UNF	SAE 12 - 1 1/16" - 12 UN	SAE 20 - 1 5/8" - 12 UN
<b>G6</b>	SAE 12 - 1 1/16" - 12 UN	SAE 16 - 1 5/16" - 12 UN	SAE 24 - 1 7/8" - 12 UN
<b>F1</b>	-	3/4" SAE 3000 psi/M	1 1/4" SAE 3000 psi/M
<b>F2</b>	-	1" SAE 3000 psi/M	1 1/2" SAE 3000 psi/M
<b>F3</b>	-	3/4" SAE 3000 psi/UNC	1 1/4" SAE 3000 psi/UNC
<b>F4</b>	-	1" SAE 3000 psi/UNC	1 1/2" SAE 3000 psi/UNC
<b>F5</b>	-	3/4" SAE 6000 psi/M	1 1/4" SAE 6000 psi/M
<b>F6</b>	-	3/4" SAE 6000 psi/UNC	1 1/4" SAE 6000 psi/UNC

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

Element Δp	Valves					
	S	B	T	D	V	Z
<b>N</b> 20 bar		•				
<b>R</b> 20 bar				•		•
<b>H</b> 210 bar	•					
<b>S</b> 210 bar			•		•	

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

### FILTER ELEMENT

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

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

Element length	HP065	HP135	HP320
<b>1</b>	•	•	•
<b>2</b>	•	•	•
<b>3</b>	•	•	•
<b>4</b>			•

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

Seals
<b>A</b> NBR
<b>V</b> FPM

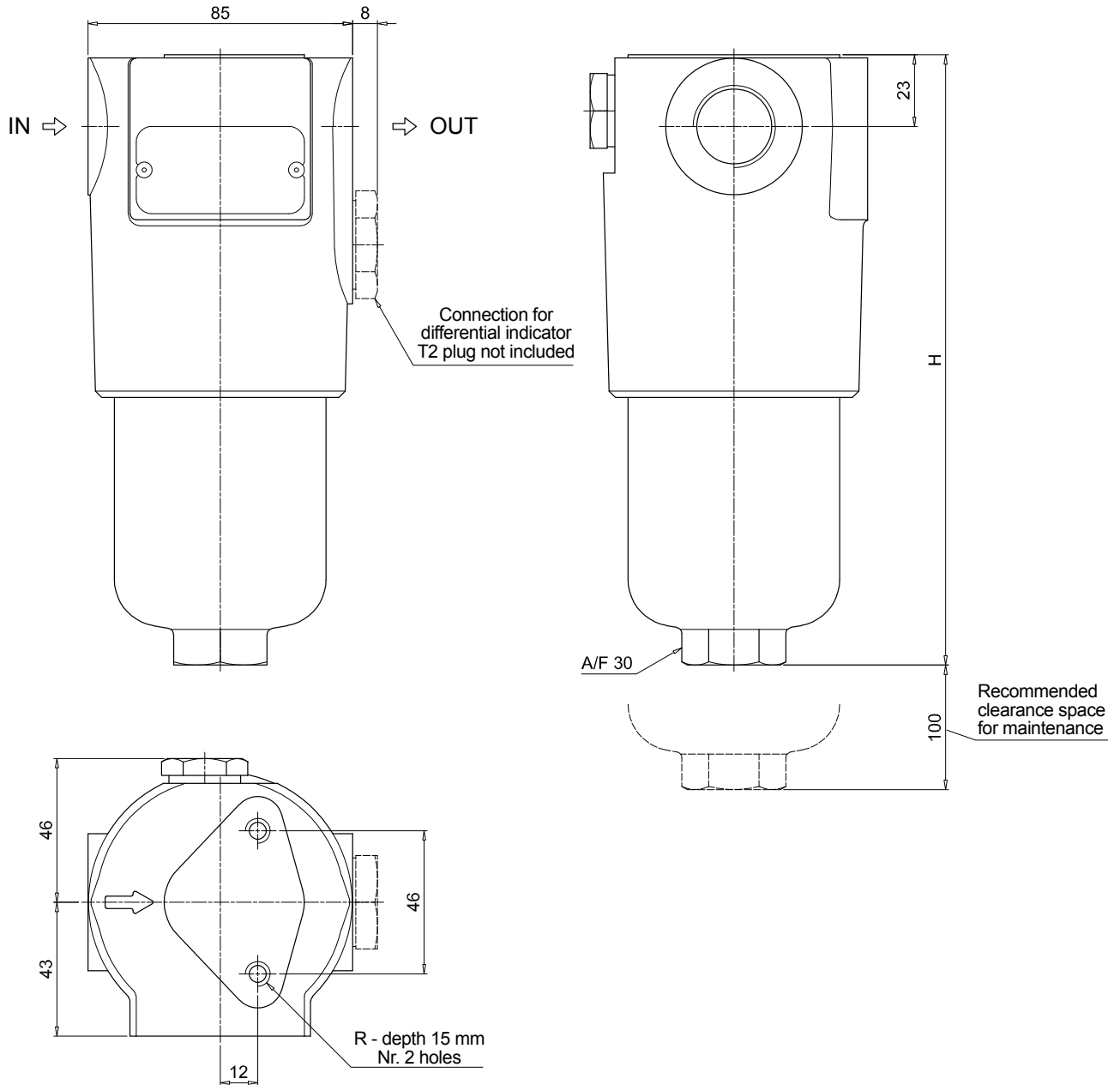
Element Δp
<b>N</b> 20 bar
<b>R</b> 20 bar
<b>H</b> 210 bar
<b>S</b> 210 bar

Execution
<b>P01</b> MP Filtri standard
<b>Pxx</b> Customized

### ACCESSORIES

Differential indicators	page		page
<b>DEA</b> Electrical differential indicator	563	<b>DLE</b> Electrical / visual differential indicator	566
<b>DEH</b> Hazardous area electronic differential indicator	563-564	<b>DTA</b> Electronic differential indicator	567
<b>DEM</b> Electrical differential indicator	564-565	<b>DVA</b> Visual differential indicator	567
<b>DLA</b> Electrical / visual differential indicator	565-566	<b>DVM</b> Visual differential indicator	567

Additional features	page
<b>T2</b> Plug	568

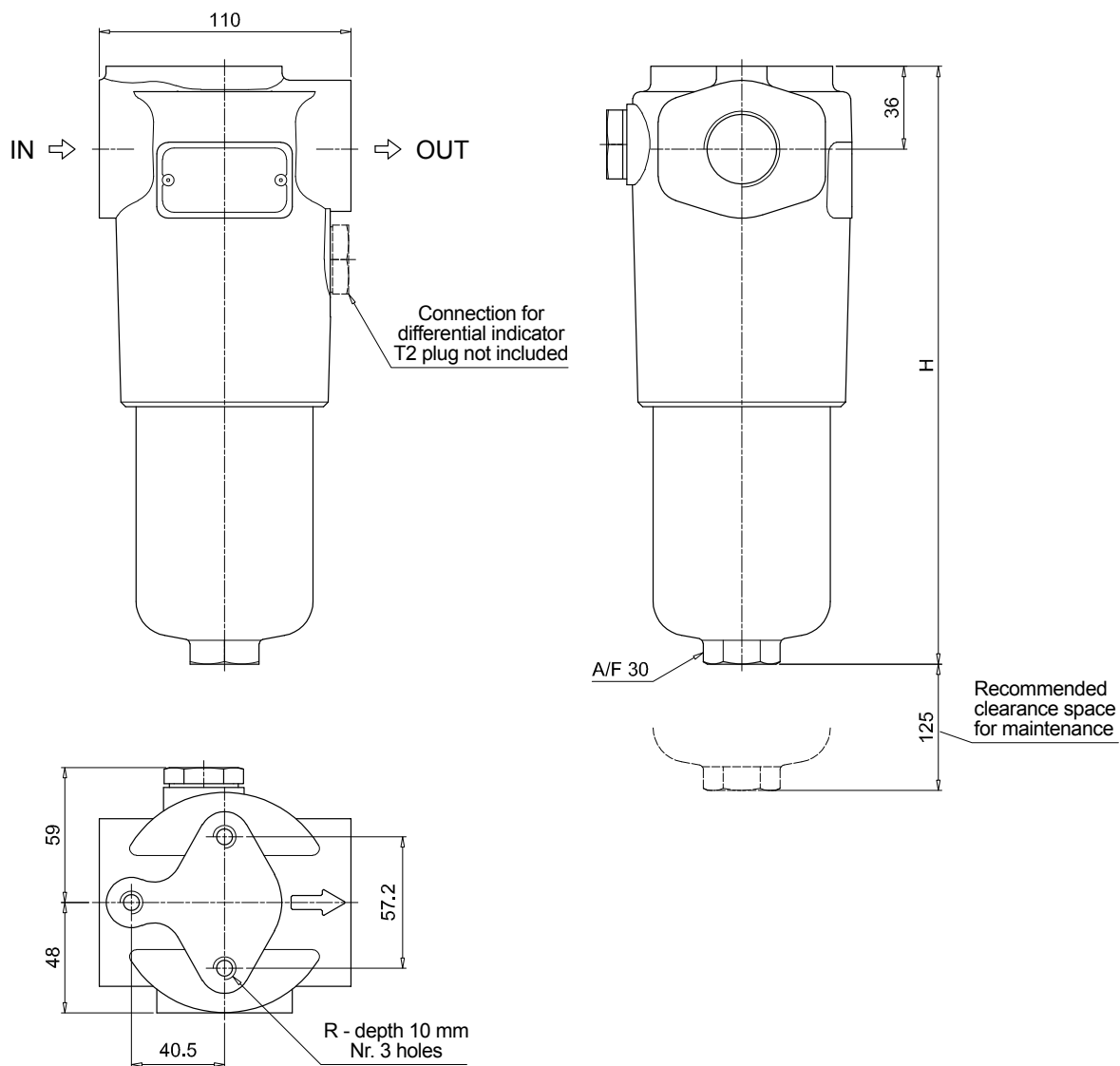


### FHP065

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

# FHP FHP065 - FHP135 - FHP320

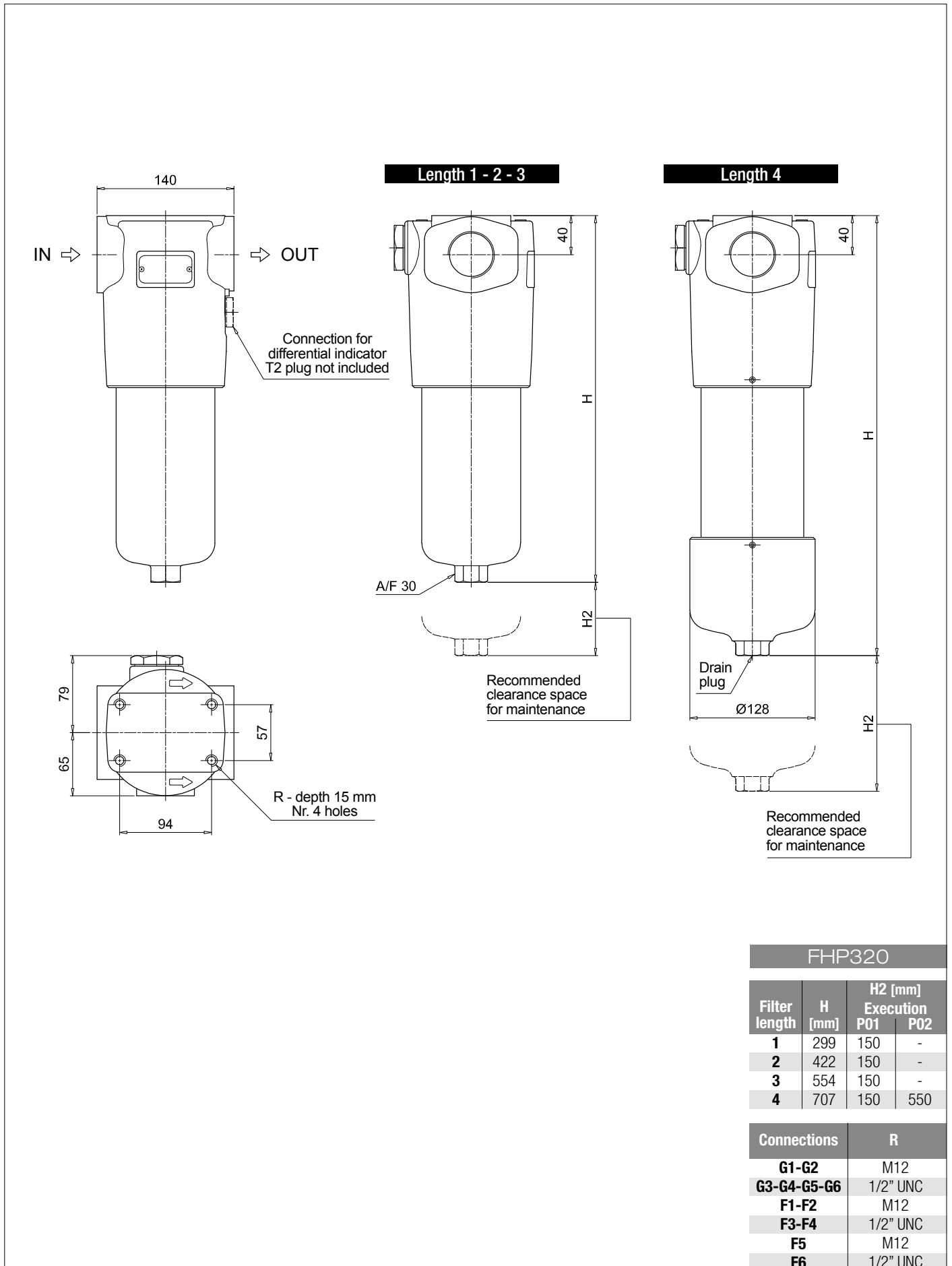
## Dimensions



### FHP135

Filter length	H [mm]
<b>1</b>	260
<b>2</b>	373
<b>3</b>	448

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



FHP320			
Filter length	H [mm]	H2 [mm]	
		Execution P01	P02
1	299	150	-
2	422	150	-
3	554	150	-
4	707	150	550

Connections	R
G1-G2	M12
G3-G4-G5-G6	1/2" UNC
F1-F2	M12
F3-F4	1/2" UNC
F5	M12
F6	1/2" UNC

## Designation & Ordering code

### COMPLETE FILTER

Series and size **FHP500** Configuration example: **FHP500** **4** **V** **A** **G1** **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

- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| <b>G1</b> G 1 1/2"                | <b>F4</b> 2" SAE 3000 psi/UNC     |
| <b>G2</b> 1 1/2" NPT              | <b>F5</b> 1 1/2" SAE 6000 psi/M   |
| <b>G3</b> SAE 24 - 1 7/8" - 12 UN | <b>F6</b> 1 1/2" SAE 6000 psi/UNC |
| <b>F1</b> 1 1/2" SAE 3000 psi/M   | <b>F7</b> 2" SAE 6000 psi/M       |
| <b>F2</b> 1 1/2" SAE 3000 psi/UNC | <b>F8</b> 2" SAE 6000 psi/UNC     |
| <b>F3</b> 2" SAE 3000 psi/M       |                                   |

#### 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
<b>N</b> 20 bar		•				
<b>R</b> 20 bar				•		•
<b>S</b> 210 bar	•		•		•	

#### Execution

Execution	Filter length				
	1	2	3	4	5
<b>P01</b> MP Filtri standard	•	•	•	•	•
<b>P02</b> Maintenance from the bottom of the housing				•	•
<b>P03</b> Drain plug on length 1 - 2 - 3	•	•	•		
<b>Pxx</b> 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	
<b>A</b>	NBR
<b>V</b>	FPM

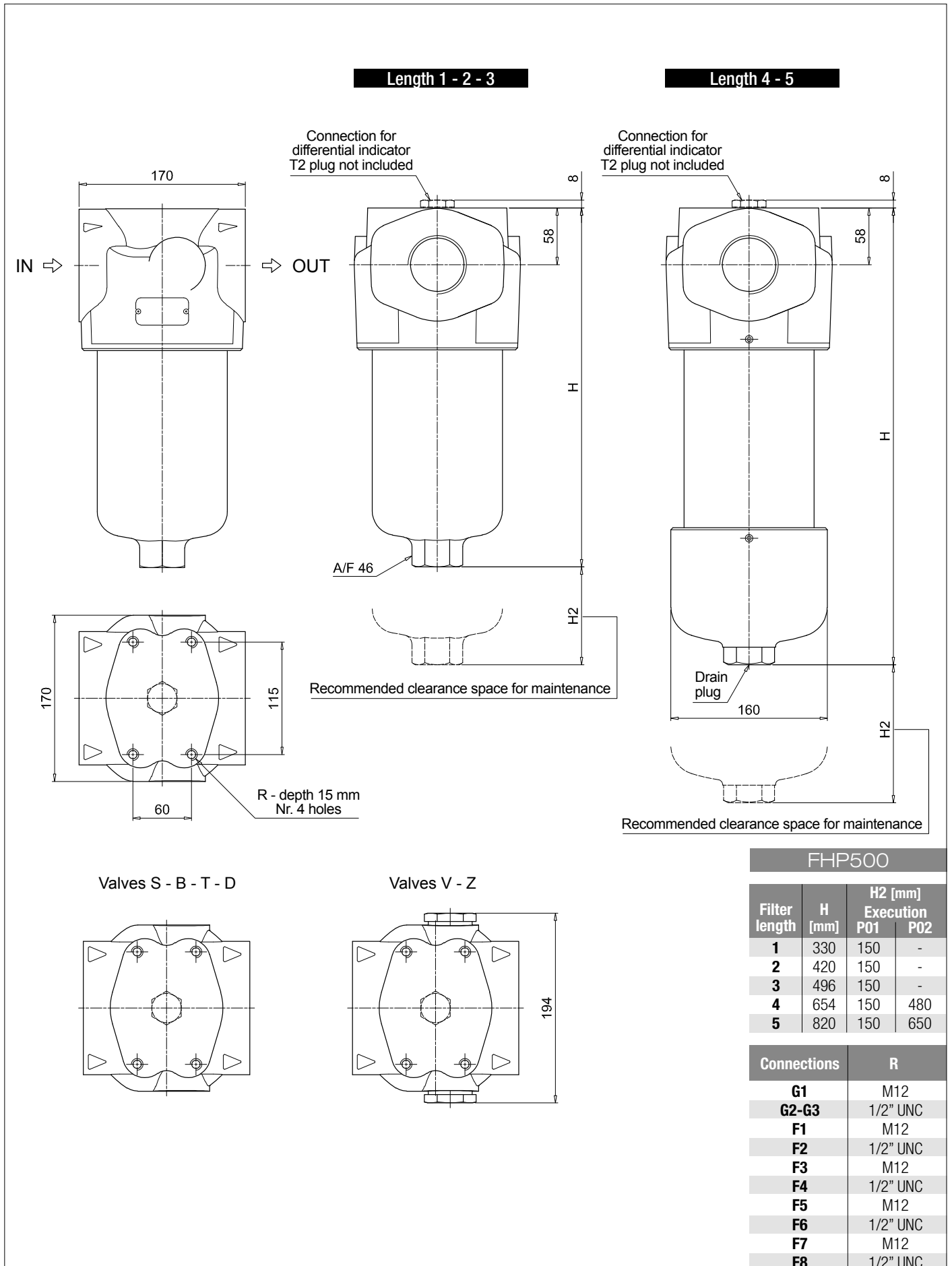
Element Δp	
<b>N</b>	20 bar
<b>R</b>	20 bar
<b>S</b>	210 bar

Execution	
<b>P01</b>	MP Filtri standard
<b>Pxx</b>	Customized

### ACCESSORIES

Differential indicators		page			page
<b>DEA</b>	Electrical differential indicator	563	<b>DLE</b>	Electrical / visual differential indicator	566
<b>DEH</b>	Hazardous area electronic differential indicator	563-564	<b>DTA</b>	Electronic differential indicator	567
<b>DEM</b>	Electrical differential indicator	564-565	<b>DVA</b>	Visual differential indicator	567
<b>DLA</b>	Electrical / visual differential indicator	565-566	<b>DVM</b>	Visual differential indicator	567

Additional features		page
<b>T2</b>	Plug	568

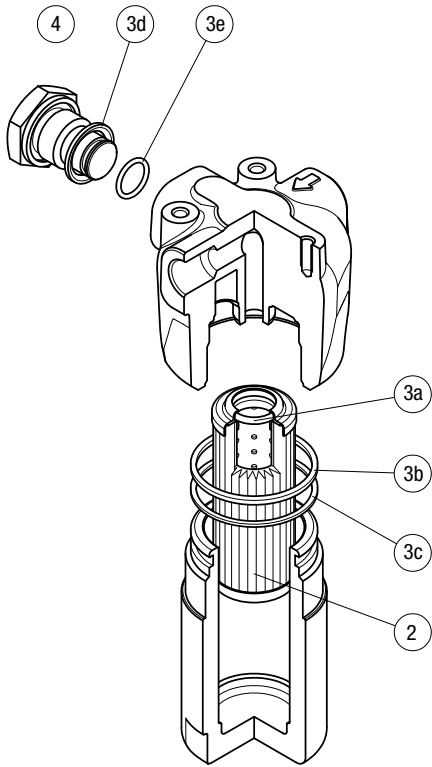




# FHP SPARE PARTS

Order number for spare parts

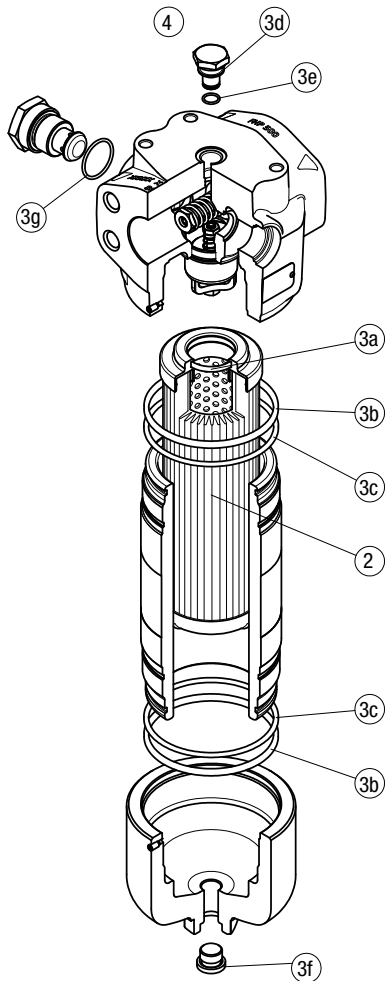
## FHP 010 - 011



Q.ty:  
nr. 0 pcs. for version 1  
(without indicator port)  
  
nr. 1 pc. for version 2  
(with indicator port)

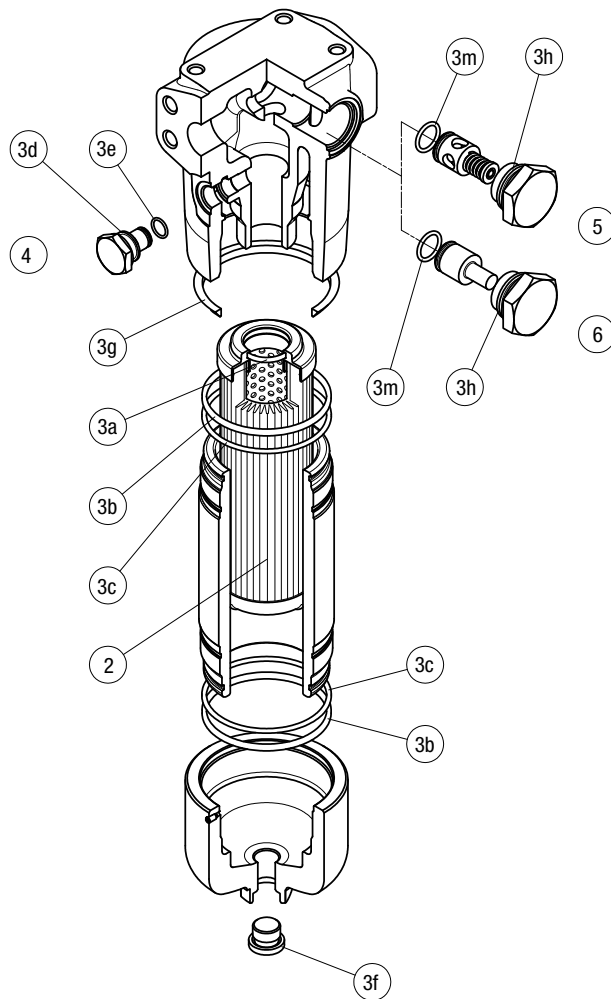
Filter series	Q.ty: 1 pc.		Q.ty: 1 pc.		Q.ty: 1 pc.	
	Item: 2	Filter element	Seal Kit code number 3 (3a ÷ 3e)		Indicator connection plug 4	
		NBR	FPM	NBR	FPM	
<b>FHP 010-011</b>	See order table	02050501	02050492	T2H	T2V	

## FHP 500



Filter series	Q.ty: 1 pc.		Q.ty: 1 pc.		Q.ty: 1 pc.	
	Item: 2	Filter element	Seal Kit code number 3 (3a ÷ 3g)		Indicator connection plug 4	
		NBR	FPM	NBR	FPM	
<b>FHP 500</b>	See order table	02050330	02050331	T2H	T2V	

FHP 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
<b>FHP 065</b>	See order table	02050265	02050276	T2H	T2V	02001116	02001136	02001142	02001139
<b>FHP 135</b>		02050269	02050280			02001117	02001137	02001143	02001392
<b>FHP 320</b>		02050272	02050283			02001118	02001138	02001144	02001395



# FMM series

Maximum working pressure up to 42 MPa (420 bar) - Flow rate up to 250 l/min



### High Pressure filters

#### In-line

**Maximum working pressure up to 42 MPa (420 bar)**

**Flow rate up to 250 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  
Phosphatized cast iron: FMM 050  
Painted cast iron: FMM 150

- 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

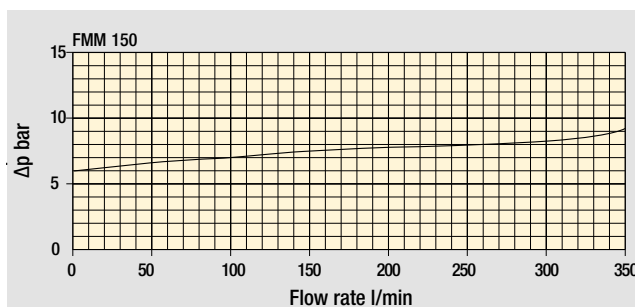
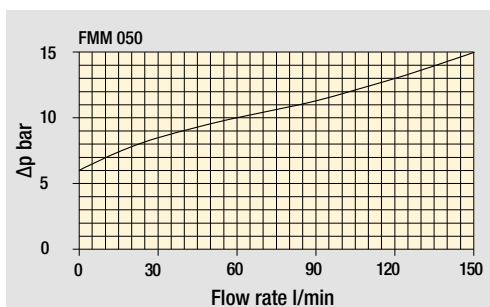
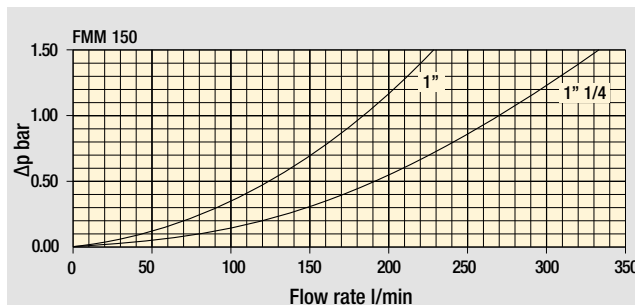
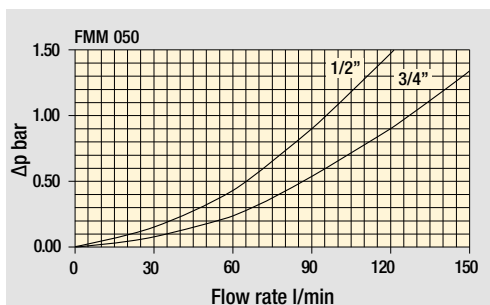
FMM filters are provided for vertical mounting



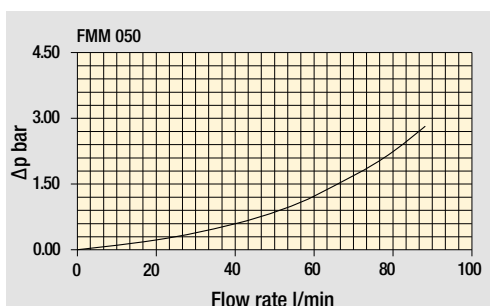
## Weights [kg] and volumes [dm<sup>3</sup>]

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

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/dm<sup>3</sup> in compliance with ISO 3968.  
Δp varies proportionally with density.

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
<b>FMM 050</b>	<b>1</b>	42	43	79	82	106	147	29	39	57	59	74
	<b>2</b>	52	57	85	96	121	149	45	49	76	88	114
	<b>3</b>	66	69	97	106	130	150	58	61	89	99	125
	<b>4</b>	83	89	113	115	134	152	74	80	106	108	129
	<b>5</b>	107	110	130	134	141	154	93	95	111	121	139
<b>FMM 150</b>	<b>1</b>	81	88	156	163	179	295					
	<b>2</b>	142	145	227	230	236	312					
	<b>3</b>	170	180	242	245	263	315					

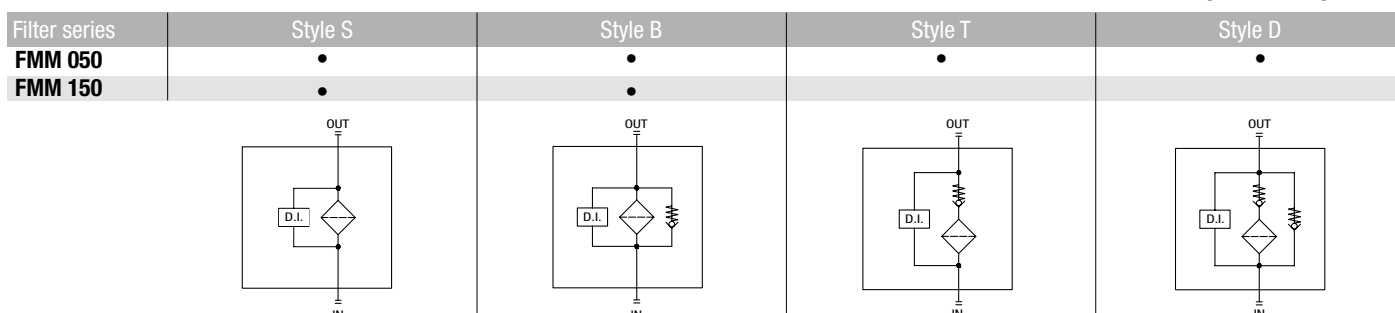
**Maximum flow rate for a complete pressure filter with a pressure drop Δp = 1.5 bar.**

The reference fluid has a kinematic viscosity of 30 mm<sup>2</sup>/s (cSt) and a density of 0.86 kg/dm<sup>3</sup>.

For different pressure drop or fluid viscosity we recommend to use our selection software available on [www.mpfiltri.com](http://www.mpfiltri.com).

Please, contact our Sales Department for further additional information.

Hydraulic symbols



## 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
- B** M22x1.5 - ISO 6149
- C** G 1/2"
- D** G 3/4"
- E** 1/2" NPT
- F** 3/4" NPT
- G** SAE 8 - 3/4" - 16 UNF
- 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	
<b>N</b> 20 bar		•			
<b>R</b> 20 bar				•	
<b>S</b> 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 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	
<b>A</b>	NBR
<b>V</b>	FPM

Element Δp	
<b>N</b>	20 bar
<b>R</b>	20 bar
<b>S</b>	210 bar

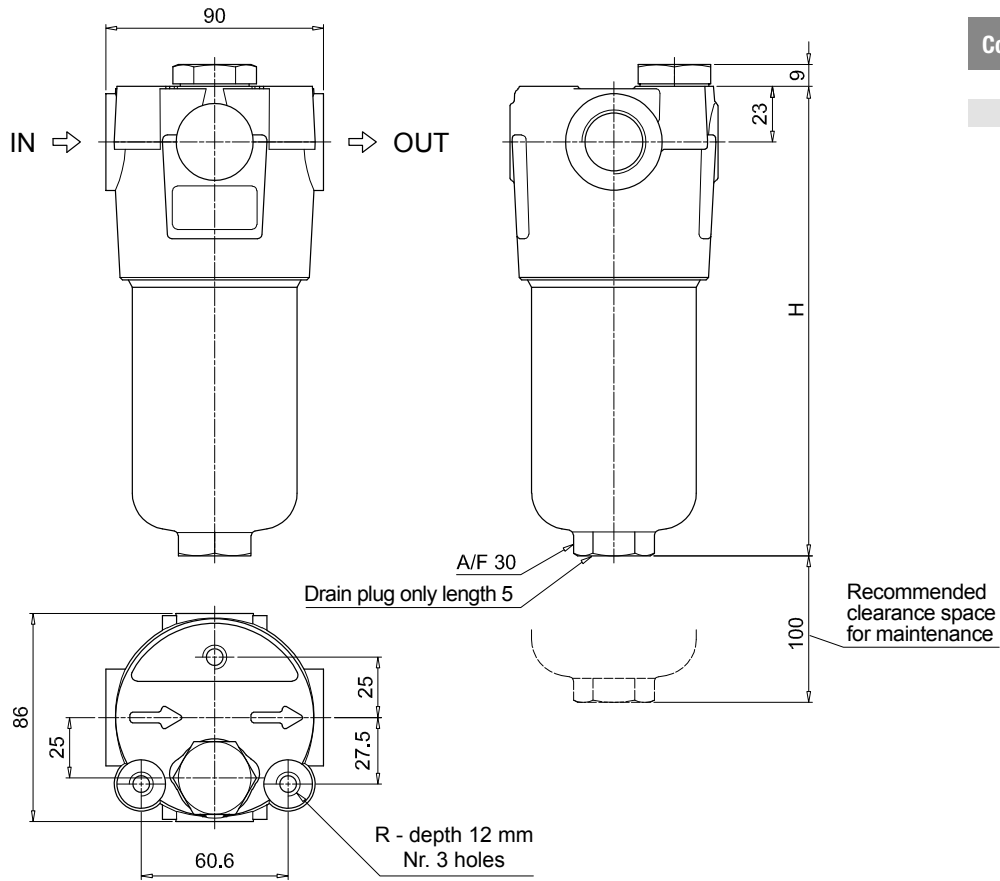
Execution	
<b>P01</b>	MP Filtri standard
<b>Pxx</b>	Customized

### ACCESSORIES

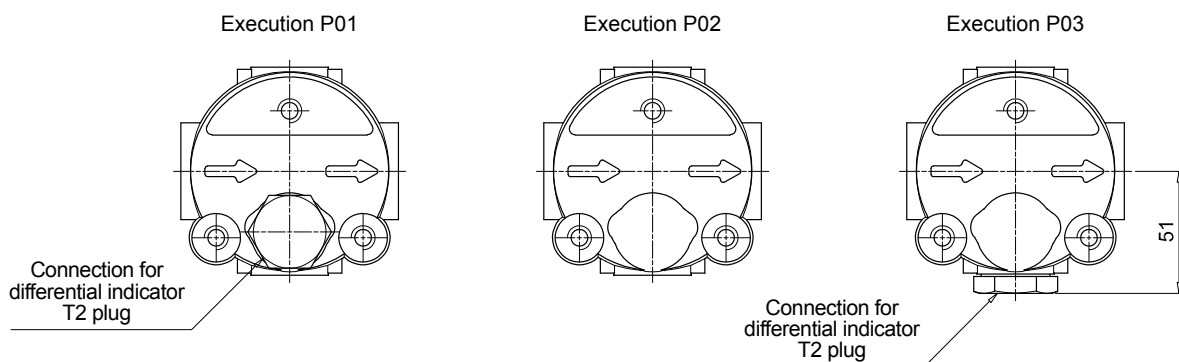
Differential indicators		page			page
<b>DEA</b>	Electrical differential indicator	563	<b>DLE</b>	Electrical / visual differential indicator	566
<b>DEH</b>	Hazardous area electronic differential indicator	563-564	<b>DTA</b>	Electronic differential indicator	567
<b>DEM</b>	Electrical differential indicator	564-565	<b>DVA</b>	Visual differential indicator	567
<b>DLA</b>	Electrical / visual differential indicator	565-566	<b>DVM</b>	Visual differential indicator	567

Additional features		page
<b>T2</b>	Plug	568





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



## Designation & Ordering code

### COMPLETE FILTER

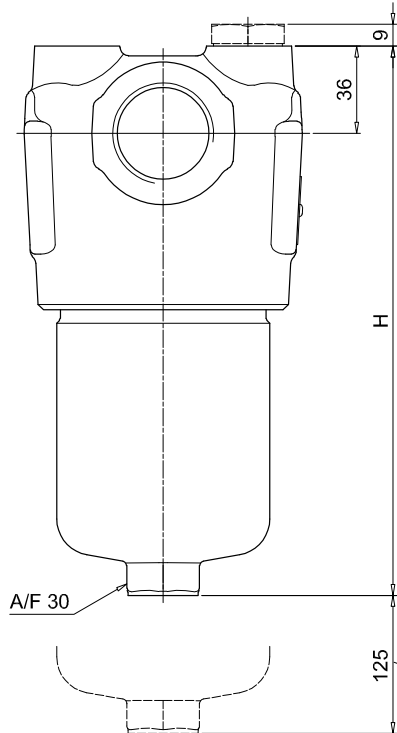
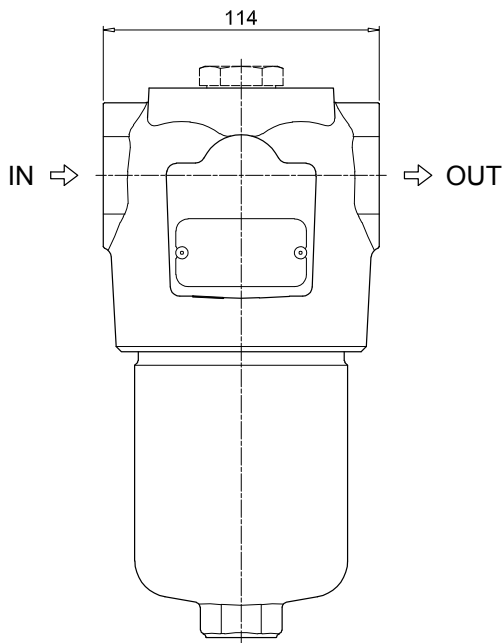
<b>Series and size</b>	Configuration example: <b>FMM150</b>   <b>2</b>   <b>B</b>   <b>A</b>   <b>D</b>   <b>2</b>   <b>M25</b>   <b>N</b>   <b>P01</b>															
<b>FMM150</b>																
<b>Length</b>	1   2   3															
<b>Valves</b>	S Without bypass B With bypass 6 bar															
<b>Seals</b>	A NBR V FPM															
<b>Connections</b>	C G 1" D G 1 1/4" E 1" NPT F 1 1/4" NPT G SAE 16 - 1 5/16" - 12 UN H SAE 20 - 1 5/8" - 12 UN															
<b>Connection for differential indicator</b>	1 Without connection 2 Upper connection 3 Frontal connection															
<b>Filtration rating (filter media)</b>	<table border="0"> <tr> <td><b>A03</b> Inorganic microfiber 3 µm</td> <td><b>A16</b> Inorganic microfiber 16 µm</td> </tr> <tr> <td><b>A06</b> Inorganic microfiber 6 µm</td> <td><b>A25</b> Inorganic microfiber 25 µm</td> </tr> <tr> <td><b>A10</b> Inorganic microfiber 10 µm</td> <td><b>M25</b> Wire mesh 25 µm</td> </tr> </table>										<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm	<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm	<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm
<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm															
<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm															
<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm															
	<b>Element Δp</b>					<b>Execution</b>										
	N 20 bar					P01 MP Filtri standard Pxx Customized										

### FILTER ELEMENT

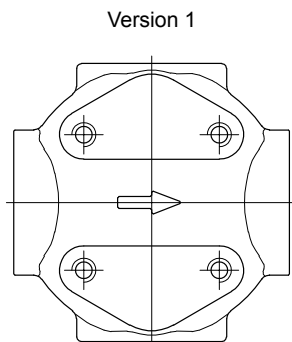
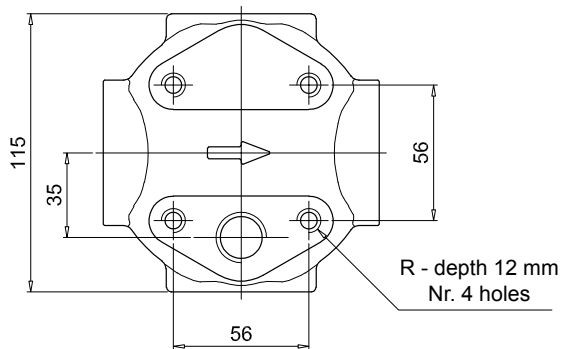
<b>Element series and size</b>	Configuration example: <b>HP150</b>   <b>2</b>   <b>M25</b>   <b>A</b>   <b>N</b>   <b>P01</b>												
<b>HP150</b>													
<b>Element length</b>	1   2   3												
<b>Filtration rating (filter media)</b>	<table border="0"> <tr> <td><b>A03</b> Inorganic microfiber 3 µm</td> <td><b>A16</b> Inorganic microfiber 16 µm</td> </tr> <tr> <td><b>A06</b> Inorganic microfiber 6 µm</td> <td><b>A25</b> Inorganic microfiber 25 µm</td> </tr> <tr> <td><b>A10</b> Inorganic microfiber 10 µm</td> <td><b>M25</b> Wire mesh 25 µm</td> </tr> </table>							<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm	<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm	<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm
<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm												
<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm												
<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm												
	<b>Seals</b>		<b>Element Δp</b>		<b>Execution</b>								
	A NBR V FPM		N 20 bar		P01 MP Filtri standard Pxx Customized								

### ACCESSORIES

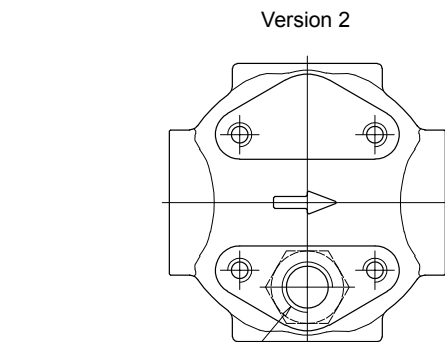
<b>Differential indicators</b>	page		page
<b>DEA</b> Electrical differential indicator	563	<b>DLE</b> Electrical / visual differential indicator	566
<b>DEH</b> Hazardous area electronic differential indicator	563-564	<b>DTA</b> Electronic differential indicator	567
<b>DEM</b> Electrical differential indicator	564-565	<b>DVA</b> Visual differential indicator	567
<b>DLA</b> Electrical / visual differential indicator	565-566	<b>DVM</b> Visual differential indicator	567
<b>Additional features</b>	page		
<b>T2</b> Plug	568		



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

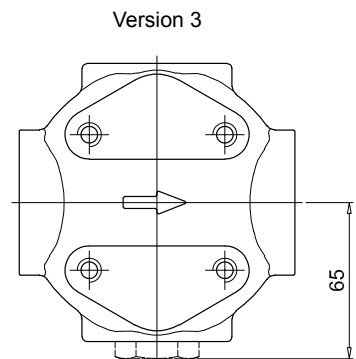


Version 1



Version 2

Connection for differential indicator  
T2 plug not included



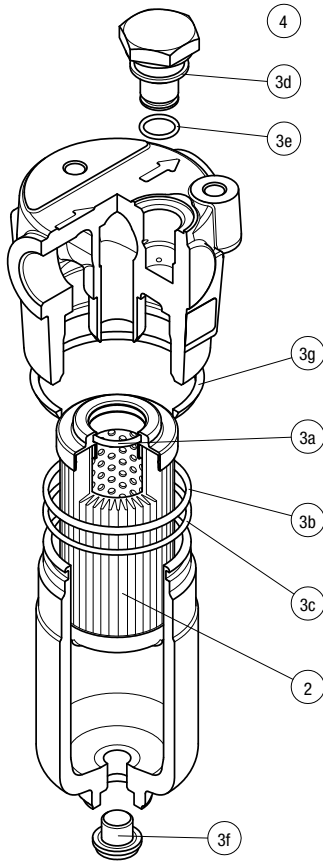
Version 3

Connection for differential indicator  
T2 plug not included

# FMM SPARE PARTS

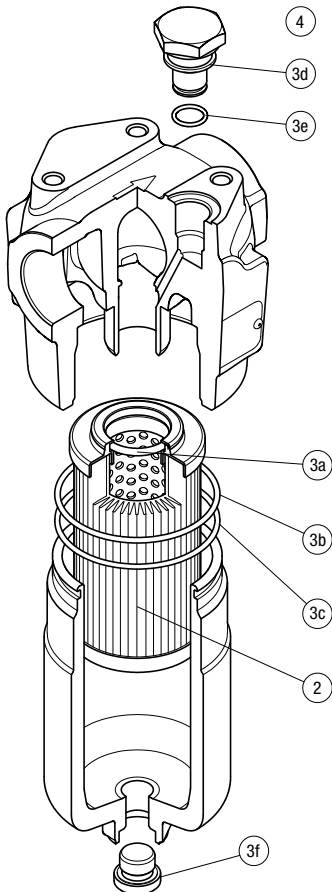
Order number for spare parts

## FMM 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	
FMM 050	See order table	NBR	FPM	NBR	FPM
	2	3 (3a ÷ 3g)		4	
		02050314	02050315	T2H	T2V

## FMM 150



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





# FHA 051 series

Maximum working pressure up to 56 MPa (560 bar) - Flow rate up to 140 l/min



## Description

## Technical data

### High Pressure filters

#### In-line

**Maximum working pressure up to 56 MPa (560 bar)**

**Flow rate up to 140 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 140 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

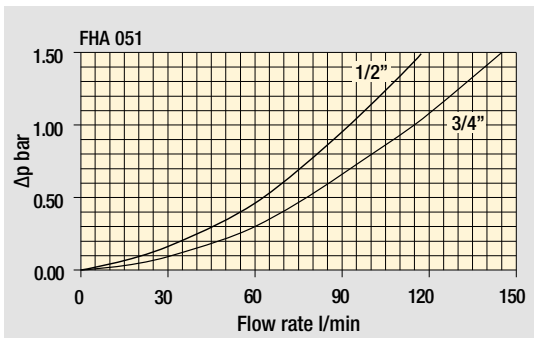
FHA filters are provided for vertical mounting



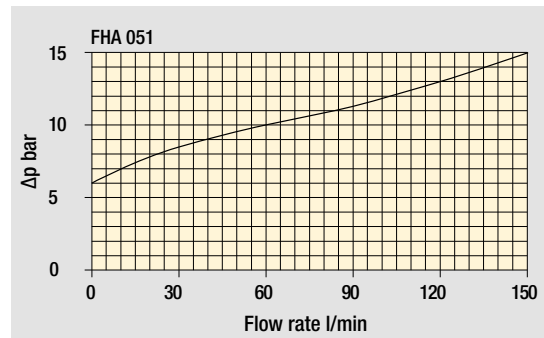
## Weights [kg] and volumes [dm<sup>3</sup>]

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

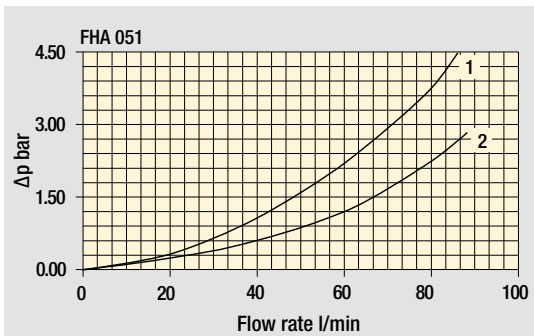




Filter housings  
Δp pressure drop



Bypass valve  
pressure drop



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/dm<sup>3</sup> in compliance with ISO 3968.  
Δp varies proportionally with density.

## Flow rates [l/min]

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
<b>FHA 051</b>	<b>1</b>	42	41	82	85	110	156	42	41	82	85	110	30	40	58	60	76
	<b>2</b>	53	58	87	100	127	158	53	58	87	100	127	45	50	78	91	120
	<b>3</b>	68	71	101	111	137	160	68	71	101	111	137	59	62	92	103	131
	<b>4</b>	86	92	118	121	142	162	86	92	118	121	142	77	83	110	113	137
	<b>5</b>	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 Δp = 1.5 bar.

The reference fluid has a kinematic viscosity of 30 mm<sup>2</sup>/s (cSt) and a density of 0.86 kg/dm<sup>3</sup>.

For different pressure drop or fluid viscosity we recommend to use our selection software available on [www.mpfiltri.com](http://www.mpfiltri.com).

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
<b>FHA 051</b>	●	●	●	●	●	●

# 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

Element Δp	Valves						
	S	B	T	D	V	Z	
<b>N</b> 20 bar		•					
<b>R</b> 20 bar				•		•	
<b>S</b> 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

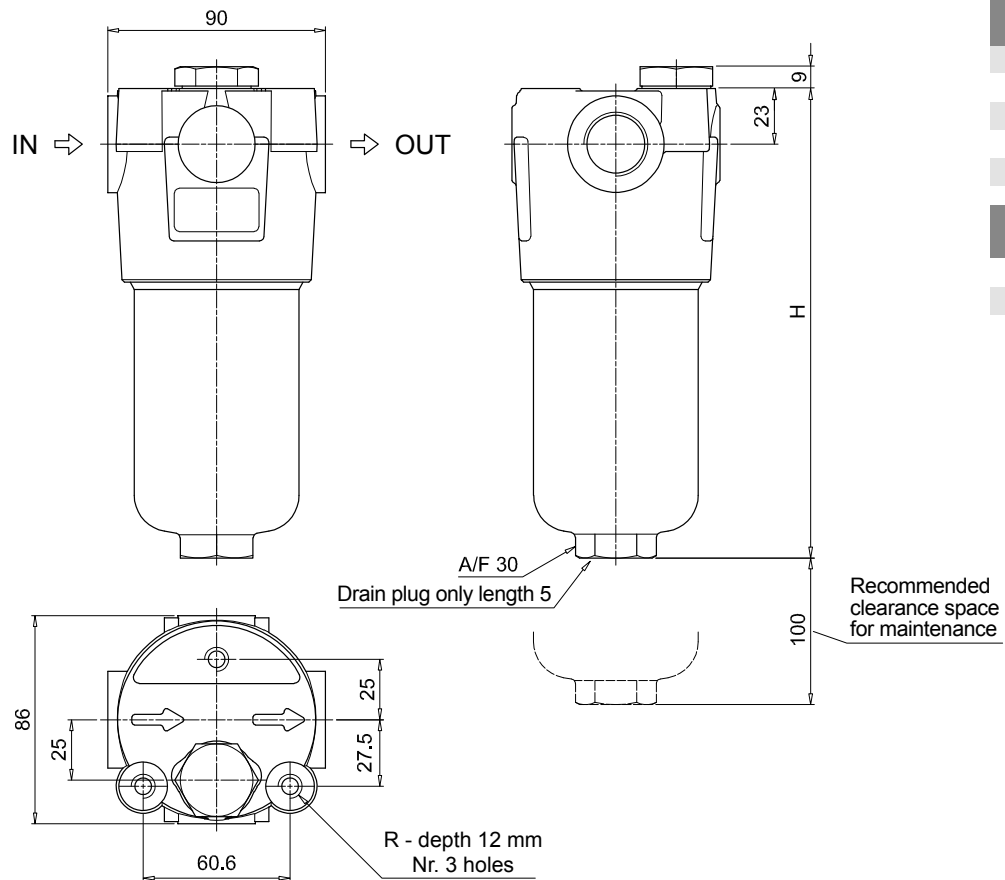
Element Δp  
**N** 20 bar  
**R** 20 bar  
**S** 210 bar

Execution  
**P01** MP Filtri standard  
**Pxx** Customized

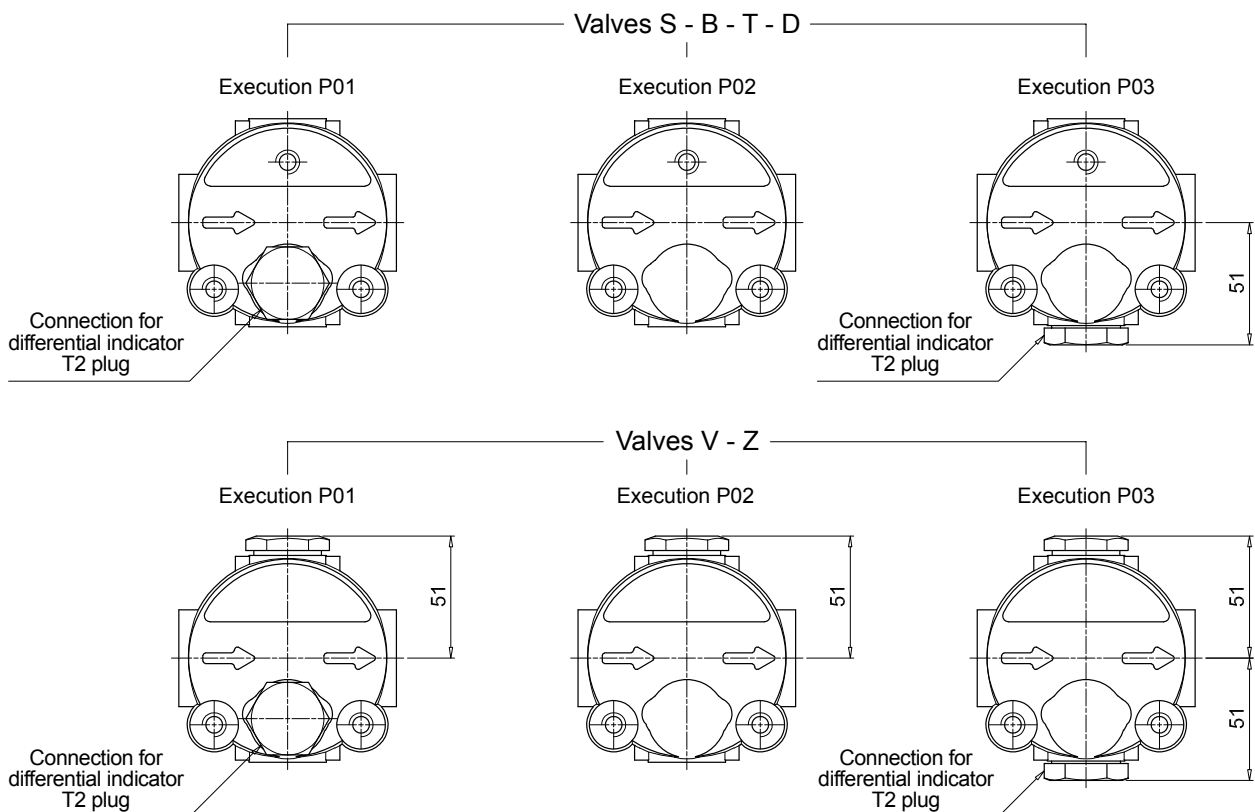
### ACCESSORIES

Differential indicators	page		page
<b>DEA</b> Electrical differential indicator	563	<b>DLE</b> Electrical / visual differential indicator	566
<b>DEH</b> Hazardous area electronic differential indicator	563-564	<b>DTA</b> Electronic differential indicator	567
<b>DEM</b> Electrical differential indicator	564-565	<b>DVA</b> Visual differential indicator	567
<b>DLA</b> Electrical / visual differential indicator	565-566	<b>DVM</b> Visual differential indicator	567

Additional features  
**T2** Plug 568



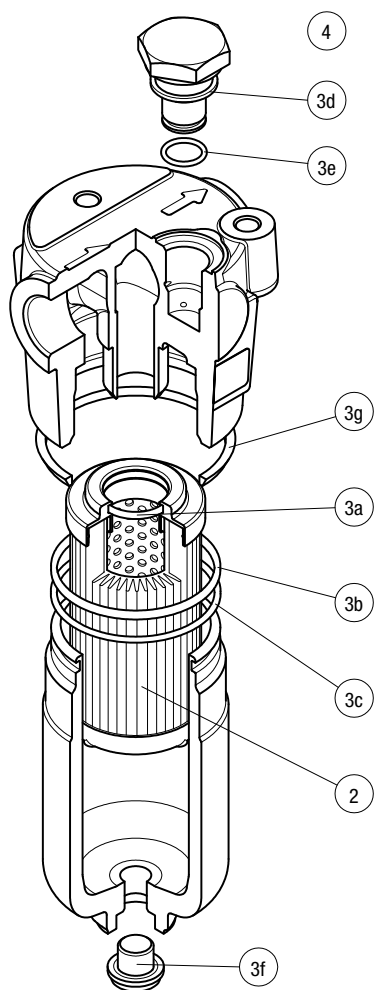
FHA051	
Filter length	H [mm]
1	158
2	195
3	237
4	285
5	407
Connections	R
A-B-C-D	M10
E-F-G-H	3/8" UNC



# FHA 051 SPARE PARTS

Order number for spare parts

## FHA 051



Filter series	Item:	Seal Kit code number		Indicator connection plug	
	Filter element	NBR	FPM	NBR	FPM
<b>FHA 051</b>	See order table	02050288	02050305	T2H	T2V





# FHM series

Maximum working pressure up to 32 MPa (320 bar) - Flow rate up to 450 l/min



### High Pressure filters

#### Manifold

**Maximum working pressure up to 32 MPa (320 bar)**

**Flow rate up to 450 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 450 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 H: 210 bar  
(only for FHM 006, FHM 007 and FHM 010)
- 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

FHM filters are provided for vertical mounting

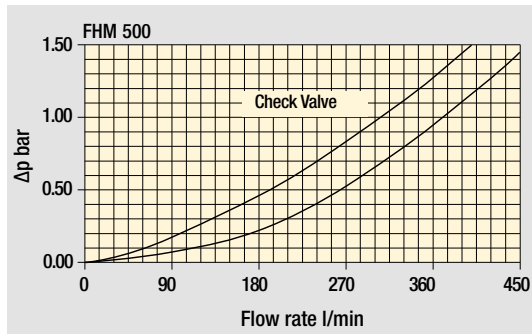
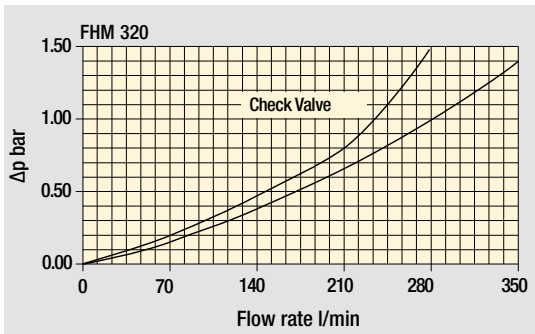
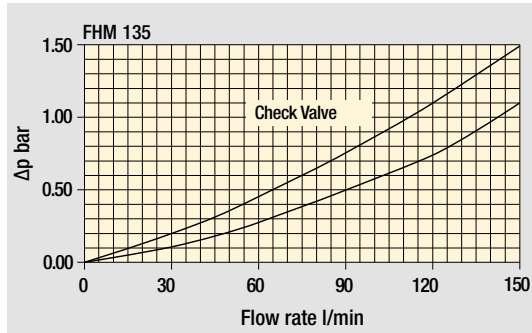
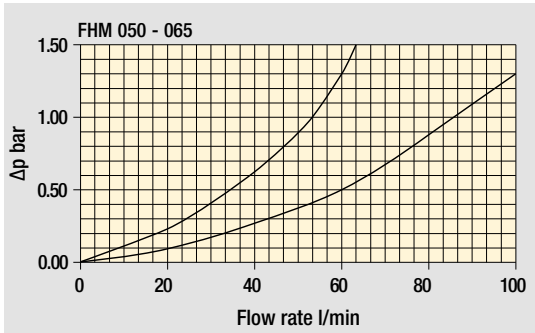
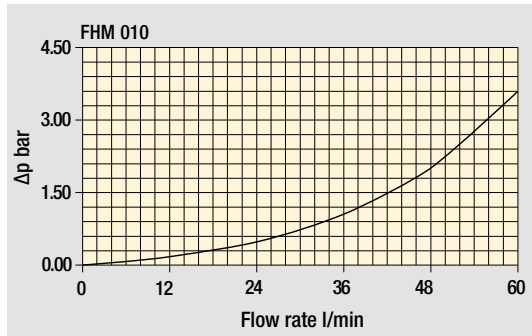
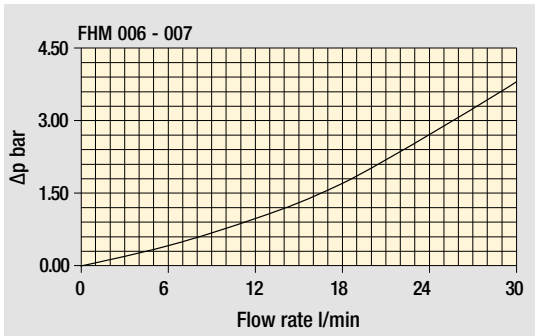


## Weights [kg] and volumes [dm<sup>3</sup>]

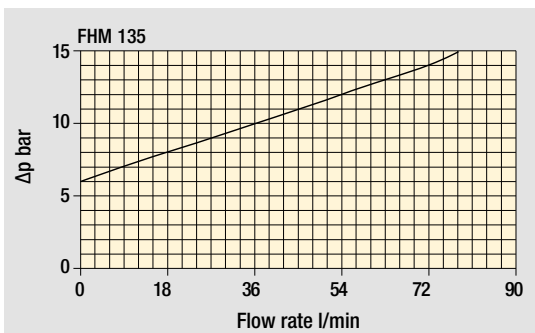
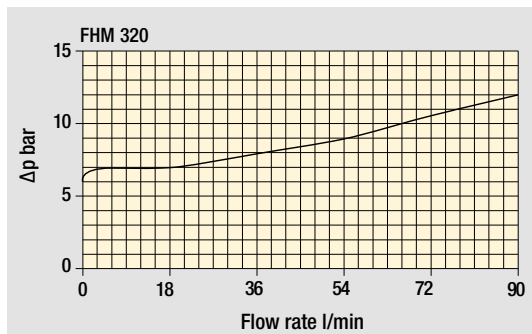
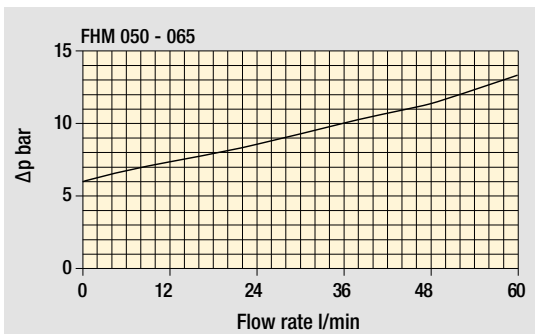
Filter series	Weights [kg]					Volumes [dm <sup>3</sup> ]						
	Length	1	2	3	4	5	Length	1	2	3	4	5
<b>FHM 006</b>		2.17	-	-	-	-		0.12	-	-	-	-
<b>FHM 007</b>		-	4.74	5.95	-	-		-	0.30	0.50	-	-
<b>FHM 010</b>		-	4.74	5.95	-	-		-	0.30	0.50	-	-
<b>FHM 050</b>		5.31	5.68	6.09	6.56	7.74		0.29	0.38	0.48	0.60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



### Filter housings $\Delta p$ pressure drop



### Bypass valve pressure drop



The curves are plotted using mineral oil with density of 0.86 kg/dm<sup>3</sup> in compliance with ISO 3968.  $\Delta p$  varies proportionally with density.

# FHM GENERAL INFORMATION

Flow rates [l/min]

Filter series	Length	Filter element design - H Series					
		A03	A06	A10	A16	A25	M25
<b>FHM 006</b>	<b>1</b>	9	10	13	14	15	16
	<b>2</b>	13	13	15	16	16	16
<b>FHM 007</b>	<b>3</b>	15	15	16	16	17	17
	<b>2</b>	23	25	32	34	37	38
<b>FHM 010</b>	<b>3</b>	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
<b>FHM 050</b>	<b>1</b>	38	37	65	67	81	101	28	36	50	52	62
	<b>2</b>	46	50	69	75	89	102	41	44	63	71	85
	<b>3</b>	57	59	76	81	93	103	51	53	71	77	90
	<b>4</b>	68	71	84	86	95	103	62	66	81	82	93
	<b>5</b>	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
<b>FHM 065</b>	<b>1</b>	23	30	48	53	71	102	22	23	43	50	67
	<b>2</b>	30	45	59	64	81	103	30	34	56	62	76
	<b>3</b>	52	60	78	82	92	105	51	58	77	81	91
<b>FHM 135</b>	<b>1</b>	61	65	99	104	131	149	46	51	83	86	122
	<b>2</b>	91	96	118	119	155	167	79	92	109	111	134
	<b>3</b>	118	119	144	146	156	168	103	112	130	137	146
<b>FHM 320</b>	<b>1</b>	112	121	187	217	252	312	97	102	156	162	228
	<b>2</b>	200	214	281	293	320	328	161	181	237	241	282
	<b>3</b>	245	267	312	320	325	333	207	233	275	280	306
	<b>4</b>	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
<b>FHM 500</b>	<b>1</b>	211	232	281	289	309	394	126	135	208	210	261
	<b>2</b>	242	262	303	308	330	397	187	206	258	266	285
	<b>3</b>	284	294	336	338	357	399	226	230	285	290	315
	<b>4</b>	302	325	346	350	361	401	251	273	314	315	341
	<b>5</b>	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 mm<sup>2</sup>/s (cSt) and a density of 0.86 kg/dm<sup>3</sup>.

For different pressure drop or fluid viscosity we recommend to use our selection software available on [www.mpfiltri.com](http://www.mpfiltri.com).

Please, contact our Sales Department for further additional information.

## Hydraulic symbols

Filter series	Style S	Style B	Style T	Style D
<b>FHM 006</b>	•			
<b>FHM 007</b>	•			
<b>FHM 010</b>	•			
<b>FHM 050</b>	•	•	•	•
<b>FHM 065</b>	•	•	•	•
<b>FHM 135</b>	•	•	•	•
<b>FHM 320</b>	•	•	•	•
<b>FHM 500</b>	•	•	•	•

--	--	--	--



## Designation & Ordering code

### COMPLETE FILTER

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

### FILTER ELEMENT

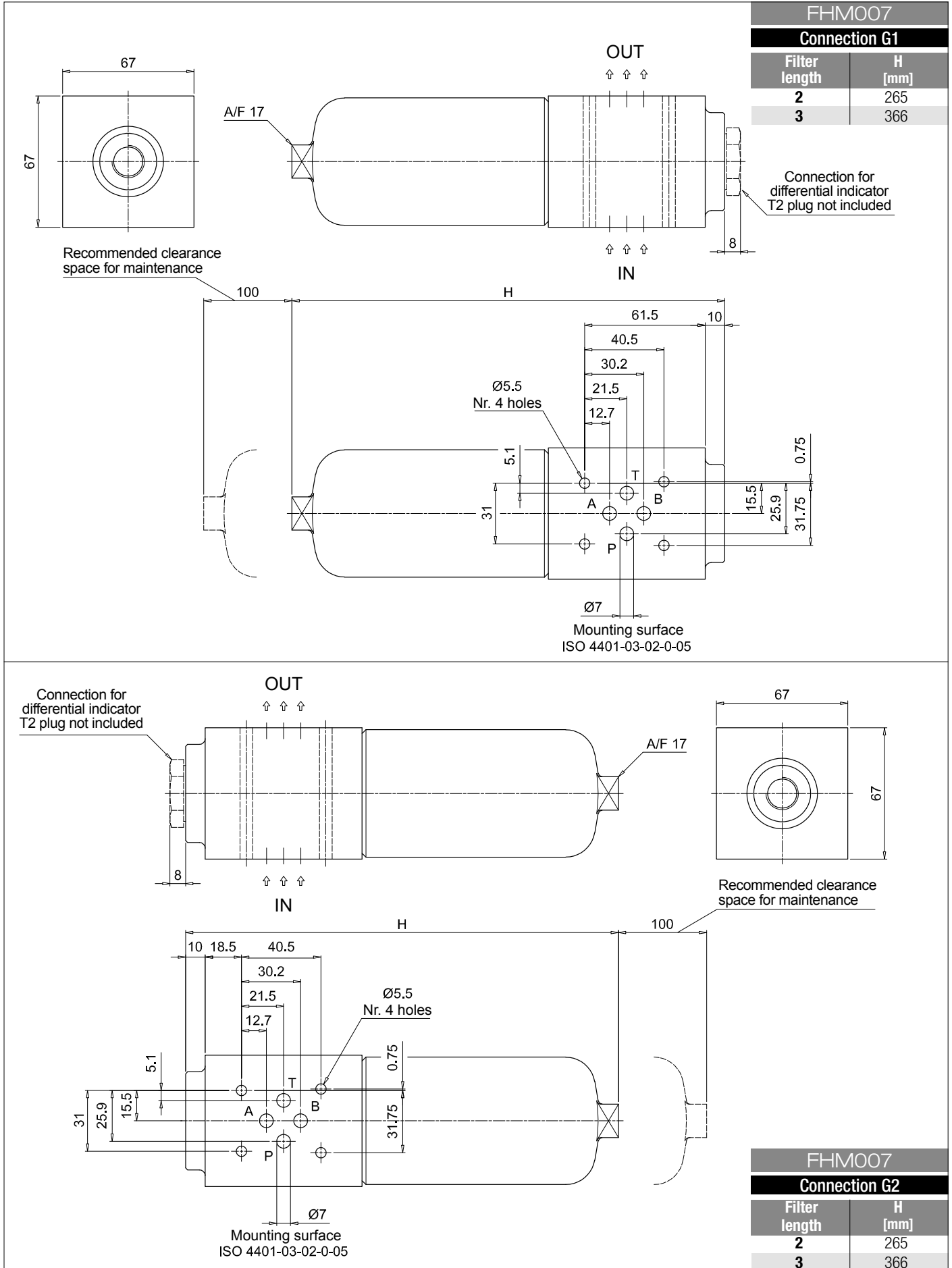
Element series and size				Configuration example: <b>HP065</b> <b>2</b> <b>A03</b> <b>A</b> <b>H</b> <b>P01</b>							
<b>HP011</b>   <b>HP065</b>											
Element length	FHM006	FHM007	FHM010								
2		•	•								
3	•	•	•								
Filtration rating (filter media)											
<b>A03</b> Inorganic microfiber	3 µm	<b>A16</b> Inorganic microfiber	16 µm						<b>Seals</b>	<b>Element Δp</b>	<b>Execution</b>
<b>A06</b> Inorganic microfiber	6 µm	<b>A25</b> Inorganic microfiber	25 µm						<b>A</b> NBR	<b>H</b> 210 bar	<b>P01</b> MP Filtri standard
<b>A10</b> Inorganic microfiber	10 µm	<b>M25</b> Wire mesh	25 µm						<b>V</b> FPM		<b>Pxx</b> Customized

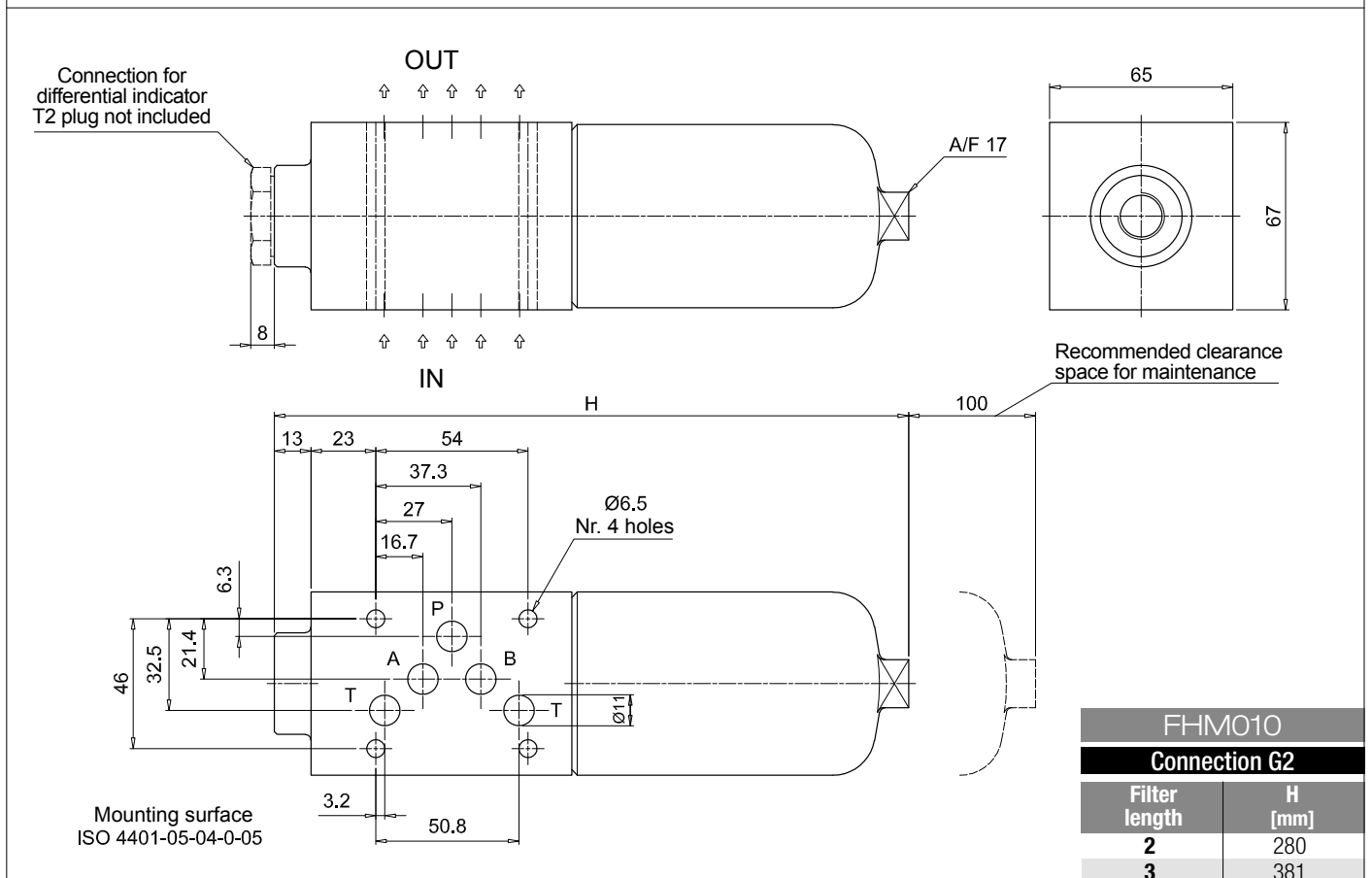
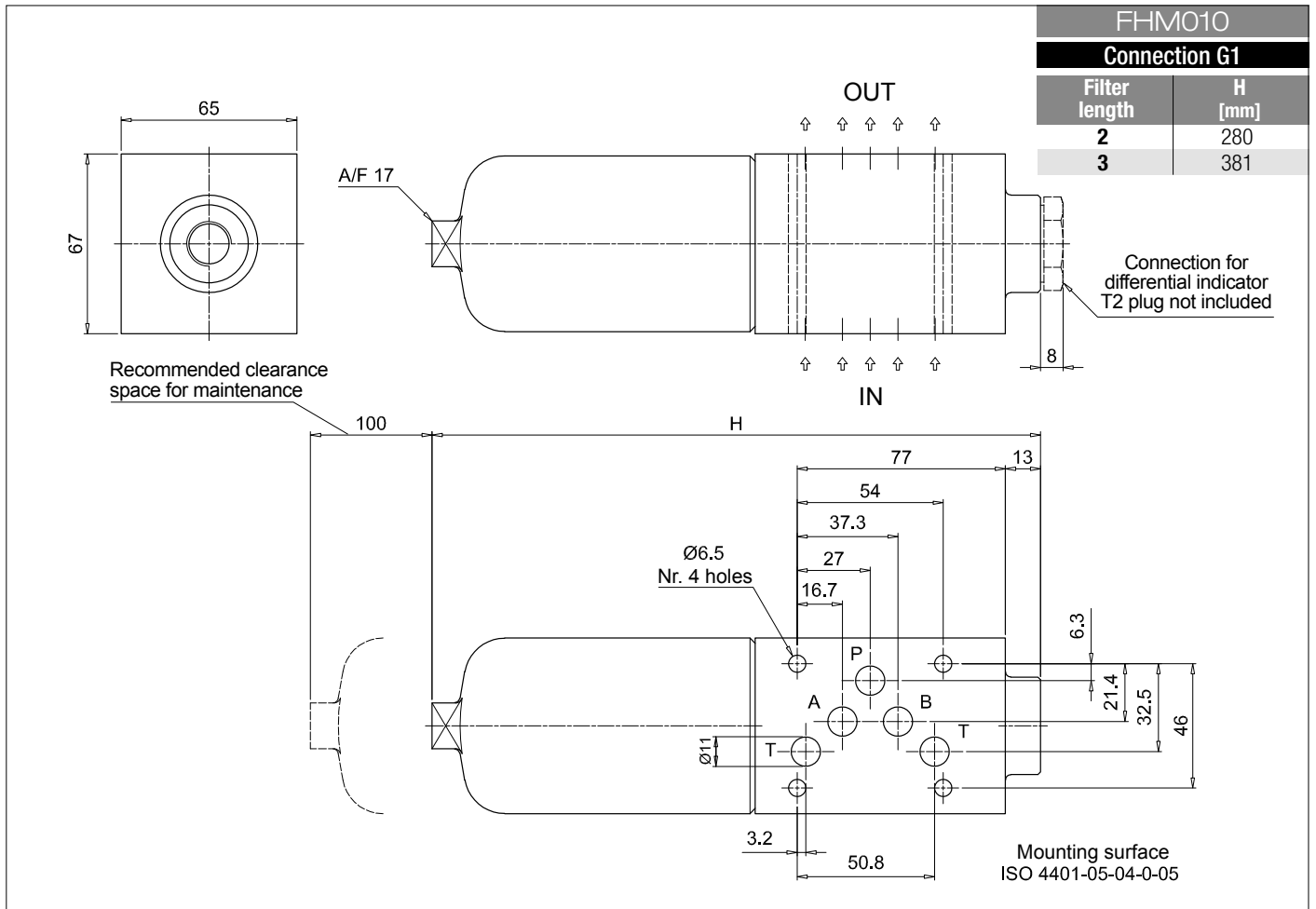
### ACCESSORIES

Additional features	page		page
<b>DEA</b> Electrical differential indicator	563	<b>DLE</b> Electrical / visual differential indicator	566
<b>DEH</b> Hazardous area electronic differential indicator	563-564	<b>DTA</b> Electronic differential indicator	567
<b>DEM</b> Electrical differential indicator	564-565	<b>DVA</b> Visual differential indicator	567
<b>DLA</b> Electrical / visual differential indicator	565-566	<b>DVM</b> Visual differential indicator	567
<b>T2</b> Plug	568		



## 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

<b>S</b>	Without bypass
<b>B</b>	With bypass 6 bar
<b>T</b>	With check valve, without bypass
<b>D</b>	With check valve, with bypass 6 bar

#### Seals

<b>A</b>	NBR
<b>V</b>	FPM

#### Connections

<b>F1</b>	Manifold
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#### Filtration rating (filter media)

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

Valves: **FHM050** **FHM065-135**

Element	Δp	S	B	T	D	S	B	T	D	Execution
<b>N</b>	20 bar		•		•		•		•	<b>P01</b> MP Filtri standard
<b>H</b>	210 bar						•		•	<b>Pxx</b> Customized
<b>S</b>	210 bar	•			•					

### 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)

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

Seals	Element	Δp	HP050	HP065	HP135	Execution
<b>A</b> NBR	<b>N</b>	20 bar	•	•	•	<b>P01</b> MP Filtri standard
<b>V</b> FPM	<b>H</b>	210 bar		•	•	<b>Pxx</b> Customized
	<b>S</b>	210 bar	•			

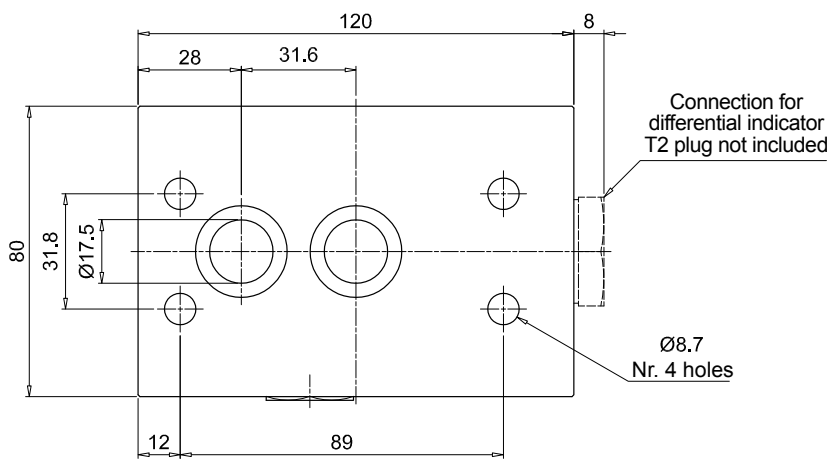
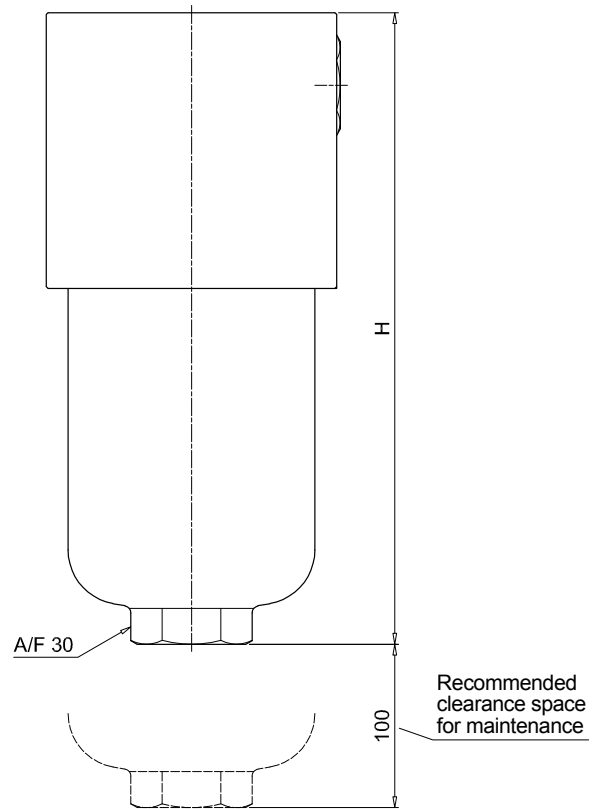
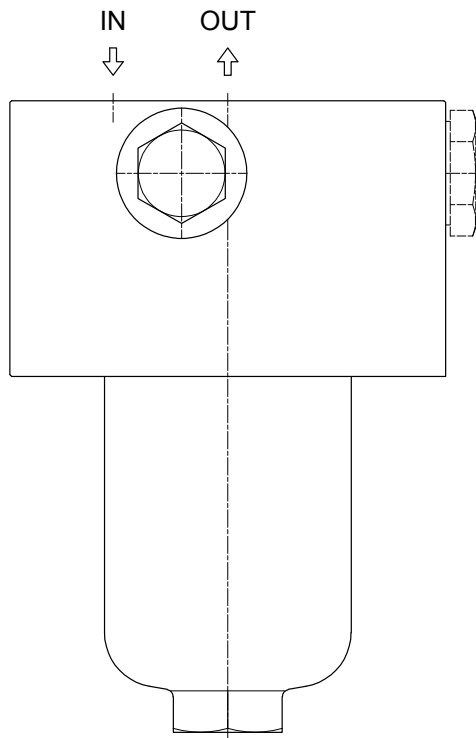
### ACCESSORIES

Differential indicators	page	Differential indicators	page
<b>DEA</b> Electrical differential indicator	563	<b>DLE</b> Electrical / visual differential indicator	566
<b>DEH</b> Hazardous area electronic differential indicator	563-564	<b>DTA</b> Electronic differential indicator	567
<b>DEM</b> Electrical differential indicator	564-565	<b>DVA</b> Visual differential indicator	567
<b>DLA</b> Electrical / visual differential indicator	565-566	<b>DVM</b> Visual differential indicator	567

Additional features	page
<b>T2</b> Plug	568

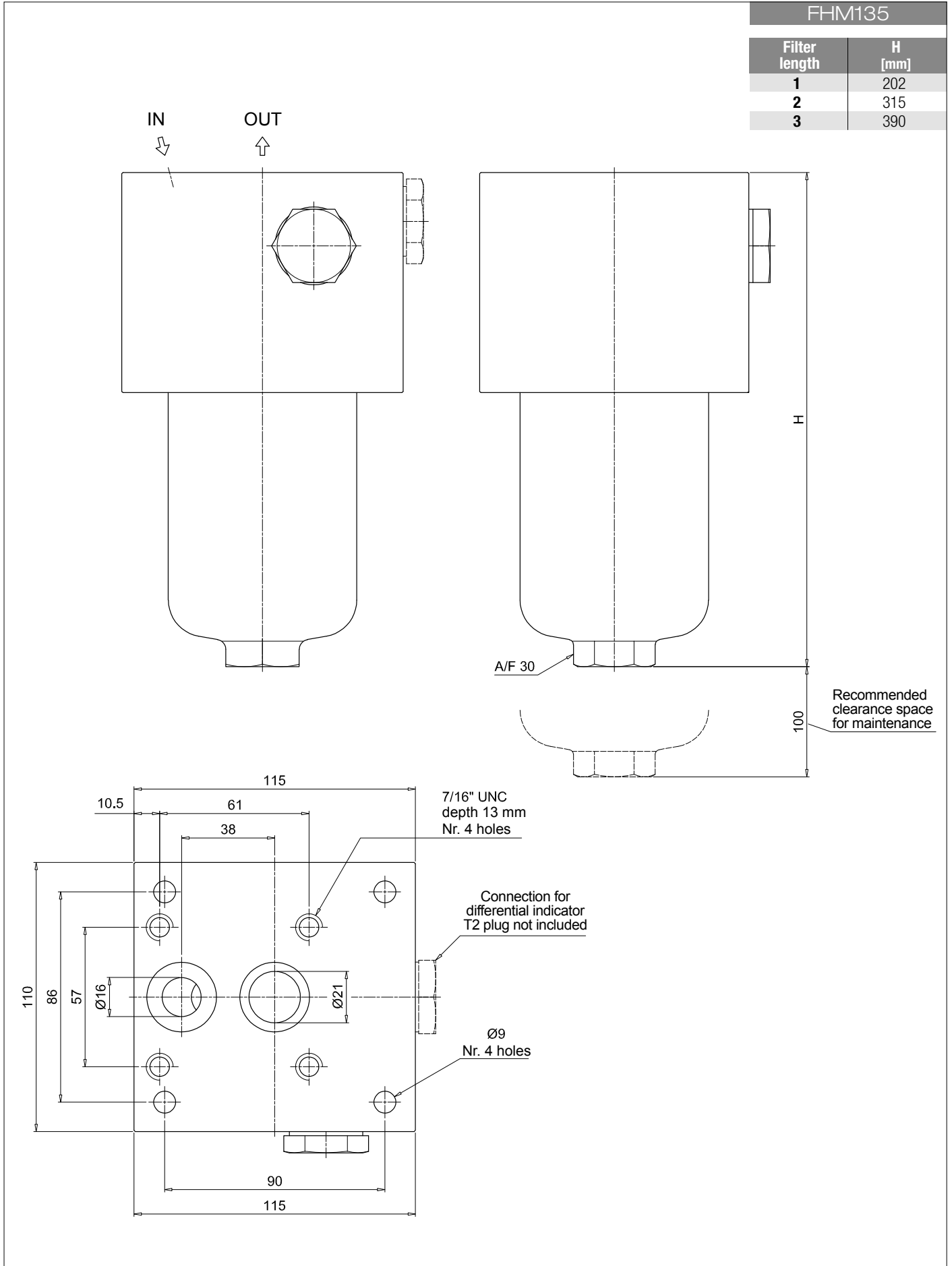


FHM050		FHM065	
Filter length	H [mm]	Filter length	H [mm]
<b>1</b>	154	<b>1</b>	162
<b>2</b>	191	<b>2</b>	193
<b>3</b>	233	<b>3</b>	295
<b>4</b>	281		
<b>5</b>	403		



# 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	
<b>S</b>	Without bypass
<b>B</b>	With bypass 6 bar
<b>T</b>	With check valve, without bypass
<b>D</b>	With check valve, with bypass 6 bar

Seals	
<b>A</b>	NBR
<b>V</b>	FPM

Connections	
<b>F1</b>	Manifold

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

Element	Δp	Valves: FHM320				FHM500				Execution					
		S	B	T	D	S	B	T	D	1	2	3	4	5	
<b>N</b>	20 bar		•		•		•		•		•	•	•	•	•
<b>H</b>	210 bar	•		•											•
<b>S</b>	210 bar					•		•							

### 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)			
<b>A03</b>	Inorganic microfiber	3 µm	
<b>A06</b>	Inorganic microfiber	6 µm	
<b>A10</b>	Inorganic microfiber	10 µm	
<b>A16</b>	Inorganic microfiber	16 µm	
<b>A25</b>	Inorganic microfiber	25 µm	
<b>M25</b>	Wire mesh	25 µm	

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

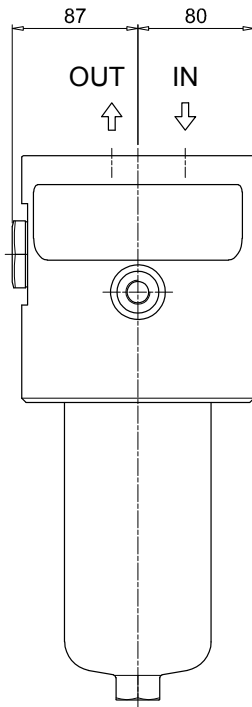
### ACCESSORIES

Differential indicators	page	Differential indicators	page
<b>DEA</b> Electrical differential indicator	563	<b>DLE</b> Electrical / visual differential indicator	566
<b>DEH</b> Hazardous area electronic differential indicator	563-564	<b>DTA</b> Electronic differential indicator	567
<b>DEM</b> Electrical differential indicator	564-565	<b>DVA</b> Visual differential indicator	567
<b>DLA</b> Electrical / visual differential indicator	565-566	<b>DVM</b> Visual differential indicator	567

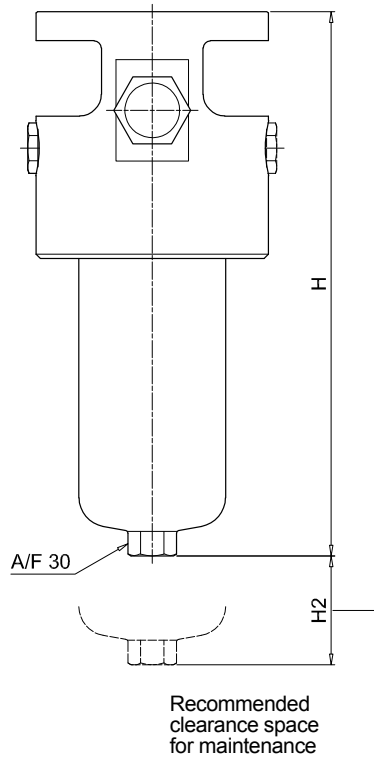
Additional features	page
<b>T2</b> Plug	568

### FHM320

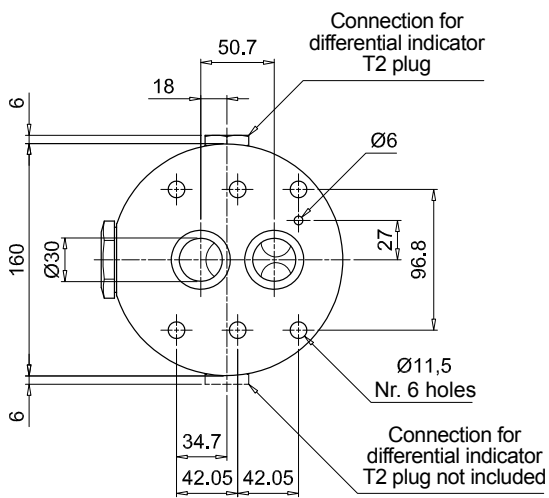
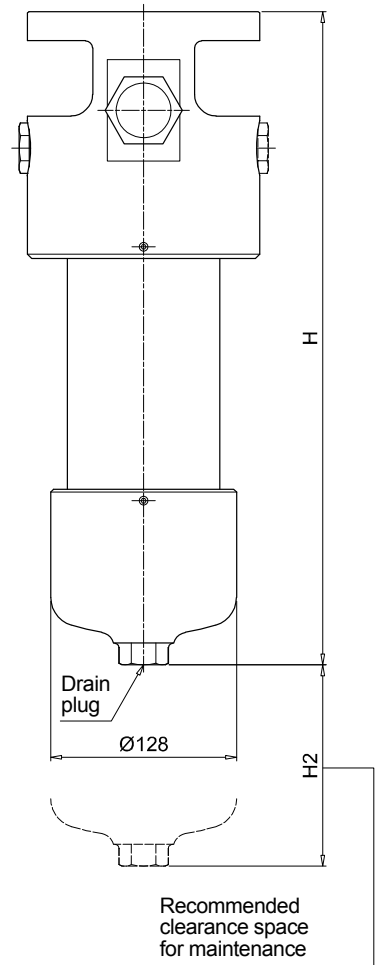
Filter length	H [mm]	H2 [mm]	
		Execution P01	Execution P02
1	293	150	-
2	416	150	-
3	548	150	-
4	702	150	550



Length 1 - 2 - 3



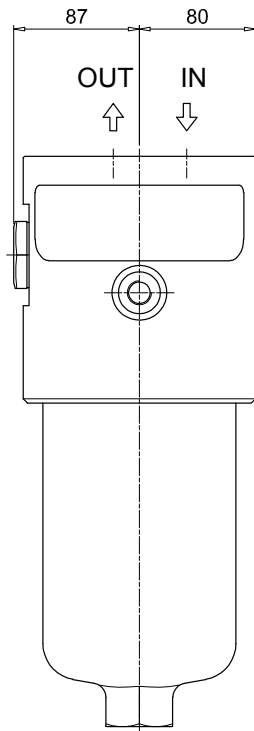
Length 4



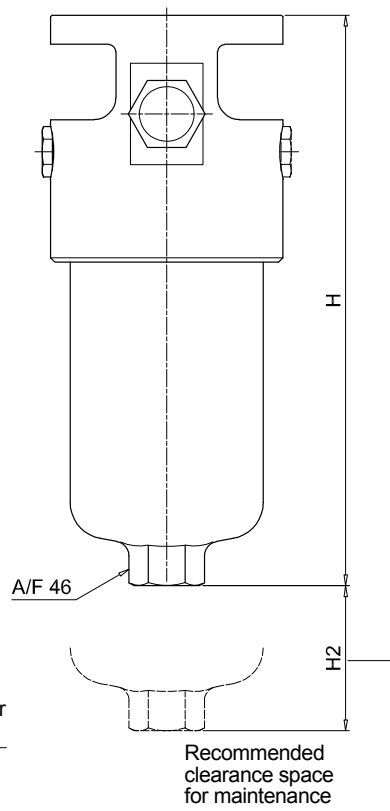
## Dimensions

### FHM500

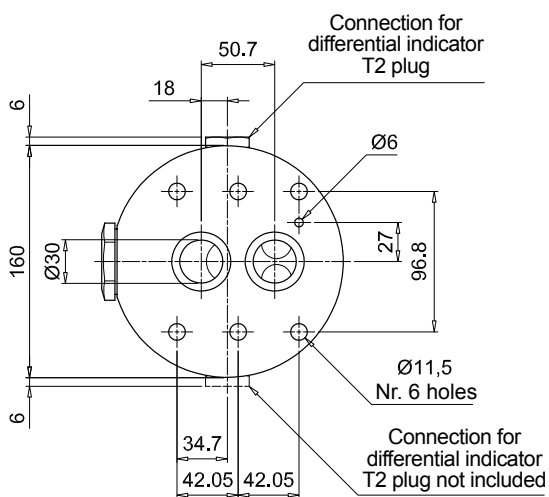
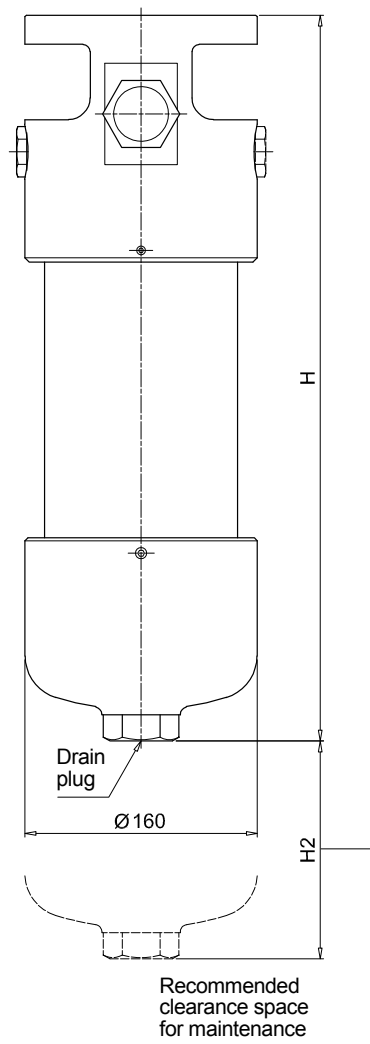
Filter length	H [mm]	H2 [mm]	
		Execution P01	Execution P02
<b>1</b>	355	150	-
<b>2</b>	445	150	-
<b>3</b>	521	150	-
<b>4</b>	679	150	480
<b>5</b>	845	150	650



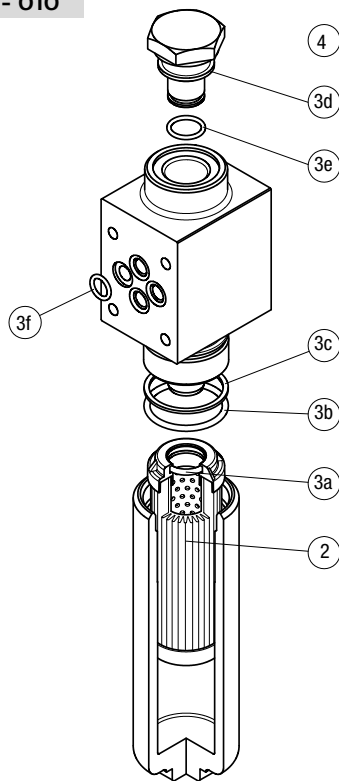
**Length 1 - 2 - 3**



**Length 4 - 5**

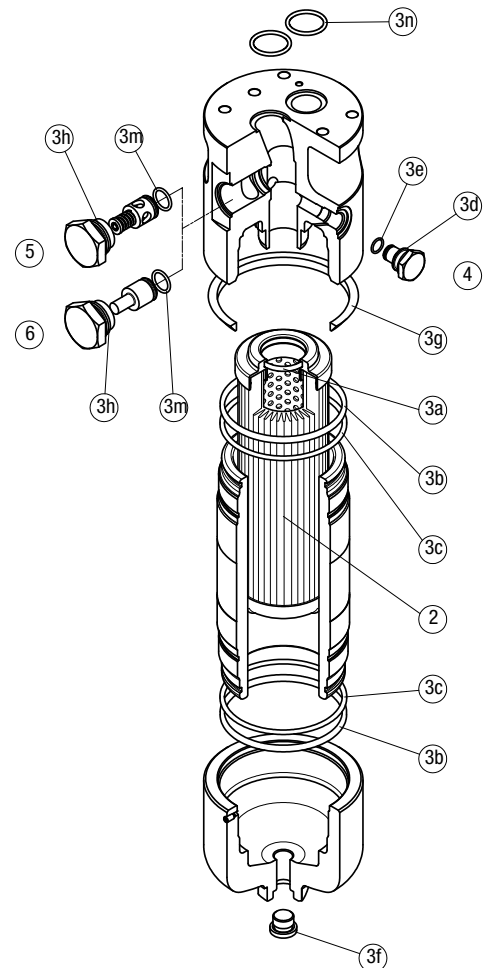


## FHM 006 - 007 - 010



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



### 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

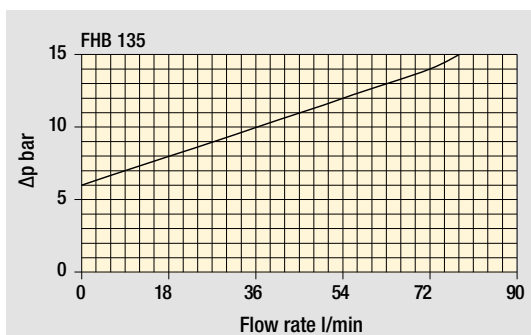
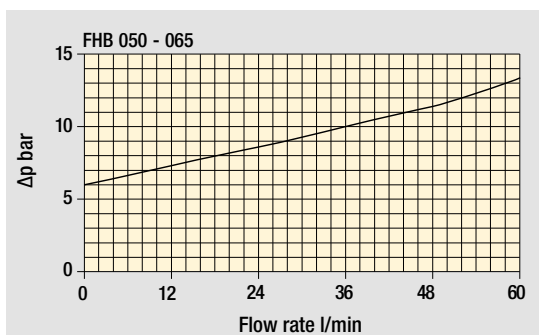
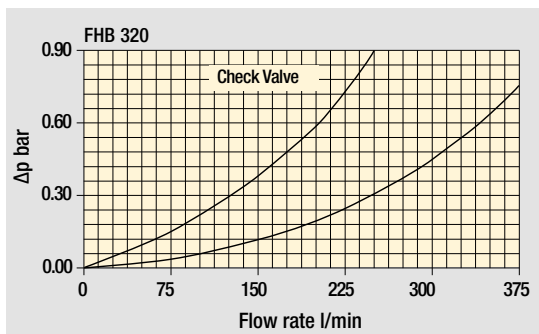
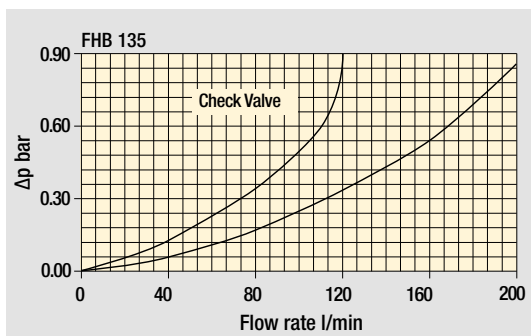
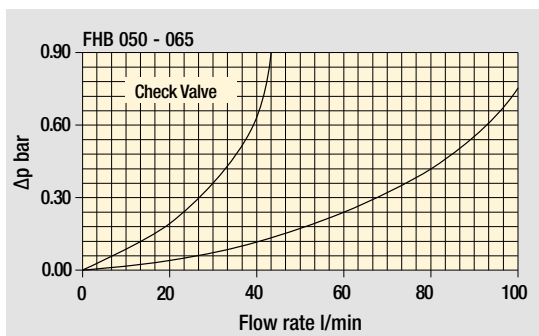
FHB filters are provided for vertical mounting



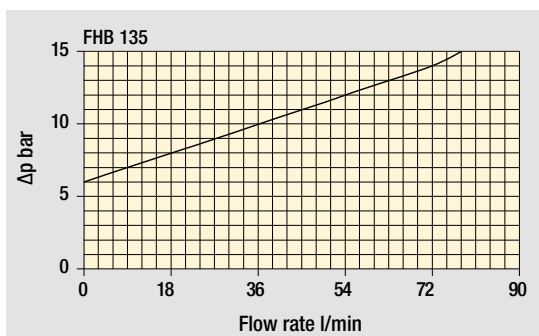
## Weights [kg] and volumes [dm<sup>3</sup>]

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

Filter housings  $\Delta p$  pressure drop



Bypass valve pressure drop



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

# FHB GENERAL INFORMATION

## 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
<b>FHB 050</b>	<b>1</b>	43	42	79	81	101	131	30	40	58	60	74
	<b>2</b>	53	58	84	93	112	132	46	50	76	86	108
	<b>3</b>	67	70	94	101	119	133	59	62	87	95	115
	<b>4</b>	82	87	106	108	122	134	74	80	101	103	119
	<b>5</b>	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
<b>FHB 065</b>	<b>1</b>	25	33	55	62	87	133	23	25	49	58	81
	<b>2</b>	33	51	70	76	101	134	33	38	66	75	94
	<b>3</b>	60	71	97	103	118	138	60	68	95	102	116
<b>FHB 135</b>	<b>1</b>	67	72	120	129	177	212	49	55	97	100	160
	<b>2</b>	109	116	152	154	224	250	90	110	137	140	182
	<b>3</b>	153	155	201	205	226	253	126	142	175	187	207
<b>FHB 320</b>	<b>1</b>	130	143	238	286	343	442	110	117	192	201	304
	<b>2</b>	259	281	391	409	454	468	200	230	319	325	392
	<b>3</b>	332	368	441	455	463	476	269	312	381	389	432
	<b>4</b>	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 mm<sup>2</sup>/s (cSt) and a density of 0.86 kg/dm<sup>3</sup>.

For different pressure drop or fluid viscosity we recommend to use our selection software available on [www.mpfiltri.com](http://www.mpfiltri.com).

Please, contact our Sales Department for further additional information.

## Hydraulic symbols

Filter series	Style S	Style B	Style T	Style D
<b>FHB 050</b>	•	•	•	•
<b>FHB 065</b>	•	•	•	•
<b>FHB 135</b>	•	•	•	•
<b>FHB 320</b>				

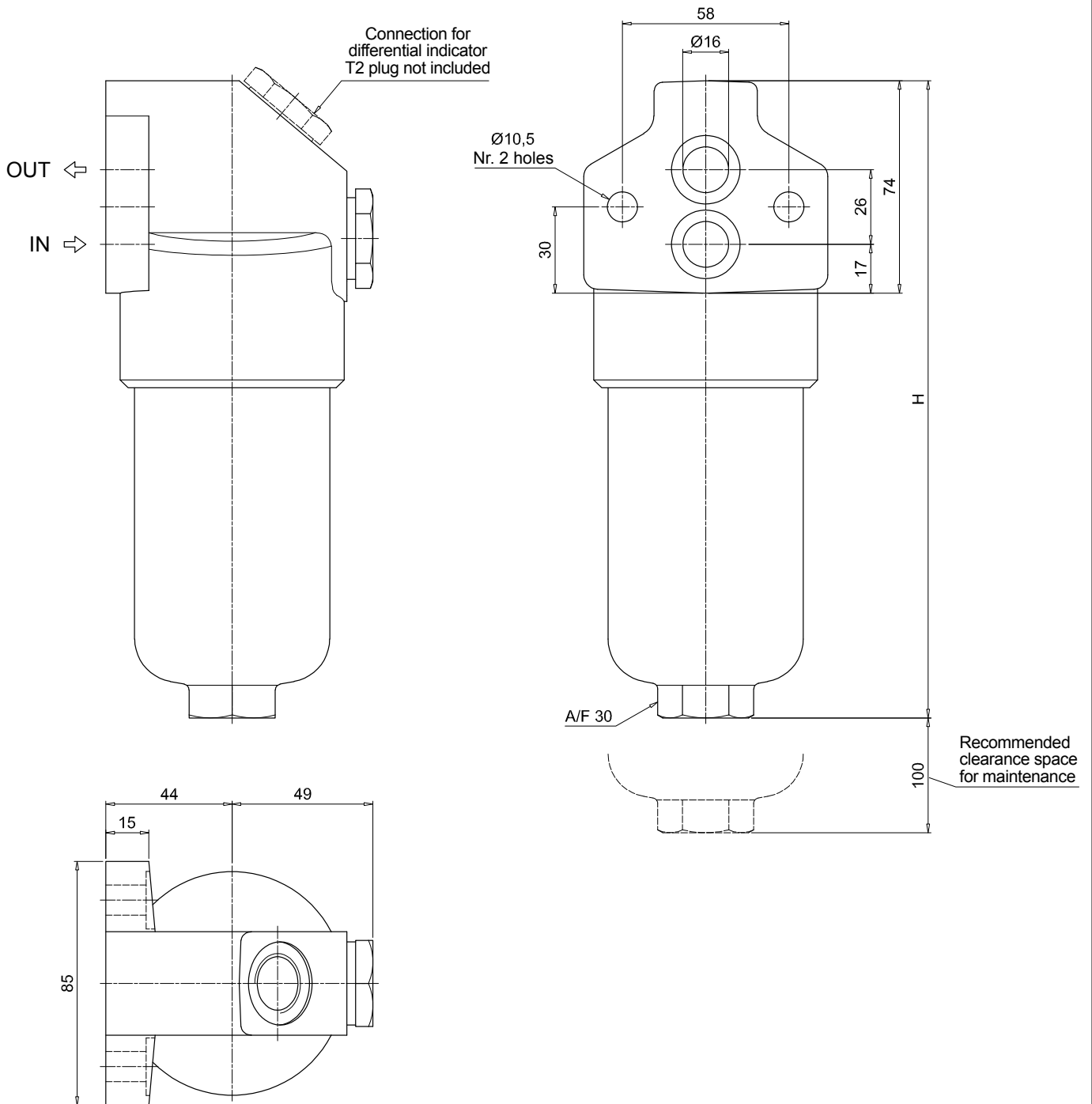
  

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FHB050	
Filter length	H [mm]
<b>1</b>	185
<b>2</b>	222
<b>3</b>	264
<b>4</b>	312
<b>5</b>	434

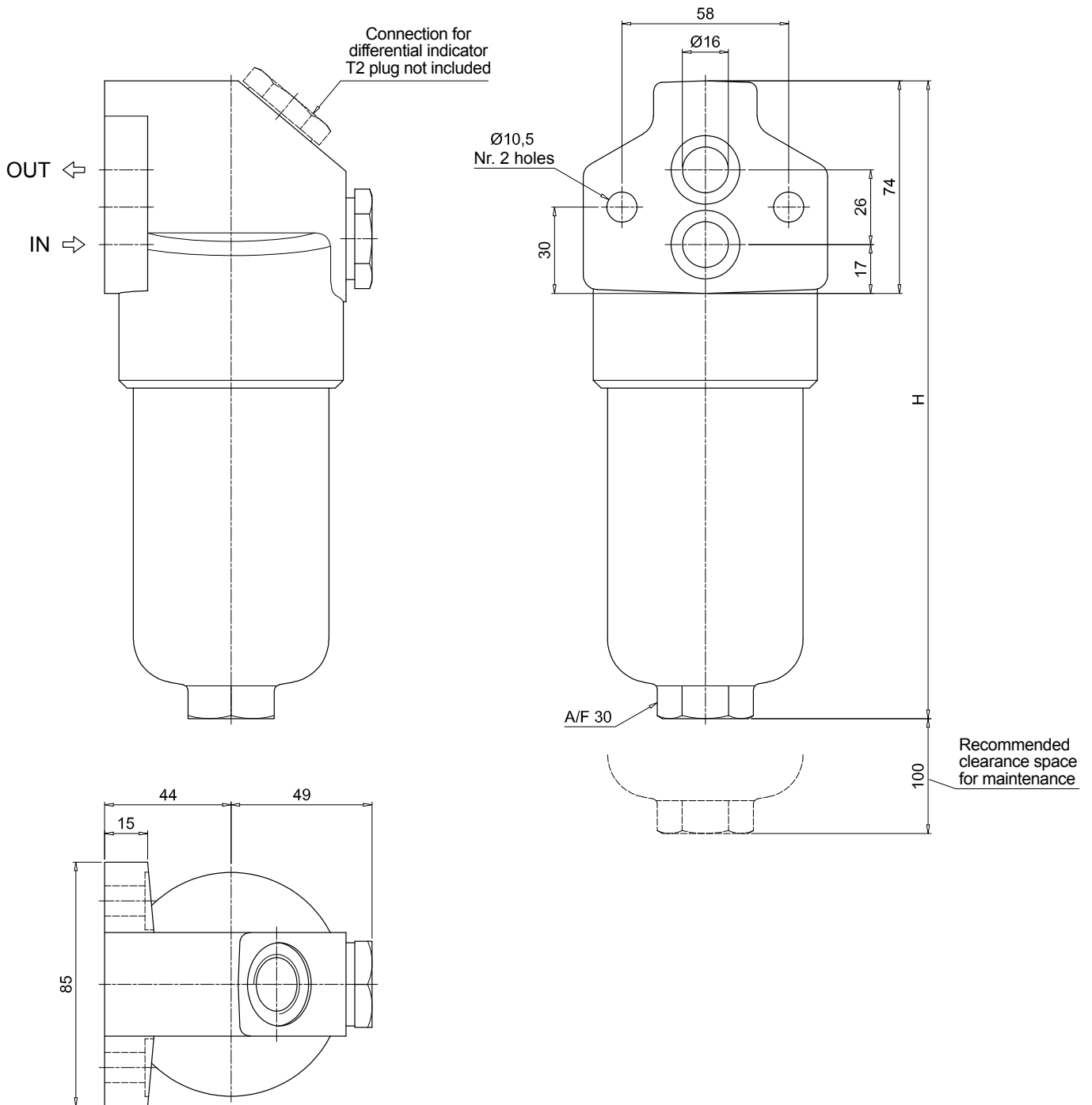






### FHB065

Filter length	H [mm]
<b>1</b>	194
<b>2</b>	225
<b>3</b>	327

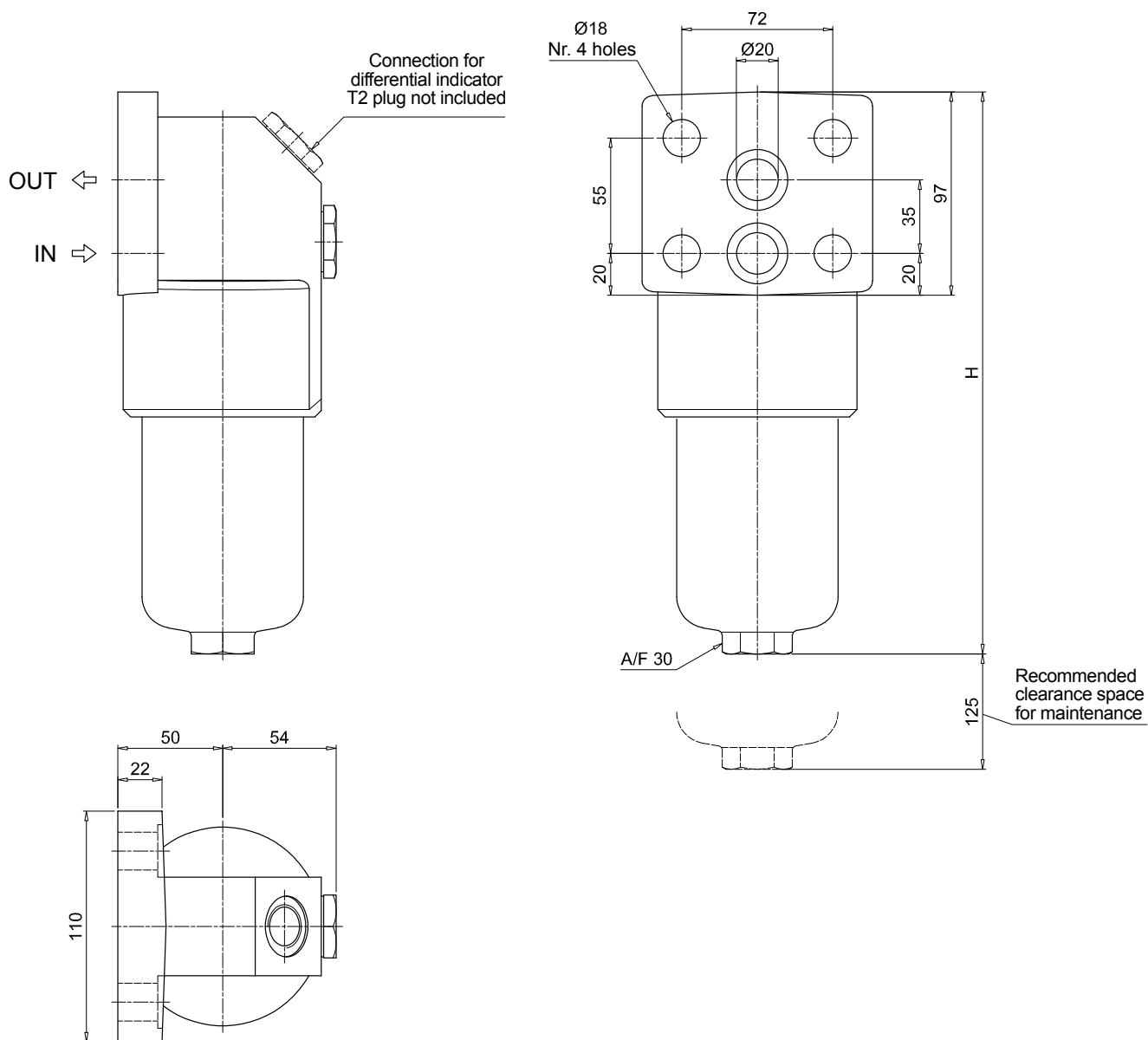


# FHB FHB065 - FHB135 - FHB320

## Dimensions

FHB135

Filter length	H [mm]
<b>1</b>	268
<b>2</b>	381
<b>3</b>	456

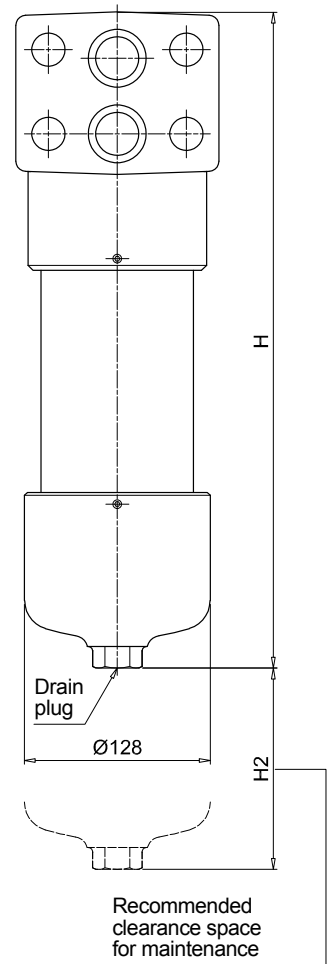
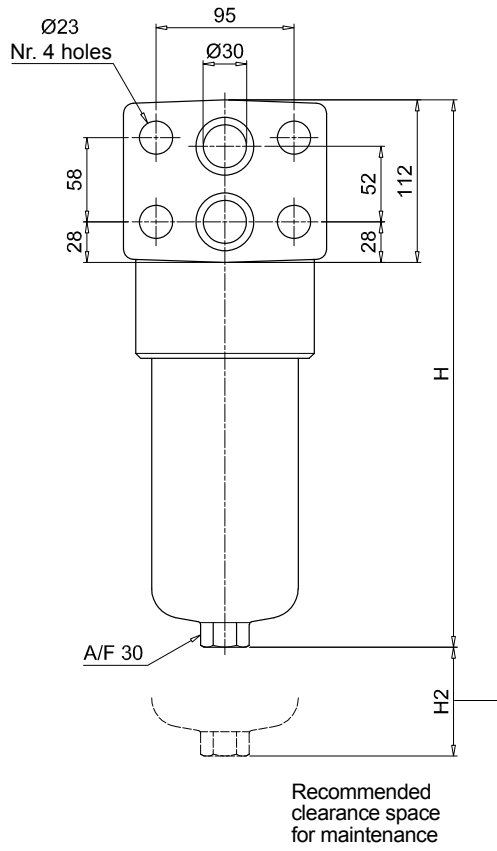
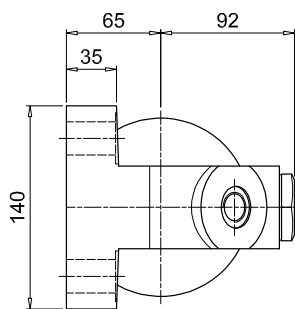
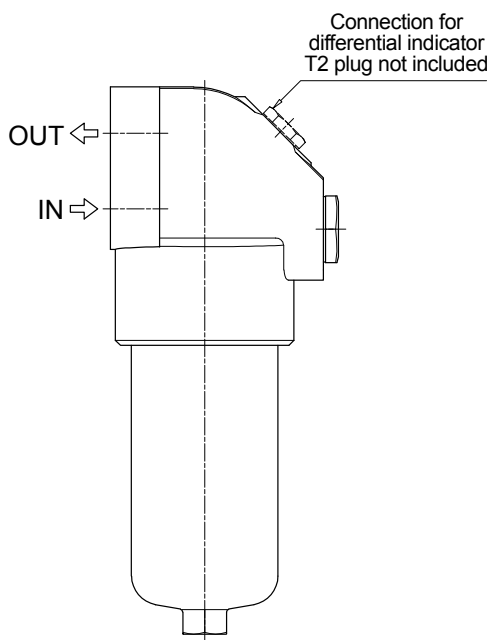


### FHB320

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

#### Length 1 - 2 - 3

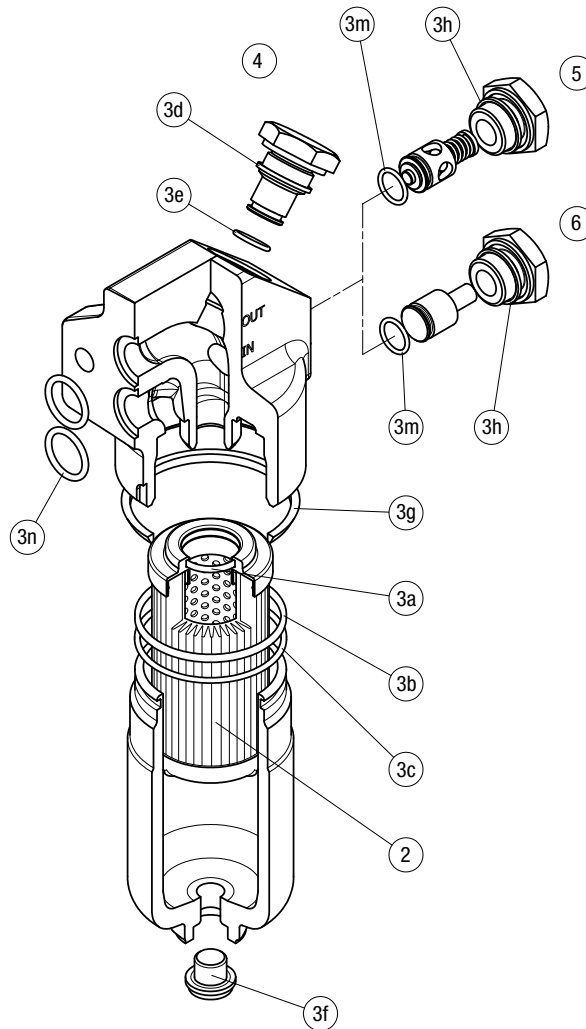
#### Length 4



# FHB SPARE PARTS

Order number for spare parts

FHB 050 - 065 - 135 - 320



Item:	Q.ty: 1 pc. <b>2</b>	Q.ty: 1 pc. <b>3</b> (3a ÷ 3n)		Q.ty: 1 pc. <b>4</b>		Q.ty: 1 pc. <b>5</b>		Q.ty: 1 pc. <b>6</b>	
Filter series	Filter element	Seal Kit code number		Indicator connection plug		Bypass assembly		Non-bypass assembly	
		NBR	FPM	NBR	FPM	NBR	FPM	NBR	FPM
<b>FHB 050</b>	See order table	02050412	02050413	T2H	T2V	02001312	02001385	02001314	02001386
<b>FHB 065</b>		02050266	02050277			02001312	02001385	02001314	02001386
<b>FHB 135</b>		02050270	02050281			02001312	02001385	02001314	02001386
<b>FHB 320</b>		02050273	02050284			02001381	02001382	02001383	02001384





# FHF 325 series

Maximum working pressure up to 35 MPa (350 bar) - Flow rate up to 500 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 500 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 500 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.

#### $\Delta p$ 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

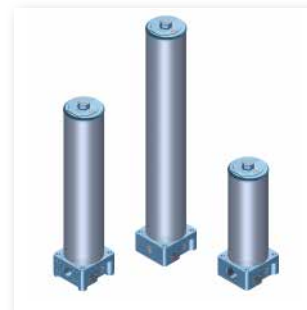
From -25 °C to +110 °C

#### 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 [dm<sup>3</sup>]

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

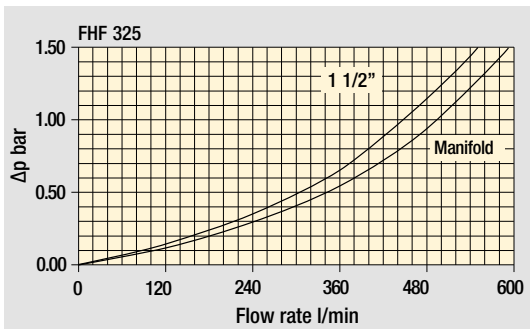


# GENERAL INFORMATION FHF 325

## Filter housing according to SAE J2066 for HF4 filter elements

Pressure drop

Filter housings  $\Delta p$  pressure drop



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

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

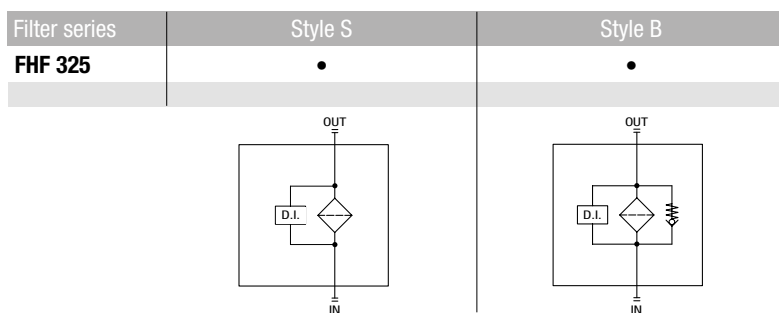
### Maximum flow rate for a complete pressure filter with a pressure drop $\Delta p = 1.5 \text{ bar}$ .

The reference fluid has a kinematic viscosity of  $30 \text{ mm}^2/\text{s}$  (cSt) and a density of  $0.86 \text{ kg/dm}^3$ .

For different pressure drop or fluid viscosity we recommend to use our selection software available on [www.mpfiltri.com](http://www.mpfiltri.com).

Please, contact our Sales Department for further additional information.

Hydraulic symbols



# FHF 325

## Designation & Ordering code

### COMPLETE FILTER

<b>Series and size</b>	Configuration example: <b>FHF325</b>   <b>2</b>   <b>S</b>   <b>A</b>   <b>H</b>   <b>7</b>   <b>A10</b>   <b>N</b>   <b>P01</b>															
<b>FHF325</b>																
<b>Length</b>	1   2   3															
<b>Valves</b>	S Without bypass B With bypass 6 bar															
<b>Seals</b>	A NBR V FPM															
<b>Connections</b>	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"															
<b>Connection for differential indicator</b>	7 With two connections plugged on both sides															
<b>Filtration rating (filter media)</b>	<table border="0"> <tr> <td><b>A03</b> Inorganic microfiber 3 µm</td> <td><b>A16</b> Inorganic microfiber 16 µm</td> </tr> <tr> <td><b>A06</b> Inorganic microfiber 6 µm</td> <td><b>A25</b> Inorganic microfiber 25 µm</td> </tr> <tr> <td><b>A10</b> Inorganic microfiber 10 µm</td> <td><b>M25</b> Wire mesh 25 µm</td> </tr> </table>										<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm	<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm	<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm
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<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm															
	<b>Element Δp</b>					<b>Execution</b>										
	N 20 bar					P01 MP Filtri standard Pxx Customized										

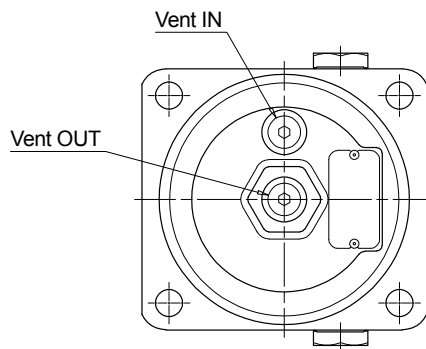
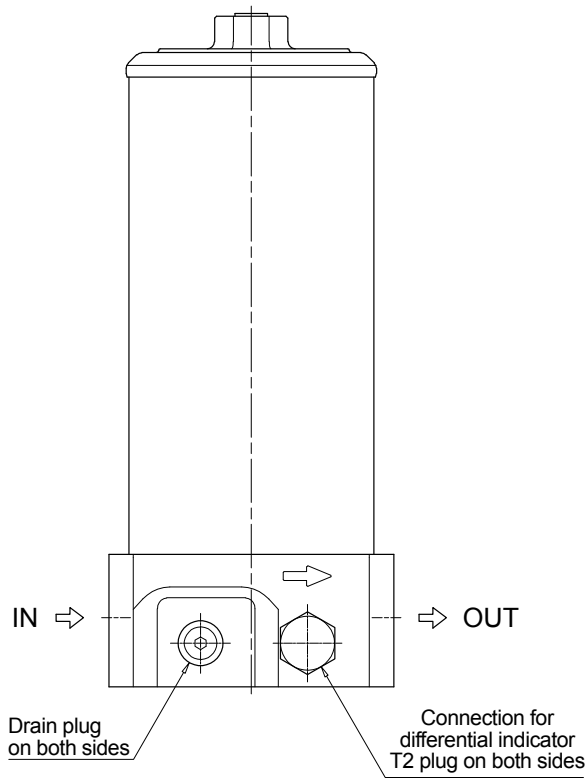
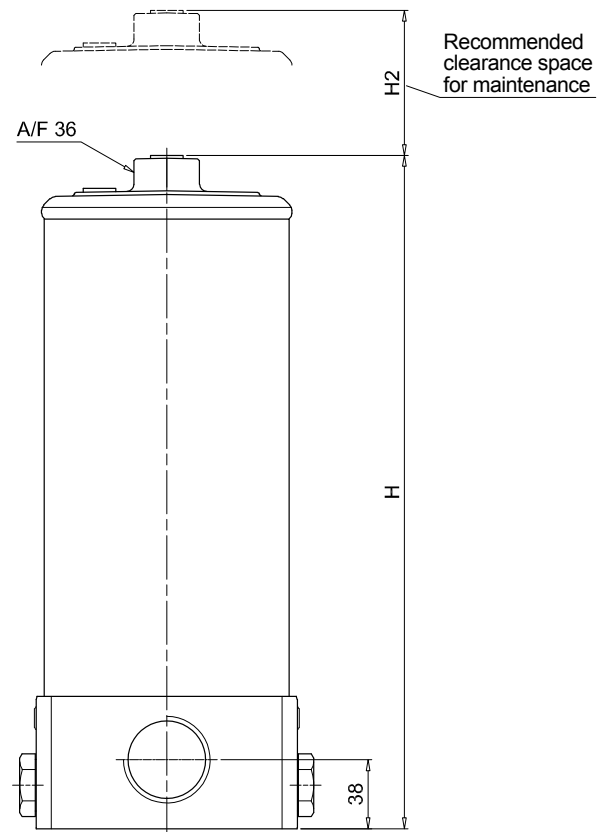
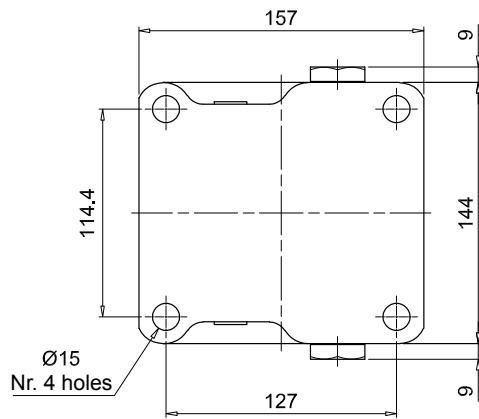
### FILTER ELEMENT

<b>Element series and size</b>	Configuration example: <b>HF325</b>   <b>2</b>   <b>A10</b>   <b>A</b>   <b>N</b>   <b>P01</b>												
<b>HF325</b>													
<b>Element length</b>	1   2   3												
<b>Filtration rating (filter media)</b>	<table border="0"> <tr> <td><b>A03</b> Inorganic microfiber 3 µm</td> <td><b>A16</b> Inorganic microfiber 16 µm</td> </tr> <tr> <td><b>A06</b> Inorganic microfiber 6 µm</td> <td><b>A25</b> Inorganic microfiber 25 µm</td> </tr> <tr> <td><b>A10</b> Inorganic microfiber 10 µm</td> <td><b>M25</b> Wire mesh 25 µm</td> </tr> </table>							<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm	<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm	<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm
<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm												
<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm												
<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm												
	<b>Seals</b>		<b>Element Δp</b>		<b>Execution</b>								
	A NBR V FPM		N 20 bar		P01 MP Filtri standard Pxx Customized								

### ACCESSORIES

Differential indicators		page			page
<b>DEA</b>	Electrical differential indicator	563	<b>DLE</b>	Electrical / visual differential indicator	566
<b>DEH</b>	Hazardous area electronic differential indicator	563-564	<b>DTA</b>	Electronic differential indicator	567
<b>DEM</b>	Electrical differential indicator	564-565	<b>DVA</b>	Visual differential indicator	567
<b>DLA</b>	Electrical / visual differential indicator	565-566	<b>DVM</b>	Visual differential indicator	567
Additional features		page			
<b>T2</b>	Plug	568			

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



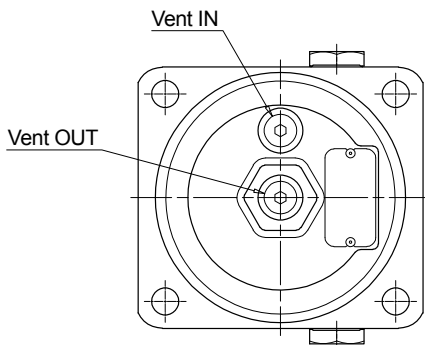
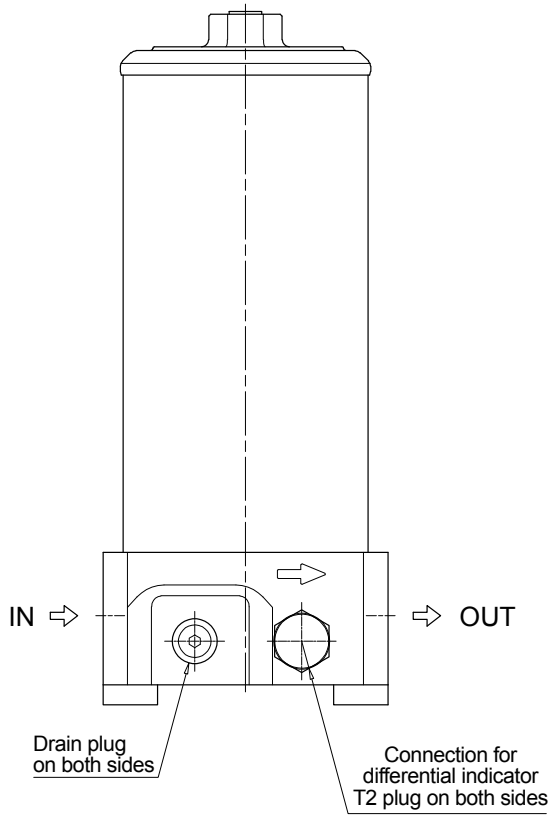
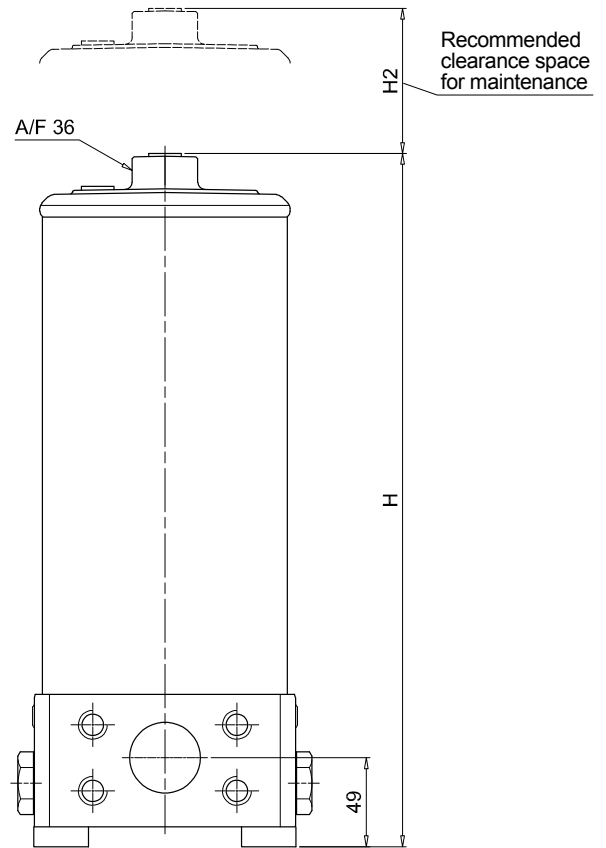
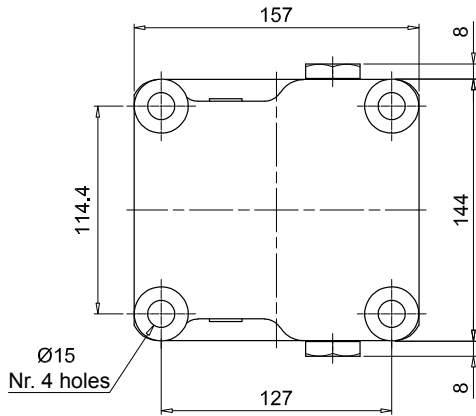
# FHF 325

## Dimensions

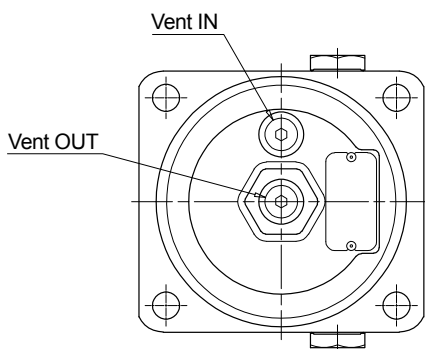
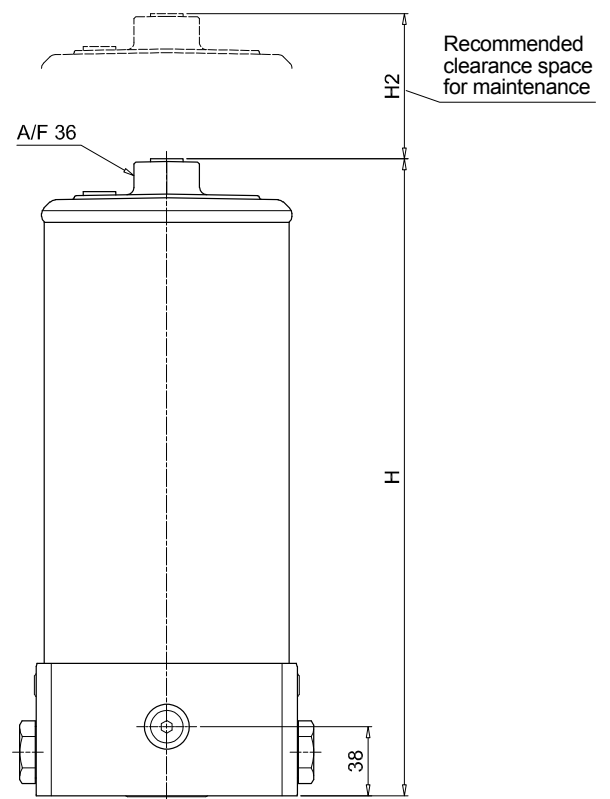
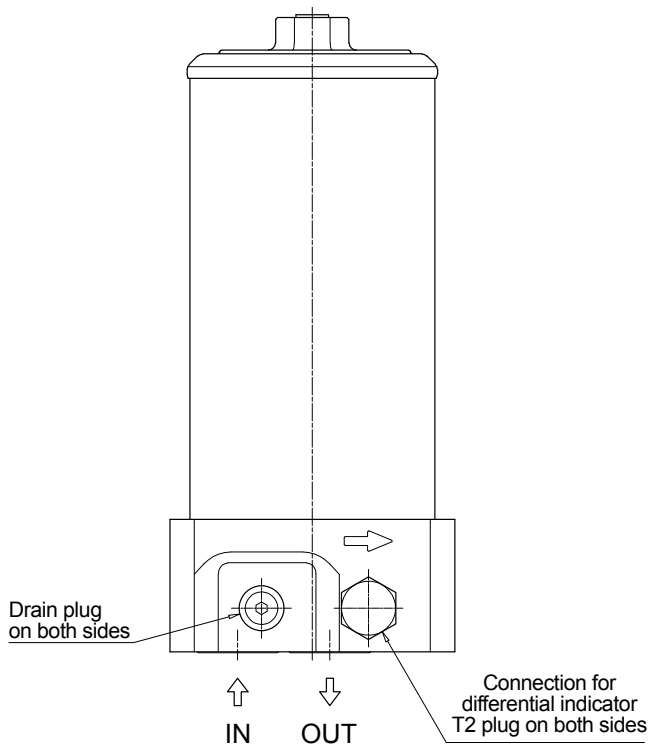
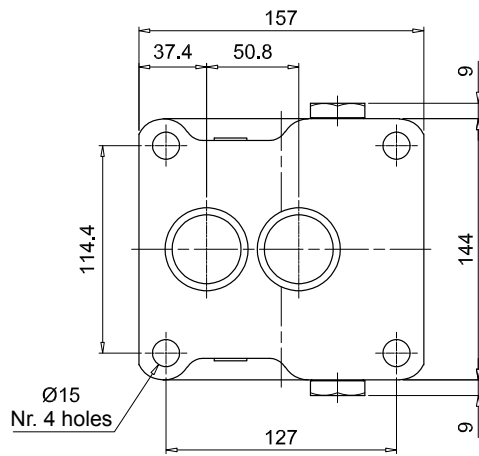
FHF325

Connection G - H

Filter length	H [mm]	H2 [mm]
<b>1</b>	463	250
<b>2</b>	701	485
<b>3</b>	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	Indicator connection plug	
<b>FHF 325</b> <b>A-B-C-G-H</b>	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	Indicator connection plug	
<b>FHF 325</b> <b>M-N</b>	See order table	02050590	02050591	T2H T2V







# FHD series

Maximum working pressure up to 35 MPa (350 bar) - Flow rate up to 345 l/min



### High Pressure filters

#### Duplex

**Maximum working pressure up to 35 MPa (350 bar)**

**Flow rate up to 345 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 integrated in the changeover lever, 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 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:

- 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 N: 20 bar
- 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

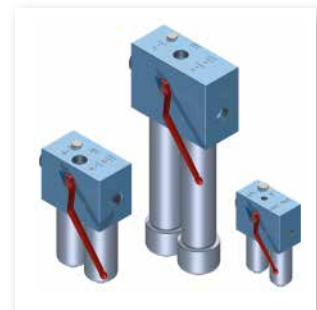
From -25 °C to +110 °C

#### Connections

In-line Inlet/Outlet 90°

#### Note

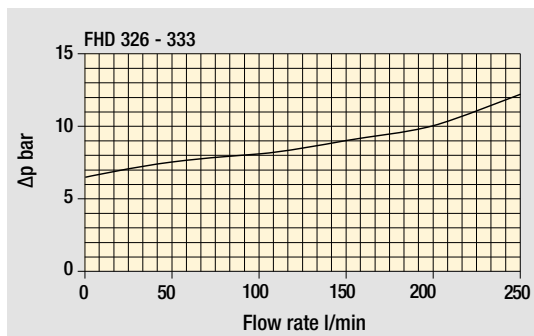
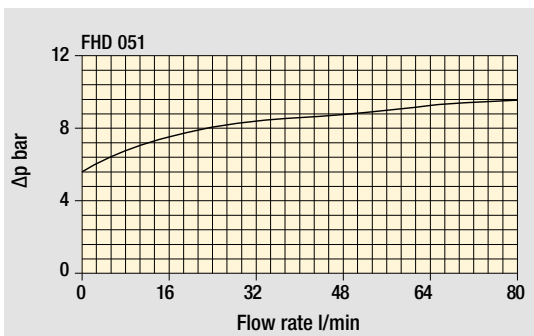
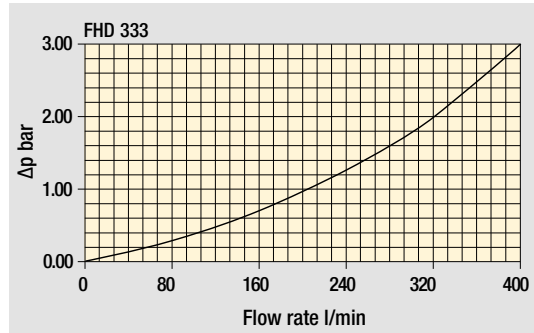
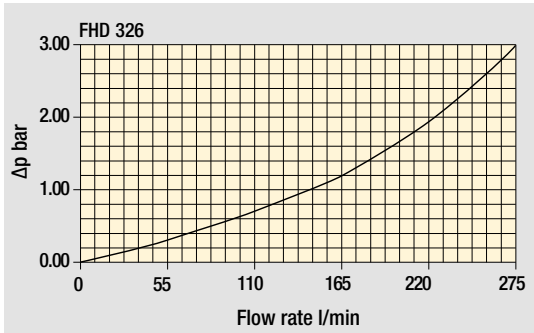
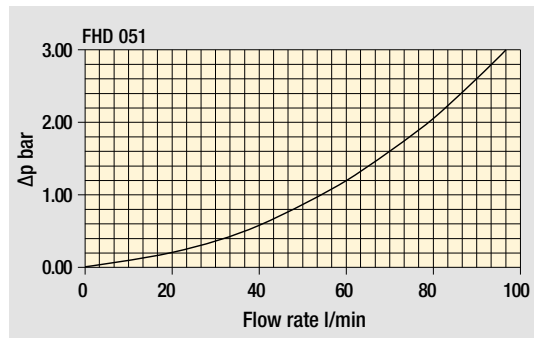
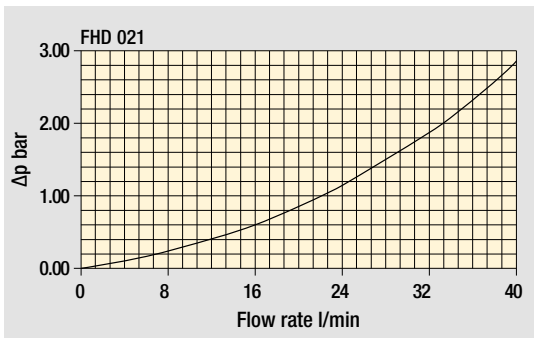
FHD filters are provided for vertical mounting



## Weights [kg] and volumes [dm<sup>3</sup>]

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

Filter housings  $\Delta p$  pressure drop



Bypass valve pressure drop

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

# FHD GENERAL INFORMATION

## Flow rates [l/min]

Filter series	Length	Filter element design - H Series					
		A03	A06	A10	A16	A25	M25
<b>FHD 021</b>	<b>2</b>	6	8	14	16	19	26
	<b>3</b>	10	12	18	20	22	27
	<b>4</b>	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	A25
<b>FHD 051</b>	<b>2</b>	39	41	51	54	59	64		35	37	48	51	58
	<b>3</b>	45	46	54	56	61	65		41	43	52	54	60
	<b>4</b>	50	52	58	58	62	65		47	49	56	56	61
	<b>5</b>	56	57	61	62	63	65		53	53	57	59	63
<b>FHD 326</b>	<b>1</b>	93	99	131	142	154	171		83	87	117	120	146
	<b>2</b>	136	141	163	166	173	176		119	128	149	151	163
	<b>3</b>	152	159	171	174	175	177		139	148	161	163	170
<b>FHD 333</b>	<b>2</b>	175	184	224	230	245	249		147	162	199	201	225
	<b>3</b>	204	217	241	245	247	252		179	196	221	224	238
	<b>4</b>	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 mm<sup>2</sup>/s (cSt) and a density of 0.86 kg/dm<sup>3</sup>.

For different pressure drop or fluid viscosity we recommend to use our selection software available on [www.mpfiltri.com](http://www.mpfiltri.com).

Please, contact our Sales Department for further additional information.

## Hydraulic symbols

Filter series	Style S	Style B	Style B
<b>FHD 021</b>	•		
<b>FHD 051</b>	•	•	
<b>FHD 326</b>	•		•
<b>FHD 333</b>	•		•

--	--	--



## Designation & Ordering code

### COMPLETE FILTER

<b>Series and size</b> <b>FHD021</b>	Configuration example: <b>FHD021</b>   <b>4</b>   <b>S</b>   <b>A</b>   <b>G1</b>   <b>A06</b>   <b>H</b>   <b>P01</b>									
<b>Length</b> <b>2</b>   <b>3</b>   <b>4</b>										
<b>Valves</b> <b>S</b> Without bypass										
<b>Seals</b> <b>A</b> NBR <b>V</b> FPM										
<b>Connections</b> <b>G1</b> G 1/2" <b>G2</b> 1/2" NPT <b>G3</b> SAE 8 - 3/4" - 16 UNF										
<b>Filtration rating (filter media)</b>										
<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm									
<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm									
<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm									

Element Δp	Filtration rating		Execution
	Axx	M25	
<b>N</b> 20 bar		•	<b>P01</b> MP Filtri standard
<b>H</b> 210 bar	•		<b>Pxx</b> Customized

### FILTER ELEMENT

<b>Element series and size</b> <b>HP011</b>	Configuration example: <b>HP011</b>   <b>4</b>   <b>A06</b>   <b>A</b>   <b>H</b>   <b>P01</b>					
<b>Element length</b> <b>2</b>   <b>3</b>   <b>4</b>						
<b>Filtration rating (filter media)</b>						
<b>A03</b> Inorganic microfiber 3 µm	<b>A16</b> Inorganic microfiber 16 µm					
<b>A06</b> Inorganic microfiber 6 µm	<b>A25</b> Inorganic microfiber 25 µm					
<b>A10</b> Inorganic microfiber 10 µm	<b>M25</b> Wire mesh 25 µm					

Seals	Element Δp	Filtration rating		Execution
		Axx	M25	
<b>A</b> NBR	<b>N</b> 20 bar		•	<b>P01</b> MP Filtri standard
<b>V</b> FPM	<b>H</b> 210 bar	•	•	<b>Pxx</b> Customized

### ACCESSORIES

Additional features	page		page
<b>DEA</b> Electrical differential indicator	563	<b>DLE</b> Electrical / visual differential indicator	566
<b>DEH</b> Hazardous area electronic differential indicator	563-564	<b>DTA</b> Electronic differential indicator	567
<b>DEM</b> Electrical differential indicator	564-565	<b>DVA</b> Visual differential indicator	567
<b>DLA</b> Electrical / visual differential indicator	565-566	<b>DVM</b> Visual differential indicator	567
<b>T2</b> Plug	568		



# 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
<b>G1</b>	G 3/4"	G 1 1/4"	-
<b>G2</b>	3/4" NPT	1 1/4" NPT	-
<b>G3</b>	G 1/2"	SAE 20 - 1 5/8" - 12 UN	-
<b>G4</b>	1/2" NPT	-	-
<b>G5</b>	SAE 8 - 3/4" - 16 UNF	-	-
<b>G6</b>	SAE 12 - 1 1/16" - 12 UN	-	-
<b>F1</b>	-	-	1 1/2" 6000 psi/M
<b>F2</b>	-	-	1 1/2" 6000 psi/UNC

#### Filtration rating (filter media)

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

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

### FILTER ELEMENT

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

**HP050** | **HP320**

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

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

#### Filtration rating (filter media)

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

Seals	Filtration rating		Execution
	Axx	M25	
<b>A</b> NBR		•	<b>P01</b> MP Filtri standard
<b>V</b> FPM	•	•	<b>Pxx</b> Customized
	•	•	

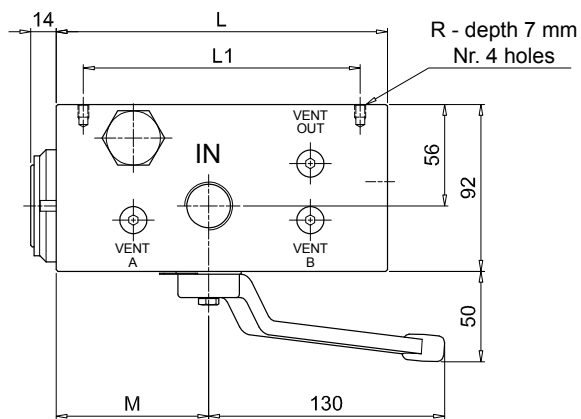
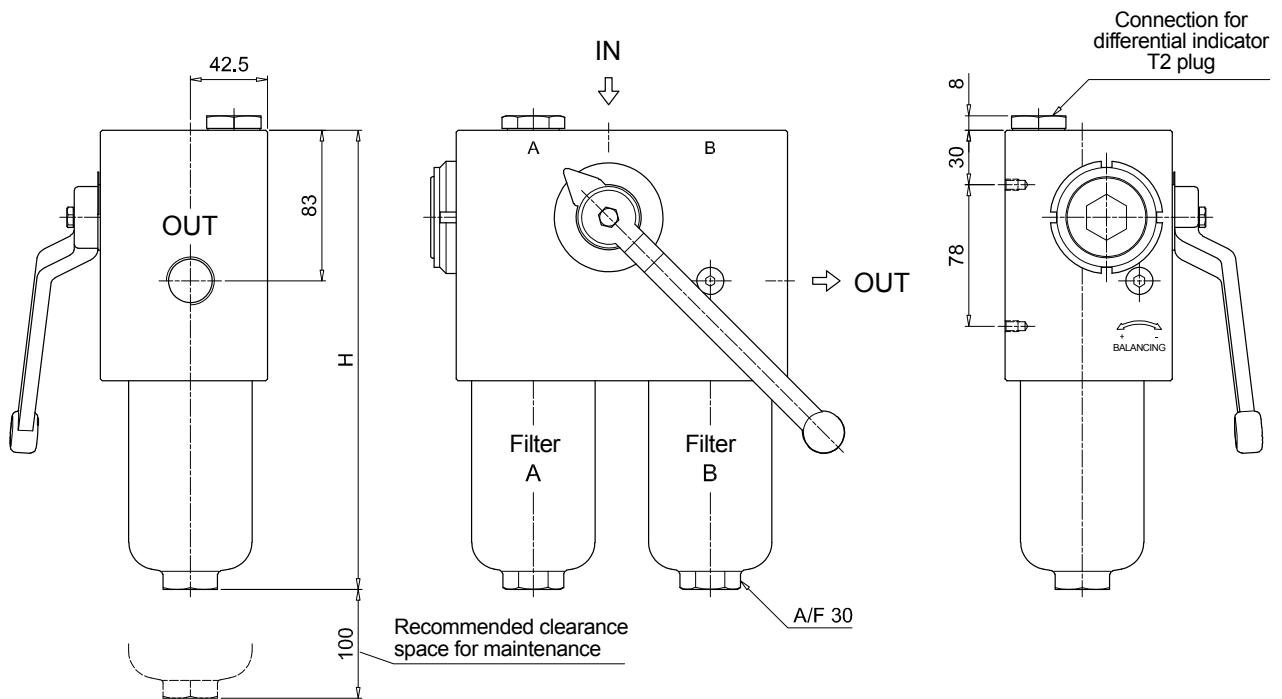
### ACCESSORIES

Differential indicators	page		page
<b>DEA</b> Electrical differential indicator	563	<b>DLE</b> Electrical / visual differential indicator	566
<b>DEH</b> Hazardous area electronic differential indicator	563-564	<b>DTA</b> Electronic differential indicator	567
<b>DEM</b> Electrical differential indicator	564-565	<b>DVA</b> Visual differential indicator	567
<b>DLA</b> Electrical / visual differential indicator	565-566	<b>DVM</b> Visual differential indicator	567

Additional features	page
<b>T2</b> Plug	568

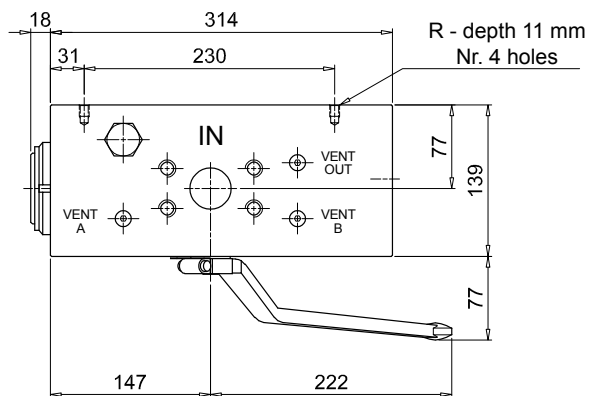
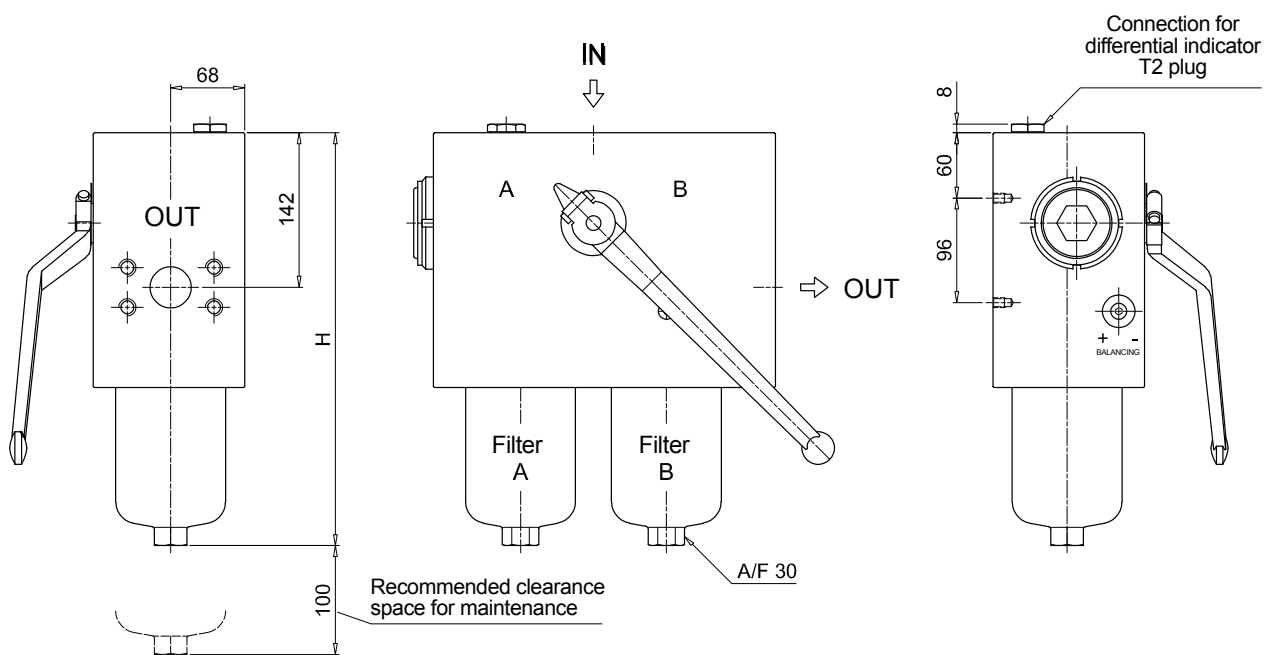


FHD051			
Filter length	H [mm]		
2	253		
3	295		
4	343		
5	465		
Connections	R		
G1	M6		
G2	1/4" UNC		
G3	M6		
G4-G5-G6	1/4" UNC		
Valves	L [mm]	L1 [mm]	M [mm]
S	168	138	84
B	182.5	152.5	98.5





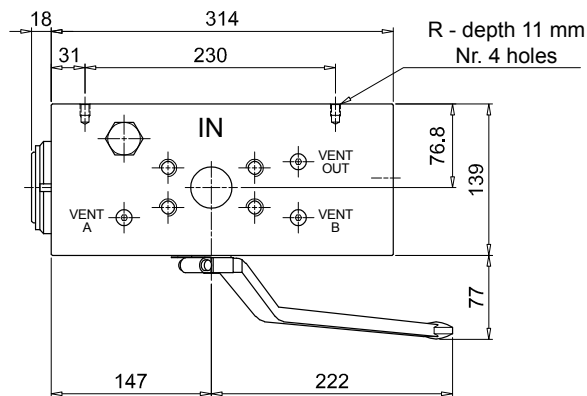
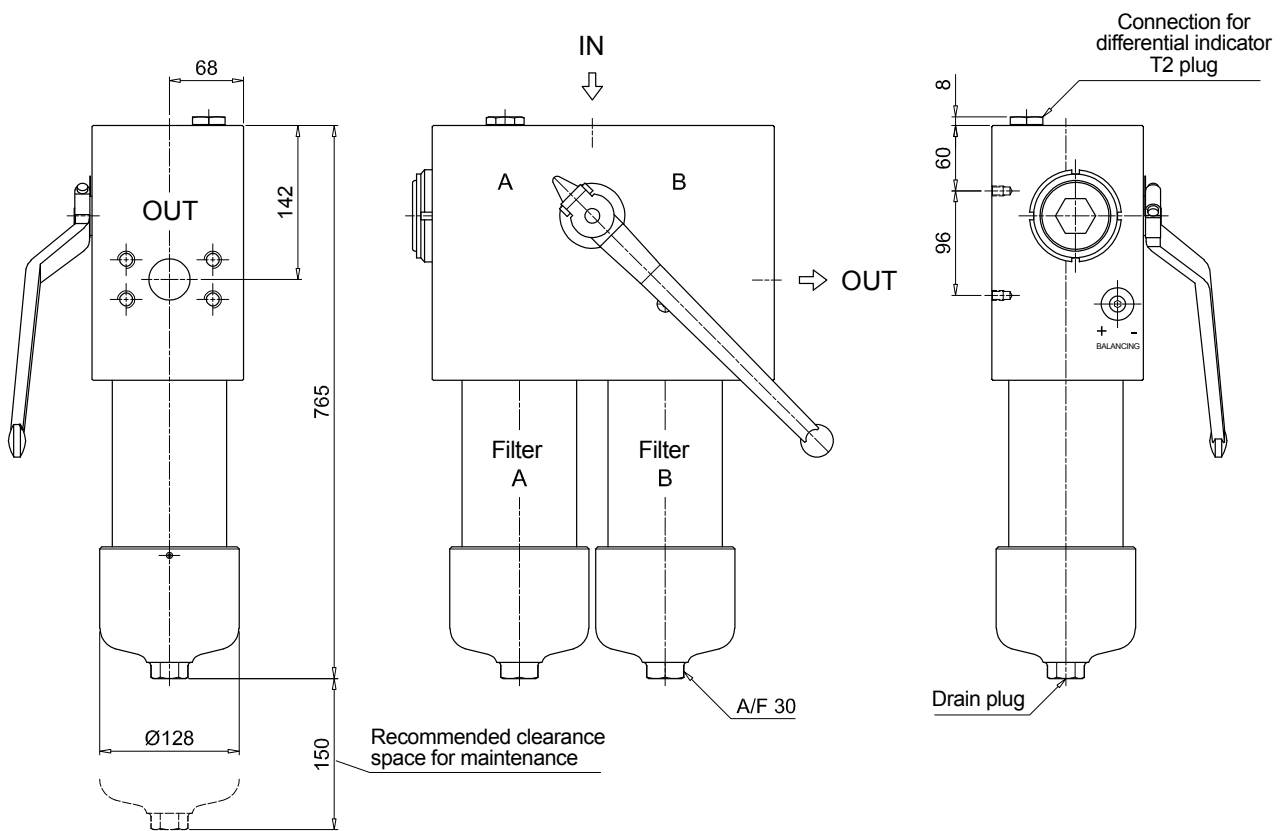
FHD333	
Length 2 - 3	
Filter length	H [mm]
2	479
3	612
Connections	R
F1	M10
F2	3/8" UNC



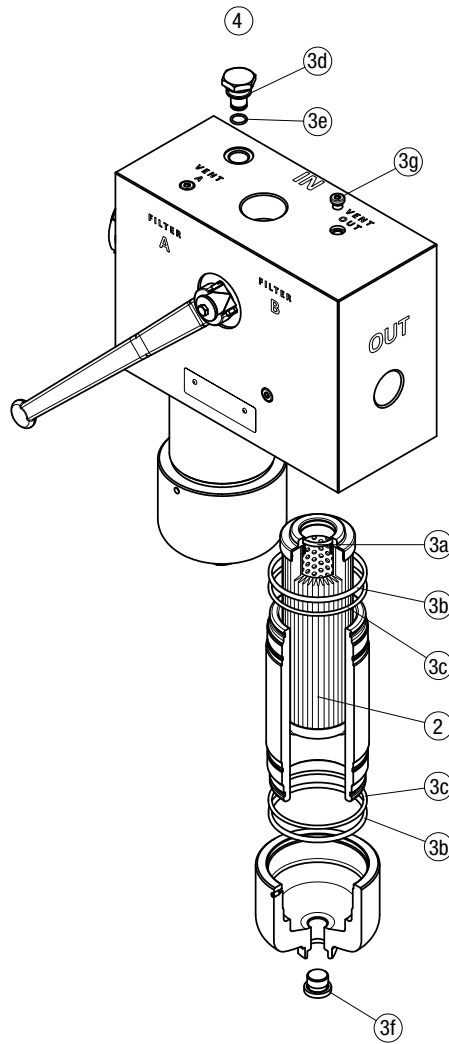
# FHD FHD051 - FHD326 - FHD333

## 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		0205011	0205012	T2H	T2V
FHD 326-333		02050420	02050421		
		02050377	02050378		

# Clogging indicators

## Differential indicators

### Introduction

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

These devices trip when the clogging of the filter element causes an increase in pressure drop across the filter element.

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 model (only available for differential type indicators) with warning signals (75% of clogging) and alarm (clogging).

### Suitable indicator types

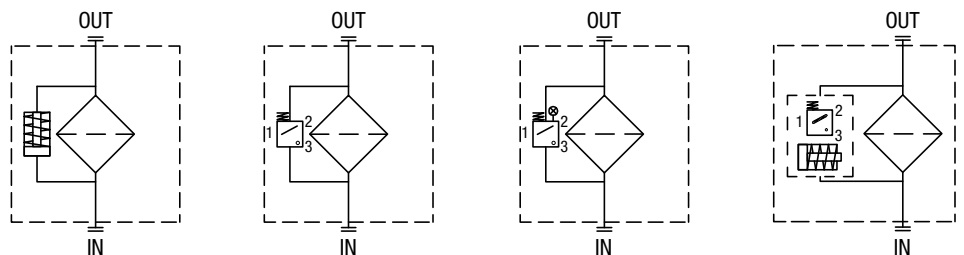
#### DIFFERENTIAL INDICATORS

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.

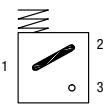
Also available in Stainless Steel models.



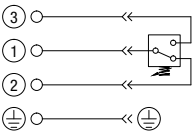
### Quick reference guide

Filter series	Visual indicator	Electrical indicator	Electrical / Visual indicator	Electronic indicator	Hazardous area electronic indicator <span style="float: right; border: 1px solid black; padding: 2px;">NEW</span>
With bypass valve FMP 039 - 065 - 135 - 320 FHP 010 - 011 - 065 - 135 - 320 - 500 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 DEM50xAxxP01	DLA50xA51P01 DLA50xA52P01 DLA50xA71P01 DLE50xA50P01 DLE50xF50P01	DTA50xF70P01	DEH50xA48P01 DEH50xA49P01 DEH50xA70P01 DEH70xA48P01 DEH70xA49P01 DEH70xA70P01
Without bypass valve FMP 039 - 065 - 135 - 320 FHP 010 - 011 - 065 - 135 - 320 - 500 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 DVM70xP01	DEA70xA50P01 DEM70xAxxP01	DLA70xA51P01 DLA70xA52P01 DLA70xA71P01 DLE70xA50P01 DLE70xF50P01	DTA70xF70P01	DEH50xA48P01 DEH50xA49P01 DEH50xA70P01 DEH70xA48P01 DEH70xA49P01 DEH70xA70P01

DEA*50	
<b>Electrical Differential Indicator</b>	
Settings	Ordering code
5 bar ±10%	DE A 50 x A 50 P01
7 bar ±10%	DE A 70 x A 50 P01
9.5 bar ±10%	DE A 95 x A 50 P01



**Hydraulic symbol**



**Electrical symbol**

**Materials**

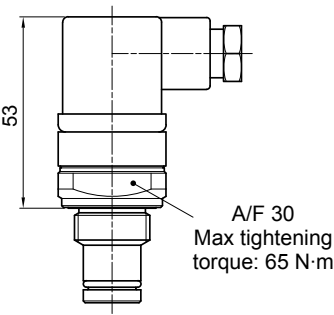
- Body: Brass
- Base: Black Nylon
- Contacts: Silver
- Seal: HNBR - FPM

**Technical data**

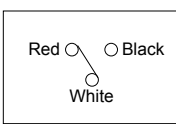
- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids  
HFA, HFB, HFC according to ISO 2943
- Degree protection: IP66 according to EN 60529  
IP69K according to ISO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

**Electrical data**

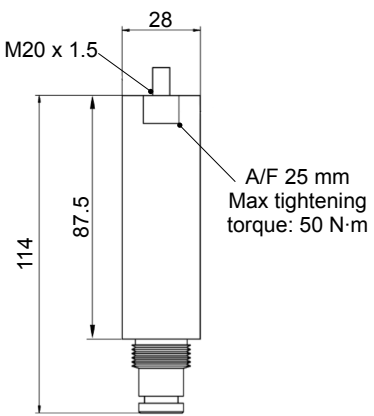
- Electrical connection: EN 175301-803
- Resistive load: 0.2 A / 115 Vdc



DEH*48	
<b>Hazardous Area Electronic Differential Indicator</b>	
Settings	Ordering code
5 bar ±10%	DE H 50 x A 48 P01
7 bar ±10%	DE H 70 x A 48 P01



**Connection diagram**



**Materials**

- Body: AISI 316 Stainless steel
- Contacts: Rhodium (tungsten optional)
- Seal: MFQ - FPM

**Protection class**

Ex ia IIC T4/T6: Intrinsically safe

**Temperature class**


T4 (135 °C) and T6 (85 °C)

**Technical data**

- Max working pressure: 420 bar
- Working temperature: From -60 °C to +125 °C
- Connection type: M20 x 1.5 - 3 core polyrad cable supplied with 5 meters
- Contact type: SPCO/SPDT (Hermetically sealed - volt free contacts)
- Compatibility with fluids: Mineral oils, Synthetic fluids  
HFA, HFB, HFC according to ISO 2943
- Degree of protection: IP 66/67/68 according to EN 60529

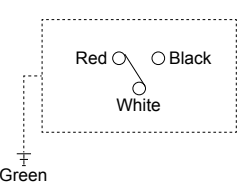
**Electrical data**

- Current Ratings: 24v DC 830mA - 110v AC 180mA
- Electrical Ratings: Ui 30V - Li 250mA - Pi 1.3W

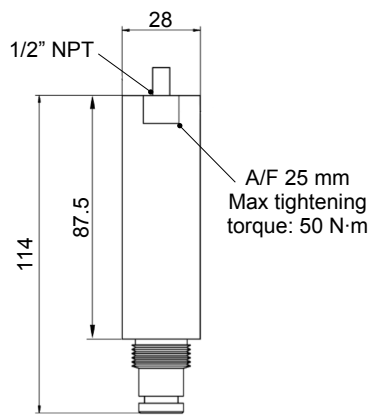


- Certification / Approvals: ATEX, IECEx, TRCU, INMETRO  
- Certification included as standard

DEH*49	
<b>Hazardous Area Electronic Differential Indicator</b>	
Settings	Ordering code
5 bar ±10%	DE H 50 x A 49 P01
7 bar ±10%	DE H 70 x A 49 P01



**Connection diagram**



**Materials**

- Body: AISI 316 Stainless steel
- Contacts: Rhodium (tungsten optional)
- Seal: MFQ - FPM

**Protection class**

Ex d IIC T4/T6: Flameproof

**Temperature class**


T4 (135 °C) and T6 (85 °C)

**Technical data**

- Max working pressure: 420 bar
- Working temperature: From -60 °C to +120 °C : ATEX, IECEx, TRCU, INMETRO  
From -60 °C to +105 °C : UL/CSA
- Connection type: 1/2" NPT - 3 core polyrad cable supplied with 5 meters
- Contact type: SPCO/SPDT (Hermetically sealed - volt free contacts)
- Compatibility with fluids: Mineral oils, Synthetic fluids  
HFA, HFB, HFC according to ISO 2943
- Degree of protection: IP 66/67/68 according to EN 60529

**Electrical data**

- Current Ratings: 24v DC 830mA - 110v AC 180mA
- Electrical Ratings: Supply Voltage | 24 VDC | 110 VAC |  
Max switching current | 830mA | 180mA |  
Max voltage | 150 V AC/DC |  
Power watts | 20 W VA |

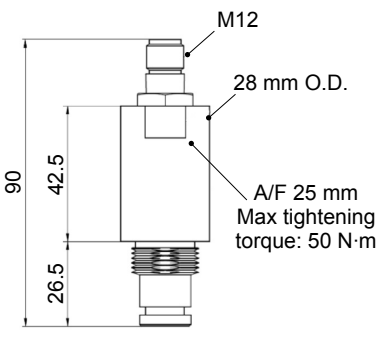


- Certification / Approvals: ATEX, IECEx, TRCU, INMETRO, UL/CSA Class I Division 1 Groups A-D, UL/CSA Class II Division 1 Groups E-G  
- Certification included as standard

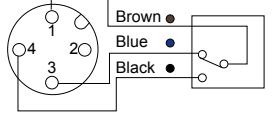
# DIFFERENTIAL INDICATORS

## Dimensions

DEH*70	
<b>Hazardous Area Electronic Differential Indicator</b>	
<b>Settings</b>	<b>Ordering code</b>
5 bar ±10%	DE H 50 x A 70 P01
7 bar ±10%	DE H 70 x A 70 P01



**Connection diagram**



**Certification / Approvals:**  
ATEX, IECEx, TRCU, INMETRO

**Certification included as standard**

**Materials**

- Body: AISI 316 Stainless steel housing with internal engineered resin switch
- Contacts: Rhodium
- Seal: MFQ - FPM

**Protection class** EX ia IIC T6: Intrinsically safe

**Temperature class** T6 (85 °C)

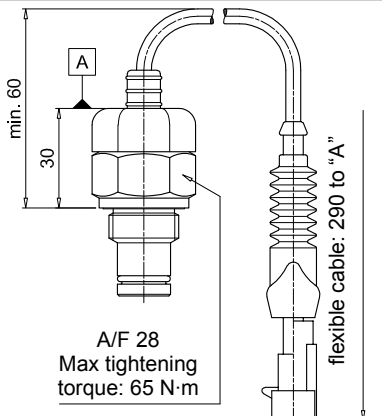
**Technical data**

- Max working pressure: 420 bar
- Working temperature: From -20 °C to +80 °C
- Connection type: 4 pole male M12 connector - plastic
- Contact type: SPCO/SPDT (Hermetically sealed - volt free contacts)
- Compatibility with fluids: Mineral oils, Synthetic fluids
- Degree of protection: IP 66/67 according to EN 60529

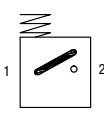
**Electrical data**

- Current Ratings: 24v DC 830mA - 110v AC 180mA
- Electrical Ratings: Ui 30V - Li 250mA - Pi 1.3W

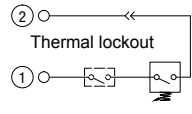
DEM*10	
<b>Electrical Differential Indicator</b>	
<b>Settings</b>	<b>Ordering code</b>
5 bar ±10%	DE M 50 x x 10 P01
7 bar ±10%	DE M 70 x x 10 P01
9.5 bar ±10%	DE M 95 x x 10 P01



**Hydraulic symbol**



**Electrical symbol**



**Materials**

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

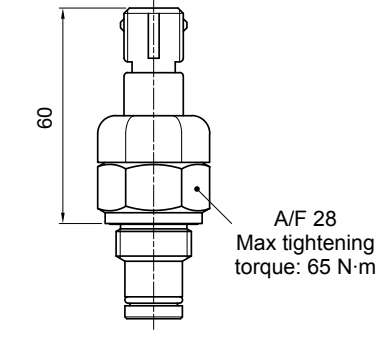
**Technical data**

- 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
- Degree protection: IP66 according to EN 60529

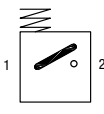
**Electrical data**

- 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")

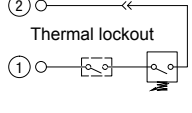
DEM*20	
<b>Electrical Differential Indicator</b>	
<b>Settings</b>	<b>Ordering code</b>
5 bar ±10%	DE M 50 x x 20 P01
7 bar ±10%	DE M 70 x x 20 P01
9.5 bar ±10%	DE M 95 x x 20 P01



**Hydraulic symbol**



**Electrical symbol**



**Materials**

- Body: Brass
- Base: Black Nylon
- 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
- Degree protection: IP66 according to EN 60529

**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")

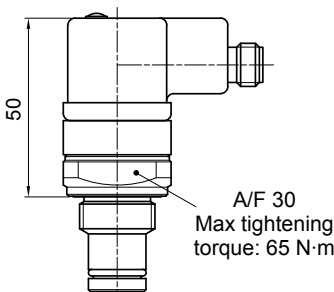




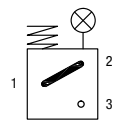
# DIFFERENTIAL INDICATORS

## Dimensions

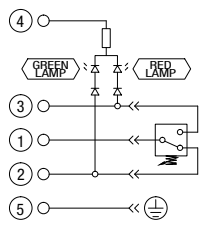
DLA*71	
<b>Electrical/Visual Differential Indicator</b>	
Settings	Ordering code
5 bar $\pm$ 10%	DL A 50 x A 71 P01
7 bar $\pm$ 10%	DL A 70 x A 71 P01
9.5 bar $\pm$ 10%	DL A 95 x A 71 P01



**Hydraulic symbol**



**Electrical symbol**



**Materials**

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

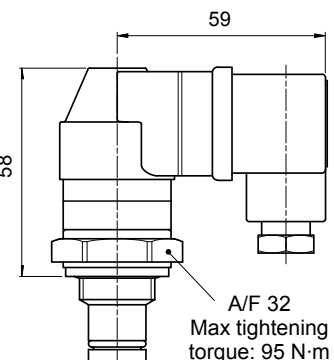
**Technical data**

- 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: IP65 according to EN 60529  
IP69K according to ISO 20653

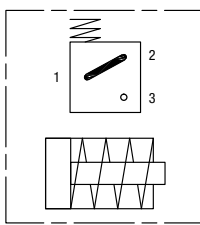
**Electrical data**

- Electrical connection: IEC 61076-2-101 D (M12)
- Lamps: 24 Vdc
- Resistive load: 0.4 A / 24 Vdc

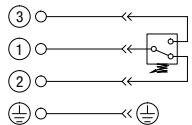
DLE*A50	
<b>Electrical/Visual Differential Indicator</b>	
Settings	Ordering code
5 bar $\pm$ 10%	DL E 50 x A 50 P01
7 bar $\pm$ 10%	DL E 70 x A 50 P01
9.5 bar $\pm$ 10%	DL E 95 x A 50 P01



**Hydraulic symbol**



**Electrical symbol**



**Materials**

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

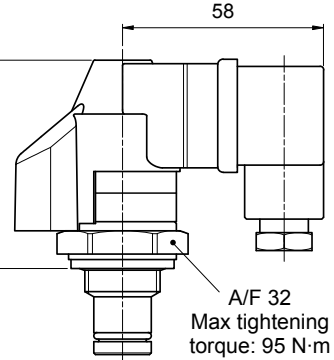
**Technical data**

- 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: IP65 according to EN 60529

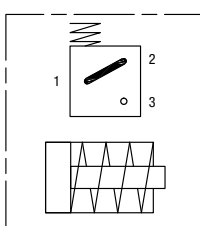
**Electrical data**

- Electrical connections: EN 175301-803
- Resistive load: 5 A / 250 Vac
- Available the connector with lamps

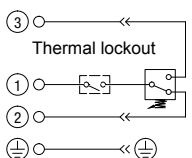
DLE*F50	
<b>Electrical/Visual Differential Indicator</b>	
Settings	Ordering code
5 bar $\pm$ 10%	DL E 50 x F 50 P01
7 bar $\pm$ 10%	DL E 70 x F 50 P01
9.5 bar $\pm$ 10%	DL E 95 x F 50 P01



**Hydraulic symbol**



**Electrical symbol**



**Materials**

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

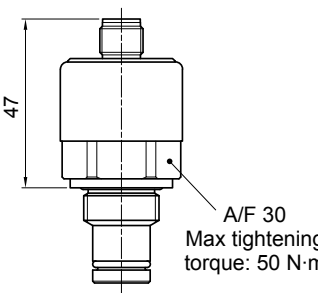
**Technical data**

- 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: IP65 according to EN 60529

**Electrical data**

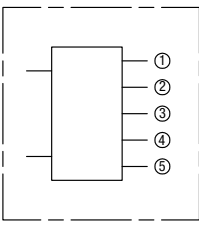
- Electrical connections: EN 175301-803
- Resistive load: 5 A / 250 Vac
- Thermal lockout setting: +30 °C

DTA*70	
<b>Electronic Differential Indicator</b>	
Settings	Ordering code
5 bar ±10%	DT A 50 x x 70 P01
7 bar ±10%	DT A 70 x x 70 P01
9.5 bar ±10%	DT A 95 x x 70 P01



A/F 30  
Max tightening torque: 50 N·m

**Hydraulic symbol**



**Electrical symbol**

①	○	○	+24 Vdc
②	○	○	4 ÷ 20 mA
③	○	○	75% - N.O. Digital output
④	○	○	100% - N.O. Digital output
⑤	○	○	0 Vdc

**Materials**

- Body: Brass
- Internal parts: Brass - Nylon
- Contacts: Silver
- Seal: HNBR - FPM

**Technical data**

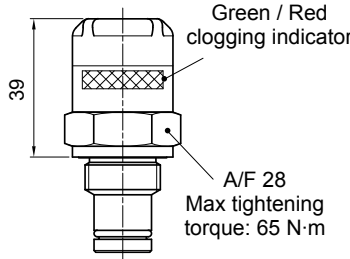
- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943
- Degree protection: IP67 according to EN 60529

**Electrical data**

- Electrical connection: IEC 61076-2-101 D (M12)
- Power supply: 24 Vdc
- Analogue output: From 4 to 20 mA
- Thermal lockout: 30 °C (all output signals stalled up to 30 °C)



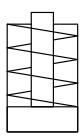
DVA	
<b>Visual Differential Indicator</b>	
Settings	Ordering code
5 bar ±10%	DV A 50 x P01
7 bar ±10%	DV A 70 x P01
9.5 bar ±10%	DV A 95 x P01



Green / Red clogging indicator

A/F 28  
Max tightening torque: 65 N·m

**Hydraulic symbol**



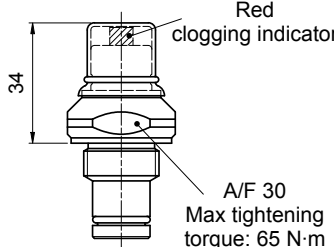
**Materials**

- Body: Brass
- Internal parts: Brass - Nylon
- Contacts: Silver
- Seal: HNBR - FPM

**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

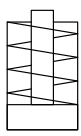
DVM	
<b>Visual Differential Indicator</b>	
Settings	Ordering code
5 bar ±10%	DV M 50 x P01
7 bar ±10%	DV M 70 x P01
9.5 bar ±10%	DV M 95 x P01



Red clogging indicator

A/F 30  
Max tightening torque: 65 N·m

**Hydraulic symbol**



**Materials**

- Body: Brass
- Internal parts: Brass - Nylon
- Contacts: Silver
- Seal: HNBR - FPM

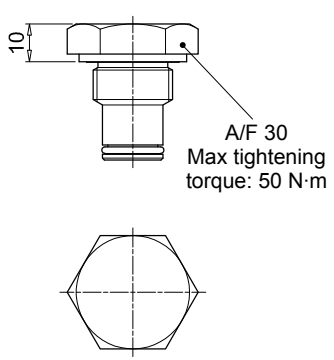
**Technical data**

- 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

# DIFFERENTIAL INDICATORS

## Dimensions

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

A/F 30  
Max tightening torque: 50 N·m

**Materials**

- Body: Phosphatized steel
- Seal: HNBR / FPM

### DESIGNATION & ORDERING CODE - DIFFERENTIAL INDICATORS

Series	Configuration example 1:							P01
<b>DE</b> Electrical or Electronic differential indicator	DE	M	50	H	F	50		P01
<b>DL</b> Electrical / Visual differential indicator	DE	H	50	F	A	70		P01
<b>DT</b> Electronic differential indicator	DL	E	70	V	A	71		P01
<b>DV</b> Visual differential indicator	DT	A	50	H	F	70		P01
	DV	M	95	V				P01

Type	DE	DL	DT	DV
<b>A</b> Standard type	•	•	•	<b>A</b> With automatic reset
<b>M</b> With wired electrical connection	•			<b>M</b> With manual reset
<b>E</b> For high power supply		•		
<b>H</b> Hazardous area	•			

Pressure setting	DEA	DEH	DEM	DLA	DLE	DT	DV
<b>50</b> 5 bar	•	•	•	•	•	•	•
<b>70</b> 7 bar	•	•	•	•	•	•	•
<b>95</b> 9.5 bar	•		•	•	•	•	•

Seals	DEA	DEH	DEM	DLA	DLE	DT	DV
<b>F</b> MFQ		•					
<b>H</b> HNBR	•		•	•	•	•	•
<b>V</b> FPM	•	•	•	•	•	•	•

Thermostat	DEA	DEH	DEM	DLA	DLE	DT	DV
<b>A</b> Without	•	•	•	•	•		
<b>F</b> With thermostat			•		•	•	

Electrical connections	DEA	DEH	DEM	DLA	DLE	DT	DV
<b>10</b> Connection AMP Superseal series 1.5			•				
<b>20</b> Connection AMP Timer Junior			•				
<b>30</b> Connection Deutsch DT-04-2-P			•				
<b>35</b> Connection Deutsch DT-04-3-P			•				
<b>48</b> Connection M20		•					
<b>49</b> Connection 1/2" NPT		•					
<b>50</b> Connection EN 175301-803	•				•		
<b>51</b> Connection EN 175301-803, transparent base with lamps 24 Vdc				•			
<b>52</b> Connection EN 175301-803, transparent base with lamps 110 Vdc				•			
<b>70</b> Connection IEC 61076-2-101 D (M12)		•				•	
<b>71</b> Connection IEC 61076-2-101 D (M12), black base with lamps 24 Vdc				•			

Option
<b>P01</b> MP Filtri standard
<b>Pxx</b> Customized

### DESIGNATION & ORDERING CODE - DIFFERENTIAL INDICATOR PLUG

Series	Configuration example	
<b>T2</b> Indicator plug	T2	H

Seals
<b>H</b> HNBR
<b>V</b> FPM

**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.**

# Clogging Indicators



# Clogging indicators



## Suitable indicator types

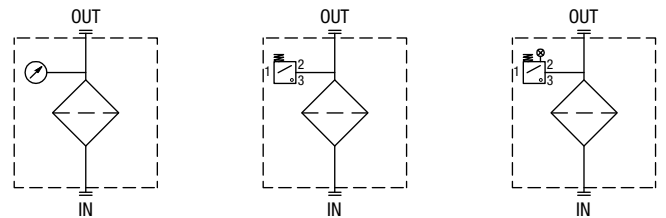
### VACUUM INDICATORS

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.

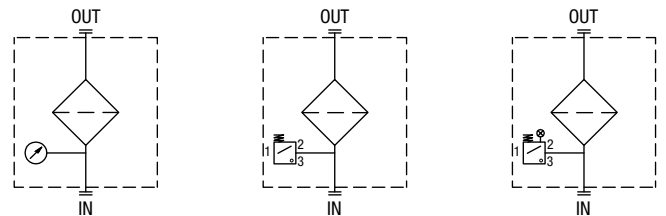


### BAROMETRIC INDICATORS

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.



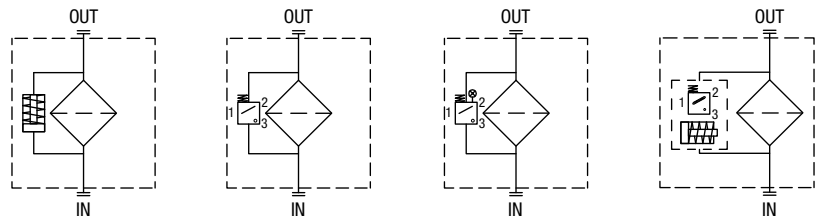
### DIFFERENTIAL INDICATORS

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.





Filter family	Filter series	Visual indicator	Electrical indicator	Electrical / Visual indicator	Electronic indicator
SUCTION FILTERS	SF2 250 - 350 SF2 500 - 501 - 503 - 504 - 505 SF2 510 - 535 - 540	WA16P01 VVR16P01	VEA21AA50P01	VLA21AA51P01 VLA21AA52P01 VLA21AA53P01 VLA21AA71P01	
RETURN FILTERS	MPFX-MPTX-MPF-MPT with bypass 1.75 bar MPH with bypass 1.75 bar	BVA14P01 BVR14P01 BVP20HP01 BVQ20HP01	BEA15HA50P01 BEM15HA41P01	BLA15HA51P01 BLA15HA52P01 BLA15HA53P01 BLA15HA71P01	
	MPFX-MPTX-MPF-MPT with bypass 3 bar MPH with bypass 2.5 bar FRI 255	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01	BEA20HA50P01 BEM20HA41P01	BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01	
	MPLX FRI 025 - 040 - 100 - 250 - 630 - 850	DVA20xP01 DVM20xP01	DEA20xA50P01 DEM20xAxxP01	DLA20xA51P01 DLA20xA52P01 DLA20xA71P01 DLE20xA50P01 DLE20xF50P01	DTA20xF70P01
RETURN / SUCTION FILTERS	Suction line MRSX 116 - 165 - 166	WB16P01 VVS16P01	VEB21AA50P01	VLB21AA51P01 VLB21AA52P01 VLB21AA53P01 VLB21AA71P01	
	Return line MRSX 116 - 165 - 166 LMP 124 MULTIPOINT	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01	BEA25HA50P01 BEM25HA41P01 BET25HF10P01 BET25HF30P01 BET25HF50P01	BLA25HA51P01 BLA25HA52P01 BLA25HA53P01 BLA25HA71P01	
SPIN-ON FILTERS	Suction line MPS 050 - 070 - 100 - 150 MPS 200 - 250 - 300 - 350	VWB16P01 VVS16P01	VEB21AA50P01	VLB21AA51P01 VLB21AA52P01 VLB21AA53P01 VLB21AA71P01	
	Return line MPS 050 - 070 - 100 - 150 MPS 200 - 250 - 300 - 350	BVA14P01 BVR14P01 BVP20HP01 BVQ20HP01	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	
LOW & MEDIUM PRESSURE FILTERS	With bypass valve LMP 110 - 112 - 116 - 118 - 119 MULTIPOINT LMP 120 - 122 - 123 MULTIPOINT 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 DEM20xAxxP01	DLA20xA51P01 DLA20xA52P01 DLA20xA71P01 DLE20xA50P01 DLE20xF50P01	DTA20xF70P01
	Without bypass valve LMP 110 - 112 - 116 - 118 - 119 MULTIPOINT LMP 120 - 122 - 123 MULTIPOINT 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 DEM50xAxxP01	DLA50xA51P01 DLA50xA52P01 DLA50xA71P01 DLE50xA50P01 DLE50xF50P01	DTA50xF70P01
HIGH PRESSURE FILTERS	With bypass valve FMP 039 - 065 - 135 - 320 FHP 010 - 011 - 065 - 135 - 320 - 500 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 DEM50xAxxP01	DLA50xA51P01 DLA50xA52P01 DLA50xA71P01 DLE50xA50P01 DLE50xF50P01	DEH50xA48P01 DEH50xA49P01 DEH50xA70P01 DEH70xA48P01 DEH70xA49P01 DEH70xA70P01
	Without bypass valve FMP 039 - 065 - 135 - 320 FHP 010 - 011 - 065 - 135 - 320 - 500 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 DVM70xP01	DEA70xA50P01 DEM70xAxxP01	DLA70xA51P01 DLA70xA52P01 DLA70xA71P01 DLE70xA50P01 DLE70xF50P01	DEH50xA48P01 DEH50xA49P01 DEH50xA70P01 DEH70xA48P01 DEH70xA49P01 DEH70xA70P01
STAINLESS STEEL HIGH PRESSURE FILTERS	With bypass valve FZH 010 - 011 - 039 FZP 039 - 136 FZX 011 FZB 039 FZM 039 FZD 051	DVX50xP01 DVY50xP01	DEX50xA50P01	DLX50xA51P01 DLX50xA52P01	DEH50xA48P01 DEH50xA49P01 DEH50xA70P01 DEH70xA48P01 DEH70xA49P01 DEH70xA70P01
	Without bypass valve FZH 010 - 011 - 039 FZP 039 - 136 FZB 039 FZM 039 FZD 010 - 021 - 051	DVX70xP01 DVY70xP01	DEX70xA50P01	DLX70xA51P01 DLX70xA52P01	DEH50xA48P01 DEH50xA49P01 DEH50xA70P01 DEH70xA48P01 DEH70xA49P01 DEH70xA70P01

**Hazardous area electronic indicator**

**NEW**









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