

# Filter element

## Element description

M - Wire Mesh

A - Microfibre

### Characteristics of filter elements with nominal filtration, M series

For wire mesh filter elements, filtration degree is defined as the maximum diameter of a sphere corresponding to the mesh size, in microns.

### Characteristics of filter elements with absolute filtration, A series

For microfibre filter elements, filtration degree is defined by the test bench MULTIPASS ISO 16889.

## Reference standards

All filter elements comply with the following ISO standards.

**ISO 2941** - Collapse and burst resistance.

**ISO 2942** - Bubble point test resistance.

**ISO 2943** - Compatibility with fluids.

**ISO 3723** - Resistance to axial deformation.

**ISO 23181** - Fatigue test with flow.

**ISO 3968** - Pressure drop.

**ISO 16889** - Filtration efficiency by means of Multipass.

## Multipass test in compliance new ISO 16889 Contaminant ISO MTD

Filtration	$\beta_{x@} \geq 1000$
Filter element	
A01*	<4
A03	5
A06	7
A10	10
A16	15
A25	20

\* On request

## International standards for fluid contamination control

Components	Recommended filtrations									
	12/10/7	13/11/8	14/12/9	15/13/10	16/14/11	17/15/12	18/16/13	19/17/14	20/18/15	
Servo valves			●	●	●					
Proportional Valves				●	●	●				
Variable displacement pumps.					●	●	●			
Cartridge valves						●	●	●		
Piston pumps						●	●	●		
Vane pumps							●	●	●	
Pressure - flow rate control valves							●	●	●	
Solenoid valves							●	●	●	
ISO code	12/10/7	13/11/8	14/12/9	15/13/10	16/14/11	17/15/12	18/16/13	19/17/14	20/18/15	
NAS code	1	2	3	4	5	6	7	8	9	
Absolute filtration recommended	$\beta_{<4@} \geq 1000$		$\beta_{5@} \geq 1000$		$\beta_{7@} \geq 1000$		$\beta_{10@} \geq 1000$	$\beta_{15@} \geq 1000$	$\beta_{20@} \geq 1000$	

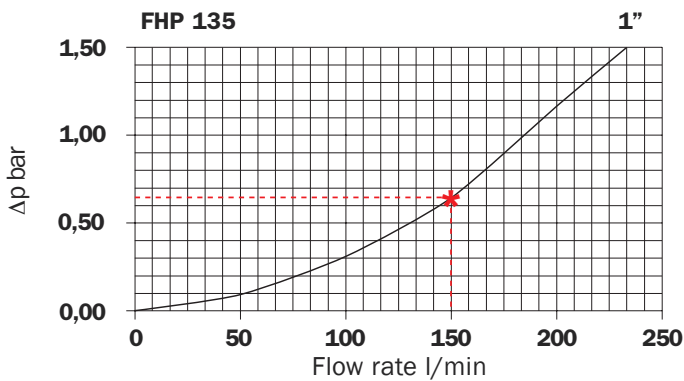
Correct sizing of the filter must be based on a variable pressure drop depending on the application:

- pressure filter  $\Delta p$  from 0,8 to 1,5 bar

The pressure drop calculation is performed by adding together the value for the housing and the value for the filter element. The pressure drop in the housing is proportional to the fluid density  $\text{kg/dm}^3$ ; all the graphs in the catalogue are referred to mineral oil with density of  $0,86 \text{ kg/dm}^3$ . The filter element pressure drop value is proportional to viscosity  $\text{mm}^2/\text{s}$ , the Y values in the catalogue are referred to viscosity of  $30 \text{ mm}^2/\text{s}$ .

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

The curves are plotted utilising mineral oil with density of  $0,86 \text{ kg/dm}^3$  to ISO 3968.  $\Delta p$  varies proportionally with density.



For Y values see next page:

### Sizing data for single cartridge, head at top

- $\Delta p$  Tot.
- $\Delta p_c$  Filter housing
- $\Delta p_e$  Filter element
- Y Multiplication factor (see pages 126 - 127)
- Q l/min = flow rate
- V1 = reference viscosity  $30 \text{ mm}^2/\text{s}$  (cSt)
- V2 = operating viscosity in  $\text{mm}^2/\text{s}$  (cSt)
- $\Delta p \text{ Tot.} = \Delta p_c + \Delta p_e$
- $\Delta p_e = Y : 1000 \times Q \times (V2/V1)$

### Calculation example with HLP Mineral Oil Variation in viscosity

- Data:
- Filter with in-line connections
- Pressure = 380 bar
- Flow rate = 150 l/min
- Viscosity =  $46 \text{ mm}^2/\text{s}$  (cSt)
- Density =  $0,86 \text{ Kg/dm}^3$
- Filtration =  $10 \mu\text{m}$  absolute
- With bypass valve

Filter type - FHP 135 3 (see housings pressure drop graphs on page 146)

### Practical example

- Q = 150 l/min
- $V_2 = 46 \text{ mm}^2/\text{s}$  (cSt)
- Pmax = 380 bar
- Filtration =  $10 \mu\text{m}$  absolute
- $\Delta p \text{ Tot. max} = 1,5 \text{ bar}$  (max. recommended value)
- Filter element series N,  $\Delta p$  max 20 bar
- $\Delta p_c = 0,657 \text{ bar}$  (\* see diagram)
- $\Delta p_e = (3,38 : 1000) \times 150 \times (46/30) = 0,777 \text{ bar}$
- $\Delta p \text{ Tot.} = 0,657 + 0,777 = 1,434 \text{ bar}$

Sized filter type:  
FHP 135 3 B A G2 A10 N P01

### Calculation examples with HFD fluid Variations in viscosity and density

- Data:
- Filter with in-line connections
- Pressure = 380 bar
- Flow rate = 150 l/min
- Viscosity =  $46 \text{ mm}^2/\text{s}$  (cSt)
- Density =  $1,1 \text{ Kg/dm}^3$
- Filtration =  $10 \mu\text{m}$  absolute
- With bypass valve

Filter type - FHP 135 3 (see housings pressure drop graphs on page 146)

### Practical example

- Q = 150 l/min
- $V_2 = 46 \text{ mm}^2/\text{s}$  (cSt)
- Pmax = 380 bar
- Filtration =  $10 \mu\text{m}$  absolute
- $\Delta p \text{ Tot. max} = 1,5 \text{ bar}$  (max. recommended value)
- Filter element series N,  $\Delta p$  max 20 bar
- $\Delta p_c = 0,657 \times (1,1/0,86) = 0,84$
- $\Delta p_e = (3,38 : 1000) \times 150 \times (46/30) = 0,777 \text{ bar}$
- $\Delta p \text{ Tot.} = 0,84 + 0,777 = 1,62 \text{ bar}$

Filter type:  
FHP 135 3 B A G2 A10 N P01 ( $\Delta p$  max exceeded)

Switch to next size up FHP 320...

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**Multiplication factor "Y" for definition of the pressure drop of filter elements.**

Reference viscosity 30 mm<sup>2</sup>/s

Filter Element	Absolute Filtration					Nominal Filtration	
	N - R Series					N Series	
Type	A 0 3	A 0 6	A 1 0	A 1 6	A 2 5	M 2 5	
<b>HP 011</b>	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	-
<b>HP 039</b>	2	70,66	53,20	25,77	20,57	14,67	4,90
	3	36,57	32,28	18,00	13,38	8,000	2,90
	4	26,57	23,27	12,46	8,80	5,580	2,20
<b>HP 050</b>	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
<b>HP 065</b>	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
<b>HP 135</b>	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
<b>HP 320</b>	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
<b>HP 500</b>	1	4,44	3,67	2,300	2,10	1,65	0,150
	2	3,37	2,77	1,775	1,68	1,24	0,100
	3	2,22	1,98	1,114	1,09	0,75	0,075
	4	1,81	1,33	0,930	0,86	0,68	0,050
	5	1,33	1,15	0,766	0,676	0,48	0,040

Filter Element	Absolute Filtration					Nominal Filtration	
	N Series					N Series	
Type	A 0 3	A 0 6	A 1 0	A 1 6	A 2 5	M 2 5	
<b>HF 320</b>	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

## Multiplication factor “Y” for definition of the pressure drop of filter elements.

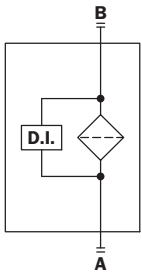
Reference viscosity 30 mm<sup>2</sup>/s

Filter Element	Absolute Filtration					
	H - S Series					
Type	A 0 3	A 0 6	A 1 0	A 1 6	A 2 5	
<b>HP 011</b>	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
<b>HP 021</b>	2	216,2	162,5	72,72	58,04	36,36
	3	108,1	81,25	36,36	29,02	18,18
<b>HP 050</b>	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
<b>HP 065</b>	1	62,28	58,56	26,66	21,66	12,42
	2	43,30	36,63	17,66	14,44	8,88
	3	20,55	16,90	8,55	7,09	4,16
<b>HP 135</b>	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
<b>HP 320</b>	1	13,00	12,19	6,80	6,40	3,32
	2	6,45	5,31	3,01	2,89	1,73
	3	4,13	3,140	1,90	1,78	1,17
	4	3,17	2,71	1,80	1,70	1,10
<b>HP 500</b>	1	9,70	8,81	4,55	4,47	2,8
	2	5,46	4,63	2,88	2,68	2,2
	3	3,90	3,74	2,20	2,07	1,53
	4	3,10	2,48	1,56	1,53	1,02
	5	1,93	1,83	1,14	1,08	0,69

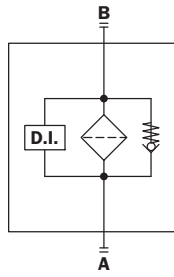
Filter Element	Absolute Filtration					
	H Series					
Type	A 0 3	A 0 6	A 1 0	A 1 6	A 2 5	
<b>HF 320</b>	1	6,50	6,20	3,95	3,32	2,70
	2	3,17	2,87	2,23	2,02	1,65
	3	2,60	2,40	1,64	1,62	1,42

# Hydraulic symbols & Compatibility

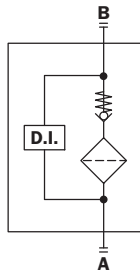
Style S



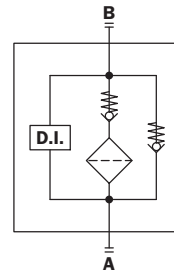
Style B



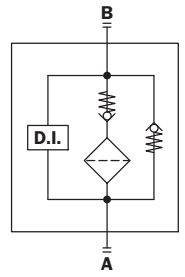
Style T



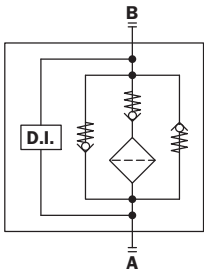
Style D



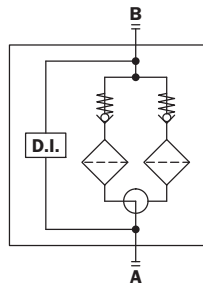
Style V



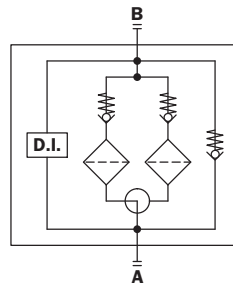
Style Z



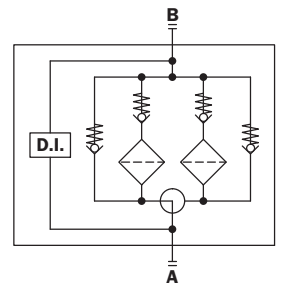
Style S  
Serie FHD



Style B  
Serie FHD 051



Style B  
Serie FHD 326 - 333



## Hydraulic symbols

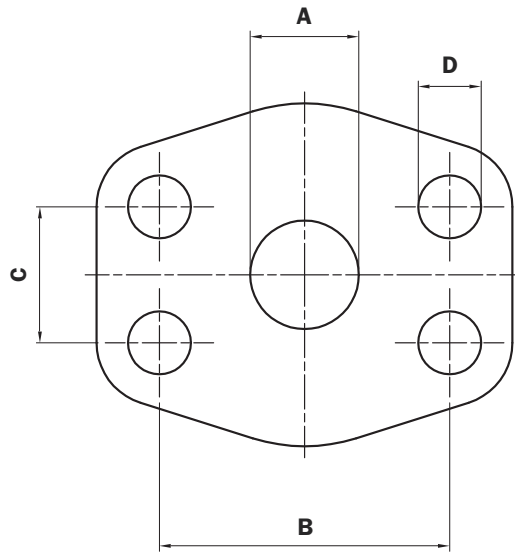
Filter series	Style S	Style B	Style T	Style D	Style V	Style Z
FMP 039	●	●				
FMM 050	●	●	●	●		
FHA 051	●	●	●	●		●
FMP	●	●	●	●		
FHP 010-011	●	●			●	●
FHP	●	●	●	●		
FHP 320-500	●	●	●	●	●	●
FHM CETOP	●					
FHM MANIFOLD	●	●	●	●		
FHB	●	●	●	●		
FHF 325	●	●				
FHD 021	●					
FHD 051	●	●				
FHD 326-333	●	●				

### Compatibility (to ISO 2943)

- Housings compatible with:  
Mineral oils, synthetic fluids  
aqueous emulsions, water and glycol.
- The filter elements are compatible with:  
Mineral oils, synthetic fluids.  
Aqueous emulsions, water and glycol  
(series W required: only for FHF 325 element).
- NBR seals series A, compatible with:  
Mineral oils, synthetic fluids, aqueous emulsions  
and water and glycol.
- FPM seals series V, compatible with:  
Mineral oils, synthetic fluids  
aqueous emulsions, water and glycol.

# Sizes - Connections DN - SAE

## FLANGE SAE 3000 - 6000 PSI



### Connection to 3000 psi SAE flange

Dimension	3/4" SAE 3000 PSI	3/4" SAE 3000 PSI	1" SAE 3000 PSI	1" SAE 3000 PSI	1 1/4" SAE 3000 PSI	1 1/4" SAE 3000 PSI	1 1/2" SAE 3000 PSI	1 1/2" SAE 3000 PSI	2" SAE 3000 PSI	2" SAE 3000 PSI
	<b>M</b>	<b>UNC</b>	<b>M</b>	<b>UNC</b>	<b>M</b>	<b>UNC</b>	<b>M</b>	<b>UNC</b>	<b>M</b>	<b>UNC</b>
<b>A</b>	19	19	25	25	32	32	38	38	51	51
<b>B</b>	47,6	47,6	52,4	52,4	58,7	58,7	70	70	77,8	77,8
<b>C</b>	22,2	22,2	26,2	26,2	30,2	30,2	35,7	35,7	42,9	42,9
<b>D</b>	M10	3/8" UNC	M10	3/8" UNC	M10	7/16" UNC	M12	1/2" UNC	M12	1/2" UNC

### Connection to 6000 psi SAE flange

Dimension	3/4" SAE 6000 PSI	3/4" SAE 6000 PSI	1 1/4" SAE 6000 PSI	1 1/4" SAE 6000 PSI	1 1/2" SAE 6000 PSI	1 1/2" SAE 6000 PSI	2" SAE 6000 PSI	2" SAE 6000 PSI
	<b>M</b>	<b>UNC</b>	<b>M</b>	<b>UNC</b>	<b>M</b>	<b>UNC</b>	<b>M</b>	<b>UNC</b>
<b>A</b>	19	19	32	32	38	38	51	51
<b>B</b>	50,8	50,8	66,7	66,7	79,4	79,4	96,8	96,8
<b>C</b>	23,8	23,8	31,8	31,8	36,5	36,5	44,5	44,5
<b>D</b>	M10	3/8" UNC	M14	1/2" UNC	M16	5/8" UNC	M20	3/4" UNC

### SAE flange connections available on Pressure filters

Filter Type	Connections									
	SAE 3000 psi					SAE 6000 psi				
	3/4"	1"	1 1/4"	1 1/2"	2"	3/4"	1 1/4"	1 1/2"	2"	
<b>FMP 135</b>	X	X								
<b>FMP 320</b>			X	X						
<b>FHP 135</b>	X	X				X				
<b>FHP 320</b>			X	X			X			
<b>FHP 500</b>				X	X			X	X	
<b>FHF 325</b>								X		
<b>FHD 333</b>								X		