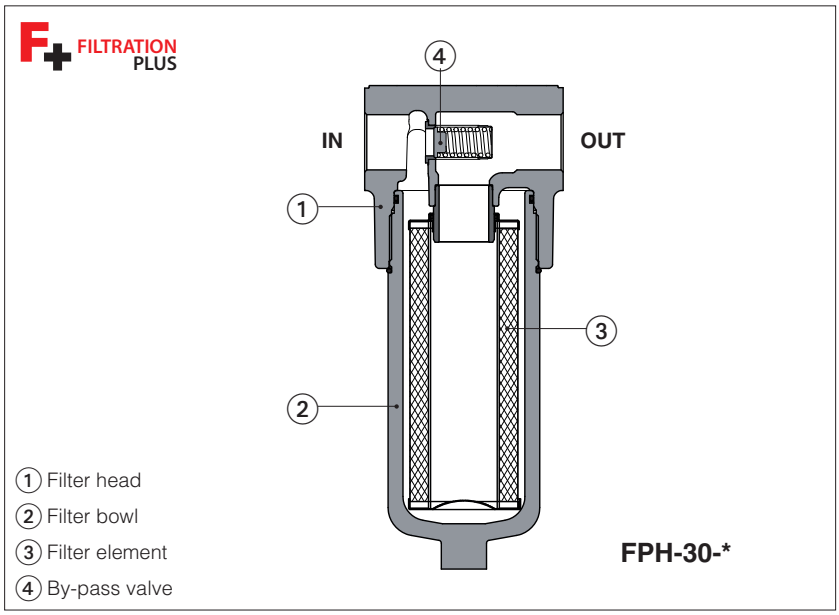
In line filters, high pressure type FPH

SAE flanged ports



1 Filter head
2 Filter bowl
3 Filter element
4 By-pass valve

FPH

In line filters are designed for installation on the pressure line downstream the pump, to ensure a high cleanliness of the fluid circulating into the hydraulic system. They protect sensible components from contamination present in the working fluid and they are particularly recommended for systems with proportional valves.

- two head sizes
- SAE 6000 flanged ports, from 3/4" to 1 1/2"
- **Filtration Plus** microfiber filter elements ensure high efficiency, low pressure drop, high DHC and long lasting performance. Collapse pressure 21 bar for filters equipped with by-pass valve or 210 bar for filters without by-pass
- filtration rating 5 - 7 - 12 - 22 µm(c) (βx (c) >1000, ISO 16889).
- versions without or with by-pass valve with cracking pressure 6 bar.
- without or with differential clogging indicator

Max flow **410 l/min**
Max working pressure **420 bar**

1 MODEL CODE OF COMPLETE FILTERS

FPH	-	10	-	A	-	F10	-	21	-	R	-	W	**	/	*

FPH: In line filter, high pressure

Filter size:
10 = ports size 3/4" ÷ 1" SAE6000 flange
30 = ports size 1 1/4" ÷ 1 1/2 SAE6000 flange

Filter length:		Max flow [l/min] **(1)** FPH-10	FPH-30
A	=	100	242
B	=	120	334
C	=	-	371
D	=	-	410

Filter element:
SN = only body, without filter element
F+ microfibre filter element βx(c) >1000 - ISO 16889:
F03 = 5 µm (c) **F10** = 12 µm (c)
F06 = 7 µm (c) **F20** = 22 µm (c)
Filter element **F01** = 4 µm (c) available on request

Ports size:
SAE 6000 flange with metric bolts:

FPH-10	FPH-30
21 = 3/4"	**23** = 1 1/4"
22 = 1"	**24** = 1 1/2"

By-pass:
R = by-pass valve with cracking pressure 6 bar (filter element with collapse pressure 21 bar)
N = without by-pass (filter element with collapse pressure 210 bar)

Differential clogging indicator see sect. 9 :
W = without, indicator port with plastic plug **(2)**
P = without, indicator port with steel plug
L = electrical indicator with LED **(3)**
M = electrical indicator without LED **(3)**
V = visual indicator **(3)**
See also note **(4)**

Series number: **

Seals material: * - = NBR **PE** = FKM

Note: filters for use in potentially explosive atmosphere are available on request, contact Atos Technical Office

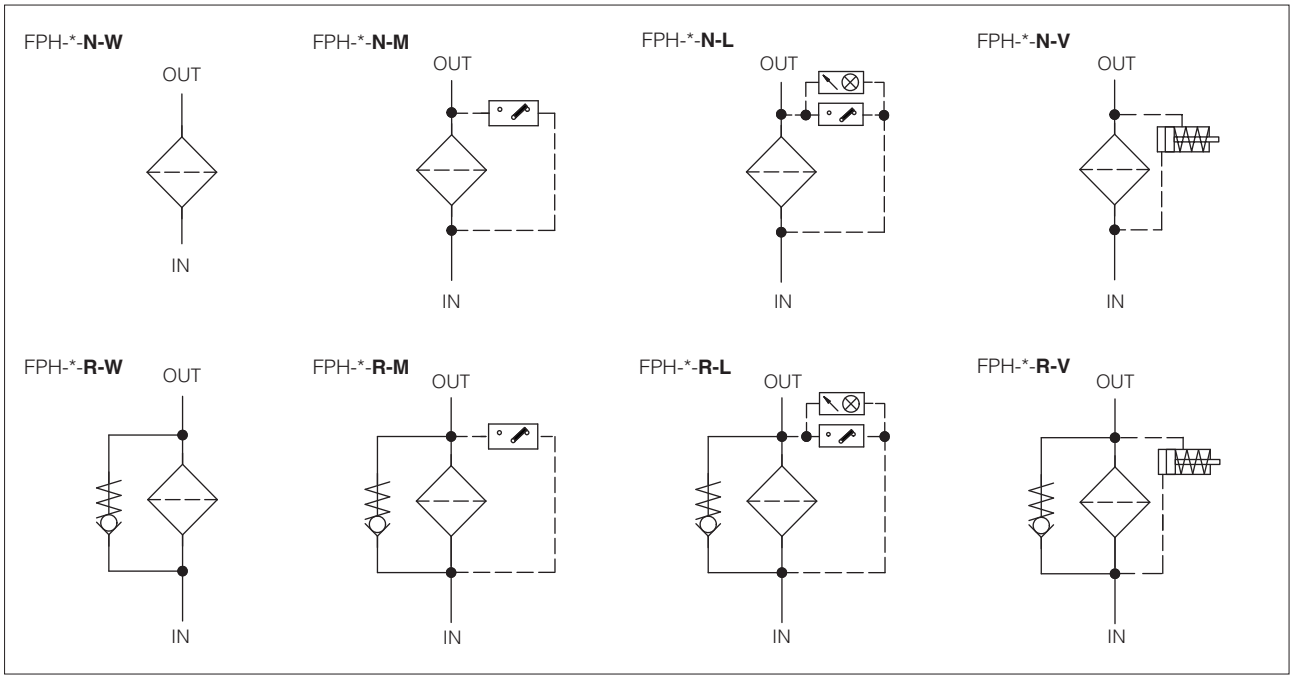
(1) Max flow rates are measured with: Δp 1 bar, filter element F20, largest port size, option -R, oil viscosity 32 mm²/s - see also section 6
In case of different conditions see section 11 for filter sizing

(2) The plastic plug (option W) is factory assembled to prevent impurities from entering the filter through the clogging indicator port. A clogging indicator must be fitted on the filter before commissioning. Do not install the filter with the plastic cap on the hydraulic system

(3) The clogging indicator is supplied disassembled from the filter. The indicator port on filter head is plugged with plastic plug

(4) Differential thermostated indicator CID-T and differential electronic transmitter with output signal 4÷20 mA CID-Z are available on request, see section 4

2 HYDRAULIC SYMBOLS (representation according to ISO 1219-1)



3 MODEL CODE OF FILTER ELEMENTS - only for spare **(1)**

PSH	-	10	-	A	-	F10	-	R	*	/	*

Spare filter element for in line filter type FPH

Filter element size:
10 = for FPH-10
30 = for FPH-30

Filter element length:

for FPH-10	for FPH-30
A	**A**
B	**B**
	C
	D

Series number

Seals material:
- = NBR
PE = FKM

R = filter element with collapse pressure 21 bar, for filter FPH-*-R with by-pass valve
N = filter element with collapse pressure 210 bar, for filter FPH-*-N without by-pass valve

Microfibre filter element, βx(c) >1000 - ISO 16889:
F03 = 5 µm (c)
F06 = 7 µm (c)
F10 = 12 µm (c)
F20 = 22 µm (c)
Filter element **F01** = 4 µm (c) available on request

(1) Select the filter element according to the model code reported on the filter nameplate, see section 17

4 MODEL CODE OF DIFFERENTIAL CLOGGING INDICATORS - only for spare - see section 13 and 14

CID	-	E	05	-	M	*	/	*

Spare differential clogging indicator for in line filter

Type of indicator:
E = electrical
V = visual
T = thermostated (available on request)
Z = electronic transmitter (available on request)

Differential switching pressure (only for CID-E and CID-V):
05 = 5 bar for filters with by-pass valve
08 = 8 bar for filters without by-pass valve

Series number

Seals material:
- = NBR
PE = FKM

Optional LED - only for CID-E
L = with LED
M = without LED

5 GENERAL CHARACTERISTICS

Assembly position / location		Vertical position with the bowl downward
Ambient temperature range		**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Storage temperature range		**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C
Materials	Filter head	Cast iron
	Filter bowl	Carbon steel
Surface protection		Zinc coating with black passivation
Fatigue strength		min. 1 x 10^6 cycles at 420 bar
Compliance		RoHS Directive 2011/65/EU as last update by 2015/863/EU REACH Regulation (EC) n°1907/2006

6 HYDRAULICS CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C (viscosity 32mm²/s)

Filter size		FPH-10				FPH-30							
Ports size code		21		22		23				24			
Ports dimension	SAE 6000 flange	3/4"		1"		1 1/4"				1 1/2"			
Filter length		A	B	A	B	A	B	C	D	A	B	C	D
Max flow (l/min) at Δp= 1 bar Filter with by-pass **-R** (see note)	**F03**	36	58	39	66	84	158	204	246	86	164	214	260
	F06	50	73	55	87	122	216	263	309	126	227	279	329
	F10	66	84	77	104	176	262	302	352	184	277	322	377
	F20	82	93	100	120	230	312	346	378	242	334	371	410
Max flow (l/min) at Δp= 1 bar Filter without by-pass **-N** (see note)	**F03**	31	44	33	48	68	116	184	207	69	119	192	217
	F06	48	57	53	64	90	180	218	274	92	188	230	291
	F10	56	80	63	98	153	234	282	320	158	246	300	342
	F20	75	90	91	114	202	297	341	352	212	316	365	380
Max operating pressure	[bar]	**420**											
Burst pressure	[bar]	**> 1260**											

Note: Max flow rates are measured with Δp= 1 bar and viscosity 32mm²/s. In case of different conditions see section 11 for filter sizing

7 FILTER ELEMENTS

Material		Inorganic microfibre
Filtration rating as per ISO16889	**F03**	$\beta_{4,5\mu m\,(c)} \geq 1000$
	F06	$\beta_{7\mu m\,(c)} \geq 1000$
	F10	$\beta_{12\mu m\,(c)} \geq 1000$
	F20	$\beta_{22\mu m\,(c)} \geq 1000$
Filter element collapse pressure	**R** = for filter with by-pass valve	21 bar
	N = for filter without by-pass valve	210 bar

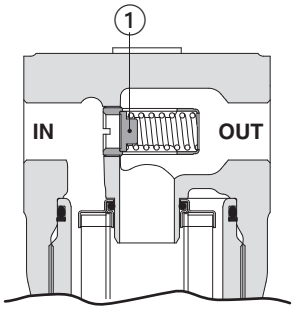
8 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature	NBR seals (standard) = -25°C ÷ +100°C FKM seals (/PE option) = -25°C ÷ +100°C		
Recommended viscosity	15 ÷ 100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922

9 BY-PASS VALVE

Filter with by-pass valve - version **-R**

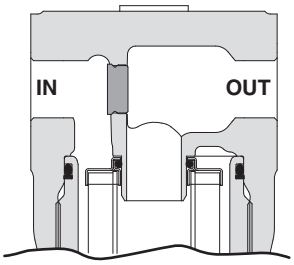
The filter with by-pass valve (1) is used in combination with filter elements PSH-*-R with collapse pressure 21 bar.
The by-pass valve allows the oil flow to by-pass the filter element in particular conditions:
- it protects the filter element from pressure peaks that could be generated, especially at the cold system start-up. In these cases the valve opens only for the instant necessary to discharge the pressure peak, limiting the quantity of oil that bypasses the filter.
- it allows the free passage of the oil flow in case of completely clogged filter element (Δp > 6 bar). This situation should be carefully avoided, by means of a scheduled maintenance, otherwise the contaminated oil will pass to the clean side of the filter and then it will circulate in the hydraulic system. The filter element must be replaced before the clogging condition, at this purpose the use of a differential clogging indicator CID-V (visual, option V) or CID-E (electrical, options L or M) is highly recommended.



FPH-*-R

Filter without by-pass valve - version **-N**

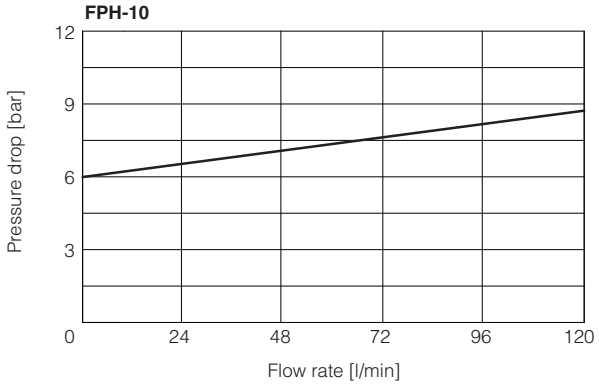
The filter version without by-pass is recommended when the hydraulic system must be absolutely protected by contamination, then avoiding the risk that the contaminant passes though the by-pass valve.
The filter without by pass must be used in combination with filter elements PSH-N with high collapse pressure 210 bar.

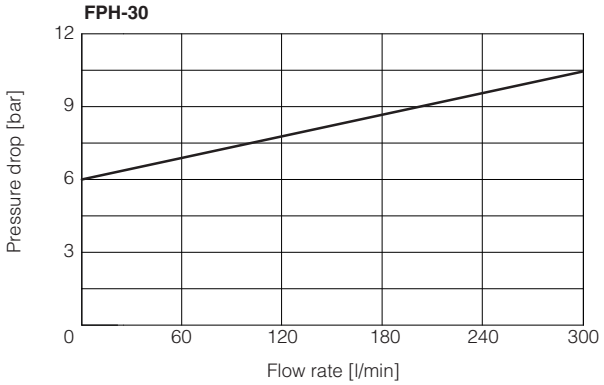


FPH-*-N

10 BY-PASS VALVE - based on mineral oil ISO VG46 at 50°C (viscosity = 32 mm²/s)

Q/Δp diagrams of flow through the by-pass valve





11 FILTERS SIZING

For the filter sizing it is necessary to consider the Total Δp at the maximum flow at which the filter must work.
The Total Δp is given by the sum of filter head Δp plus the filter element Δp:

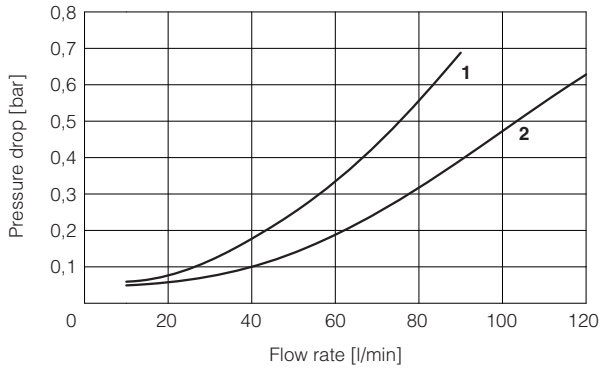
Total Δp = filter head Δp + filter element Δp

In the best conditions the total Δp should not exceed 1,0 bar
See below sections to calculate the Δp of filter head and Δp of the filter element

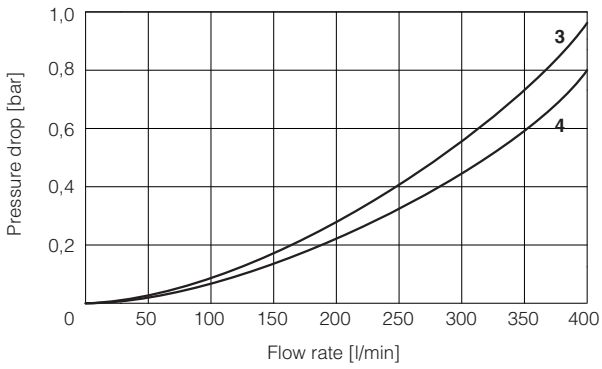
11.1 Q/Δp DIAGRAMS OF FILTER HEAD

The pressure drop of filter head mainly depends on the ports size and fluid density
In the following diagrams are reported the Δp characteristics of filter head based on mineral oil with density 0,86 kg/dm³ and viscosity 30 mm²/s

FPH-10



FPH-30



1 = FPH-10*** 21 (3/4" SAE 6000) **2** = FPH-10*** 22 (1" SAE 6000)

3 = FPH-30*** 23 (1 1/4"SAE 6000) **4** = FPH-30*** 24 (G 1 1/2"SAE 6000)

11.2 FILTER ELEMENT Δp

The pressure drop through the filter depends to:
- size of filter element
- filtration rating
- fluid viscosity

The Δp of filter element is given by the formula:

$$\Delta p \text{ of filter element} = Q \times \frac{Gc}{1000} \times \frac{\text{Viscosity}}{32}$$

Q = working flow (l/min)
Gc = Gradient coefficient (mbar/(l/min)).
The Gc values are reported in the following table

Viscosity = effective fluid viscosity in the working conditions (mm²/s)

Gradient coefficient Gc of PSH filter elements

Filter element size		10		20			30			
Filter element length		A	B	A	B	C	A	B	C	D
Filter element type	Filtration rating	**Gc** Gradient coefficient								
R for filter with bypass valve	**F03**	21.30	10.84	11.07	9.23	6.74	10.26	4.82	3.27	2.30
	F06	13.97	6.79	7.27	6.06	4.43	6.73	2.98	1.99	1.26
	F10	8.39	4.42	4.45	3.71	2.71	4.12	2.02	1.36	0.70
	F20	4.78	2.93	2.87	2.39	1.75	2.66	1.21	0.77	0.40
N for filter without bypass valve	**F03**	26.03	16.72	14.19	11.83	8.64	13.00	7.15	3.87	3.21
	F06	14.77	11.25	9.50	7.92	5.79	9.63	4.00	2.93	1.80
	F10	11.57	5.25	5.66	4.72	3.45	5.05	2.57	1.67	1.10
	F20	6.13	3.34	3.41	2.84	2.07	3.33	1.44	0.83	0.70

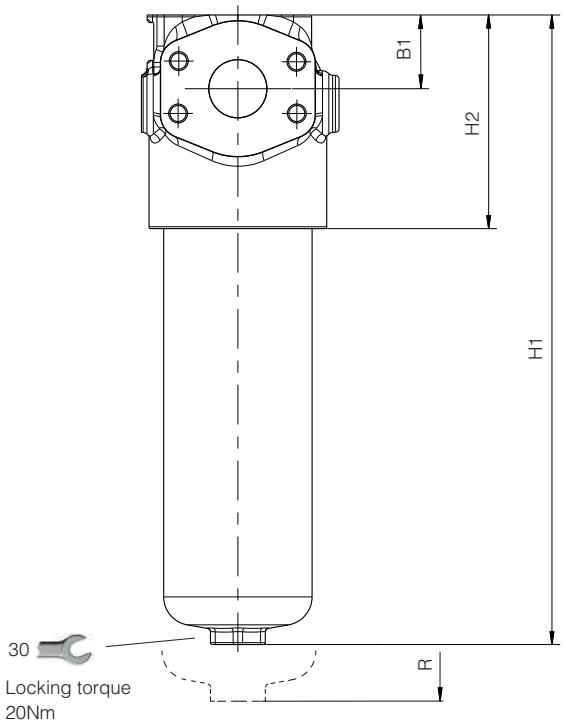
Example:
Calculation of Total Δp for filter type FPH-10-B-F10-22-R at Q = 80 l/min and viscosity 46 mm²/s (filter element PSH-10-B-F10-R)
Δp of filter head = 0,32 bar
Gr = 4,42 mbar/(l/min)

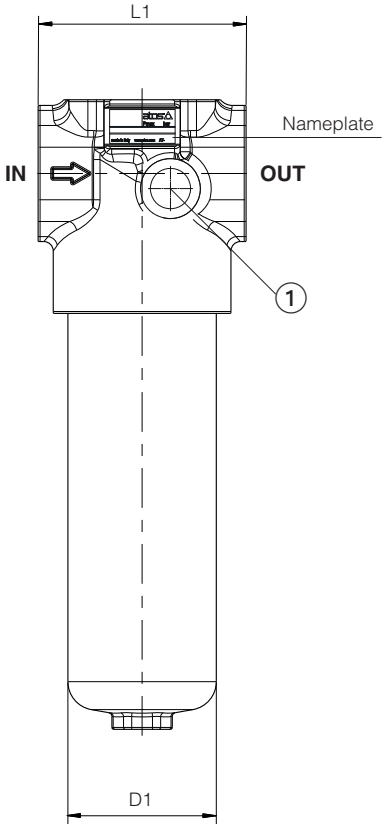
$$\textbf{Filter element } \Delta p = 80 \times \frac{4{,}42}{1000} \times \frac{46}{32} = 0{,}51 \text{ bar}$$

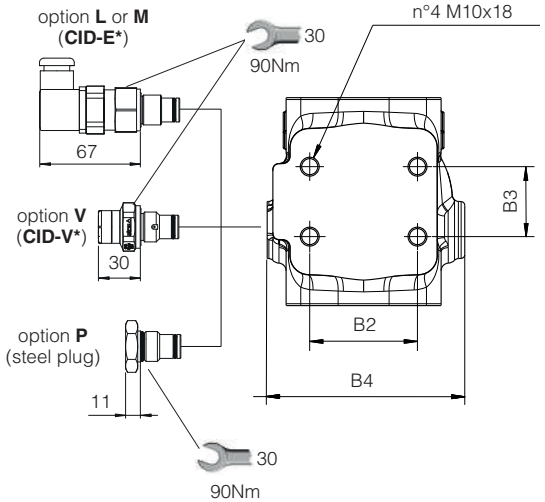
Total Δp = 0,32 + 0,51 = **0,83 bar**

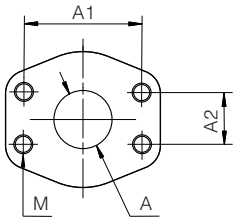
12 INSTALLATION DIMENSIONS OF FPH FILTERS [mm]

FPH -10







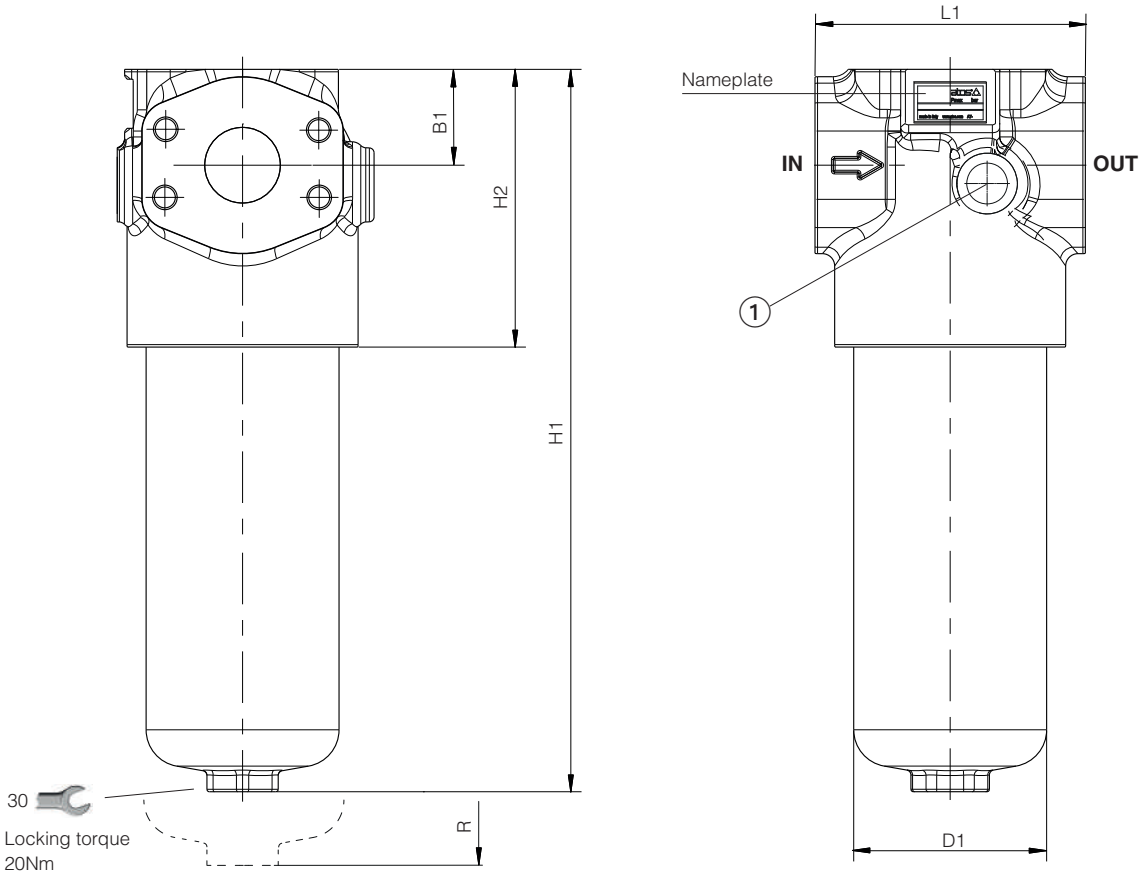


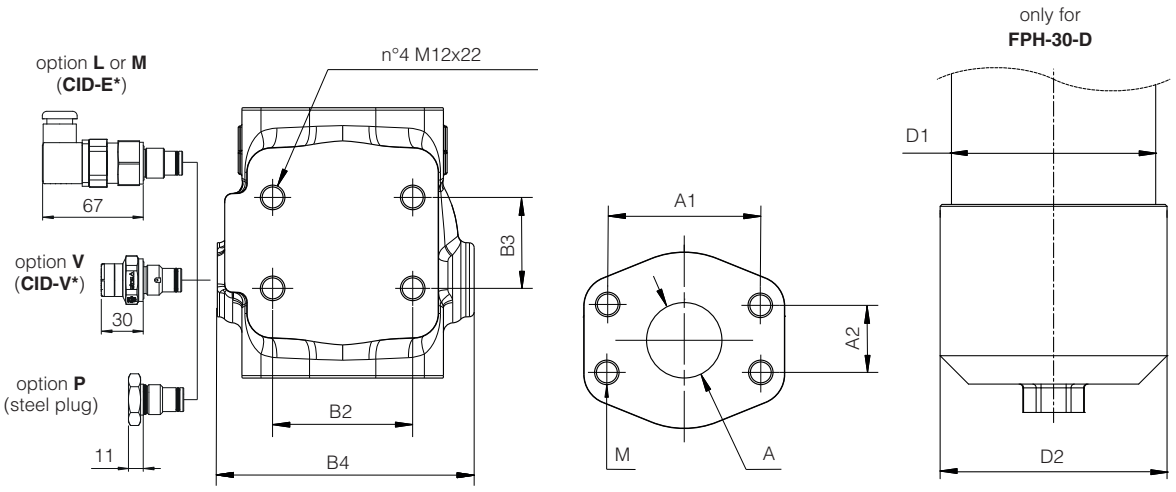
SAE J518-6000 FLANGE	A	A1	A2	M
3/4"	19	50.8	23.8	M10
1"	22	57.2	27.8	M12

(1) Clogging indicator port M20x1.5

Code	B1	B2	B3	B4	D1	D2	F	H1	H2	L1	R (element removal)	Mass (Kg)
FPH-10-A	39	57	37	105	78,5	-	68	222	113	110	130	6,7
FPH-10-B								333				8,4

FPH -30



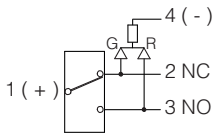
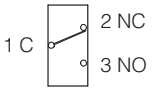
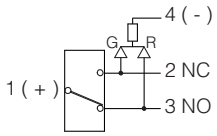
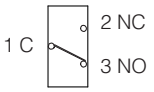


SAE J518-6000 FLANGE	A	A1	A2	M
1 1/4”	32	66.7	31.8	M14
1 1/2”	38	79.4	36.5	M16

(1) Clogging indicator port M20x1.5

Code	B1	B2	B3	B4	D1	D2	F	H1	H2	L1	R (element removal)	Mass (Kg)
FPH-30-A	47	76	64	140	107	-	68	262	145	140	140	13,2
FPH-30-B								355				15,5
FPH-30-C								475				18,4
FPH-30-D						120		568				22,8

13 CHARACTERISTICS OF DIFFERENTIAL CLOGGING INDICATORS

Model code		**CID-E* ELECTRICAL**		**CID-V* VISUAL**
Differential switching pressure	CID-E05, CID-V05	5 bar ± 10%		5 bar ± 15%
	CID-E08, CID-V08	8 bar ± 10%		8 bar ± 10%
Max pressure		450 bar		420 bar
Max differential pressure		200 bar		
Ambient temperature		-25°C ÷ +100°C		-25°C ÷ +80°C
Hydraulic connection		M20x1,5		
Duty factor		100%		
Mechanical life		1 x 10^6 operations		
Mass (Kg)		0,16		0,11
Electric connection		Electric plug connection as per DIN 43650 with cable gland type PG7		-
Power supply	CID-E05-L, CID-E08-L	24 VDC ± 10%		-
	CID-E05-M, CID-E08-M	14 VDC ÷ 30 VDC	125 VAC ÷ 250 VAC	-
Max current - resistive (inductive)		5 A (4 A) ÷ 4 A (3 A)	5 A (3 A) ÷ 3 A (2 A)	-
Protection degree to DIN EN 60529		IP65 with mating connector		-
Switching scheme		**CID-*-L**	**CID-*-M**	
	clean filter element			GREEN
	clogged filter element			RED

14 DIMENSIONS OF DIFFERENTIAL CLOGGING INDICATORS

ELECTRICAL INDICATOR

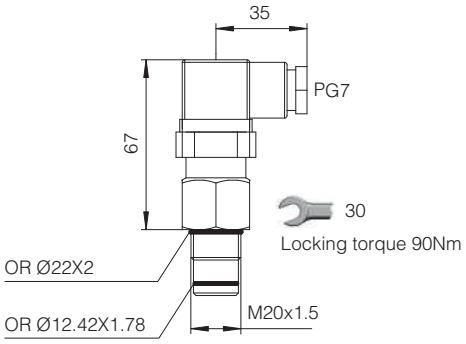
CID-E05-L
CID-E08-L

Electric connector
DIN 43650
Transparent
with internal Led

CID-E05-M
CID-E08-M

Electric connector
DIN 43650
Black colour

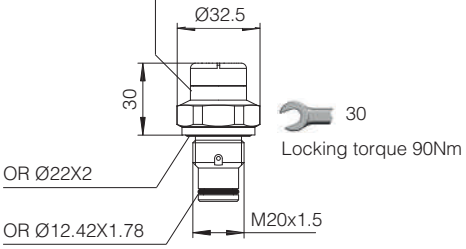
Led signal:
Green = clean filter element
Red = clogged filter element
(filter elements to be replaced)



VISUAL INDICATOR

CID-V05
CID-V08

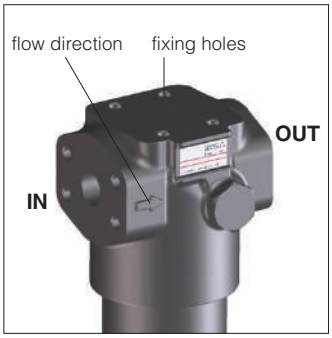
Visual signal:
Green = clean filter element
Red = clogged filter element
(filter elements to be replaced)



Note: the electrical connector can be oriented at steps of 90°

NOTE: Differential thermostated indicator CID-T and differential electronic transmitter with output signal 4÷20 mA CID-Z are available on request

15 INSTALLATION AND COMMISSIONING



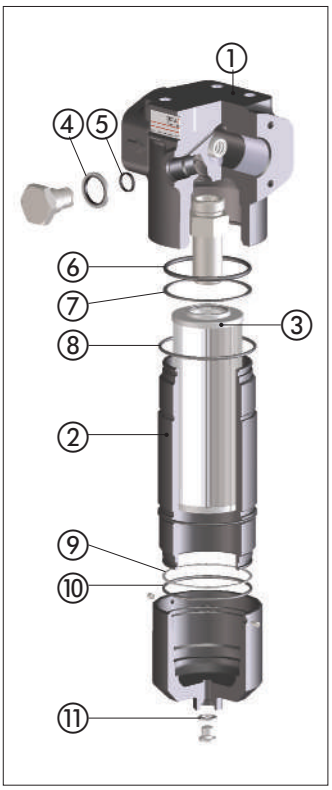
The max operating pressure of the system must not exceed the max working pressure of the filter (420 bar).
During the filter installation, pay attention to respect the flow direction, shown by the arrow on the filter head.
The filter should be preferably mounted with the housing downward.
The filter should be properly secured using the threaded fixing holes on the filter head.
Make sure that there is enough space for the replacement of the filter element, see dimension "**R**" at section 13.
Never run the system without the filter element.



For filters ordered with clogging indicator:
- remove the plastic plug from the indicator port on the filter head
- install the clogging indicator and lock it at the specified torque

During the cold start up (fluid temperature lower than 30°C), a false clogging indicator signal can be given due to the high fluid viscosity.
To avoid false signal, a differential threaded clogging indicator CID-T can be used.

16 MAINTENANCE



The filter element must be replaced as soon as the clogging indicator switches to highlight the filter clogged condition
For filters without clogging indicator, the filter element must be replaced according to the system manufacturer's recommendations.
Select the new filter element according to the model code reported on the filter nameplate, see section 17.

For the replacement of the filter element, proceed as follow:
- releases the system pressure; the filter has no pressure bleeding device
- pay attention to the fluid and filter surface temperature. Always use suitable gloves and protection glasses
- unscrew the bowl ② from the filter head ① by turning counterclockwise (view from bottom side)
- remove the dirty filter element ③ pulling it carefully
- lubricate the seal of new filter element and insert it over the spigot in the filter head
- clean the bowl internally, check the o-ring ⑥ ⑧ and replace them if damaged
- lubricate the o-ring and threads and screw by hand the bowl to the filter head by turning clockwise (view from bottom side). Tighten at the recommended torque.

⚠ **WARNING**: The dirty filter elements cannot be cleaned and re-used. They are classified as "dangerous waste material", then they must be disposed of by authorized Companies, according to the local laws.

16.1 SEALS KIT

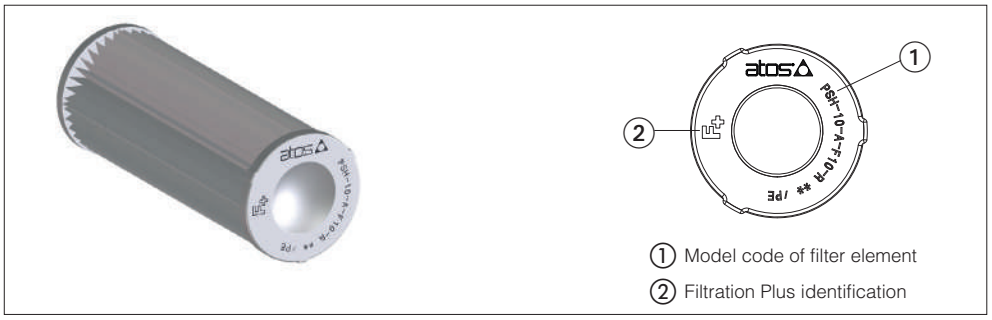
Filter type	Seal kit code (NBR)	Seal kit code (FKM)	Seal kit composition
FPH-10	GUARN FPH-10	GUARN FPH-10 /PE	④+⑤+⑥+⑦+⑧
FPH-30	GUARN FPH-30	GUARN FPH-30 /PE	④+⑤+⑥+⑦+⑧
FPH-30-D	GUARN FPH-30-D	GUARN FPH-30-D /PE	④+⑤+⑥+⑦+⑧+⑨+⑩+⑪

17 FILTER IDENTIFICATION NAMEPLATE



① Model code of complete filter
② Model code of filter element
③ Max working pressure
④ Filter matrix code

17.1 IDENTIFICATION OF FILTER ELEMENT



① Model code of filter element
② Filtration Plus identification

18 RELATED DOCUMENTATION

LF010	Fluid contamination
LF020	Filtration guidelines