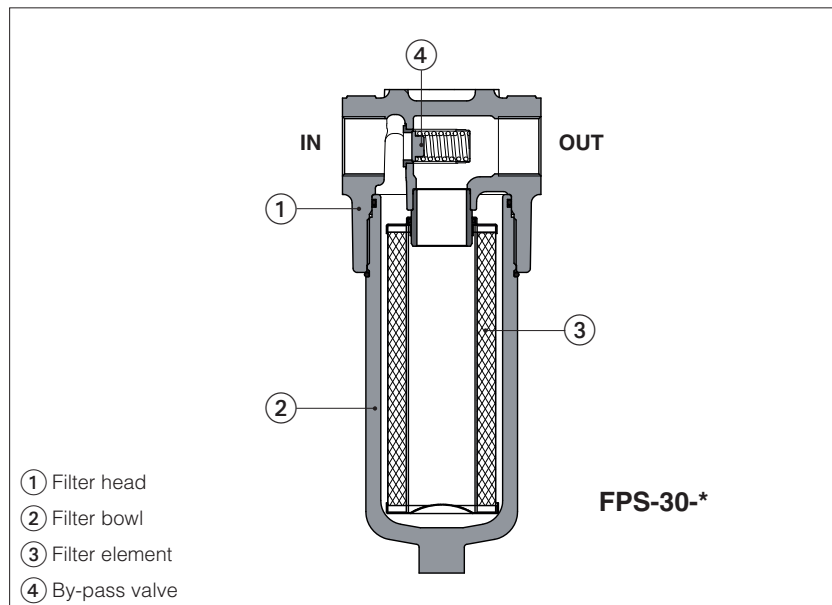


## In line filters type FPS

Threaded ports - max flow 330 l/min, max pressure 320 bar



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

**FPS** in line filters are designed to protect the whole hydraulic circuit or a single valve from contamination present in the working fluid. They are particularly recommended for systems with proportional valves.

FPS filters are available with following features:

- two head sizes with BSPP or SAE threaded ports, from 3/4" to 1 1/2"
- max working pressure 320 bar
- four filter lengths with max flow 330 l/min
- without or with by-pass valve with cracking pressure 6 bar
- microfibre filter element with filtration rating 4,5 - 7 - 12  $\mu\text{m(c)}$  ( $\beta_x(c) > 1000$ , ISO 16889). Collapse pressure 21 bar for filters equipped with by-pass valve or 210 bar for filters without by-pass
- without or with electrical differential clogging indicator with optional led

### 1 MODEL CODE OF COMPLETE FILTERS

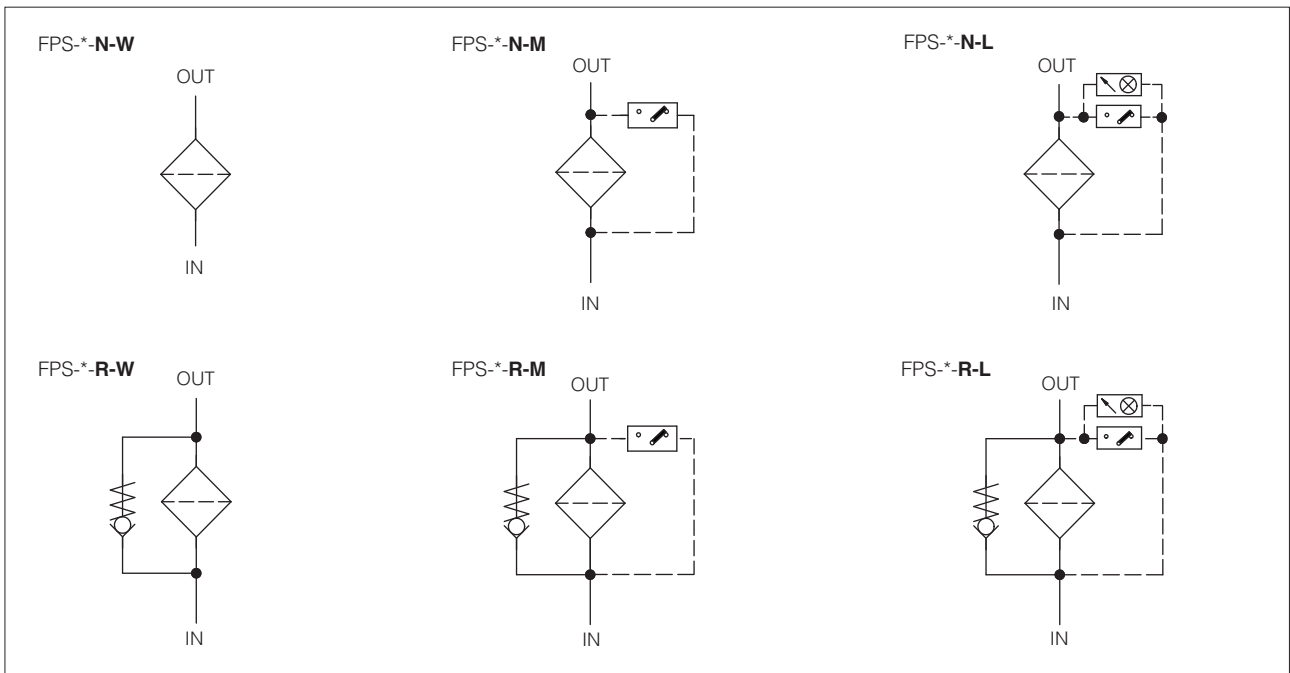
<b>FPS</b>	-	<b>10</b>	-	<b>A</b>	-	<b>F10</b>	-	<b>01</b>	-	<b>R</b>	-	<b>W</b>	<b>**</b>	/	<b>*</b>																
In line filter													Series number		Seals material: - = NBR <b>PE = FKM (4)</b>																
<b>Filter size:</b> <b>10</b> = ports size 3/4" ÷ 1" <b>30</b> = ports size 1 1/4" ÷ 1 1/2"													<b>Electrical differential clogging indicator</b> see sect. 9: <b>W</b> = without, indicator port unplugged <b>P</b> = without, indicator port with steel plug <b>L</b> = indicator with LED (3) <b>M</b> = indicator without LED (3)																		
<table border="1"> <thead> <tr> <th>Filter length:</th> <th>FPS-10</th> <th>FPS-30</th> </tr> </thead> <tbody> <tr> <td><b>A</b></td> <td>= 75</td> <td>170</td> </tr> <tr> <td><b>B</b></td> <td>= 105</td> <td>250</td> </tr> <tr> <td><b>C</b></td> <td>= -</td> <td>300</td> </tr> <tr> <td><b>D</b></td> <td>= -</td> <td>330</td> </tr> </tbody> </table>													Filter length:	FPS-10	FPS-30	<b>A</b>	= 75	170	<b>B</b>	= 105	250	<b>C</b>	= -	300	<b>D</b>	= -	330	<b>By-pass:</b> <b>R</b> = by-pass valve with cracking pressure 6 bar (filter element PSH-*-R with collapse pressure 21 bar) <b>N</b> = without by-pass (filter element PSH-*-N with collapse pressure 210 bar)			
Filter length:	FPS-10	FPS-30																													
<b>A</b>	= 75	170																													
<b>B</b>	= 105	250																													
<b>C</b>	= -	300																													
<b>D</b>	= -	330																													
<b>Microfibre filtration rating</b> , $\beta_x(c) > 1000$ - ISO 16889: <b>F03</b> = 4,5 $\mu\text{m(c)}$ <b>F06</b> = 7 $\mu\text{m(c)}$ <b>F10</b> = 12 $\mu\text{m(c)}$													<b>Ports size:</b> BSPP threaded: FPS-10 <b>01</b> = G 3/4" <b>02</b> = G 1" SAE J1926-1 threaded (2): FPS-10 <b>42</b> = SAE-16 (1")				FPS-30 <b>03</b> = G 1 1/4" <b>04</b> = G 1 1/2" FPS-30 <b>44</b> = SAE-24 (1 1/2")														

- (1) Max flow rates are performed in following conditions:
- clean filter element
  - filtration rating F10 (12  $\mu\text{m(c)}$ )
  - largest port size
  - option /R, filter element with collapse pressure 21 bar
  - $\Delta p = 1$  bar
  - mineral oil with viscosity 32 mm<sup>2</sup>/s

In case of different conditions the max flow rates have to be recalculated - see section 10

- (2) Filters with SAE threaded ports are available on request  
 (3) The clogging indicator is supplied disassembled from the filter. The indicator port on filter head is plugged with plastic plug  
 (4) Filters with FKM seals are available on request

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



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

<b>PSH</b>	-	<b>10</b>	-	<b>A</b>	-	<b>F10</b>	-	<b>R</b>	/	<b>**</b>	/	<b>*</b>
Spare filter element for in line filter type FPS										Series number		Seals material: - = NBR <b>PE</b> = FKM (2)
<b>Filter element size:</b> 10 = for FPS-10 30 = for FPS-30								<b>R</b> = filter element with collapse pressure 21 bar, for filter FPS-*-R with by-pass valve <b>N</b> = filter element with collapse pressure 210 bar, for filter FPS-*-N without by-pass valve				
<b>Filter element length:</b> for FPS-10    for FPS-30 <b>A</b> <b>A</b> <b>B</b> <b>B</b> <b>C</b> <b>D</b>								<b>Microfibre filtration rating, <math>\beta_{x(c)} &gt; 1000</math> - ISO 16889:</b> <b>F03</b> = 4,5 $\mu\text{m}$ (c) <b>F06</b> = 7 $\mu\text{m}$ (c) <b>F10</b> = 12 $\mu\text{m}$ (c)				

- (1) Select the filter element according to the model code reported on the filter nameplate, see section 14.1  
 (2) Filters element with FKM seals are available on request

**4 MODEL CODE OF ELECTRICAL DIFFERENTIAL CLOGGING INDICATORS** - only for spare

<b>CID</b>	-	<b>E05</b>	-	<b>M</b>	/	<b>**</b>	/	<b>*</b>
Spare electrical differential clogging indicator for in line filter						Series number		Seals material: - = NBR <b>PE</b> = FKM
<b>Differential switching pressure:</b> <b>E05</b> = 5 bar for filters with by-pass valve <b>E08</b> = 8 bar for filters without by-pass valve						<b>Optional LED for visual indication:</b> <b>L</b> = with LED <b>M</b> = without LED		

## 5 GENERAL CHARACTERISTICS

Assembly position / location	Vertical position with the bowl downward	
Ambient temperature range	<b>Standard</b> = -20°C ÷ +70°C / <b>PE</b> option = -20°C ÷ +70°C	
Storage temperature range	<b>Standard</b> = -20°C ÷ +80°C / <b>PE</b> option = -20°C ÷ +80°C	
Materials	Filter head	Cast iron
	Filter bowl	Steel
Surface protection	Phosphatized	
Fatigue strength	min. 1 x 10 <sup>6</sup> cycles at 320 bar	

## 6 HYDRAULICS CHARACTERISTICS

Filter size	<b>10</b>			<b>30</b>		
Port size code	<b>01</b>	<b>02</b>	<b>42</b>	<b>03</b>	<b>04</b>	<b>44</b>
Port dimension	BSP threaded	G3/4"	G1"	G1 1/4"	G1 1/2"	
	SAE J1926-1 threaded			SAE-16		SAE-24
Max operating pressure (bar)	320					
Max flow (1) (l/min)	<b>R</b> = filter with by-pass	60 ÷ 80	75 ÷ 105	60 ÷ 80	165 ÷ 305	170 ÷ 330
	<b>N</b> = filter without by-pass	55 ÷ 75	65 ÷ 90	55 ÷ 75	145 ÷ 245	150 ÷ 260
Direction of filtration	See the arrow on the filter head					

### (1) Max flow rates are performed in following conditions:

- clean filter element
- filtration rating F10 (12 µm (c))
- Δp 1 bar
- min ÷ max filter length
- mineral oil with viscosity 32 mm<sup>2</sup>/s

In case of different conditions the max flow rates have to be recalculated - **see section 10**

## 7 FILTER ELEMENTS

Material		Inorganic microfibre
Filtration rating as per ISO16889	<b>F03</b>	$\beta_{4,5\mu m(c)} \geq 1000$
	<b>F06</b>	$\beta_{7,5\mu m(c)} \geq 1000$
	<b>F10</b>	$\beta_{12\mu m(c)} \geq 1000$
Filter element collapse pressure	<b>R</b> = for filter with by-pass valve	21 bar
	<b>N</b> = 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, with HFC hydraulic fluids = +10°C ÷ +50°C FKM seals (/PE option) = -25°C ÷ +100°C		
Recommended viscosity	15 ÷ 100 mm <sup>2</sup> /s - max allowed range 2.8 ÷ 500 mm <sup>2</sup> /s		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVL, HVPD	DIN 51524
Flame resistant without water	FKM	HFDR, HFDR	ISO 12922
Flame resistant with water	NBR	HFC	

## 9 ELECTRICAL DIFFERENTIAL CLOGGING INDICATORS

Differential switching pressure	CID-E05	5 bar ± 10% for filters with by-pass valve	
	CID-E08	8 bar ± 10% for filters without by-pass valve	
Max pressure	450 bar		
Max differential pressure	200 bar		
Electric connection	Electric plug connection as per DIN 43650 with cable gland type PG7		
Power supply	CID-*-L	24 V <sub>DC</sub> ± 10%	
	CID-*-M	14 V <sub>DC</sub> ÷ 30 V <sub>DC</sub>	125 V <sub>AC</sub> ÷ 250 V <sub>AC</sub>
Max current - resistive (inductive)	5 A (4 A) ÷ 4 A (3 A)		5 A (3 A) ÷ 3 A (2 A)
Fluid temperature	-25°C ÷ +100°C		
Protection degree to DIN EN 60529	IP65 with mating connector		
Hydraulic connection	M20x1,5		
Duty factor	100%		
Mechanical life	1 x 10 <sup>6</sup> operations		
Mass (Kg)	0,16		
Electric scheme shown with switch position in case of clean filter element	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>CID-*-L</b></p> </div> <div style="text-align: center;"> <p><b>CID-*-M</b></p> </div> </div>		

## 10 FILTERS SIZING

For the filter sizing it is necessary to consider the Total  $\Delta p$  at the maximum flow at which the filter must work.

The Total  $\Delta p$  is given by the sum of filter head  $\Delta p$  plus the filter element  $\Delta p$ :

$$\text{Total } \Delta p = \text{filter head } \Delta p + \text{filter element } \Delta p$$

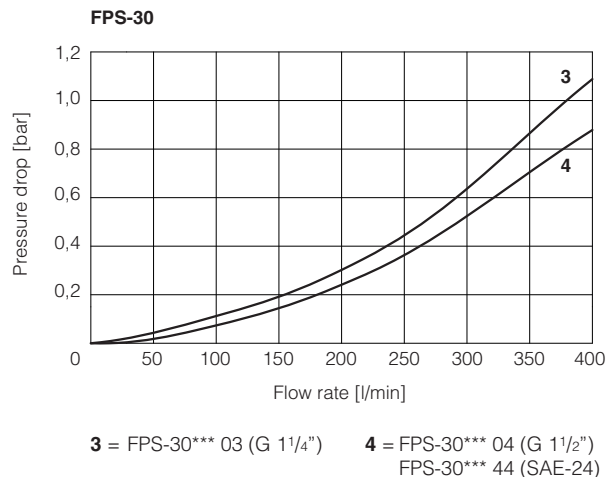
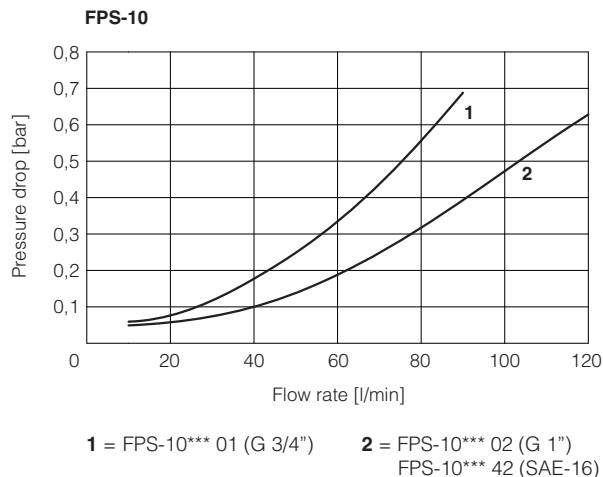
In the best conditions the total  $\Delta p$  should not exceed 1,0 bar

See below sections to calculate the  $\Delta p$  of filter head and  $\Delta p$  of the filter element

### 10.1 Q/ $\Delta p$ 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  $\Delta p$  characteristics of filter head based on mineral oil with density 0,86 kg/dm<sup>3</sup> and viscosity 30 mm<sup>2</sup>/s



### 10.2 FILTER ELEMENT $\Delta p$

The pressure drop through the filter depends to:

- size of filter element
- filtration rating
- fluid viscosity

The  $\Delta p$  of filter element is given by the formula:

$$\Delta p \text{ of filter element} = Q \times \frac{Gc}{1000} \times \frac{\text{Viscosity}}{30}$$

**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 (mm<sup>2</sup>/s)

#### Gradient coefficient Gc of PSH filter elements

Filter element size		10		30			
Filter element lenght		A	B	A	B	C	D
Filter element type	Filtration rating	Gc Gradient coefficient					
R for filter with bypass valve	F03	27.75	15.25	14	7.13	4.7	3.62
	F06	15.12	7.58	8.03	3.37	2.2	1.89
	F10	9.37	4.91	4.43	2.33	1.5	1.12
N for filter without bypass valve	F03	32.2	17.32	16.48	8.13	5.5	4.71
	F06	22.38	9.41	11.88	4.18	3.28	2.91
	F10	11.2	6.27	5.27	3.45	2.36	2.15

#### Example:

Calculation of Total  $\Delta p$  for filter type FPS-10-B-F10-02-R at Q = 80 l/min and viscosity 46 mm<sup>2</sup>/s (filter element PSH-10-B-F10-R)

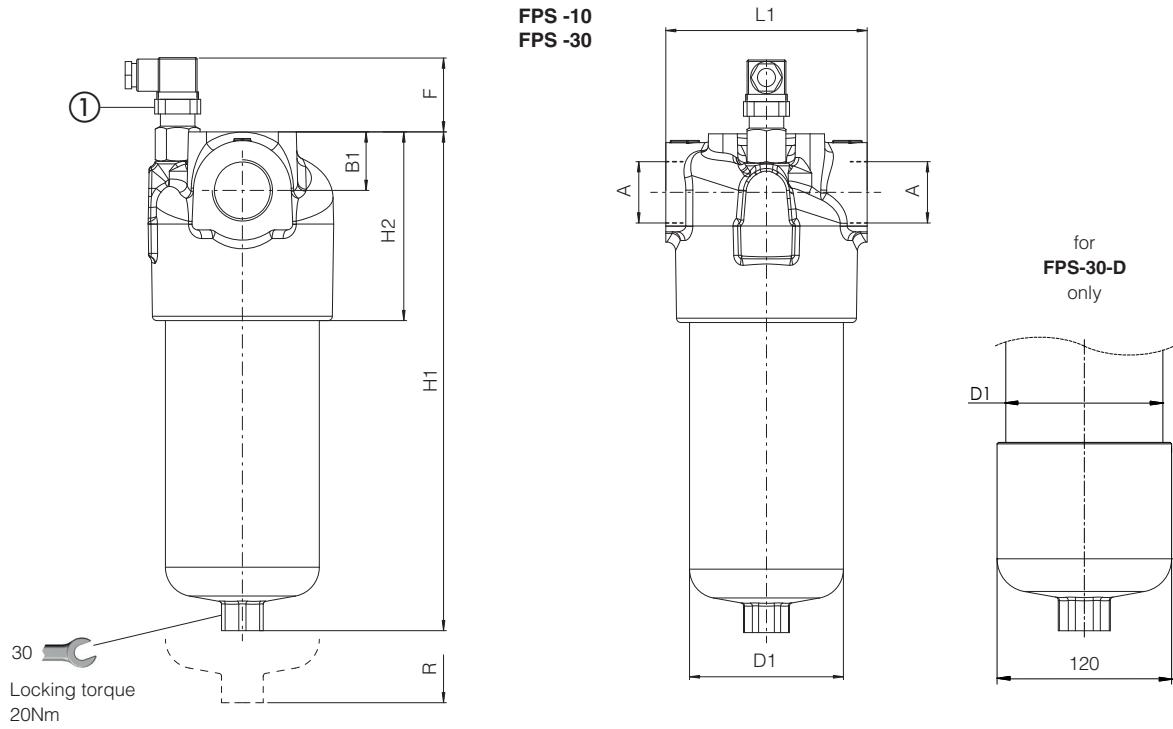
$\Delta p$  of filter head = 0,31 bar

**Gr** = 4,91 mbar/(l/min)

$$\text{Filter element } \Delta p = 80 \times \frac{4,91}{1000} \times \frac{46}{30} = 0,60 \text{ bar}$$

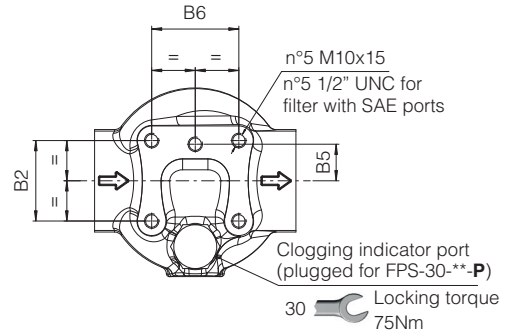
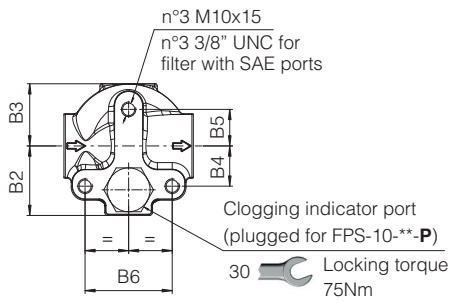
$$\text{Total } \Delta p = 0,31 + 0,60 = \mathbf{0,91 \text{ bar}}$$

11 INSTALLATION DIMENSIONS OF FPS FILTERS [mm]



FPS -10

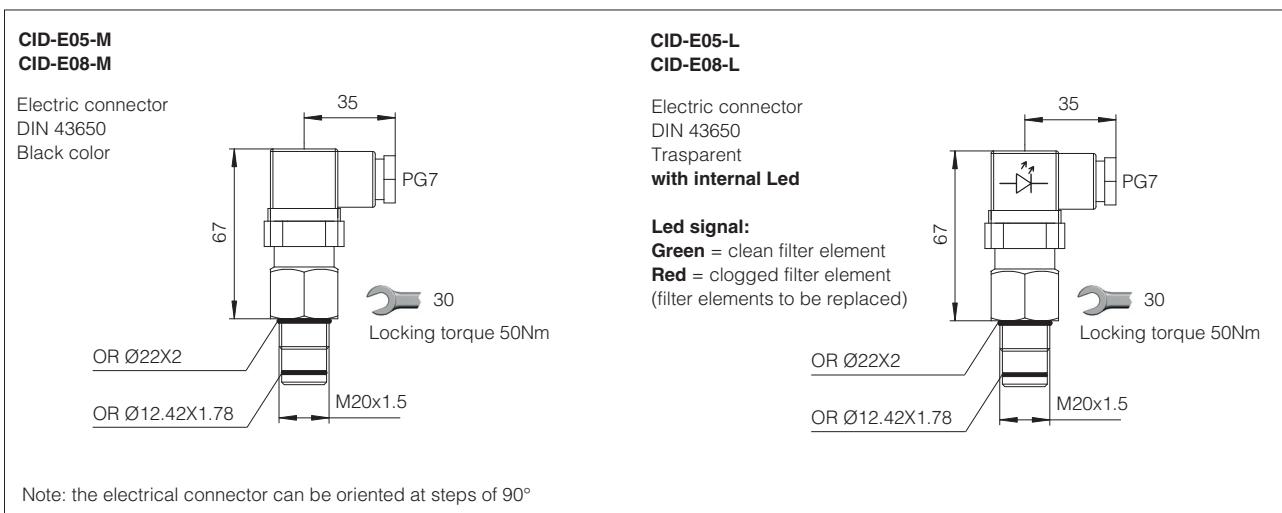
FPS -30



① Optional electrical differential clogging indicator

Code	A	B1	B2	B3	B4	B5	B6	D1	F	H1	H2	L1	R (element removal)	Mass (Kg)
FPS-10-A	3/4" BSPP 1" BSPP SAE-16	22,5	47,5	43,5	27,5			70	70	200	92	90	110	3,5
FPS-10-B										293				4,5
FPS-30-A	1 1/4" BSPP 1 1/2 BSPP SAE-24	40	55	-	-	25	60,6	107	50	248	129	140	130	9,0
FPS-30-B										341				9,5
FPS-30-C						461	14,4							
FPS-30-D						554	18,8							

## 12 DIMENSIONS OF ELECTRICAL DIFFERENTIAL CLOGGING INDICATORS



## 13 INSTALLATION AND COMMISSIONING

The max operating pressure of the system must not exceed the max working pressure of the filter.  
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 bowl downward.  
The filter head 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.  
Never run the system without the filter element.

For filters ordered with clogging indicator, code L or M:

- 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.



## 14 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.

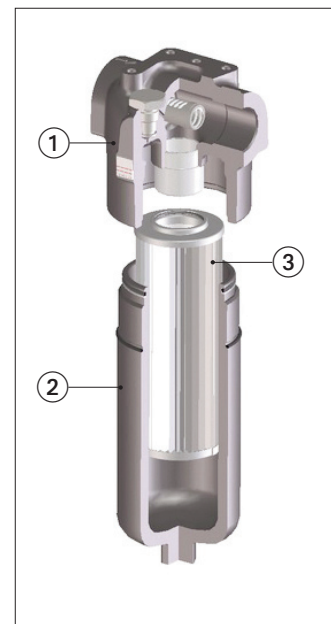
Select the new filter element according to the model code reported on the filter nameplate, see section 14.1

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, lubricate the 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.



### 14.1 FILTER IDENTIFICATION NAMEPLATE



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