In line filters, high pressure type FPH
Threaded or SAE flanged ports - max flow 340 l/min, max pressure 420 bar

FPH 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 circuits with proportional valves.

FPH filters are available with following features:

- two body sizes with BSPP or SAE threaded ports or SAE 6000 flanged ports, from 3/4" to 1 1/2"
- max working pressure up to 420 bar
- four filter lengths with max flow 340 l/min
- without or with by-pass valve with cracking pressure 6 bar
- microfibre filter element with filtration rating 4,5 - 7 - 12 µm (c) (βx(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 differential clogging indicator (electrical or visual).

Model Code of Complete Filters

| FPH   | - | 10 | - | A | - | F10 | - | 01 | - | R | - | W | ** | / | * |
|-------|---|----|---|---|---|----|---|----|---|----|---|---|----|---|---|---|
|       | In line filter, high pressure |
| Filter size: | Max flow [l/min] (1) |
| A | = 75 | 175 |
| B | = 105 | 260 |
| C | = - | 310 |
| D | = - | 340 |

Microfibre filtration rating, βx(c) > 1000 - ISO 16889:
F03 = 4,5 µm (c)
F06 = 7 µm (c)
F10 = 12 µm (c)

Differential clogging indicator see sect. [7]
W = without, indicator port unplugged
P = without, indicator port with steel plug
L = electrical indicator with LED (3)
M = electrical indicator without LED (3)
V = visual indicator (3)

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

(1) Max flow rates are performed in following conditions:
- clean filter element
- filtration rating F10 (12 µm (c))
- largest port size
- option /R, filter element with collapse pressure 21 bar
- ΔP = 1 bar
- mineral oil with viscosity 32 mm²/s

In case of different conditions the max flow rates have to be recalculated - see section [9]

(2) Filters with SAE threaded ports and SAE 6000 flange with UNC bolts 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
**3 MODEL CODE OF FILTER ELEMENTS** - only for spare (1)

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

- **Filter element length:**
  - for FPH-10
  - for FPH-30
  - A
  - B
  - C
  - D

- **Microfibre filtration rating**, $\beta_x$ > 1000 - ISO 16889:
  - F03 = 4.5 µm (c)
  - F06 = 7 µm (c)
  - F10 = 12 µm (c)

- **Seals material:**
  - - = NBR
  - PE = FKM (2)

- **Series number**
  - 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

(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 DIFFERENTIAL CLOGGING INDICATORS** - only for spare

- **Spare differential clogging indicator** for in line filter

- **Type of indicator:**
  - E = electrical
  - V = visual

- **Differential switching pressure:**
  - 05 = 5 bar for filters with by-pass valve
  - 08 = 8 bar for filters without by-pass valve

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

- **Series number**
  - E = CID-E
  - M = CID-M
  - L = with LED
  - M = without LED

Optional LED - only for CID-E

---
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: Steel

Surface protection
Phosphatized

Fatigue strength
min. 1 x 10⁶ cycles at 420 bar

6 | HYDRAULICS CHARACTERISTICS

<table>
<thead>
<tr>
<th>Filter size</th>
<th>10</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port size code</td>
<td>G3/4”</td>
<td>G1”</td>
<td>G1 1/4”</td>
</tr>
</tbody>
</table>

Ports dimensions:
- BSP threaded
- SAE J1926-1 threaded
- SAE 6000 with metric bolts
- SAE 6000 with UNC bolts

Max operating pressure (bar): 420

Max flow (l/min):
- R = filter with by-pass
  - 65 ÷ 80
- N = filter without by-pass
  - 55 ÷ 70

Direction of filtration:
- See the arrow on the filter head

7 | FILTER ELEMENTS

<table>
<thead>
<tr>
<th>Material</th>
<th>Inorganic microfibre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filtation rating as per ISO 16889</td>
<td></td>
</tr>
</tbody>
</table>
- F03: β₁₆₅ (μm (c)) ≥ 1000
- F06: β₁₇₅ (μm (c)) ≥ 1000
- F10: β₁₂₀ (μm (c)) ≥ 1000

Filter element collapse pressure:
- R = filter with by-pass valve
  - 21 bar
- N = filter without by-pass valve
  - 210 bar

8 | SEALS AND HYDRAULIC FLUIDS

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 mm²/s - max allowed range 2.8 ÷ 500 mm²/s

Hydraulic fluid
<table>
<thead>
<tr>
<th>Suitable seals type</th>
<th>Classification</th>
<th>Ref. Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral oils NBR, FKM</td>
<td>HL, HLP, HLPD, HVLP, HVLPD</td>
<td>DIN 51524</td>
</tr>
<tr>
<td>Flame resistant without water FKM</td>
<td>HPDU, HPDR</td>
<td>ISO 12922</td>
</tr>
</tbody>
</table>

9 | DIFFERENTIAL CLOGGING INDICATORS

Model code
<table>
<thead>
<tr>
<th>CID-E* ELECTRICAL</th>
<th>CID-V* VISUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential switching pressure</td>
<td>5 bar ± 10%</td>
</tr>
<tr>
<td>CID-E05, CID-V05</td>
<td>8 bar ± 10%</td>
</tr>
<tr>
<td>CID-E08, CID-V08</td>
<td>Max pressure</td>
</tr>
<tr>
<td>CID-E10, CID-V10</td>
<td>Max differential pressure</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-25°C ÷ +100°C</td>
</tr>
<tr>
<td>Hydraulic connection</td>
<td>M20x1.5</td>
</tr>
<tr>
<td>Duty factor</td>
<td>100%</td>
</tr>
<tr>
<td>Mechanical life</td>
<td>1 x 10⁶ operations</td>
</tr>
<tr>
<td>Mass (Kg)</td>
<td>0.16</td>
</tr>
<tr>
<td>Electric connection</td>
<td>Electric plug connection as per DIN 43650 with cable gland type PG7</td>
</tr>
<tr>
<td>Power supply</td>
<td>CID-E05-L, CID-E08-L</td>
</tr>
<tr>
<td>CID-E05-M, CID-E08-M</td>
<td>125 VAC + 250 Vac</td>
</tr>
<tr>
<td>Max current - resistive (inductive)</td>
<td>5 A (4 A) ÷ 4 A (3 A)</td>
</tr>
<tr>
<td>Protection degree to DIN EN 60529</td>
<td>IP65 with mating connector</td>
</tr>
</tbody>
</table>

Electric scheme shown with switch position in case of clean filter element

CID-E* L
- G (+) 4 NC
- 1 NC

CID-V* M
- 2 NC
- 3 NO

(1) Max flow rates are performed in following conditions:
- clean filter element
- min = max filter length
- filtration rating F10 (12 µm (c))
- mineral oil with viscosity 32 mm²/s
- Δp 1 bar

In case of different conditions the max flow rates have to be recalculated - see section [10]
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/dm³ and viscosity 30 mm²/s

10.2 FILTER ELEMENT $\Delta p$

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

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

\[
\text{\(\Delta p\) of filter element} = Q \times \frac{Gc}{1000} \times \text{Viscosity} \times \frac{30}{1000}
\]

$Q$ = 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

<table>
<thead>
<tr>
<th>Filter element size</th>
<th>10</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter element length</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>F03</td>
<td>27.75</td>
<td>15.25</td>
</tr>
<tr>
<td>F06</td>
<td>15.12</td>
<td>7.58</td>
</tr>
<tr>
<td>F10</td>
<td>9.37</td>
<td>4.91</td>
</tr>
<tr>
<td>F03</td>
<td>32.2</td>
<td>17.32</td>
</tr>
<tr>
<td>F06</td>
<td>22.38</td>
<td>9.41</td>
</tr>
<tr>
<td>F10</td>
<td>11.2</td>
<td>6.27</td>
</tr>
</tbody>
</table>

Example:

calculation of Total $\Delta p$ for filter type FPH-30-C-F06-04-R at $Q = 200$ l/min and viscosity 46 mm²/s (filter element PSH-30-C-F06-R)

$\Delta p$ of filter head = 0.22 bar

$Gr = 2.2$ mbar/(l/min)

$\Delta p$ of filter element $= 200 \times \frac{2.2}{1000} \times \frac{46}{30} = 0.68$ bar

Total $\Delta p = 0.22 + 0.68 = 0.90$ bar
**INSTALLATION DIMENSIONS OF FPH FILTERS [mm]**

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>D1</th>
<th>D2</th>
<th>F</th>
<th>H1</th>
<th>H2</th>
<th>L1</th>
<th>R</th>
<th>Mass (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPH-10-A</td>
<td>39</td>
<td>57</td>
<td>37</td>
<td>105</td>
<td>78.5</td>
<td>-</td>
<td>68</td>
<td>222</td>
<td>113</td>
<td>110</td>
<td>130</td>
<td></td>
<td>6.7</td>
</tr>
<tr>
<td>FPH-10-B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>333</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.4</td>
</tr>
<tr>
<td>FPH-30-A</td>
<td>47</td>
<td>76</td>
<td>64</td>
<td>140</td>
<td>107</td>
<td></td>
<td>68</td>
<td>262</td>
<td>110</td>
<td>145</td>
<td>140</td>
<td>140</td>
<td>13.2</td>
</tr>
<tr>
<td>FPH-30-B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>355</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.5</td>
</tr>
<tr>
<td>FPH-30-C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>475</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18.4</td>
</tr>
<tr>
<td>FPH-30-D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>568</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22.8</td>
</tr>
</tbody>
</table>

Optional differential clogging indicator. The drawing shows the electrical indicator type CIA-E*. Filter version with ports type SAE 6000.

**Notes:**
- Locking torque 20Nm for FPH-10, 75Nm for FPH-30.
- FPH-10: n°4 M10x18, n°4 3/8" UNC for filters with SAE ports.
- FPH-30: n°4 M12x22, n°6 1/2" UNC for filters with SAE ports.
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 housing 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:
- 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 (3) from the filter head (1) by turning counterclockwise (view from bottom side)
- remove the dirty filter element (2) 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