

Medium Pressure Filter

Pi 360

Nominal pressure 210/315 bar (2990/4480 psi), nominal size up to 450

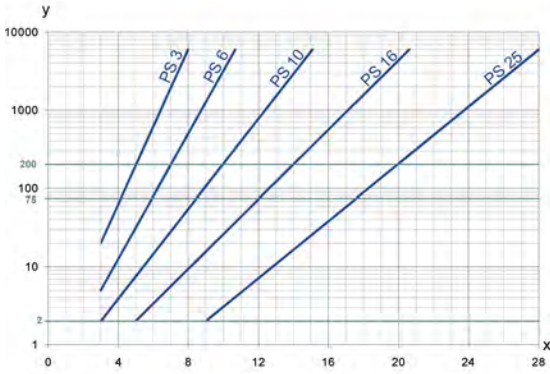
1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance control
- Threaded connections
- Change over valve on upstream side
- Ergonomic switch-over handle with safety lock and pressure compensation
- User-optimized one-hand-operation
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution



3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 1171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS 3 $\beta_{5(C)} \geq 200$
PS 6 $\beta_{7(C)} \geq 200$
PS 10 $\beta_{10(C)} \geq 200$
PS 25 $\beta_{20(C)} \geq 200$

PS vst elements with
max. Δ p 210 bar

PS vst 3 $\beta_{5(C)} \geq 200$
PS vst 6 $\beta_{7(C)} \geq 200$
PS vst 10 $\beta_{10(C)} \geq 200$
PS vst 25 $\beta_{20(C)} \geq 200$

values guaranteed up to
10 bar differential pressure

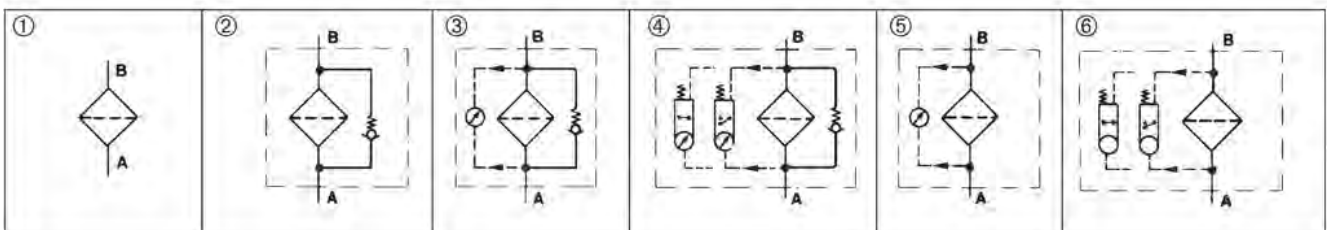
values guaranteed up to
20 bar differential pressure

5. Quality assurance

MAHLE filters and filter elements are produced according to the following international standards:

| Norm | Designation |
|--------------|---|
| DIN ISO 2941 | Hydraulic fluid power filter elements; verification of collapse/burst resistance |
| DIN ISO 2942 | Hydraulic fluid power filter elements; verification of fabrication integrity |
| DIN ISO 2943 | Hydraulic fluid power filter elements; verification of material compatibility with fluids |
| DIN ISO 3723 | Hydraulic fluid power filter elements; method for end load test |
| DIN ISO 3724 | Hydraulic fluid power filter elements; verification of flow fatigue characteristics |
| ISO 3968 | Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics |
| ISO 10771.1 | Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications |
| ISO 16889 | Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element |

6. Symbols



7. Order numbers

Example for ordering filters:

| | |
|--|---|
| <p>1. Filter housing V=80 l/min and electrical maintenance indicator Type: Pi 3608-15 Order number: 77666282</p> | <p>2. Filter element PS vst 3 Type: Pi 2208 PS vst 3 Order number: 77680200</p> |
|--|---|

7.1 Housing design

| Nominal size NG [l/min] | Order number | Type | ① no options | ② with bypass and indicator cavity | ③ with bypass and visual indicator | ④ with bypass and electrical indicator | ⑤ with visual indicator | ⑥ with electrical indicator |
|----------------------------|-----------------|-------------|-----------------|---|--|---|----------------------------------|--------------------------------------|
| 50 | 77655996 | Pi 3605-060 | | | | | | |
| | 77666217 | Pi 3605-011 | | | | | | |
| | 77666225 | Pi 3605-012 | | | | | | |
| | 77656044 | Pi 3605-013 | | | | | | |
| | 77666233 | Pi 3605-014 | | | | | | |
| | 77666241 | Pi 3605-015 | | | | | | |
| 80 | 77656002 | Pi 3608-060 | | | | | | |
| | 77666258 | Pi 3608-011 | | | | | | |
| | 77666266 | Pi 3608-012 | | | | | | |
| | 77656036 | Pi 3608-013 | | | | | | |
| | 77666274 | Pi 3608-014 | | | | | | |
| | 77666282 | Pi 3608-015 | | | | | | |
| 110 | 77656010 | Pi 3611-060 | | | | | | |
| | 77666290 | Pi 3611-011 | | | | | | |
| | 77666308 | Pi 3611-012 | | | | | | |
| | 77656028 | Pi 3611-013 | | | | | | |
| | 77731821 | Pi 3611-014 | | | | | | |
| | 77666316 | Pi 3611-015 | | | | | | |
| 150 | 77647845 | Pi 3615-060 | | | | | | |
| | 77731854 | Pi 3615-011 | | | | | | |
| | 77666324 | Pi 3615-012 | | | | | | |
| | 77655988 | Pi 3615-013 | | | | | | |
| | 77731862 | Pi 3615-014 | | | | | | |
| | 77731847 | Pi 3615-015 | | | | | | |
| 300 | 77655970 | Pi 3630-060 | | | | | | |
| | 77731896 | Pi 3630-011 | | | | | | |
| | 77666332 | Pi 3630-012 | | | | | | |
| | 77647837 | Pi 3630-013 | | | | | | |
| | 77731904 | Pi 3630-014 | | | | | | |
| | 77731888 | Pi 3630-015 | | | | | | |
| 450 | 70328126 | Pi 3645-060 | | | | | | |
| | 79343153 | Pi 3645-011 | | | | | | |
| | 79350810 | Pi 3645-012 | | | | | | |
| | 77883648 | Pi 3645-013 | | | | | | |
| | 79343161 | Pi 3645-014 | | | | | | |
| | 78299307 | Pi 3645-015 | | | | | | |

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements (a wider range of element types is available on request)

| Nominal size NG [l/min] | Order number | Type | Filter material | max. Δp [bar] | Filter surface [cm ²] |
|----------------------------|-----------------|-------------------|--------------------|--------------------------|--------------------------------------|
| 50 | 77680135 | Pi 2105 PS 3 | PS 3 | 20 | 590 |
| | 77943509 | Pi 5105 PS 6 | PS 6 | | 590 |
| | 77680325 | Pi 3105 PS 10 | PS 10 | | 590 |
| | 77680440 | Pi 4105 PS 25 | PS 25 | | 590 |
| | 77680192 | Pi 2205 PS vst 3 | PS vst 3 | 210 | 425 |
| | 77943533 | Pi 5205 PS vst 6 | PS vst 6 | | 425 |
| | 77680382 | Pi 3205 PS vst 10 | PS vst 10 | | 425 |
| | 77680507 | Pi 4205 PS vst 25 | PS vst 25 | | 425 |
| 80 | 77680143 | Pi 2108 PS 3 | PS 3 | 20 | 1150 |
| | 77943517 | Pi 5108 PS 6 | PS 6 | | 1150 |
| | 77680341 | Pi 3108 PS 10 | PS 10 | | 1150 |
| | 77680457 | Pi 4108 PS 25 | PS 25 | | 1150 |
| | 77680200 | Pi 2208 PS vst 3 | PS vst 3 | 210 | 850 |
| | 77943541 | Pi 5208 PS vst 6 | PS vst 6 | | 850 |
| | 77681190 | Pi 3208 PS vst 10 | PS vst 10 | | 850 |
| | 77680515 | Pi 4208 PS vst 25 | PS vst 25 | | 850 |
| 110 | 77680150 | Pi 2111 PS 3 | PS 3 | 20 | 1700 |
| | 77943525 | Pi 5111 PS 6 | PS 6 | | 1700 |
| | 77680333 | Pi 3111 PS 10 | PS 10 | | 1700 |
| | 77680465 | Pi 4111 PS 25 | PS 25 | | 1700 |
| | 77680218 | Pi 2211 PS vst 3 | PS vst 3 | 210 | 1275 |
| | 77943558 | Pi 5211 PS vst 6 | PS vst 6 | | 1275 |
| | 77680390 | Pi 3211 PS vst 10 | PS vst 10 | | 1275 |
| | 77680523 | Pi 4211 PS vst 25 | PS vst 25 | | 1275 |
| 150 | 77680168 | Pi 2115 PS 3 | PS 3 | 20 | 2425 |
| | 77955099 | Pi 5115 PS 6 | PS 6 | | 2425 |
| | 77680358 | Pi 3115 PS 10 | PS 10 | | 2425 |
| | 77680473 | Pi 4115 PS 25 | PS 25 | | 2425 |
| | 77680226 | Pi 2215 PS vst 3 | PS vst 3 | 210 | 2010 |
| | 77955123 | Pi 5215 PS vst 6 | PS vst 6 | | 2010 |
| | 77680408 | Pi 3215 PS vst 10 | PS vst 10 | | 2010 |
| | 77680531 | Pi 4215 PS vst 25 | PS vst 25 | | 2010 |
| 300 | 77680176 | Pi 2130 PS 3 | PS 3 | 20 | 4620 |
| | 77955107 | Pi 5130 PS 6 | PS 6 | | 4620 |
| | 77680366 | Pi 3130 PS 10 | PS 10 | | 4620 |
| | 77680481 | Pi 4130 PS 25 | PS 25 | | 4620 |
| | 77680234 | Pi 2230 PS vst 3 | PS vst 3 | 210 | 3800 |
| | 77955131 | Pi 5230 PS vst 6 | PS vst 6 | | 3800 |
| | 77680416 | Pi 3230 PS vst 10 | PS vst 10 | | 3800 |
| | 77680549 | Pi 4230 PS vst 25 | PS vst 25 | | 3800 |
| 450 | 77680184 | Pi 2145 PS 3 | PS 3 | 20 | 6865 |
| | 77955115 | Pi 5145 PS 6 | PS 6 | | 6865 |
| | 77680374 | Pi 3145 PS 10 | PS 10 | | 6865 |
| | 77680499 | Pi 4145 PS 25 | PS 25 | | 6865 |
| | 77680242 | Pi 2245 PS vst 3 | PS vst 3 | 210 | 5600 |
| | 77955149 | Pi 5245 PS vst 6 | PS vst 6 | | 5600 |
| | 77680424 | Pi 3245 PS vst 10 | PS vst 10 | | 5600 |
| | 77680556 | Pi 4245 PS vst 25 | PS vst 25 | | 5600 |

8. Technical specifications

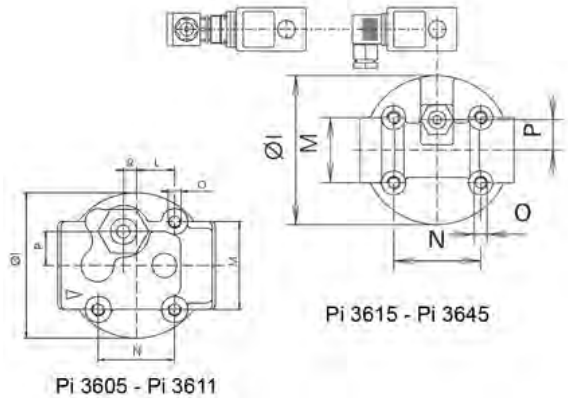
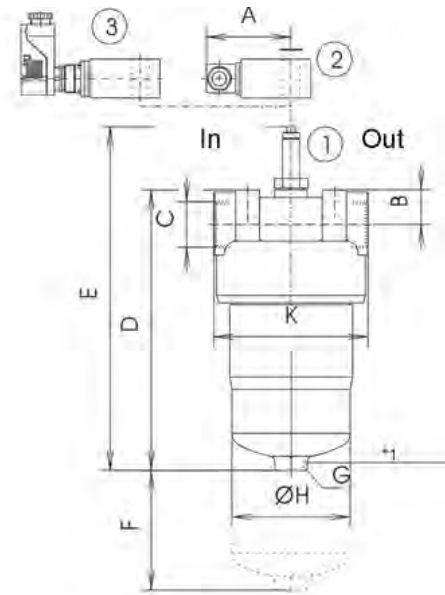
| | |
|---|---|
| Design: | line mounting filter |
| Nominal pressure: Pi 3615-3645 | 210 bar (2990 psi) |
| Pi 3605, 3608, 3611 | 315 bar (4480 psi) |
| Test pressure: Pi 3615-3645 | 275 bar (3910 psi) |
| Pi 3605, 3608, 3611 | 410 bar (5830 psi) |
| Temperature range: | -10 °C to +120 °C |
| | (other temperature ranges on request) |
| Bypass setting: | Δp 7 bar \pm 10 % |
| Filter head material: | GGG |
| Filter housing material: | St |
| Sealing material: | NBR/PTFE |
| Maintenance indicator setting: | Δp 5 bar \pm 10 % |
| Electrical data of maintenance indicator: | |
| Max. voltage: | 250 V AC/200 V DC |
| Max. current: | 1 A |
| Contact load: | 70 W |
| Type of protection: | IP 65 in inserted and secured status |
| Contact: | normally open/closed |
| Cable sleeve: | M20x1.5 |

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.



- In = inlet
- Out = outlet
- Pos 1 - Visual maintenance indicator
- Pos 2 - Electrical upper section connector according DIN EN 175301-803
- Executions: Pis 3092, 3105, 3115
- Pos 3 - Electrical upper section connector according DIN EN 175201-804
- Executions: Pis 3102, 3122, 3110, 3132

*1 NG 300 and NG 450 with drain screw G $\frac{1}{4}$

9. Dimensions

All dimensions except "C" in mm.

| Type | A | B | C* | D | E | F | G SW | H | I | K | L | M | N | O | P | R | Weight [kg] |
|---------|----|----|------------------|-----|-----|-----|---------|-----|-----|-----|------|----|----|--------|----|---|----------------|
| Pi 3605 | 78 | 31 | G $\frac{1}{2}$ | 189 | 247 | 80 | 27 | 66 | 90 | 92 | 23.5 | 54 | 47 | M8x16 | 21 | 8 | 4.1 |
| Pi 3608 | 78 | 31 | G $\frac{3}{4}$ | 267 | 325 | 80 | 27 | 66 | 90 | 92 | 23.5 | 54 | 47 | M8x16 | 21 | 8 | 5.0 |
| Pi 3611 | 78 | 31 | G $\frac{1}{2}$ | 343 | 401 | 80 | 27 | 66 | 90 | 92 | 23.5 | 54 | 47 | M8x16 | 21 | 8 | 5.9 |
| Pi 3615 | 78 | 32 | G1 $\frac{1}{4}$ | 257 | 312 | 110 | 30 | 109 | 137 | 142 | - | 60 | 80 | M12x16 | 30 | - | 9.8 |
| Pi 3630 | 78 | 32 | G1 $\frac{1}{4}$ | 371 | 426 | 110 | 30 | 109 | 137 | 142 | - | 60 | 80 | M12x16 | 30 | - | 12.5 |
| Pi 3645 | 78 | 32 | G1 $\frac{1}{4}$ | 487 | 542 | 110 | 30 | 109 | 137 | 142 | - | 60 | 80 | M12x16 | 30 | - | 14.0 |

* NPT- and SAE- port connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards.

The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

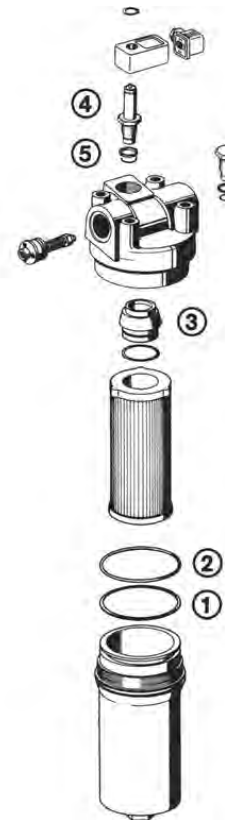
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa.

10.3 When should the filter be replaced?

- Filters equipped with visual and electrical maintenance indicator:
During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature. The filter element must be replaced after the end of the shift.
- Filters without maintenance indicator: The filter element should be replaced after trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
- Please always ensure that you have original MAHLE spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

- Stop system and relieve filter from pressure.
- Filter sizes 300 and 450: empty the filter housing by removing the drain plug.
- Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
- Remove element by pulling down carefully.
- Check o-ring, spigot and o-ring in the element locator for damage. Replace, if necessary.
- Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
- Lightly lubricate the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 60 Nm, for NG 150 to 450 = 100 Nm.
- Check seals of vent drain plug - if necessary, please replace.
Torque drain plug 30 Nm.



11. Spare parts list

| Order numbers for spare parts | | |
|-------------------------------|------------------------------------|--------------|
| Position | Type | Order number |
| ① - ③ | Seal kit | |
| | Pi 3605 - Pi 3611 | |
| | NBR | 77637150 |
| | FPM | 77637168 |
| | EPDM | 77637176 |
| | Pi 3615 - Pi 3645 | |
| | NBR | 77637184 |
| | FPM | 77637192 |
| | EPDM | 77637200 |
| ④ | Maintenance indicator | |
| | Visual PiS 3093/5 | 77669914 |
| | Visual/electrical PiS 3092/5 | 77669864 |
| | Electrical upper section only | 77536550 |
| ⑤ | Seal kit for maintenance indicator | |
| | NBR | 77760275 |
| | FPM | 77760283 |
| | EPDM | 77760291 |