

MAHLE

Industrial Filtration

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High Pressure Filter

Pi 420

Operating pressure 400 bar, Nominal size up to 450

1. Features

Efficient filters for modern hydraulic systems

- Modular design principle
- Compact design
- Minimal pressure drop
- Optical/electrical/electronic contamination control
- Threaded or SAE flange connection

Quality filters, easy to service

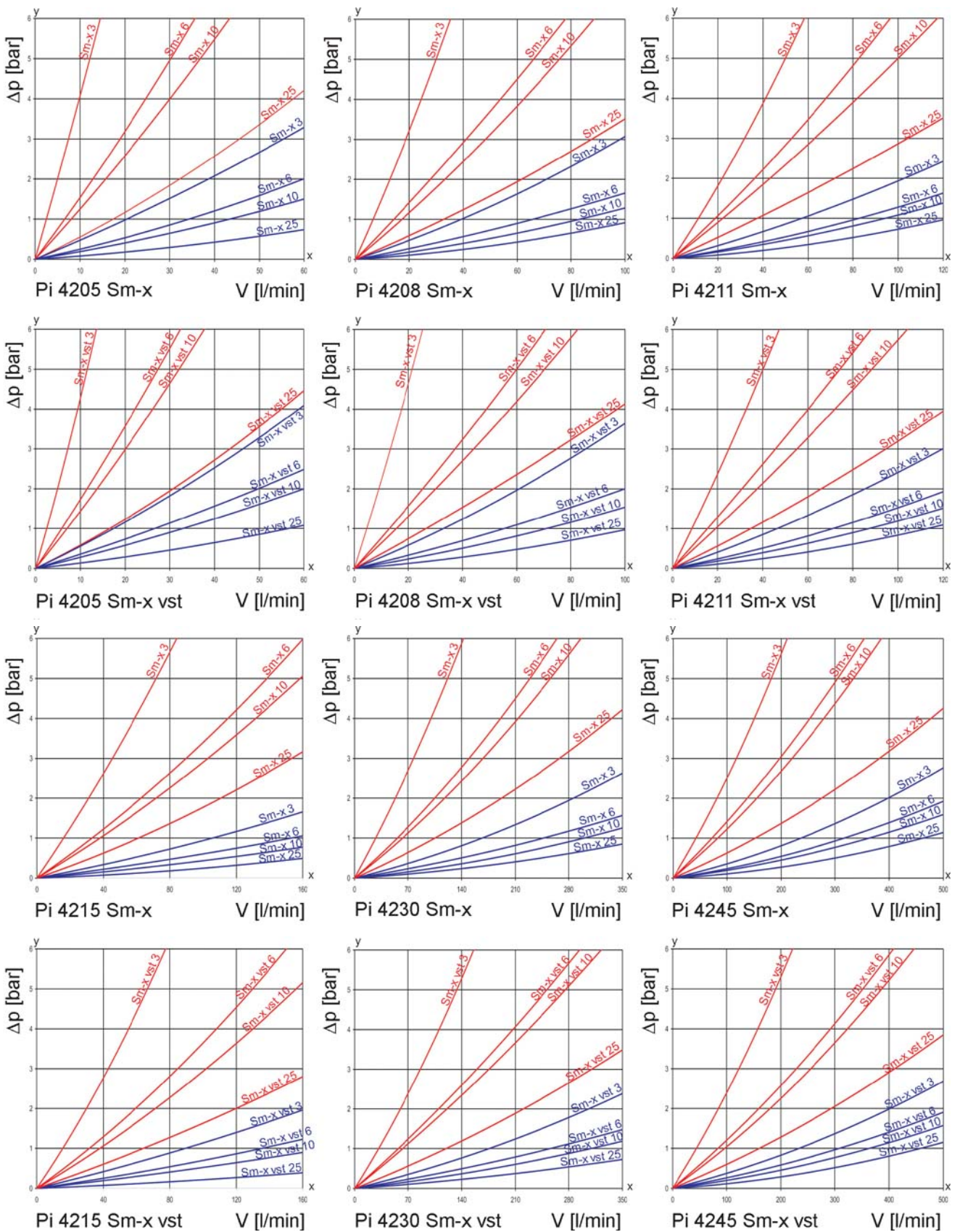
- Equipped with highly efficient Sm-x filter elements
- β -valued elements per ISO 16889
- High dirt holding capacity and differential pressure stability providing optimal element service life

Worldwide distribution



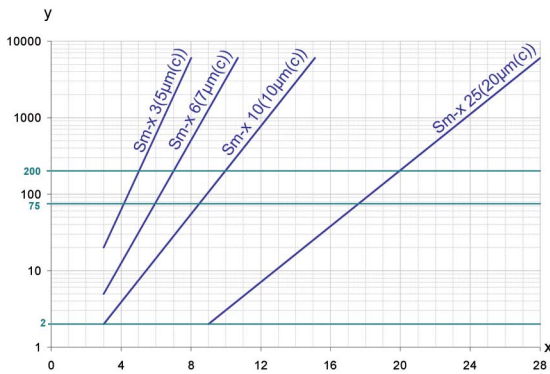
2. Flow rate/pressure drop curve complete filter

■ 190 mm²/s (25° E)
■ 33 mm²/s (4,5° E)



y = differential pressure Δp [bar]
 x = flow rate V [l/min]

3. Separation characteristics



y = beta - ratio
x = particle size [µm]

determined by multipass test (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

measured according to ISO 16889 (multipass test)

Sm-x elements with
Δ p 20 bar

| | | |
|------|----|--------------------------|
| Sm-x | 3 | $\beta_{5(C)} \geq 200$ |
| Sm-x | 6 | $\beta_{7(C)} \geq 200$ |
| Sm-x | 10 | $\beta_{10(C)} \geq 200$ |
| Sm-x | 25 | $\beta_{20(C)} \geq 200$ |

up to 10 bar differential
pressure

Sm-x vst elements with
Δ p 210 bar

| | | |
|----------|----|--------------------------|
| Sm-x vst | 3 | $\beta_{5(C)} \geq 200$ |
| Sm-x vst | 6 | $\beta_{7(C)} \geq 200$ |
| Sm-x vst | 10 | $\beta_{10(C)} \geq 200$ |
| Sm-x vst | 25 | $\beta_{20(C)} \geq 200$ |

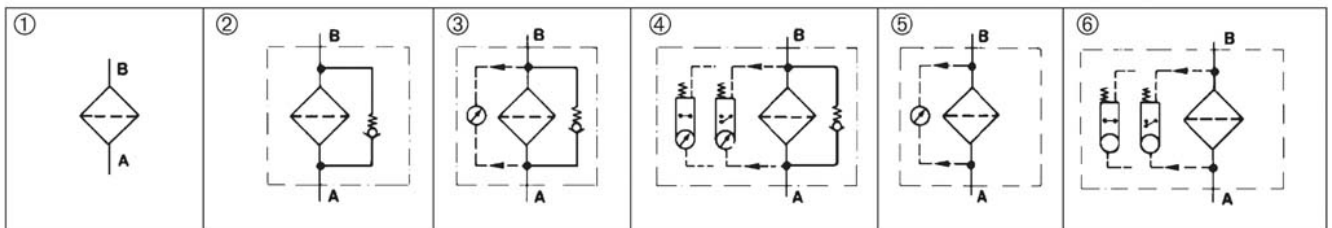
up to 20 bar differential
pressure

5. Quality assurance

MAHLE filter and filter elements are manufactured respectively, tested in accordance with 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:

| 1. Housing design | 2. Filter elements |
|---|--|
| Housing design V = 80 l/min, electrical indicator Type: Pi 4208-15 Order number: 77666472 | Sm-x vst 3 Type: Pi 2208 Sm-x vst 3 Order number: 77680200 |

7.1 Housing design

| Nominal size NG [l/min] | Order number | Type | Order number | Type | ① | ② | ③ | ④ | ⑤ | ⑥ |
|-------------------------|--------------|------------|--------------|---------------|-----------------------|--|---|--|------------------------|---------------------------|
| | | | | | with indicator cavity | with bypass valve and indicator cavity | with bypass valve and optical indicator | with bypass valve and electrical indicator | with optical indicator | with electrical indicator |
| 50 | 77666357 | Pi 4205-10 | 77967714 | Pi 4205-10 FL | | | | | | |
| | 77666365 | Pi 4205-11 | 77967722 | Pi 4205-11 FL | | | | | | |
| | 77666373 | Pi 4205-12 | 77967730 | Pi 4205-12 FL | | | | | | |
| | 77666381 | Pi 4205-13 | 77967748 | Pi 4205-13 FL | | | | | | |
| | 77666399 | Pi 4205-14 | 77967755 | Pi 4205-14 FL | | | | | | |
| | 77666415 | Pi 4205-15 | 77967763 | Pi 4205-15 FL | | | | | | |
| 80 | 77666423 | Pi 4208-10 | 77967771 | Pi 4208-10 FL | | | | | | |
| | 77666431 | Pi 4208-11 | 77967789 | Pi 4208-11 FL | | | | | | |
| | 77666449 | Pi 4208-12 | 77967797 | Pi 4208-12 FL | | | | | | |
| | 77666456 | Pi 4208-13 | 77967805 | Pi 4208-13 FL | | | | | | |
| | 77666464 | Pi 4208-14 | 77967813 | Pi 4208-14 FL | | | | | | |
| | 77666472 | Pi 4208-15 | 77967821 | Pi 4208-15 FL | | | | | | |
| 110 | 77666480 | Pi 4211-10 | 77967839 | Pi 4211-10 FL | | | | | | |
| | 77666498 | Pi 4211-11 | 77967847 | Pi 4211-11 FL | | | | | | |
| | 77666506 | Pi 4211-12 | 77967854 | Pi 4211-12 FL | | | | | | |
| | 77666514 | Pi 4211-13 | 77967862 | Pi 4211-13 FL | | | | | | |
| | 77666522 | Pi 4211-14 | 77967870 | Pi 4211-14 FL | | | | | | |
| | 77666530 | Pi 4211-15 | 77967888 | Pi 4211-15 FL | | | | | | |
| 150 | 77666548 | Pi 4215-10 | 77968596 | Pi 4215-10 FL | | | | | | |
| | 77666555 | Pi 4215-11 | 77968604 | Pi 4215-11 FL | | | | | | |
| | 77666563 | Pi 4215-12 | 77968612 | Pi 4215-12 FL | | | | | | |
| | 77666571 | Pi 4215-13 | 77968620 | Pi 4215-13 FL | | | | | | |
| | 77666589 | Pi 4215-14 | 77968638 | Pi 4215-14 FL | | | | | | |
| | 77666597 | Pi 4215-15 | 77968646 | Pi 4215-15 FL | | | | | | |
| 300 | 77666613 | Pi 4230-10 | 77968653 | Pi 4230-10 FL | | | | | | |
| | 77666621 | Pi 4230-11 | 77968661 | Pi 4230-11 FL | | | | | | |
| | 77666639 | Pi 4230-12 | 77968679 | Pi 4230-12 FL | | | | | | |
| | 77666647 | Pi 4230-13 | 77968687 | Pi 4230-13 FL | | | | | | |
| | 77666654 | Pi 4230-14 | 77968695 | Pi 4230-14 FL | | | | | | |
| | 77666662 | Pi 4230-15 | 77964505 | Pi 4230-15 FL | | | | | | |
| 450 | 77666688 | Pi 4245-10 | 77968703 | Pi 4245-10 FL | | | | | | |
| | 77666696 | Pi 4245-11 | 77968711 | Pi 4245-11 FL | | | | | | |
| | 77666704 | Pi 4245-12 | 77968729 | Pi 4245-12 FL | | | | | | |
| | 77666712 | Pi 4245-13 | 77968737 | Pi 4245-13 FL | | | | | | |
| | 77666720 | Pi 4245-14 | 77968745 | Pi 4245-14 FL | | | | | | |
| | 77666746 | Pi 4245-15 | 77968752 | Pi 4245-15 FL | | | | | | |

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

| 7.2 Filter elements* | | | | | |
|----------------------------|-----------------|---------------------|-----------------|----------------------------|--------------------------------------|
| Nominal size NG [l/min] | Order number | Type | Filter material | Collapse pressure [bar] | Filter surface [cm ²] |
| 50 | 77680135 | Pi 2105 Sm-x 3 | Sm-x 3 | 20 | 590 |
| | 77943509 | Pi 5105 Sm-x 6 | Sm-x 6 | | 590 |
| | 77680325 | Pi 3105 Sm-x 10 | Sm-x 10 | | 590 |
| | 77680440 | Pi 4105 Sm-x 25 | Sm-x 25 | | 590 |
| | 77680192 | Pi 2205 Sm-x vst 3 | Sm-x vst 3 | 210 | 425 |
| | 77943533 | Pi 5205 Sm-x vst 6 | Sm-x vst 6 | | 425 |
| | 77680382 | Pi 3205 Sm-x vst 10 | Sm-x vst 10 | | 425 |
| | 77680507 | Pi 4205 Sm-x vst 25 | Sm-x vst 25 | | 425 |
| 80 | 77680143 | Pi 2108 Sm-x 3 | Sm-x 3 | 20 | 1150 |
| | 77943517 | Pi 5108 Sm-x 6 | Sm-x 6 | | 1150 |
| | 77680341 | Pi 3108 Sm-x 10 | Sm-x 10 | | 1150 |
| | 77680457 | Pi 4108 Sm-x 25 | Sm-x 25 | | 1150 |
| | 77680200 | Pi 2208 Sm-x vst 3 | Sm-x vst 3 | 210 | 850 |
| | 77943541 | Pi 5208 Sm-x vst 6 | Sm-x vst 6 | | 850 |
| | 77681190 | Pi 3208 Sm-x vst 10 | Sm-x vst 10 | | 850 |
| | 77680515 | Pi 4208 Sm-x vst 25 | Sm-x vst 25 | | 850 |
| 110 | 77680150 | Pi 2111 Sm-x 3 | Sm-x 3 | 20 | 1700 |
| | 77943525 | Pi 5111 Sm-x 6 | Sm-x 6 | | 1700 |
| | 77680333 | Pi 3111 Sm-x 10 | Sm-x 10 | | 1700 |
| | 77680465 | Pi 4111 Sm-x 25 | Sm-x 25 | | 1700 |
| | 77680218 | Pi 2211 Sm-x vst 3 | Sm-x vst 3 | 210 | 1275 |
| | 77943558 | Pi 5211 Sm-x vst 6 | Sm-x vst 6 | | 1275 |
| | 77680390 | Pi 3211 Sm-x vst 10 | Sm-x vst 10 | | 1275 |
| | 77680523 | Pi 4211 Sm-x vst 25 | Sm-x vst 25 | | 1275 |
| 150 | 77680168 | Pi 2115 Sm-x 3 | Sm-x 3 | 20 | 2425 |
| | 77955099 | Pi 5115 Sm-x 6 | Sm-x 6 | | 2425 |
| | 77680358 | Pi 3115 Sm-x 10 | Sm-x 10 | | 2425 |
| | 77680473 | Pi 4115 Sm-x 25 | Sm-x 25 | | 2425 |
| | 77680226 | Pi 2215 Sm-x vst 3 | Sm-x vst 3 | 210 | 2010 |
| | 77955123 | Pi 5215 Sm-x vst 6 | Sm-x vst 6 | | 2010 |
| | 77680408 | Pi 3215 Sm-x vst 10 | Sm-x vst 10 | | 2010 |
| | 77680531 | Pi 4215 Sm-x vst 25 | Sm-x vst 25 | | 2010 |
| 300 | 77680176 | Pi 2130 Sm-x 3 | Sm-x 3 | 20 | 4620 |
| | 77955107 | Pi 5130 Sm-x 6 | Sm-x 6 | | 4620 |
| | 77680366 | Pi 3130 Sm-x 10 | Sm-x 10 | | 4620 |
| | 77680481 | Pi 4130 Sm-x 25 | Sm-x 25 | | 4620 |
| | 77680234 | Pi 2230 Sm-x vst 3 | Sm-x vst 3 | 210 | 3800 |
| | 77955131 | Pi 5230 Sm-x vst 6 | Sm-x vst 6 | | 3800 |
| | 77680416 | Pi 3230 Sm-x vst 10 | Sm-x vst 10 | | 3800 |
| | 77680549 | Pi 4230 Sm-x vst 25 | Sm-x vst 25 | | 3800 |
| 450 | 77680184 | Pi 2145 Sm-x 3 | Sm-x 3 | 20 | 6865 |
| | 77955115 | Pi 5145 Sm-x 6 | Sm-x 6 | | 6865 |
| | 77680374 | Pi 3145 Sm-x 10 | Sm-x 10 | | 6865 |
| | 77680499 | Pi 4145 Sm-x 25 | Sm-x 25 | | 6865 |
| | 77680242 | Pi 2245 Sm-x vst 3 | Sm-x vst 3 | 210 | 5600 |
| | 77955149 | Pi 5245 Sm-x vst 6 | Sm-x vst 6 | | 5600 |
| | 77680424 | Pi 3245 Sm-x vst 10 | Sm-x vst 10 | | 5600 |
| | 77680556 | Pi 4245 Sm-x vst 25 | Sm-x vst 25 | | 5600 |

* further elements available upon request.

8. Specifications

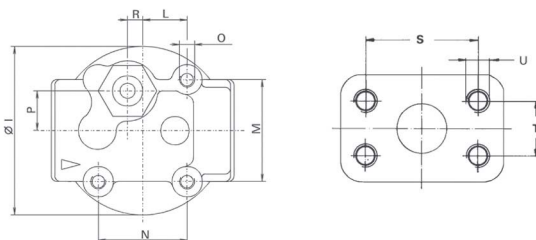
| | |
|---|---|
| Design: | line mounting filter |
| Operating pressure: | 400 bar |
| Test pressure: | 520 bar |
| Temperature range: | -10 °C to +120 °C (other temperature ranges on request) |
| Bypass opening pressure: | Δp 7 bar \pm 10 % |
| Filter head material: | GGG |
| Filter bowl material: | St |
| Sealing material: | NBR/PTFE |
| Activating pressure of optical/ electrical differential pressure in- dicator: | Δp 5 bar \pm 10 % |
| Electrical data of contamination indicator: | |
| Maximum voltage: | 250 V AC/200 V DC |
| Maximum current on contact | 1 A |
| Inrush current: | 70 W |
| Type of protection: | IP 65 when inserted and secured |
| Contact: | bistable |
| Cable connection: | M 20 x 1.5 |

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. The use of quenching circuits must be checked in the case of inductivity in the DC current circuit. The contamination indicator data sheet contains further information and additional contamination indicator versions.

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.

When using our filters in areas which are to be classified according to EU Directive 94/9 EG (ATEX 95), we recommend prior discussion with us. The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EG article 9). Please consult with us if using other media.

Subject to technical alteration without prior notice.

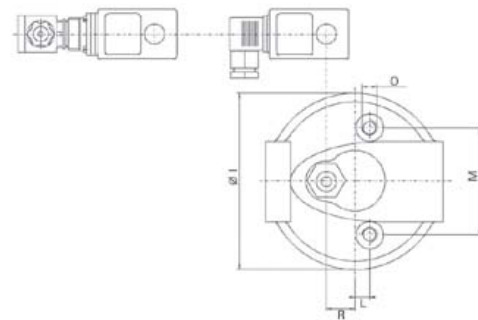
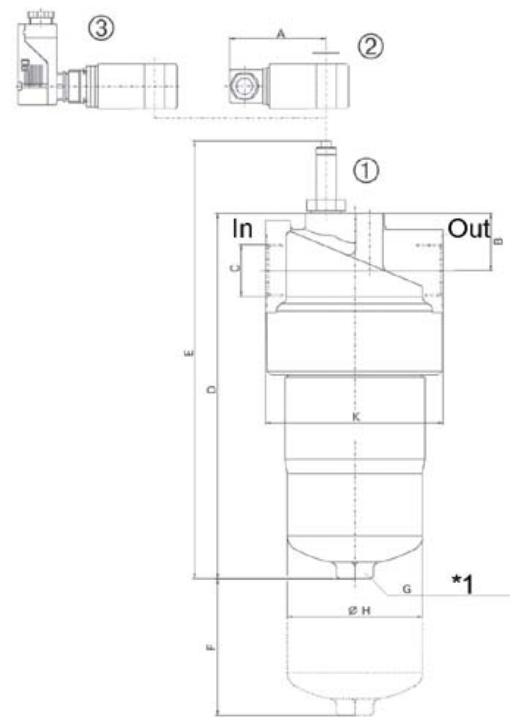


NG 50 - 110

*1

*1

DN 25 according to SAE 1" 6000psi
 DN 38 according to SAE 1½" 6000psi
 Flange, screw, o-ring not included in delivery



NG 150 - 450

- In = intake
 Out = outlet
 Pos 1 Optical contamination indicator
 Pos 2 Electrical upper section connector according
 DIN EN 175301-803,
 Executions: 3092, 3105, 3115
 Pos 3 Electrical upper section connector according
 DIN EN 175201-804,
 Executions: 3102, 3122, 3110

*1
 NG 300, 450 with drain screw G ¼ DIN 910

9. Dimensions

All dimensions except "C" in mm.

| Type | A | B | C | D | E | F | G SW | H | I | K |
|------------|----|----|-------|-----|-----|-----|---------|-----|-----|-------|
| Pi 4205 | 78 | 31 | G ½ | 189 | 247 | 80 | 27 | 66 | 90 | 92 |
| Pi 4205 FL | | 28 | DN 25 | 204 | 262 | | | | 85 | 95 |
| Pi 4208 | 78 | 31 | G 1 | 267 | 325 | 80 | 27 | 66 | 90 | 92 |
| Pi 4208 FL | | 28 | DN 25 | 282 | 340 | | | | 85 | 95 |
| Pi 4211 | 78 | 31 | G 1 | 343 | 401 | 80 | 27 | 66 | 90 | 92 |
| Pi 4211 FL | | 28 | DN 25 | 358 | 416 | | | | 85 | 95 |
| Pi 4215 | 78 | 46 | G 1¼ | 284 | 342 | 110 | 30 | 109 | 142 | 143.5 |
| Pi 4215 FL | | 40 | DN 38 | | | | | | | |
| Pi 4230 | 78 | 46 | G 1¼ | 409 | 467 | 110 | 30 | 109 | 142 | 143.5 |
| Pi 4230 FL | | 40 | DN 38 | | | | | | | |
| Pi 4245 | 78 | 46 | G 1½ | 525 | 583 | 110 | 30 | 109 | 142 | 143.5 |
| Pi 4245 FL | | 40 | DN 38 | | | | | | | |

| Type | L | M | N | O | P | R | S | T | U | Weight [kg] |
|------------|------|----|----|-----------|----|----|------|------|-----------|----------------|
| Pi 4205 | 23.5 | 54 | 47 | M 8 x 14 | 21 | 8 | 57.1 | 27.8 | M 12 x 20 | 4.1 |
| Pi 4205 FL | 10 | | - | | | 12 | | | | 4.6 |
| Pi 4208 | 23.5 | 54 | 47 | M 8 x 14 | 21 | 8 | 57.1 | 27.8 | M 12 x 20 | 4.9 |
| Pi 4208 FL | 10 | | - | | | 12 | | | | 5.3 |
| Pi 4211 | 23.5 | 54 | 47 | M 8 x 14 | 21 | 8 | 57.1 | 27.8 | M 12 x 20 | 5.8 |
| Pi 4211 FL | 10 | | - | | | 12 | | | | 6.2 |
| Pi 4215 | 12 | 86 | - | M 12 x 15 | - | 23 | 79.4 | 36.5 | M 16 x 20 | 12.3 |
| Pi 4215 FL | | | | | | | | | | 13.3 |
| Pi 4230 | 12 | 86 | - | M 12 x 15 | - | 23 | 79.4 | 36.5 | M 16 x 20 | 14.8 |
| Pi 4230 FL | | | | | | | | | | 15.9 |
| Pi 4245 | 12 | 86 | - | M 12 x 15 | - | 23 | 79.4 | 36.5 | M 16 x 20 | 17.1 |
| Pi 4245 FL | | | | | | | | | | 18.6 |

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 bowl. Preferable the filter should be installed with the filter bowl pointing downwards. The contamination indicator must be visible.

10.2 Connecting the electrical contamination indicator

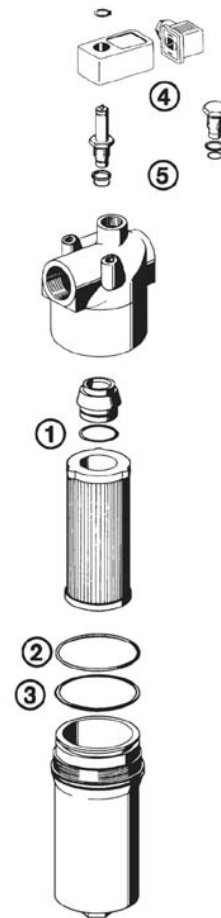
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When must the filter element be replaced?

- Filters equipped with optical and electrical contamination indicator:
During cold starts, the indicator may give a warning signal. Depress the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops out 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 contamination indicator:
The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
- Please always ensure that you have Original MAHLE replacement elements in stock: disposable elements (Sm-x) cannot be cleaned.

10.4 Element replacement

- Stop system and relieve filter from pressure.
- Unscrew the filter bowl by turning counter-clockwise. Clean the bowl using a suitable cleaning solvent.
- Remove the filter element with a side-to-side motion.
- Check o-ring and spigot for damage. Replace, if necessary.
- Make sure that the order number on the spare element corresponds with the order number of the plate. Remove the plastic bag and push element over the spigot in the filter head.
- Complete installation by screwing on the bowl, turning clockwise until it comes to a full stop. Back off the bowl 1/8 to 1/2 turn.



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78356990.11/2006

11. Spare parts list

| Order numbers for spare parts | | |
|-------------------------------|--------------------------------------|--------------|
| Position | Type | Order number |
| ① - ③ | Seal kit | |
| | Pi 4205 - Pi 4211 | |
| | NBR | 77544851 |
| | FPM | 77544869 |
| | EPDM | 77544877 |
| | Pi 4215 - Pi 4245 | |
| | NBR | 77544885 |
| | FPM | 77544893 |
| | EPDM | 77544901 |
| ④ | Contaminant indicator | |
| | Optical PiS 3093/5 | 77669914 |
| | Electrical PiS 3092/5 | 77669864 |
| | Electrical upper section only | 77536550 |
| ⑤ | Seal kit for contamination indicator | |
| | NBR | 77760275 |
| | FPM | 77760283 |
| | EPDM | 77760291 |