MAHLE

Industrial Filtration

Low Pressure Filter
Pi 2000

Operating pressure 25/63 bar, Nominal size up to 400
according DIN 24550

1. Features

Efficient filters for modern hydraulic systems

- Modular design principle
- Compact design
- Minimal pressure drop
- Optical/electrical/electronic contamination control
- Thread connection

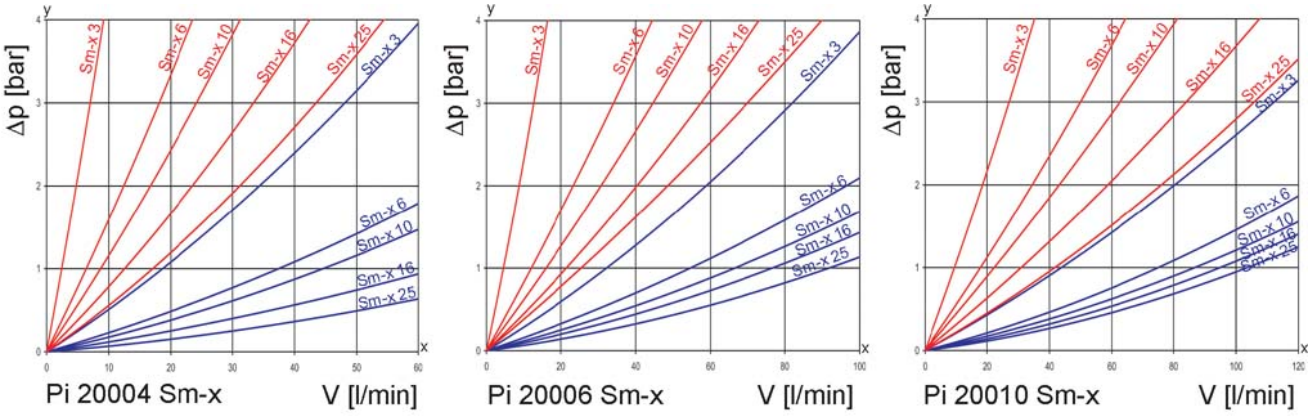
Quality filters, easy to service

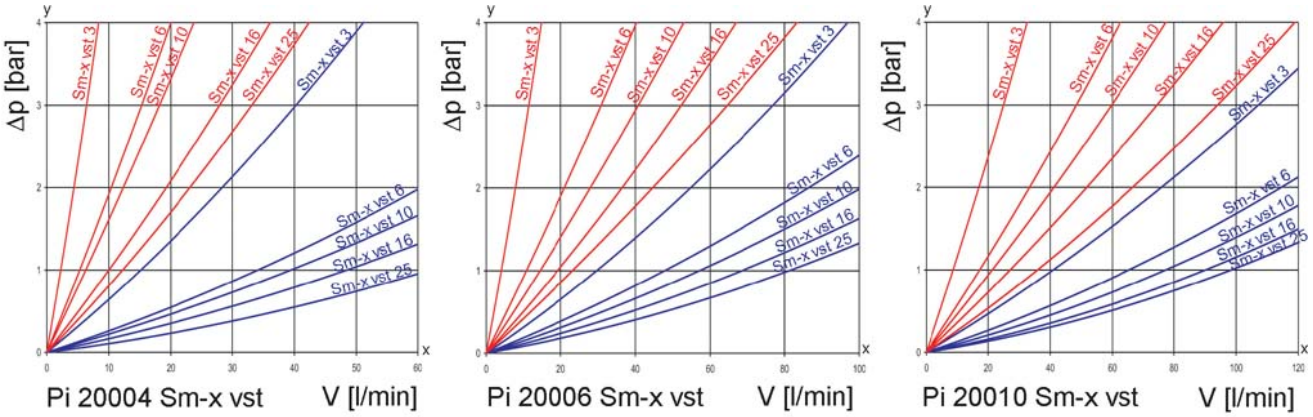
- Equipped with higly efficient Sm-x filter elements
- β-valued elements per ISO 16889
- High dirt holding capacity and differential pressure stability providing optimal element service life

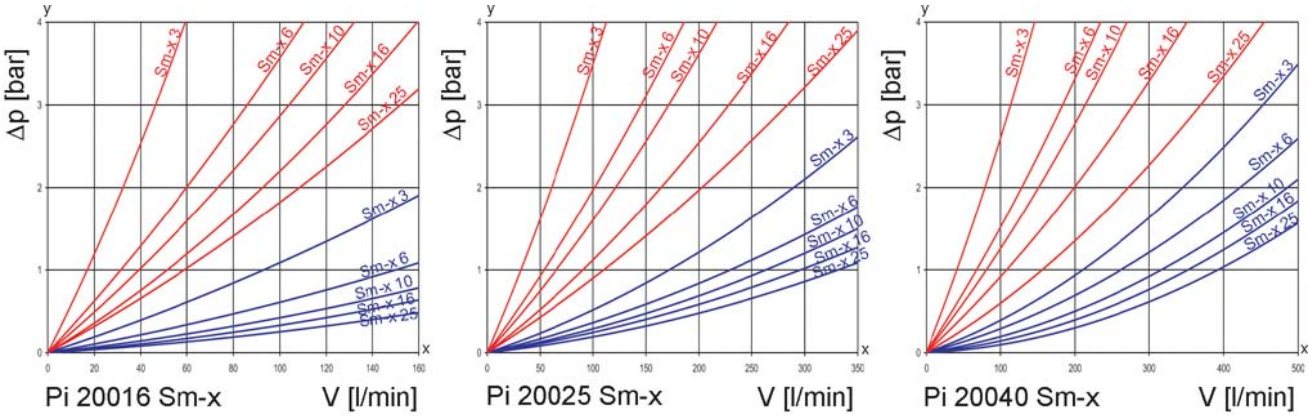
Worldwide distribution

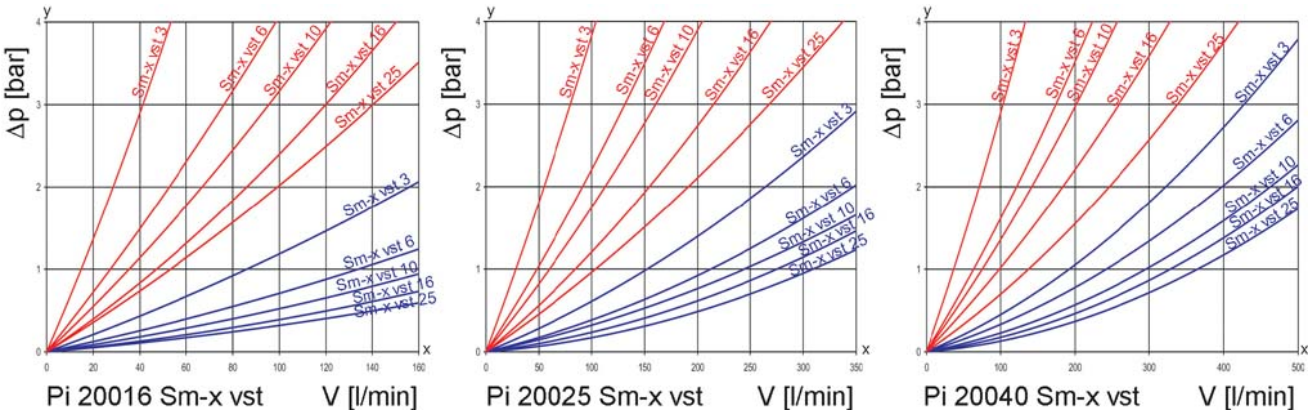
2. Flow rate/pressure drop curve complete filter

190 mm²/s (25° E)
33 mm²/s (4,5° E)



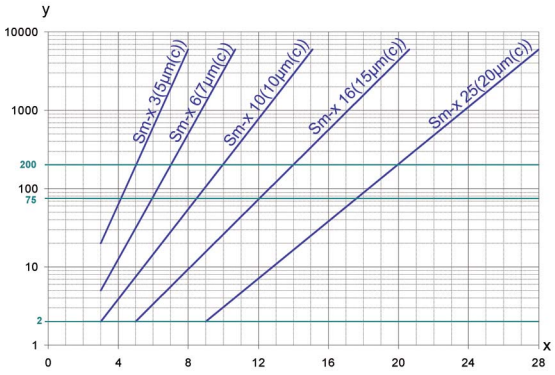






y = differential pressure Δp [bar]
x = flow rate V [l/min]

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	$\beta_{5(C)}$	≥200
Sm-x	6	$\beta_{7(C)}$	≥200
Sm-x	10	$\beta_{10(C)}$	≥200
Sm-x	16	$\beta_{15(C)}$	≥200
Sm-x	25	$\beta_{20(C)}$	≥200

up to 10 bar differential pressure

Sm-x vst elements with
Δ p 210 bar

Sm-x vst	3	$\beta_{5(C)}$	≥200
Sm-x vst	6	$\beta_{7(C)}$	≥200
Sm-x vst	10	$\beta_{10(C)}$	≥200
Sm-x vst	16	$\beta_{15(C)}$	≥200
Sm-x vst	25	$\beta_{20(C)}$	≥200

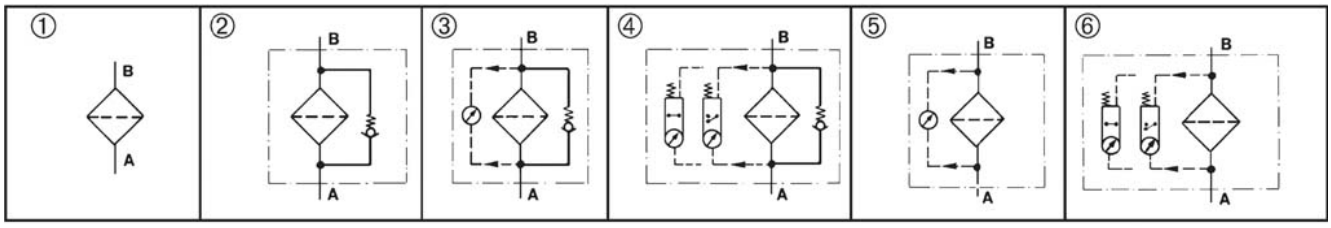
up to 20 bar differential pressure

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 2923	Hydraulic fluid power filter elements; method for end load test
DIN ISO 2924	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 element
V = 100 l/min with optical/electrical contamination indicator Type: Pi 20010-069 Order number: 78265035	Sm-x vst 3 NBR Type: Pi 71010 DN Sm-x vst 3 NBR Order number: 78227480

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① no options	② with bypass	③ with bypass valve and optical indicator	④ with bypass valve and electrical indicator	⑤ with optical indicator	⑥ with electrical indicator
40	76116974	Pi 20004-060	■					
	76116982	Pi 20004-056		■				
	79328394	Pi 20004-057			■			
	79328402	Pi 20004-058				■		
	79328410	Pi 20004-068					■	
	79328428	Pi 20004-069						■
63	76116990	Pi 20006-060	■					
	76117006	Pi 20006-056		■				
	76117014	Pi 20006-057			■			
	76117022	Pi 20006-058				■		
	76117030	Pi 20006-068					■	
	76117048	Pi 20006-069						■
100	76117055	Pi 20010-060	■					
	76117063	Pi 20010-056		■				
	79328436	Pi 20010-057			■			
	77958705	Pi 20010-058				■		
	79328444	Pi 20010-068					■	
	78265035	Pi 20010-069						■
160	76117071	Pi 20016-060	■					
	76117089	Pi 20016-056		■				
	76117097	Pi 20016-057			■			
	79713520	Pi 20016-058				■		
	76114102	Pi 20016-068					■	
	76114110	Pi 20016-069						■
250	76114128	Pi 20025-060	■					
	76114136	Pi 20025-056		■				
	79328451	Pi 20025-057			■			
	77958879	Pi 20025-058				■		
	79328469	Pi 20025-068					■	
	79328477	Pi 20025-069						■
400	76114144	Pi 20040-060	■					
	76114151	Pi 20040-056		■				
	79714395	Pi 20040-057			■			
	76114169	Pi 20040-058				■		
	76114177	Pi 20040-068					■	
	76114185	Pi 20040-069						■

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

Types Pi 20004 - Pi 20010 have an operating pressure of 63 bar/test pressure of 82 bar.

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**Collapse pressure [bar]**	**Filter surface [cm²]**
40	78260929	Pi 21004 DN Sm-x 3 NBR	Sm-x 3	**20**	475
	77690859	Pi 22004 DN Sm-x 6 NBR	Sm-x 6		475
	77925571	Pi 23004 DN Sm-x 10 NBR	Sm-x 10		475
	78260937	Pi 24004 DN Sm-x 16 NBR	Sm-x 16		475
	78260945	Pi 25004 DN Sm-x 25 NBR	Sm-x 25		475
	78216079	Pi 71004 DN Sm-x vst 3 NBR	Sm-x vst 3	**210**	445
	77960156	Pi 72004 DN Sm-x vst 6 NBR	Sm-x vst 6		445
	77925654	Pi 73004 DN Sm-x vst 10 NBR	Sm-x vst 10		445
	78216087	Pi 74004 DN Sm-x vst 16 NBR	Sm-x vst 16		445
	78216095	Pi 75004 DN Sm-x vst 25 NBR	Sm-x vst 25		445
63	78260960	Pi 21006 DN Sm-x 3 NBR	Sm-x 3	**20**	835
	77960867	Pi 22006 DN Sm-x 6 NBR	Sm-x 6		835
	77925589	Pi 23006 DN Sm-x 10 NBR	Sm-x 10		835
	78260978	Pi 24006 DN Sm-x16 NBR	Sm-x 16		835
	78260986	Pi 25006 DN Sm-x 25 NBR	Sm-x 25		835
	78216137	Pi 71006 DN Sm-x vst 3 NBR	Sm-x vst 3	**210**	780
	77960149	Pi 72006 DN Sm-x vst 6 NBR	Sm-x vst 6		780
	77925662	Pi 73006 DN Sm-x vst 10 NBR	Sm-x vst 10		780
	78216145	Pi 74006 DN Sm-x vst 16 NBR	Sm-x vst 16		780
	78216152	Pi 75006 DN Sm-x vst 25 NBR	Sm-x vst 25		780
100	78227472	Pi 21010 DN Sm-x 3 NBR	Sm-x 3	**20**	1375
	77960875	Pi 22010 DN Sm-x 6 NBR	Sm-x 6		1375
	77925597	Pi 23010 DN Sm-x 10 NBR	Sm-x 10		1375
	78261000	Pi 24010 DN Sm-x 16 NBR	Sm-x 16		1375
	78261018	Pi 25010 DN Sm-x 25 NBR	Sm-x 25		1375
	78227480	Pi 71010 DN Sm-x vst 3 NBR	Sm-x vst 3	**210**	1275
	77960131	Pi 72010 DN Sm-x vst 6 NBR	Sm-x vst 6		1275
	77925670	Pi 73010 DN Sm-x vst 10 NBR	Sm-x vst 10		1275
	78261281	Pi 74010 DN Sm-x vst 16 NBR	Sm-x vst 16		1275
	78216160	Pi 75010 DN Sm-x vst 25 NBR	Sm-x vst 25		1275

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**Collapse pressure [bar]**	**Filter surface [cm²]**
160	78261034	Pi 21016 DN Sm-x 3 NBR	Sm-x 3	**20**	2530
	77960826	Pi 22016 DN Sm-x 6 NBR	Sm-x 6		2530
	77925605	Pi 23016 DN Sm-x 10 NBR	Sm-x 10		2530
	78261042	Pi 24016 DN Sm-x 16 NBR	Sm-x 16		2530
	78261059	Pi 25016 DN Sm-x 25 NBR	Sm-x 25		2530
	77940638	Pi 71016 DN Sm-x vst 3 NBR	Sm-x vst 3	**210**	1885
	77960123	Pi 72016 DN Sm-x vst 6 NBR	Sm-x vst 6		1885
	77925688	Pi 73016 DN Sm-x vst 10 NBR	Sm-x vst 10		1885
	78269797	Pi 74016 DN Sm-x vst 16 NBR	Sm-x vst 16		1885
	78216178	Pi 75016 DN Sm-x vst 25 NBR	Sm-x vst 25		1885
250	78227516	Pi 21025 DN Sm-x 3 NBR	Sm-x 3	**20**	4020
	77960834	Pi 22025 DN Sm-x 6 NBR	Sm-x 6		4020
	77925613	Pi 23025 DN Sm-x 10 NBR	Sm-x 10		4020
	78261075	Pi 24025 DN Sm-x 16 NBR	Sm-x 16		4020
	78261083	Pi 25025 DN Sm-x 25 NBR	Sm-x 25		4020
	77940646	Pi 71025 DN Sm-x vst 3 NBR	Sm-x vst 3	**210**	3090
	77960115	Pi 72025 DN Sm-x vst 6 NBR	Sm-x vst 6		3090
	77925696	Pi 73025 DN Sm-x vst 10 NBR	Sm-x vst 10		3090
	78269813	Pi 74025 DN Sm-x vst 16 NBR	Sm-x vst 16		3090
	78216186	Pi 75025 DN Sm-x vst 25 NBR	Sm-x vst 25		3090
400	78227522	Pi 21 040 DN Sm-x 3 NBR	Sm-x 3	**20**	6770
	77960842	Pi 22 040 DN Sm-x 6 NBR	Sm-x 6		6770
	77925621	Pi 23 040 DN Sm-x 10 NBR	Sm-x 10		6770
	78261109	Pi 24 040 DN Sm-x 16 NBR	Sm-x 16		6770
	78261117	Pi 25 040 DN Sm-x 25 NBR	Sm-x 25		6770
	77940653	Pi 71 040 DN Sm-x vst 3 NBR	Sm-x vst 3	**210**	5240
	77960107	Pi 72 040 DN Sm-x vst 6 NBR	Sm-x vst 6		5240
	77930829	Pi 73 040 DN Sm-x vst 10 NBR	Sm-x vst 10		5240
	78269821	Pi 74 040 DN Sm-x vst 16 NBR	Sm-x vst 16		5240
	78260903	Pi 75 040 DN Sm-x vst 25 NBR	Sm-x vst 25		5240

* further elements available upon request.

8. Specifications

Design:	line mounting filter
Operating pressure:	25/63 bar*
Test pressure:	33/82 bar
Temperature range:	- 10 °C to + 120 °C (other temperature ranges on request)
Bypass opening pressure:	Δ p 3.5 bar ± 10 %
Filter head material:	GDAL
Filter bowl material:	AL/St.
Sealing material:	NBR/AL
Activating pressure of optical/ electrical differential pressure indicator:	Δ p 2.2 bar ± 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
Contatct:	bistable
Cable connection:	M 20 x 1.5

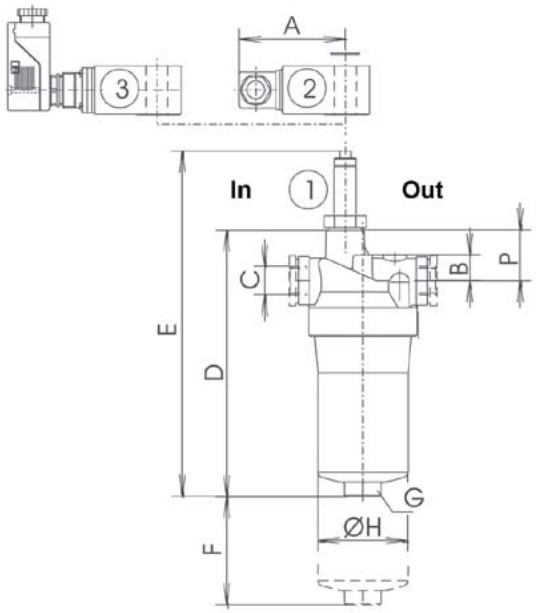
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact.
The use of quenching circuits must be checked in the case of inductivity in the DC current circuit. The contamination indicator data sheet contains further information and additional contamination indicator versions.

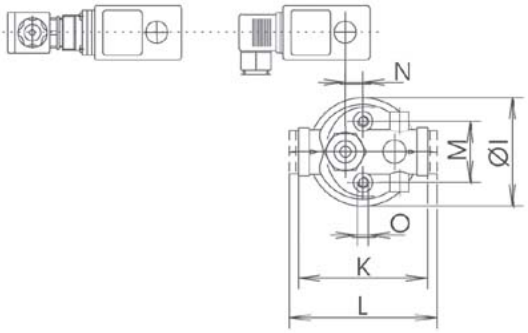
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer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

When using our filters in areas which are to be classified according to EU Directive 94/9 EC (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 EC Article 9). Please consult with us if using other media.

Subject to technical alteration without prior notice.

* Types Pi 20004 - Pi 20010 have an operating pressure of 63 bar/ test pressure of 82 bar.





In = inlet
Out = outlet

Pos. 1	Optical contamination indicator
Pos. 2	El. upper section connector according DIN EN 175301-803 Executions: PiS 3097, 3116, 3119
Pos.3	El. upper section connector according DIN EN 175201-804 Executions: PiS 3012, 3124, 3110

Connection: M 12 x 1
Executions: PiS 3116 M 12 x 1, PiS 3151, 3154

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*	*Weight [kg]*
Pi 20004	*78*	*19*	*G ½*	*182*	*240*	*80*	*27*	*66*	*80*	*-*	*109*	*45*	*13*	*M 8 x 10*	*37.5*	*0.9*
Pi 20006	*78*	*19*	*G ¾*	*242*	*300*	*80*	*27*	*66*	*80*	*95*	*-*	*45*	*13*	*M 8 x 10*	*37.5*	*1*
Pi 20010	*78*	*19*	*G ¾*	*335*	*393*	*80*	*27*	*66*	*80*	*95*	*-*	*45*	*13*	*M 8 x 10*	*37.5*	*1.1*
Pi 20016	*78*	*30*	*G 1¼*	*268*	*326*	*110*	*32*	*109*	*128*	*150*	*-*	*60*	*24.5*	*M 12 x 15*	*43.5*	*2.3*
Pi 20025	*78*	*30*	*G 1¼*	*363*	*421*	*110*	*32*	*109*	*128*	*150*	*-*	*60*	*24.5*	*M 12 x 15*	*43.5*	*2.5*
Pi 20040	*78*	*30*	*G 1¼*	*508*	*566*	*110*	*24*	*109*	*128*	*150*	*-*	*60*	*24.5*	*M 12 x 15*	*43.5*	*7.4*

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing 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 to normally closed position or vice versa.

10.3 When must the filter be replaced?

1 . Filters equipped with optical and electrical contamination indicator:
During cold starts, the indicator may give a warning signal. Depress the red button of the optical 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.

2 . Filters without contamination indicator: The filter element should be replaced after trial run or flushing of the system. Afterwards follow instructions of the manufacturer.

3 . Please always ensure that you have Original MAHLE replacement elements in stock: disposable elements SM-x cannot be cleaned.

10.4 Element replacement

1 . Stop system and relieve filter from pressure.

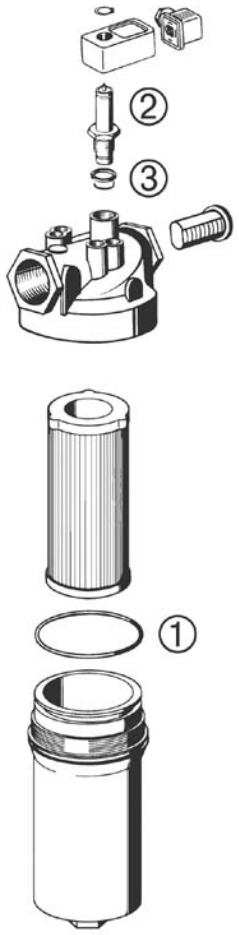
2 . Unscrew the filter bowl by turning counter-clockwise. Clean the bowl using a suitable cleaning solvent.

3 . Remove filter element with a side-to-side motion.

4 . Check o-ring on the filter bowl and spigot for damage. Replace, if necessary.

5 . Make sure that the part number on the spare element corresponds with the part number on the filter label.
Open the plastic bag and push element over the spigot in the filter head. Now remove plastic bag.

6 . Complete installation by screwing on the filter bowl, turning clockwise until it comes to a full stop. Back off the bowl 1/8 to 1/2 turn.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit for filter housing	
	Pi 20004 - Pi 20010	
	NBR	79328485
	FPM	79328493
	EPDM	79357609
	Pi 20016 - Pi 20040	
	NBR	79357617
	FPM	79357625
	EPDM	79357633
②	Contamination indicator	
	Optical PiS 3098/2.2	77669971
	Electrical PiS 3097/2.2	77669948
	Electrical upper section only	77536550
③	Seal kit for contamination indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325

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