

### Low Pressure Filter

Pi 220

Operating pressure 10 bar, Nominal size up to 160

#### 1. Features

##### Efficient filters for modern hydraulic systems

- Modular design principle
- Compact design
- Minimal pressure drop
- Optical/electrical/electronic differential pressure indication
- Thread connection

##### Quality filters, easy to service

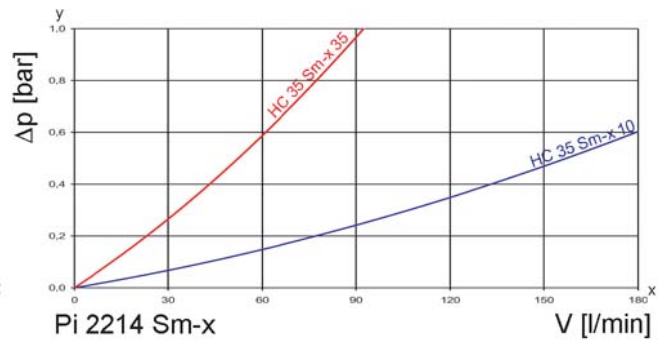
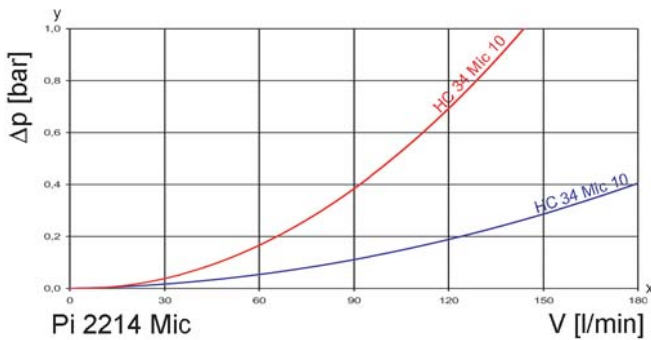
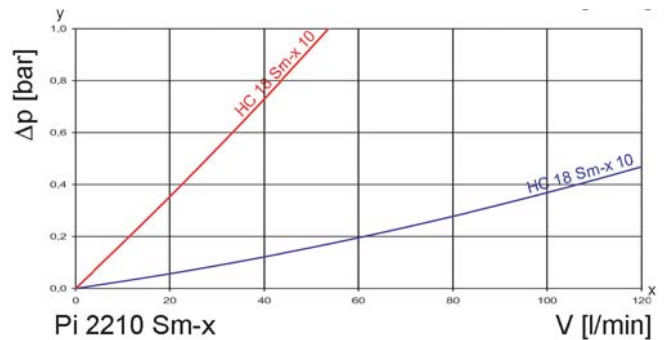
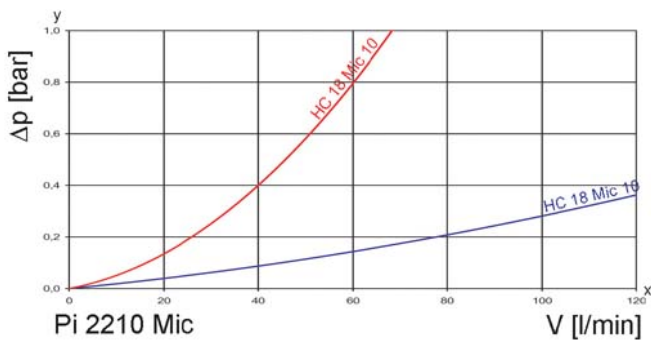
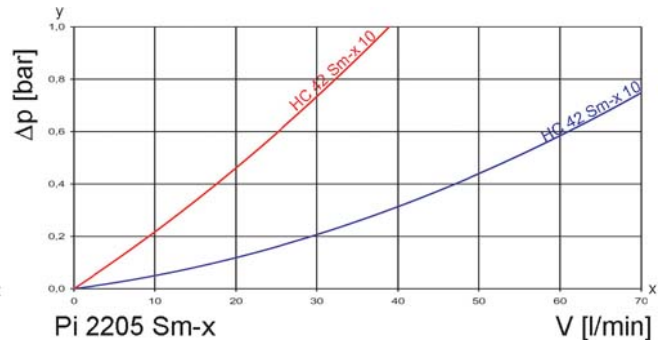
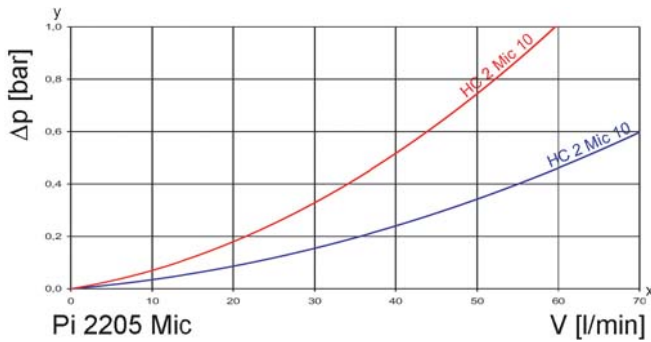
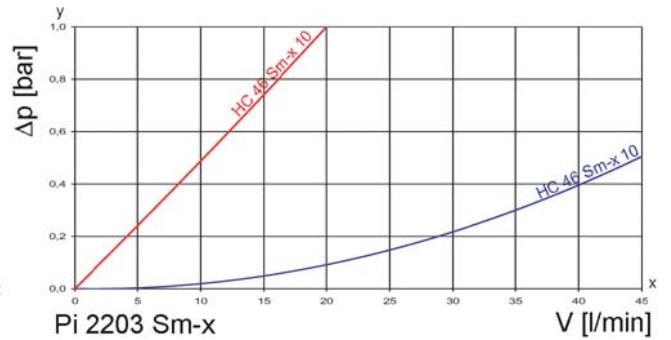
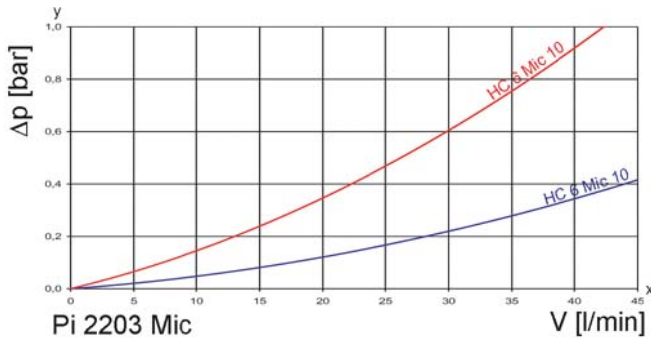
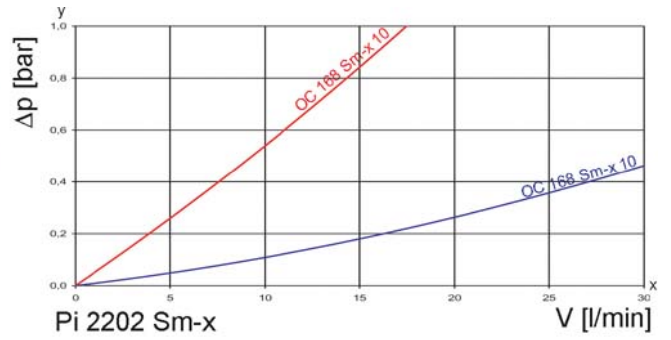
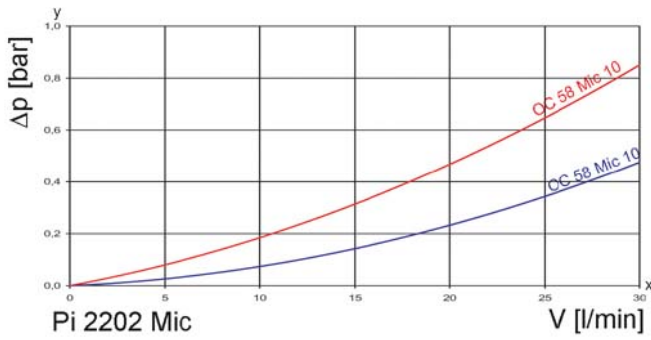
- Equipped with highly efficient Sm-x filter elements
- $\beta$ -valued elements per ISO 16889
- High dirt holding capacity and differential pressure stability providing optimal element service life

##### Worldwide



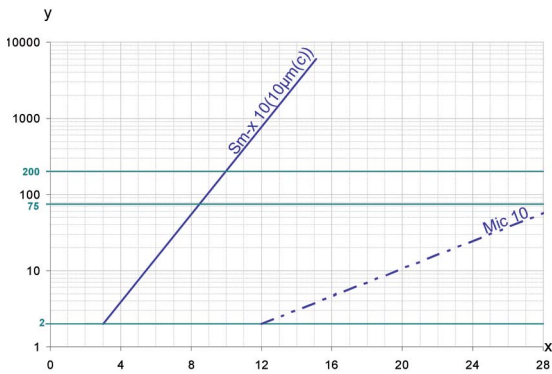
## 2. Flow rate/pressure drop curve complete filter

■ 190 mm<sup>2</sup>/s (25° E)  
■ 33 mm<sup>2</sup>/s (4,5° E)



y = differential pressure  $\Delta p$  [bar]  
 x = flow rate V [l/min]

### 3. Separation characteristics



y = beta-ratio

x = particle size [ $\mu\text{m}$ ]

determined by multipass tests (ISO 16889)

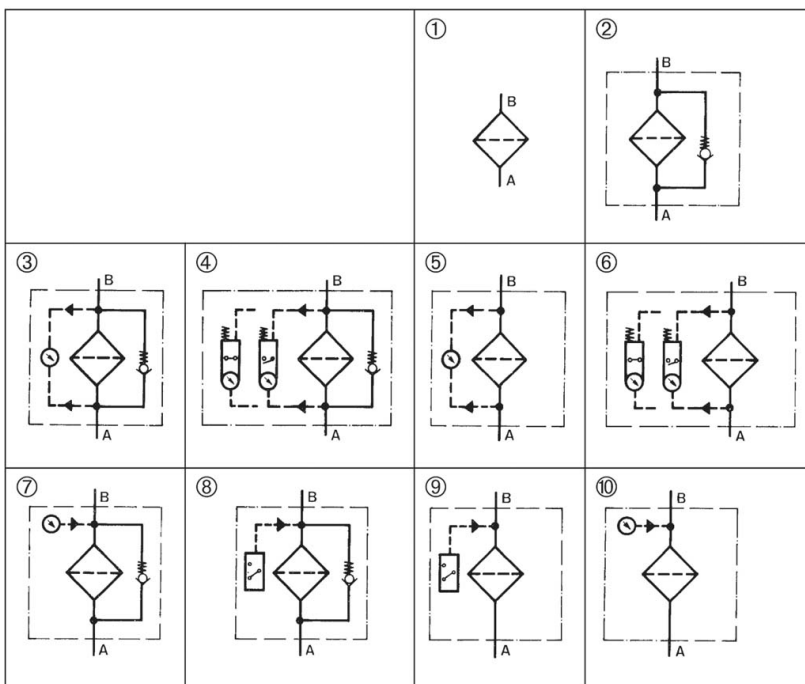
calibration according to ISO 11171 (NIST)

### 4. 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

### 5. Symbols



## 6. Order numbers for pressure-side installation

Example for ordering filters:

1. Housing design	2. Spin-on cartridge
V=25 l/min, bypass, electrical contamination indicator Type: Pi 2202-58 Order number: 77665649	Mic 10 Type: Pi OC 58 Order number: 77785933

6.1 Housing design								
Nominal size NG [l/min]	Order number	Type	① no options	② with bypass valve	③ with bypass valve and optical indicator	④ with bypass valve and electrical indicator	⑤ with optical indicator	⑥ with electrical indicator
25	77665656	Pi 2202-60						
	77665623	Pi 2202-56						
	77665631	Pi 2202-57						
	77665649	Pi 2202-58						
	77665664	Pi 2202-68						
	77665672	Pi 2202-69						
40	77665714	Pi 2203-60						
	77665680	Pi 2203-56						
	77665698	Pi 2203-57						
	77665706	Pi 2203-58						
	77665748	Pi 2203-68						
	77665755	Pi 2203-69						
63	77665813	Pi 2205-60						
	77665789	Pi 2205-56						
	77665797	Pi 2205-57						
	77665805	Pi 2205-58						
	77665847	Pi 2205-68						
	77665854	Pi 2205-69						
100	77666001	Pi 2210-60						
	77665979	Pi 2210-56						
	77665987	Pi 2210-57						
	77665995	Pi 2210-58						
	77666050	Pi 2210-68						
	77666068	Pi 2210-69						
160	77666126	Pi 2214-60						
	77666092	Pi 2214-56						
	77666100	Pi 2214-57						
	77666118	Pi 2214-58						
	77666183	Pi 2214-68						
	77666191	Pi 2214-69						

6.2 Spin-on cartridges					
Nominal size NG [l/min]	Order number	Type	Filter material	Collapse pressure [bar]	Filter surface [cm <sup>2</sup> ]
25	77785983	OC 58	Mic 10	5	1700
	77500184	OC 168	Sm-x 10		1200
40	77501273	HC 6	Mic 10	5	3200
	77501232	HC 46	Sm-x 10		2100
63	72013241	HC 2	Mic 10	5	5100
	77501372	HC 42	Sm-x 10		3300
100	77643331	HC 18	Mic 10	5	7000
	77643398	HC 28	Sm-x 10		4100
160	77504194	HC 34	Mic 10	5	13500
	77643844	HC 35	Sm-x 10		7500

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

## 7. Order numbers for suction-side installation

7.1 Housing design								
Nominal size NG [l/min]	Order number	Type	① no options	② with bypass 0.25 bar	⑦ with bypass 0.25 bar and vacuum gauge	⑧ with bypass 0.25 bar and vacuum switch	⑨ with vacuum switch	⑩ with vacuum gauge
10	77665656	Pi 2202-60						
	77736614	Pi 2202-67						
	77736622	Pi 2202-62						
	77736630	Pi 2202-61						
	77736606	Pi 2202-65						
	77736598	Pi 2202-66						
16	77665714	Pi 2203-60						
	77665730	Pi 2203-67						
	77736689	Pi 2203-62						
	77736697	Pi 2203-61						
	77736671	Pi 2203-65						
	77665722	Pi 2203-66						
25	77665813	Pi 2205-60						
	77736747	Pi 2205-67						
	77665821	Pi 2205-62						
	77736754	Pi 2205-61						
	77665839	Pi 2205-65						
	77736739	Pi 2205-66						
40	77666001	Pi 2210-60						
	77735947	Pi 2210-67						
	77666027	Pi 2210-62						
	77666019	Pi 2210-61						
	77666035	Pi 2210-65						
	77666043	Pi 2210-66						
63	77666126	Pi 2214-60						
	77666175	Pi 2214-67						
	77666142	Pi 2214-62						
	77666134	Pi 2214-61						
	77666159	Pi 2214-65						
	77666167	Pi 2214-66						

## 8. Specifications

Design:	line mounting filter
Operating pressure:	10 bar*
Test pressure:	13 bar
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)

Bypass opening pressure:	
Pressure side:	$\Delta p$ 3.5 bar $\pm$ 10%
Suction side:	$\Delta p$ 0.25 bar $\pm$ 10%
Filter head material:	GDAL
Filter bowl material:	St
Sealing material:	NBR/AL
Activating pressure of optical/ electrical differential pressure in- dicator:	$\Delta p$ 2.2 bar $\pm$ 0.3 bar
Indicating range vacuum meter:	-1 bar to + 1.5 bar
Pressure setting vacuum switch:	200 mbar
Type of protection (suction side):	IP 54
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.

Spin-on cartridges are compatible with standard mineral oils.

Please consult with us if using other media.

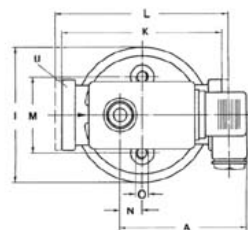
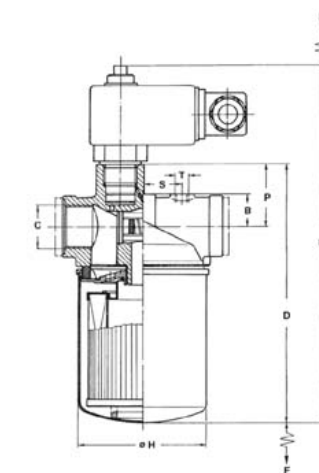
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer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

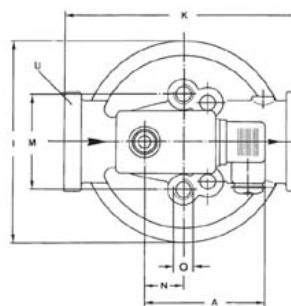
The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC article 9). Please consult with us if using other media.

Subject to technical alteration without prior notice.

\* For the contamination of the housing designs as per 6.1 with medium-pressure spin-on cartridges refer to leaflet "spin-on cartridges" for dimensions and specifications. Operating pressure on request.



Pi 2202 -  
Pi 2205



Pi 2210 -  
Pi 2214

## 9. Dimensions

All dimensions except "C" and "T" in mm.

Type	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	R	S*	T*	U SW	Weight [kg]
Pi 2202	78	19	G ½	181	241	30	-	76	80	-	109	45	13	M 8 x 10	37.5	45	23.5	G 1/8	36	0.9
Pi 2203	78	19	G ½	201	261	30	-	93	80	-	109	45	13	M 8 x 10	37.5	45	23.5	G 1/8	36	1.0
Pi 2205	78	19	G ¾	268	328	30	-	93	80	95	-	45	13	M 8 x 10	37.5	45	23.5	G 1/8	36	1.25
Pi 2210	78	30	G 1 ¼	242	302	40	-	136	128	150	-	60	24,5	M 12 x 15	43.5	45	40	G 1/8	55	2.3
Pi 2214	78	30	G 1 ¼	382	442	40	-	136	128	150	-	60	24,5	M 12 x 15	43.5	45	40	G 1/8	55	2.7

\*with suction-side installation only.

## 10. Installation, operating and maintenance instructions

### 10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove spin-on cartridge. Filter should be installed with the spin-on cartridge 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.

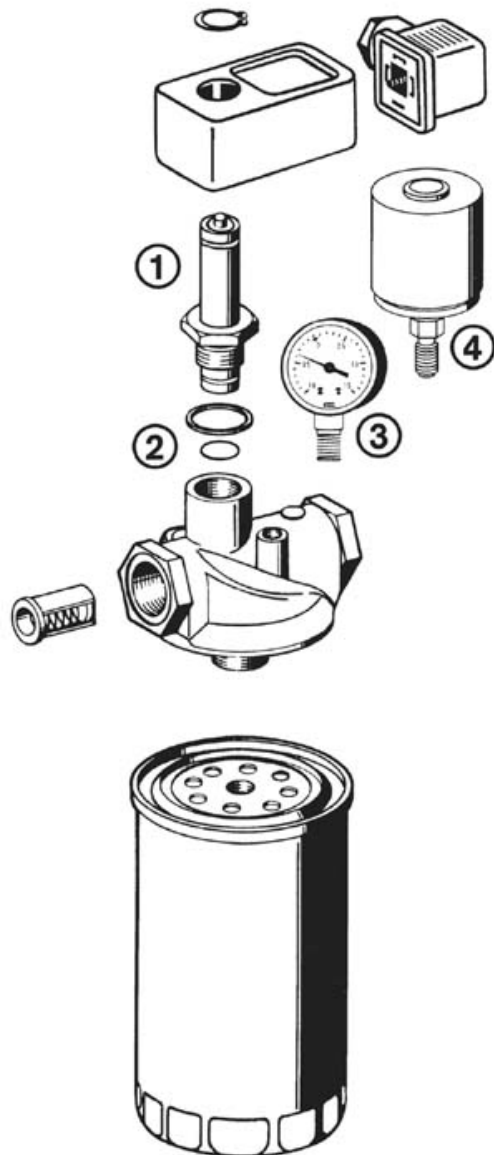
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

### 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 Spin-on cartridge replacement

- Stop system and relieve filter from pressure.
- Unscrew the spin-on cartridge with the aid of a belt spanner by turning same to the left
- Make sure that the order number on the spin-on cartridge corresponds with the order number of the plate.
- The seal of the screw-on cartridge should be lightly oiled.
- Screw cartridge on in accordance with the printed-on instructions.



## 11. Spare parts list

Order numbers for spare parts		
Position	Type	Order number
①	Contamination indicator	
	Optical PiS 3098	77669971
	Electrical PiS 3097	77669948
	Electrical upper part only	77536550
②	Seal kit for contamination indicator	
	NBR	77760309
③	Vacuum gauge	77548027
④	Vacuum switch	77669724

# MAHLE

*Industrial Filtration*

MAHLE Filtersysteme GmbH  
Industriefiltration  
Schleifbachweg 45  
D-74613 Öhringen  
Phone +49 (0) 7941/67-0  
Fax +49 (0) 7941/67-23429  
industriefiltration@mahle.com  
www.mahle-industriefiltration.com  
78356610.11/2006