Filtration Group®
Filtering The World

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High Pressure Filter
Pi 4000

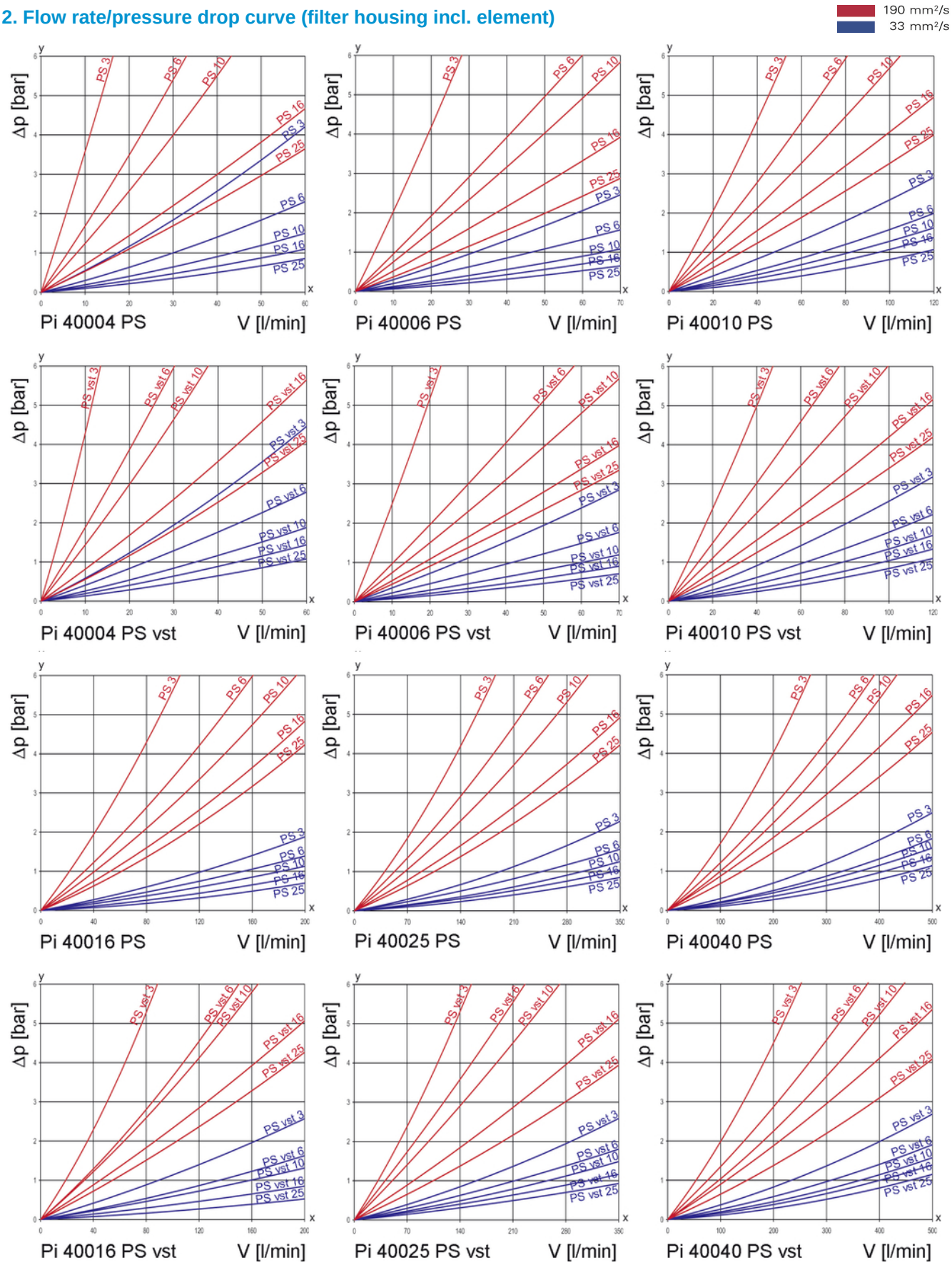
Nominal pressure 400 bar (5690 psi), nominal size up to 400
according DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta reated 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

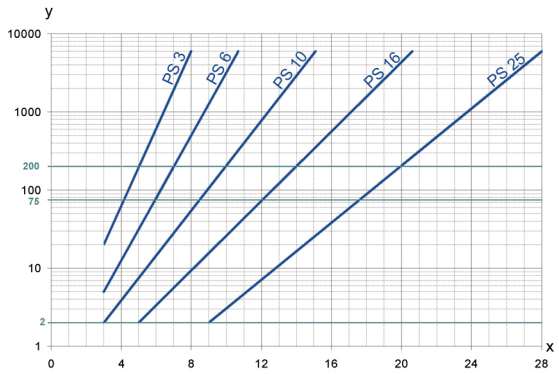
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

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

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

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

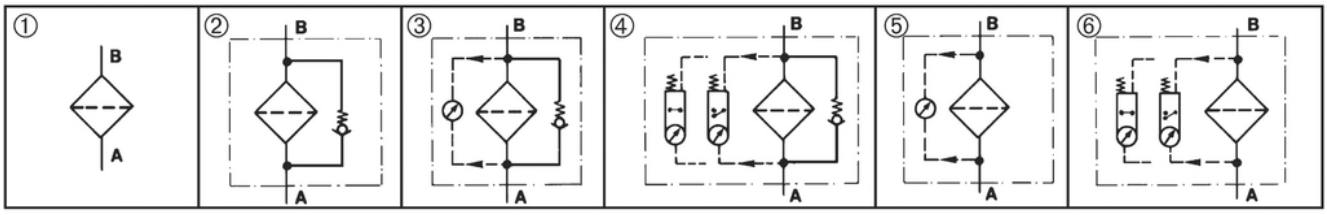
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group 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:

1. Filter housing	2. Filter element
V = 100 l/min and electrical maintenance indicator Type: Pi 40010-015, Order number: 77978448	PS vst 3 Type: Pi 71010 DN PS vst 3, Order number: 78227480

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① with indicator cavity	② with bypass valve and indicator cavity	③ with bypass valve and visual indicator	④ with bypass valve and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
40	78207201	Pi 40004-010	■					
	78207219	Pi 40004-011		■				
	78207227	Pi 40004-012			■			
	78304156	Pi 40004-013				■		
	78207243	Pi 40004-014					■	
	77978463	Pi 40004-015						■
63	78207268	Pi 40006-010	■					
	78207276	Pi 40006-011		■				
	78207284	Pi 40006-012			■			
	78304164	Pi 40006-013				■		
	78207300	Pi 40006-014					■	
	77978455	Pi 40006-015						■
100	78207326	Pi 40010-010	■					
	78207334	Pi 40010-011		■				
	78207342	Pi 40010-012			■			
	78304172	Pi 40010-013				■		
	78207367	Pi 40010-014					■	
	77978448	Pi 40010-015						■
160	78207383	Pi 40016-010	■					
	78207391	Pi 40016-011		■				
	78207409	Pi 40016-012			■			
	78304107	Pi 40016-013				■		
	78207425	Pi 40016-014					■	
	78207433	Pi 40016-015						■
250	78207458	Pi 40025-010	■					
	78207466	Pi 40025-011		■				
	78207474	Pi 40025-012			■			
	78304115	Pi 40025-013				■		
	78207490	Pi 40025-014					■	
	78207813	Pi 40025-015						■
400	78207821	Pi 40040-010 FL	■					
	78207839	Pi 40040-011 FL		■				
	78207847	Pi 40040-012 FL			■			
	78304123	Pi 40040-013 FL				■		
	78207862	Pi 40040-014 FL					■	
	78207870	Pi 40040-015 FL						■

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

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	78260929	Pi 21004 DN PS 3	PS 3	**20**	475
	77960859	Pi 22004 DN PS 6	PS 6		475
	77925571	Pi 23004 DN PS 10	PS 10		475
	78260937	Pi 24004 DN PS 16	PS 16		475
	78260945	Pi 25004 DN PS 25	PS 25		475
	78216079	Pi 71004 DN PS vst 3	PS vst 3	**210**	445
	77960156	Pi 72004 DN PS vst 6	PS vst 6		445
	77925654	Pi 73004 DN PS vst 10	PS vst 10		445
	78216087	Pi 74004 DN PS vst 16	PS vst 16		445
	78216095	Pi 75004 DN PS vst 25	PS vst 25		445
63	78260960	Pi 21006 DN PS 3	PS 3	**20**	835
	77960867	Pi 22006 DN PS 6	PS 6		835
	77925589	Pi 23006 DN PS 10	PS 10		835
	78260978	Pi 24006 DN PS 16	PS 16		835
	78260986	Pi 25006 DN PS 25	PS 25		835
	78216137	Pi 71006 DN PS vst 3	PS vst 3	**210**	780
	77960149	Pi 72006 DN PS vst 6	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10	PSvst 10		780
	78216145	Pi 74006 DN PS vst 16	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25	PS vst 25		780
100	78227472	Pi 21010 DN PS 3	PS 3	**20**	1375
	77960875	Pi 22010 DN PS 6	PS 6		1375
	77925597	Pi 23010 DN PS 10	PS 10		1375
	78261000	Pi 24010 DN PS 16	PS 16		1375
	78261018	Pi 25010 DN PS 25	PS 25		1375
	78227480	Pi 71010 DN PS vst 3	PS vst 3	**210**	1275
	77960131	Pi 72010 DN PS vst 6	PS vst 6		1275
	77925670	Pi 73010 DN PS vst 10	PS vst 10		1275
	78261281	Pi 74010 DN PS vst 16	PS vst 16		1275
	78216160	Pi 75010 DN PS vst 25	PS vst 25		1275

* a wider range of element types is available on request

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	78261034	Pi 21016 DN PS 3	PS 3	**20**	2530
	77960826	Pi 22016 DN PS 6	PS 6		2530
	77925605	Pi 23016 DN PS 10	PS 10		2530
	78261042	Pi 24016 DN PS 16	PS 16		2530
	78261059	Pi 25016 DN PS 25	PS 25		2530
	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885
250	78227514	Pi 21025 DN PS 3	PS 3	**20**	4020
	77960834	Pi 22025 DN PS 6	PS 6		4020
	77925613	Pi 23025 DN PS 10	PS 10		4020
	78261075	Pi 24025 DN PS 16	PS 16		4020
	78261083	Pi 25025 DN PS 25	PS 25		4020
	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090
400	78227522	Pi 21040 DN PS 3	PS 3	**20**	6770
	77960842	Pi 22040 DN PS 6	PS 6		6770
	77925621	Pi 23040 DN PS 10	PS 10		6770
	78261109	Pi 24040 DN PS 16	PS 16		6770
	78261117	Pi 25040 DN PS 25	PS 25		6770
	77940653	Pi 71040 DN PS vst 3	PS vst 3	**210**	5240
	77960107	Pi 72040 DN PS vst 6	PS vst 6		5240
	77930829	Pi 73040 DN PS vst 10	PS vst 10		5240
	78269821	Pi 74040 DN PS vst 16	PS vst 16		5240
	78260903	Pi 75040 DN PS vst 25	PS vst 25		5240

* a wider range of element types is available on request

8. Technical specifications

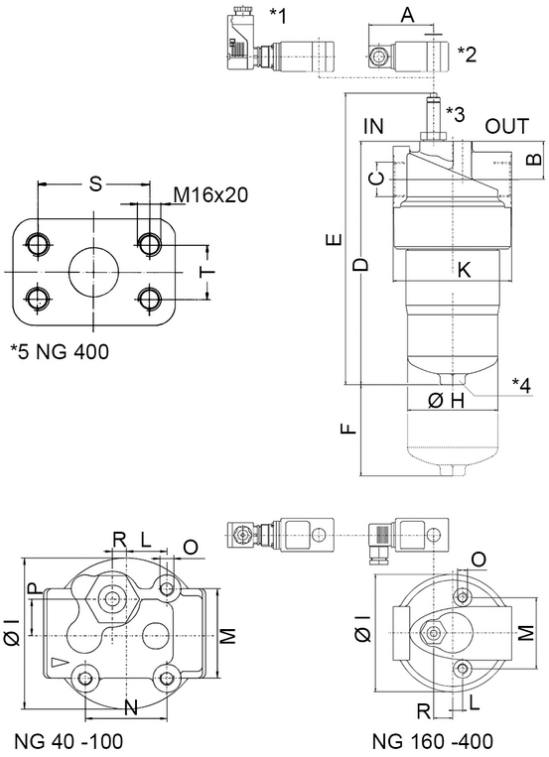
Design:	in-line filter
Nominal pressure:	400 bar (5690 psi)
Test pressure:	520 bar (7400 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	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 and not 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 our filters in areas governed by the EU Directive 94/9 EG (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 EG 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
*1 Electrical upper section connector acc. DIN EN 175301-804, Versions: PiS 3102, 3122, 3110
*2 Electrical upper section connector acc. DIN EN 175301-803, Versions: PiS 3092, 3105, 3115
*3 Visual maintenance indicator
*4 NG 250, 400 with drain screw G ¼ DIN 910
*5 DN 38 according to SAE 1½" 6000 psi. Flanges, bolts, o-rings are not included in delivery.

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	S	T	Weight [kg]
Pi 40004	78	31.5	G½	180	238	80	27	66	90	92	23.5	54	47	M8x16	21	8	-	-	4.2
Pi 40006	78	31.5	G¾	240	298	80	27	66	90	92	23.5	54	47	M8x16	21	8	-	-	4.9
Pi 40010	78	31.5	G1	330	388	80	27	66	90	92	23.5	54	47	M8x16	21	8	-	-	5.8
Pi 40016	78	46	G1¼	293	350	110	30	109	142	143.5	12	86	-	M12x15	-	23	-	-	12.6
Pi 40025	78	46	G1½	383	440	110	30	109	142	143.5	12	86	-	M12x15	-	23	-	-	14.2
Pi 40040 FL	78	46	DN 38	533	590	110	30	109	142	143.5	12	86	-	M12x15	-	23	79.4	36.5	18.4

* NPT- and SAE-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 position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. 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.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original FGC spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Filter sizes 250 and 400: empty the filter housing by removing the drain plug.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling down carefully.
5. Check o-ring and spigot for damage. Replace, if necessary.
6. 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.
7. Oil the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 40 to 100 = 60 Nm, for NG 160 to 400 = 100 Nm.
8. Check seals of vent drain plug - if necessary, please replace.
   Torque drain plug 30 Nm.

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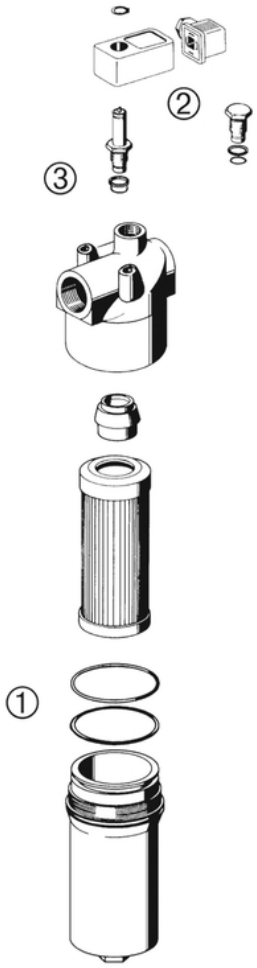

11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	
	Pi 40004 - Pi 40010	
	NBR	78383804
	FPM	78383812
	EPDM	78383820
	Pi 40016 - Pi 40040	
	NBR	78383838
	FPM	78383846
	EPDM	78383853
②	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
③	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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High Pressure Filter
Pi 410

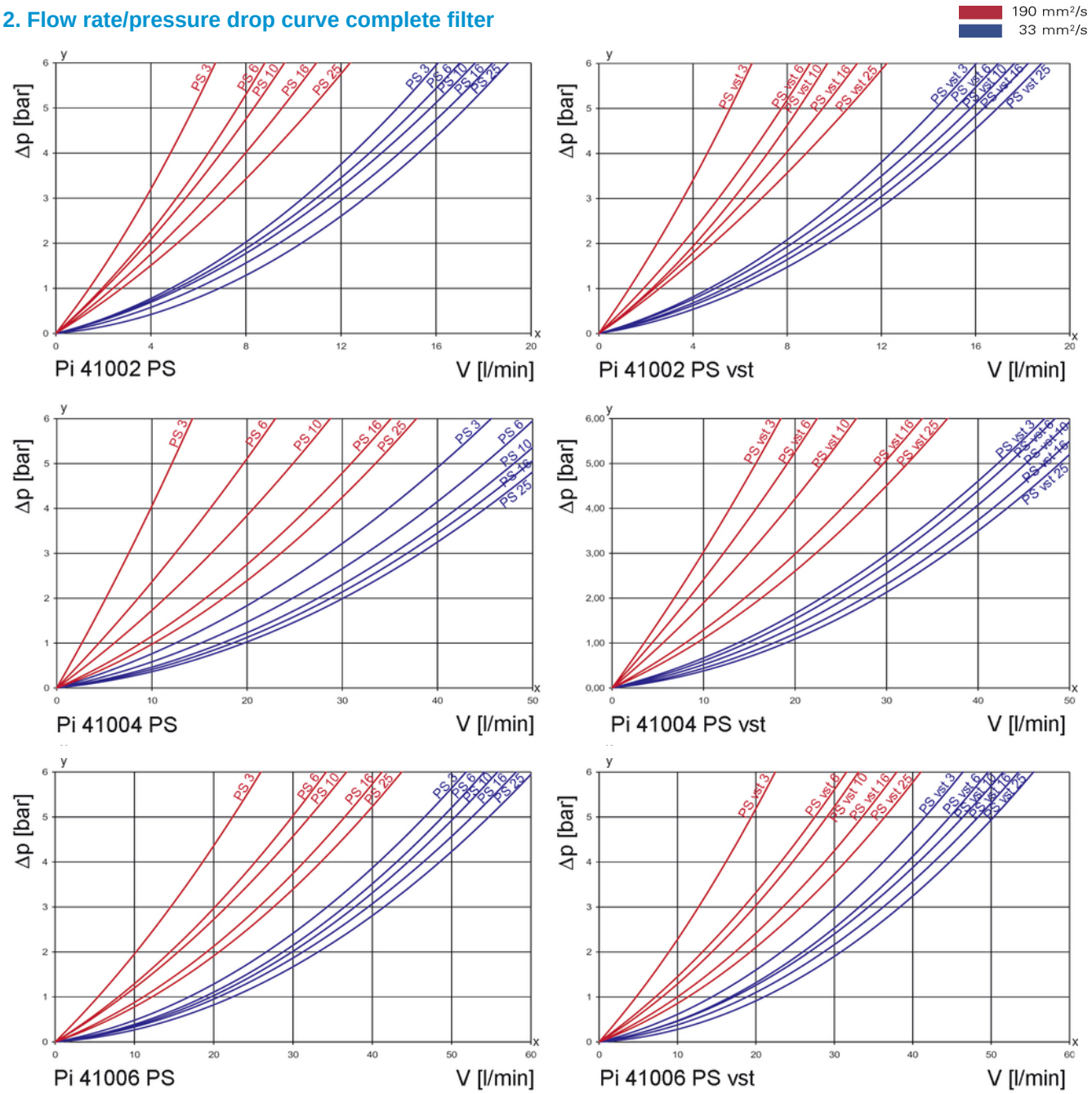
Nominal pressure 315 bar (4480 psi), nominal size 20-63

1. Features

High performance filters for modern hydraulic systems

- Provided for valve block installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Connections according DIN 24340
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Nominal sizes 40 and 63 equipped with filter elements according to DIN 24550
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

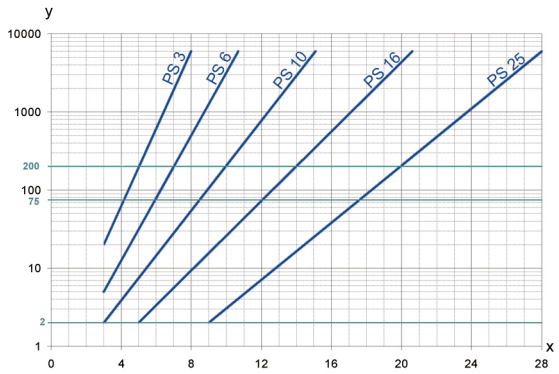
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



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

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

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

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

values guaranteed up to
20 bar differential pressure

5. Quality assurance

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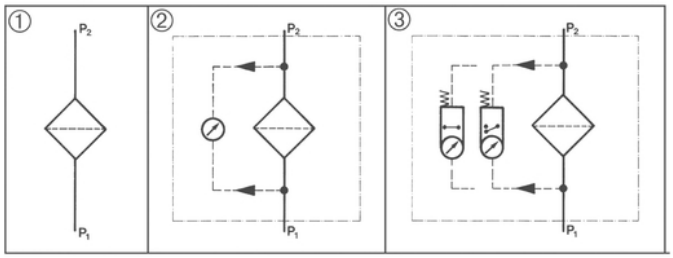
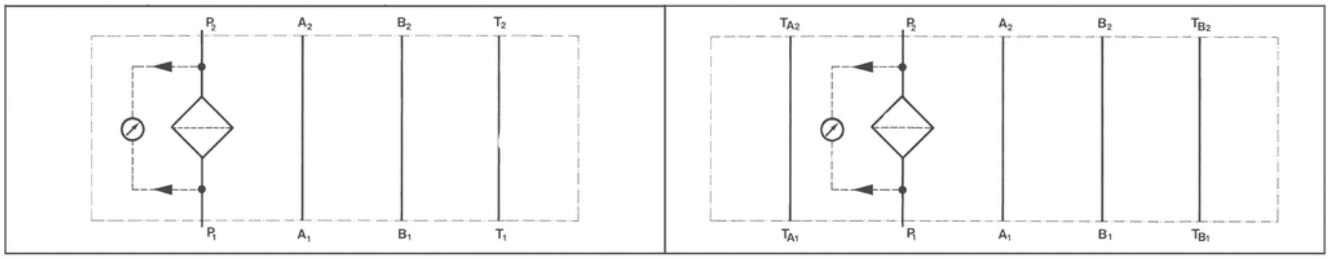
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols





NG 20

NG 40-63

7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V = 40 l/min, visual/electrical indicator Type: Pi 41004-015/Order number: 77937600	PS 3 Type: Pi 21004 DN PS 3/Order number: 78260929

7.1 Housing design

NG [l/min]	Order number	Type	① with indicator cavity	② with visual indicator	③ with electrical indicator
20	77937543	Pi 41002-046	■		
	77937550	Pi 41002-014		■	
	77937568	Pi 41002-015			■
40	77937618	Pi 41004-046	■		
	77937592	Pi 41004-014		■	
	77937600	Pi 41004-015			■
63	77937642	Pi 41006-046	■		
	77937626	Pi 41006-014		■	
	77937634	Pi 41006-015			■

The collapse pressure of the element must not be exceeded.

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

NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filter surface [cm²]
20	77685407	852 243 PS 3	PS 3	20	305
	78216038	852 243 PS 6	PS 6		305
	77740327	852 243 PS 10	PS 10		305
	78216053	852 243 PS 16	PS 16		305
	77685415	852 243 PS 25	PS 25		305
	77685423	852 243 PS vst 3	PS vst 3	160	275
	78216046	852 243 PS vst 6	PS vst 6		275
	77685431	852 243 PS vst 10	PS vst 10		275
	78216061	852 243 PS vst 16	PS vst 16		275
	77685449	852 243 PS vst 25	PS vst 25		275
40	78260929	Pi 21004 DN PS 3	PS 3	20	475
	77960859	Pi 22004 DN PS 6	PS 6		475
	77925571	Pi 23004 DN PS 10	PS 10		475
	78260937	Pi 24004 DN PS 16	PS 16		475
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	77960867	Pi 22006 DN PS 6	PS 6		835
	77925589	Pi 23006 DN PS 10	PS 10		835
	78260978	Pi 24006 DN PS 16	PS 16		835
	78260986	Pi 25006 DN PS 25	PS 25		835
	78216137	Pi 71006 DN PS vst 3	PS vst 3	210	780
	77960149	Pi 72006 DN PS vst 6	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10	PS vst 10		780
	78216145	Pi 74006 DN PS vst 16	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25	PS vst 25		780

8. Technical specifications

Design:	installation in vertical interlink
Nominal pressure:	315 bar (4480 psi)
Test pressure:	410 bar (5830 psi)
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)
Filter head material:	steel
Filter housing material:	steel
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 0.5 bar
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current on contact:	1 A
Inrush current:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	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.

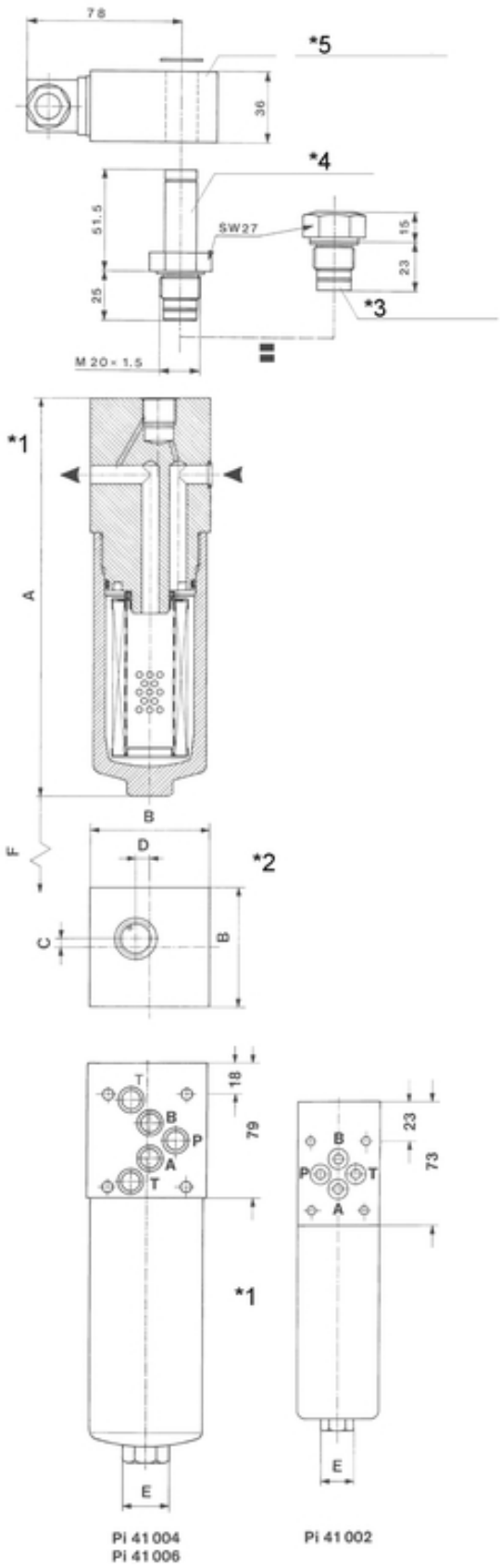
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer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

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EG (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 EG Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions

Dimension	Pi 41002	Pi 41004	Pi 41006
A	241	235	295
B	48	70	70
C	3	5	5
D	2	8	8
E	SW 17	SW 27	SW 27
F	50	50	50
Master gauge for holes DIN 24340	A6	A10	A10
O-ring for connecting plate Ø	9.25x1.78	12x2	12x2
Weight [kg]	2.65	5.00	5.70



*1 View A
*2 View B
*3 Screw plug
*4 Visual maintenance indicator
*5 Electrical upper section for maintenance indicator

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. 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 position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

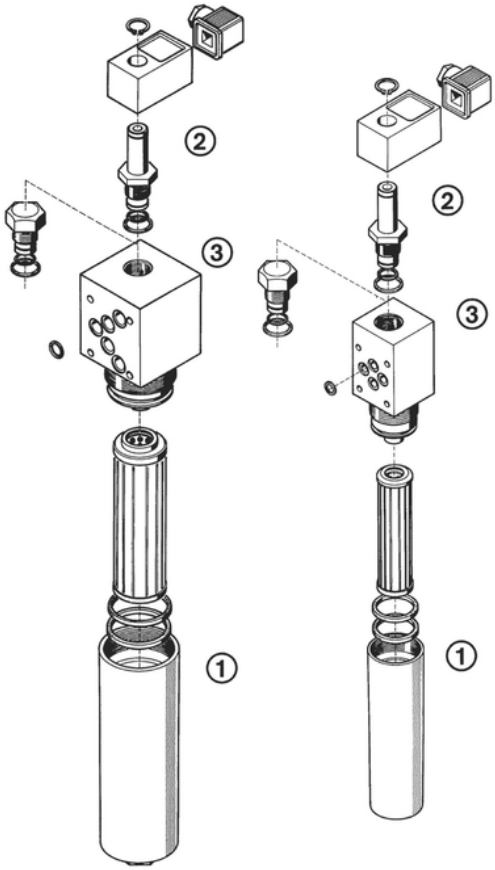
1 . Filters equipped with visual and electrical maintenance indicator:
During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.

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

3 . Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1 . Stop system and relieve filter from pressure.
2 . Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
3 . Remove the filter element by pulling down carefully.
4 . Check O-ring and spigot for damage. Replace, if necessary.
5 . 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.
6 . 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.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	
	Pi 41002	
	NBR	77996861
	FPM	77996879
	EPDM	77996887
	Pi 41004 - Pi 41006	
	NBR	77996895
	FPM	77996903
	EPDM	77996911
②	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
③	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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High Pressure Filter
Pi 420

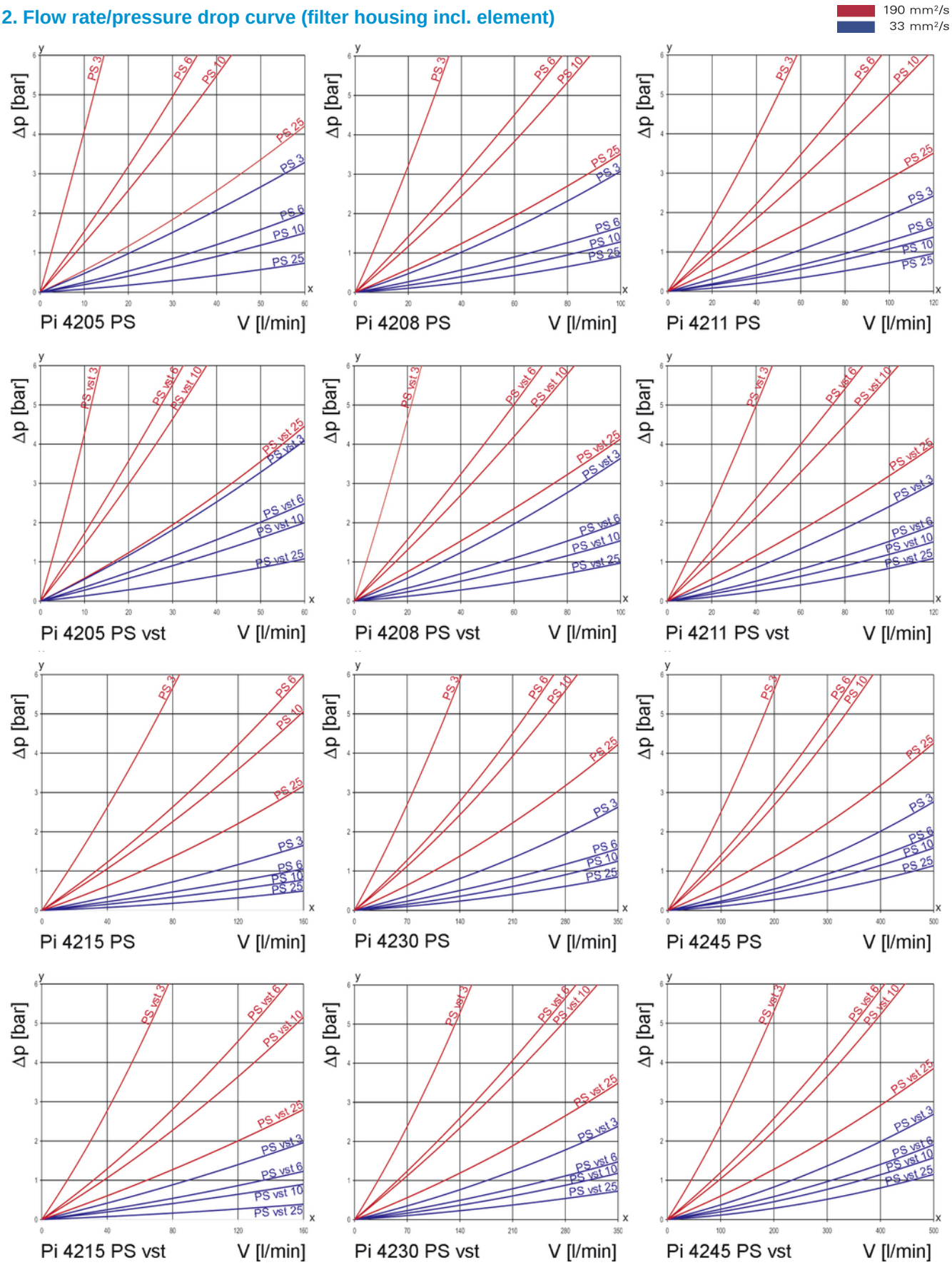
Nominal pressure 400 bar (5690 psi), nominal size up to 450
optional with reverse flow valve

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded or flanged connections
- 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

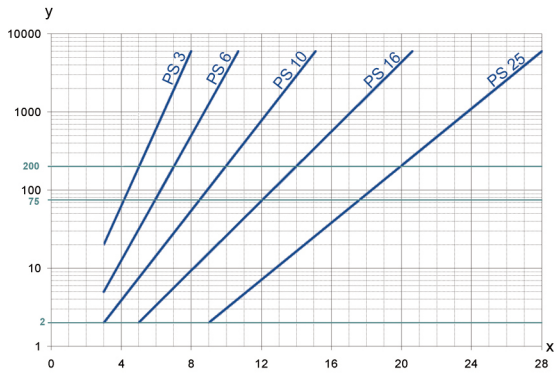
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle-size [µm]

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

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

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

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

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

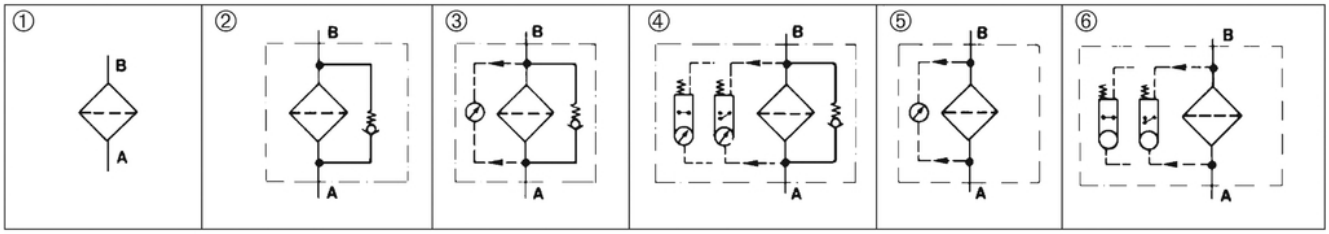
values guaranteed up to
20 bar differential pressure

5. Quality assurance

FGC 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:

1. Housing design	2. Filter elements
Housing design V = 80 l/min, electrical maintenance indicator Type: Pi 4208-015 Order number: 77666472	PS vst 3 Type: Pi 2208 PS vst 3 Order number: 77680200

7.1 Housing design

Nominal size NG [l/min]	Order number thread version	Type thread version	Order number flange version	Type flange version	① with indicator cavity	② with bypass valve and indicator cavity	③ with bypass valve and visual indicator	④ with bypass valve and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
50	77666357	Pi 4205-010	77967714	Pi 4205-010 FL	■					
	77666365	Pi 4205-011	77967722	Pi 4205-011 FL		■				
	77666373	Pi 4205-012	77967730	Pi 4205-012 FL			■			
	77666381	Pi 4205-013	77967748	Pi 4205-013 FL				■		
	77666399	Pi 4205-014	77967755	Pi 4205-014 FL					■	
	77666415	Pi 4205-015	77967763	Pi 4205-015 FL						■
80	77666423	Pi 4208-010	77967771	Pi 4208-010 FL	■					
	77666431	Pi 4208-011	77967789	Pi 4208-011 FL		■				
	77666449	Pi 4208-012	77967797	Pi 4208-012 FL			■			
	77666456	Pi 4208-013	77967805	Pi 4208-013 FL				■		
	77666464	Pi 4208-014	77967813	Pi 4208-014 FL					■	
	77666472	Pi 4208-015	77967821	Pi 4208-015 FL						■
110	77666480	Pi 4211-010	77967839	Pi 4211-010 FL	■					
	77666498	Pi 4211-011	77967847	Pi 4211-011 FL		■				
	77666506	Pi 4211-012	77967854	Pi 4211-012 FL			■			
	77666514	Pi 4211-013	77967862	Pi 4211-013 FL				■		
	77666522	Pi 4211-014	77967870	Pi 4211-014 FL					■	
	77666530	Pi 4211-015	77967888	Pi 4211-015 FL						■
150	77666548	Pi 4215-010	77978596	Pi 4215-010 FL	■					
	77666555	Pi 4215-011	77978604	Pi 4215-011 FL		■				
	77666563	Pi 4215-012	77978612	Pi 4215-012 FL			■			
	77666571	Pi 4215-013	77978620	Pi 4215-013 FL				■		
	77666589	Pi 4215-014	77978638	Pi 4215-014 FL					■	
	77666597	Pi 4215-015	77978646	Pi 4215-015 FL						■
300	77666613	Pi 4230-010	77978653	Pi 4230-010 FL	■					
	77666621	Pi 4230-011	77978661	Pi 4230-011 FL		■				
	77666639	Pi 4230-012	77978679	Pi 4230-012 FL			■			
	77666647	Pi 4230-013	77978687	Pi 4230-013 FL				■		
	77666654	Pi 4230-014	77978695	Pi 4230-014 FL					■	
	77666662	Pi 4230-015	77964505	Pi 4230-015 FL						■
450	77666688	Pi 4245-010	77978703	Pi 4245-010 FL	■					
	77666696	Pi 4245-011	77978711	Pi 4245-011 FL		■				
	77666704	Pi 4245-012	77978729	Pi 4245-012 FL			■			
	77666712	Pi 4245-013	77978737	Pi 4245-013 FL				■		
	77666720	Pi 4245-014	77978745	Pi 4245-014 FL					■	
	77666746	Pi 4245-015	77978752	Pi 4245-015 FL						■

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 [cm²]**
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

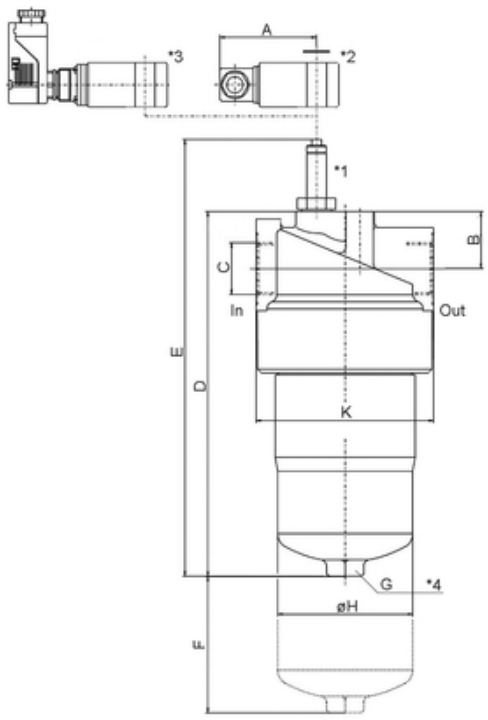
Design:	line mounting filter
Nominal pressure:	400 bar (5690 psi)
Test pressure:	520 bar (7400 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable connection:	M20x1.5

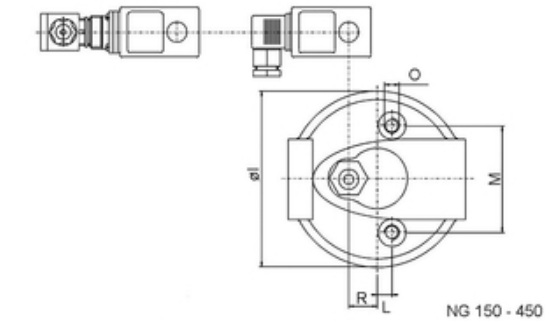
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance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

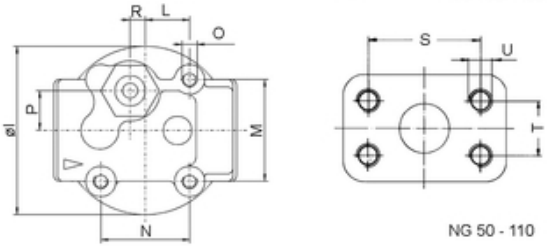
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer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

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EG (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 EG Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration.







In = Inlet
Out = Outlet
*1 = Visual maintenance indicator
*2 = Electrical upper section connector according DIN EN 175301-803, version: PiS 3092, 3105, 3115
*3 = Electrical upper section connector according DIN EN 175301-804, version: PiS3102, 3122, 3110
*4 = NG 300, 450 with drain screw G¼ DIN 910

DN25 according to SAE1" 6000 psi
DN38 according to SAE1½" 6000 psi
Flange, screw, o-ring not included in delivery.

9. Dimensions

All dimensions except "C" in mm.

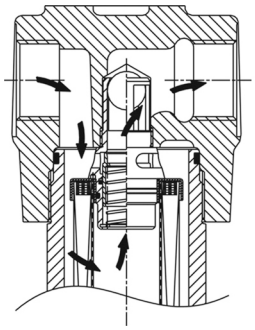
Type	A	B	C*	D	E	F	G SW	H	I	K
Pi 4205	78	31	G½	189	247	80	27	66	90	92.0
Pi 4205 FL		28	DN25	204	262				85	95.0
Pi 4208	78	31	G1	267	325	80	27	66	90	92.0
Pi 4208 FL		28	DN25	282	340				85	95.0
Pi 4211	78	31	G1	343	401	80	27	66	90	92.0
Pi 4211 FL		28	DN25	358	416				85	95.0
Pi 4215	78	46	G1¼	284	342	110	30	109	142	143.5
Pi 4215 FL			DN38							
Pi 4230	78	46	G1¼	409	467	110	30	109	142	143.5
Pi 4230 FL			DN38							
Pi 4245	78	46	G1½	525	583	110	30	109	142	143.5
Pi 4245 FL			DN38							

* NPT- und SAE-connections on request

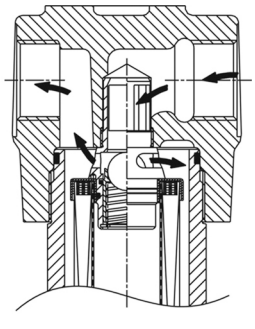
Type	L	M	N	O	P	R	S	T	U	Weight [kg]
Pi 4205	23.5	54	47	M8x14	21	8	57.1	27.8	M12x20	4.1
Pi 4205 FL	10.5		-			12				4.6
Pi 4208	23.5	54	47	M8x14	21	8	57.1	27.8	M12x20	4.9
Pi 4208 FL	10.5		-			12				5.3
Pi 4211	23.5	54	47	M8x14	21	8	57.1	27.8	M12x20	5.8
Pi 4211 FL	10.5		-			12				6.2
Pi 4215	12.0	86	-	M12x15	-	23	79.4	36.5	M16x20	12.3
Pi 4215 FL										13.3
Pi 4230	12.0	86	-	M12x15	-	23	79.4	36.5	M16x20	14.8
Pi 4230 FL										15.9
Pi 4245	12.0	86	-	M12x15	-	23	79.4	36.5	M16x20	17.1
Pi 4245 FL										18.6

10. Execution with reverse flow valve

Filters are normally designed for single- direction flow only. Reverse flows result in destruction of the cartridge. Some applications can require the medium to flow through the filter in both directions, however. The Pi 420 with a reverse flow valve can be used here. It allows medium flows in both directions, although it only filters in one. The liquid is not filtered in reverse mode. The reverse flow valve can be supplied with or without a bypass function.



Filtration mode



Reverse mode

11. Installation, operating and maintenance instructions

11.1 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.

11.2 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 position to normally closed position or vice versa.

11.3 When should the filter element be replaced?

1. 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.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original FGC spare elements in stock: Disposable elements (PS) cannot be cleaned.

11.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Filter sizes 300 and 450: empty the filter housing by removing the drain plug.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling down carefully.
5. Check o-ring, spigot and o-ring in the element locator for damage. Replace, if necessary.
6. 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.
7. Oil 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.
8. Check seals of vent drain plug - if necessary, please replace.
   Torque drain plug 30 Nm.

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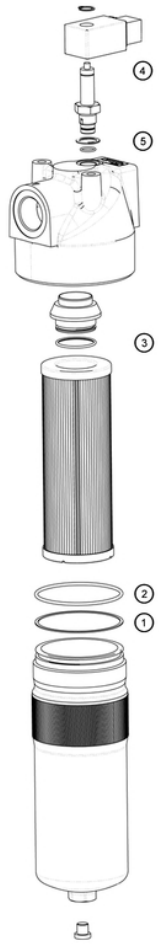

12. Spare parts list

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

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High Pressure Filter
Pi 420 KV/Pi 4000 KV

Nominal pressure 400 bar (5690 psi), NG 50, 80, 110/NG 40, 63, 100
according to DIN 24 550

1. Features

High pressure filter with differential pressure controlled cold-start valve

The filterhead contains a cold-start valve which guarantees under all operating conditions that the hydraulic system is provided only with filtered fluid.
When the differential pressure rises above the opening pressure of the cold-start valve (e.g. due to high cold-start viscosity or due to a not serviced filter element), a partial flow is returned to the tank via the filter heads` tank connection.

- The system is provided only with filter fluids
- A reduction of the flow rate indicates an outstanding filter element change
- Performance curves as per leaflet Pi 420 respectively Pi 4000
- Worldwide distribution

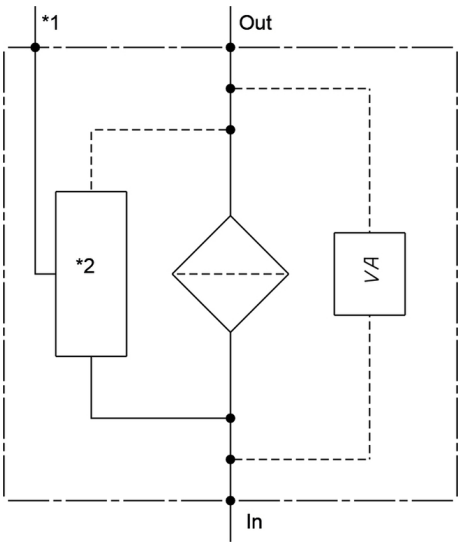
2. Technical specifications

Design:	line mounting filter
Nominal pressure:	400 bar (5690 psi)
Test pressure:	520 bar (7400 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 8 bar
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR
Maintenance indicator setting:	Δ p 5 bar
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 when inserted and secured
Contact:	normally open/normally closed
Cable connection:	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.

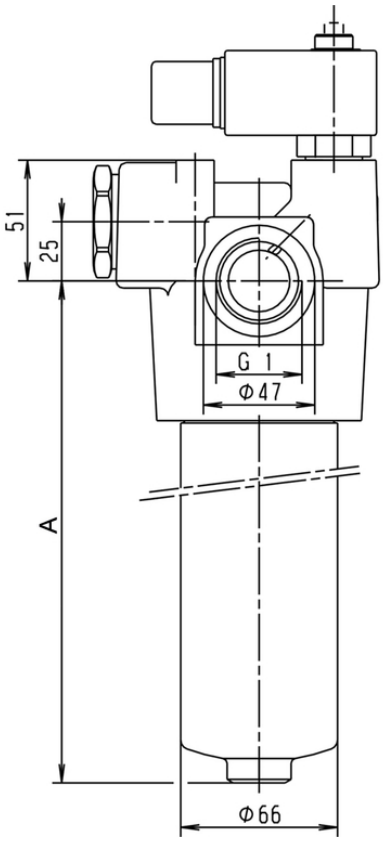
3. Symbols

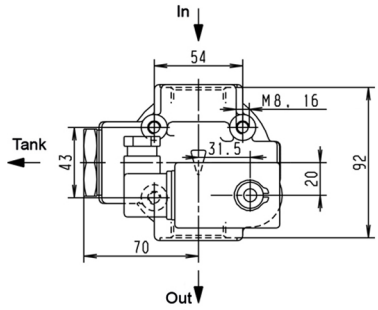


*1 Tank G½
*2 Cold start valve
VA = Maintenance indicator
In = G1
Out =G1

We recommend to contact us concerning applications of our filters in areas governed by the Eu Directive 94/9 EC (ATEX). 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.





4. Dimensions

Pi 420 KV	A	Pi 4000 KV	A
NG 50	158	NG 40	158
NG 80	236	NG 63	236
NG 110	312	NG 100	312

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High Pressure Filter
Pi 422

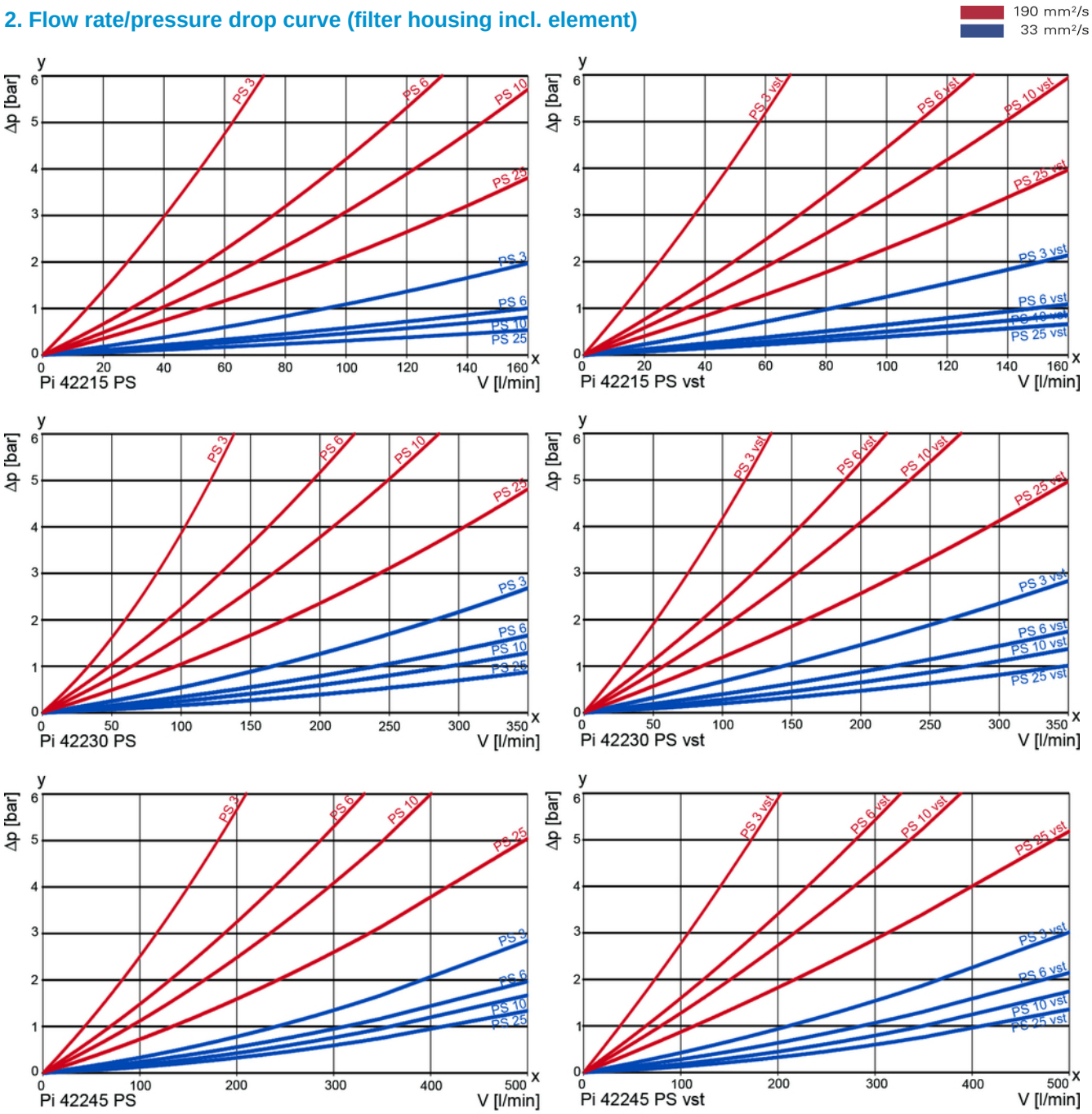
Nominal pressure 400 bar (5690 psi), nominal size up to 450
optional with reverse flow valve

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded or flanged connections
- Quality filters, easy to service
- Inlet sideways, outlet sideways or at the top
- 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

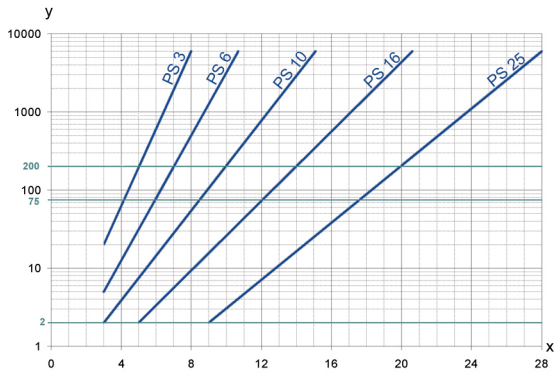
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle-size [µm]

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

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

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

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

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

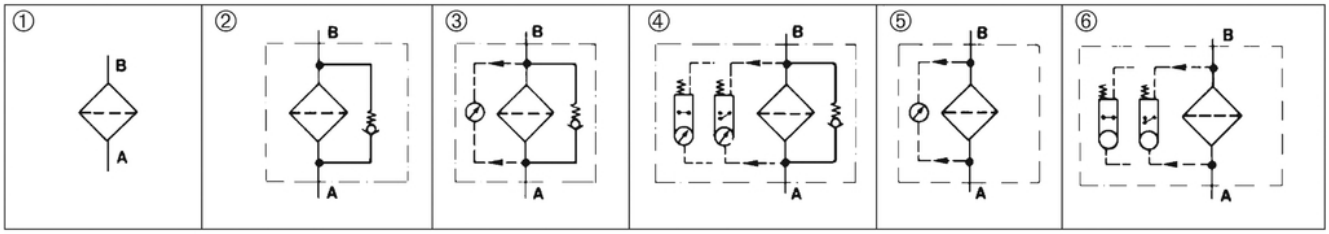
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group 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. Type number key, housing design, order numbers

7.1 Type number key

Type					
Pi 422	High pressure filter series				
	NG				
	15	nominal size 150			
	30	nominal size 300			
	45	nominal size 450			
		Connection variant 1st position			
		/1	inlet and outlet sideways		
		/2	inlet sideways, outlet at the top		
			Connection variant 2nd position		
			1	G1½	
			2	flange SAE 1¼ (only for inlet sideways/outlet at the top version)	
			3	flange SAE 1½	
			4	G1¼ (only for inlet sideways/outlet at the top version)	
				Housing design	
				-010	with hole for maintenance indicator
				-011	with bypass valve and Bohrung für Wartungsanzeige
				-012	with bypass valve and visual maintenance indicator
				-013	with bypass valve and electrical maintenance indicator
				-014	with visual maintenance indicator
				-015	with electrical maintenance indicator
Pi 422	**30**	**/1**	**2**	**-011**	**ordering example**

7.2 Housing design

Nominal size NG [l/min]	Type inlet sideways outlet sideways	Type inlet sideways outlet at the top	① with hole for indicator	② with bypass and hole for indicator	③ with bypass and visual indicator	④ with bypass and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
150	Pi 42215/1*-010	Pi 42215/2*-010	■					
	Pi 42215/1*-011	Pi 42215/2*-011		■				
	Pi 42215/1*-012	Pi 42215/2*-012			■			
	Pi 42215/1*-013	Pi 42215/2*-013				■		
	Pi 42215/1*-014	Pi 42215/2*-014					■	
	Pi 42215/1*-015	Pi 42215/2*-015						■
300	Pi 42230/1*-010	Pi 42230/2*-010	■					
	Pi 42230/1*-011	Pi 42230/2*-011		■				
	Pi 42230/1*-012	Pi 42230/2*-012			■			
	Pi 42230/1*-013	Pi 42230/2*-013				■		
	Pi 42230/1*-014	Pi 42230/2*-014					■	
	Pi 42230/1*-015	Pi 42230/2*-015						■
450	Pi 42245/1*-010	Pi 42245/2*-010	■					
	Pi 42245/1*-011	Pi 42245/2*-011		■				
	Pi 42245/1*-012	Pi 42245/2*-012			■			
	Pi 42245/1*-013	Pi 42245/2*-013				■		
	Pi 42245/1*-014	Pi 42245/2*-014					■	
	Pi 42245/1*-015	Pi 42245/2*-015						■

* Connection variants see type number key 2nd position

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

7.3 Filter elements (other elements on request)					
Nominal size NG [l/min]	**Order number**	**Type designation**	**Filter material**	**Max. Δp [bar]**	**Filter surface [cm²]**
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:	in-line filter inlet sideways; outlet optional sideways or on the top
Nominal pressure:	400 bar (5690 psi)
Test pressure:	520 bar (7400 psi)
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	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 and not 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.

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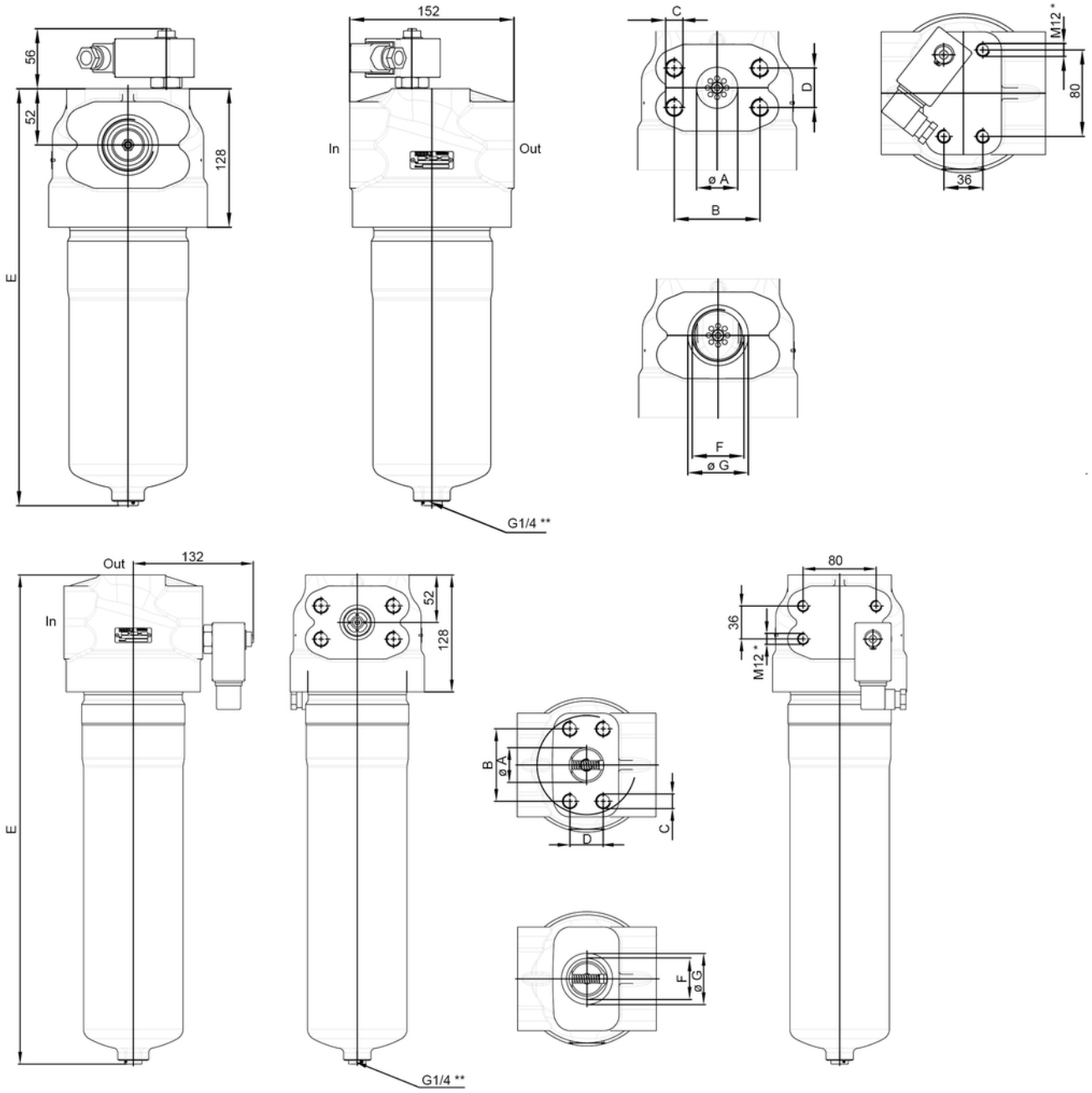
Subject to technical alteration without prior notice.

9. Dimensions



In = Inlet
Out = Outlet
* Thread depth 17 mm
** NG 150 without drain screw

All dimensions except "NG" in mm.

Type	NG	E
Pi 42215/...	150	281
Pi 42230/...	300	399
Pi 42245/...	450	515

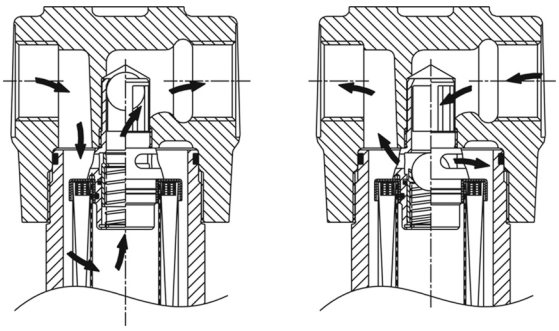
All dimensions except "F" in mm.

Con-nection	ø A	B	C	D	F	ø G
G1¼ *	-	-	-	-	1¼"	56
G1½	-	-	-	-	1½"	56
SAE1¼ *	32	66,6	M12	31,8	-	-
SAE1½	38	79,3	M16	36,8	-	-

* only for inlet sideways/outlet at the top version

10. Execution with reverse flow valve

Filters are normally designed for single- direction flow only. Reverse flows result in destruction of the cartridge. Some applications can require the medium to flow through the filter in both directions, however. The Pi 422 with a reverse flow valve can be used here. It allows medium flows in both directions, although it only filters in one. The liquid is not filtered in reverse mode. The reverse flow valve can be supplied with or without a bypass function.



Filtration mode | Reverse mode

11. Installation, operating and maintenance instructions

11.1 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.

11.2 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 position to normally closed position or vice versa.

11.3 When should the filter element be replaced?

1 . 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.
2 . Filters without maintenance indicator: The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3 . Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

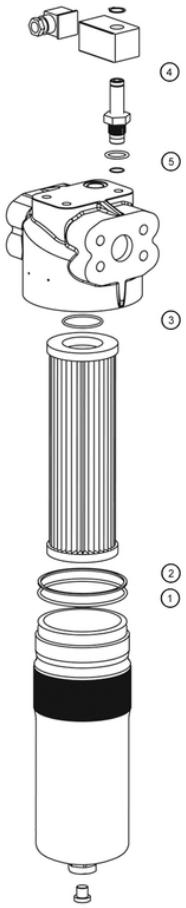
11.4 Element replacement

1 . Stop system and relieve filter from pressure.
2 . Filter sizes 300 and 450: empty the filter housing by removing the drain plug.
3 . Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4 . Remove element by pulling down carefully.
5 . Check o-ring, spigot and o-ring in the element locator for damage. Replace, if necessary.
6 . 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.
7 . Oil the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 150 to 450 = 100 Nm.
8 . Check seals of vent drain plug - if necessary, please replace. Torque drain plug 30 Nm.

12. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
① - ③	Seal kit	
	NBR	77544885
	FPM	77544893
	EPDM	77544901
④	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
⑤	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

.



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High Pressure Filter
Pi 4220

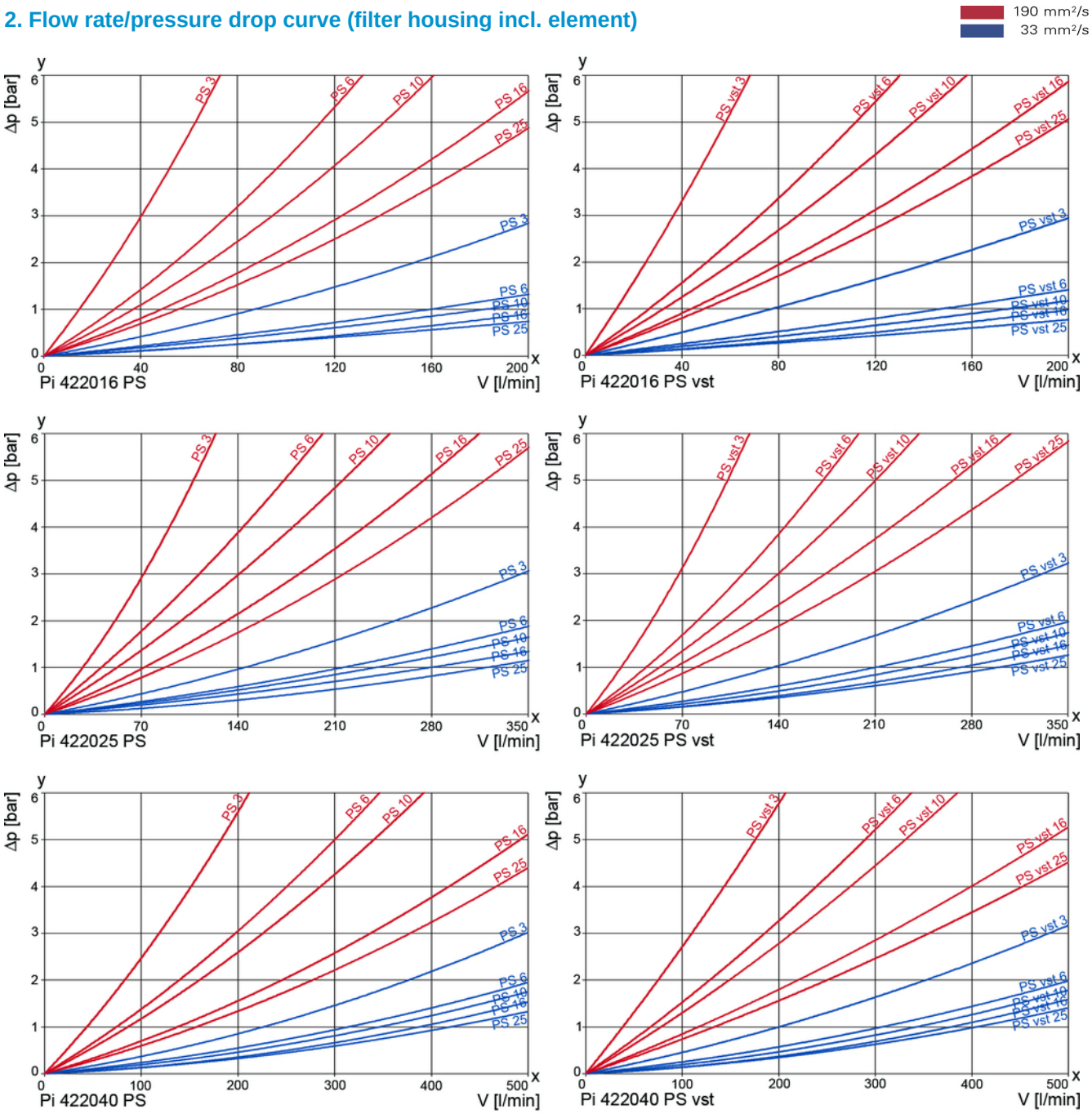
Nominal pressure 400 bar (5690 psi), nominal size up to 400
optional with reverse flow valve

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded or flanged connections
- Quality filters, easy to service
- Inlet sideways, outlet sideways or at the top
- 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

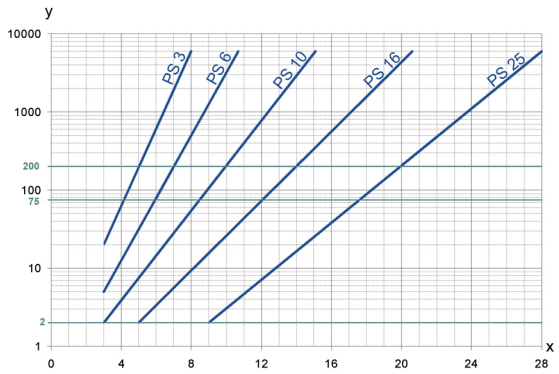
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle-size [µm]

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

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

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

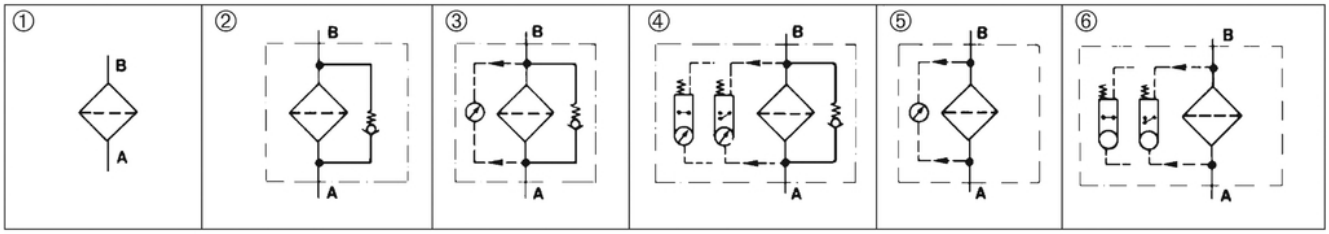
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group 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. Type number key, housing design, order numbers

7.1 Type number key

Type					
Pi 4220	High pressure filter series				
	NG				
	16	nominal size 160			
	25	nominal size 250			
	40	nominal size 400			
		Connection variant 1st position			
		/1	inlet and outlet sideways		
		/2	inlet sideways, outlet at the top		
			Connection variant 2nd position		
			1	G1½	
			2	flange SAE 1¼ (only for inlet sideways/outlet at the top version)	
			3	flange SAE 1½	
			4	G1¼ (only for inlet sideways/outlet at the top version)	
				Housing design	
				-010	with hole for maintenance indicator
				-011	with bypass valve and Bohrung für Wartungsanzeige
				-012	with bypass valve and visual maintenance indicator
				-013	with bypass valve and electrical maintenance indicator
				-014	with visual maintenance indicator
				-015	with electrical maintenance indicator
Pi 4220	**25**	**/1**	**1**	**-011**	**ordering example**

7.2 Housing design

Nominal size NG [l/min]	Type inlet sideways outlet sideways	Type inlet sideways outlet at the top	① with hole for indicator	② with bypass and hole for indicator	③ with bypass and visual indicator	④ with bypass and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
160	Pi 422016/1*-010	Pi 422016/2*-010	■					
	Pi 422016/1*-011	Pi 422016/2*-011		■				
	Pi 422016/1*-012	Pi 422016/2*-012			■			
	Pi 422016/1*-013	Pi 422016/2*-013				■		
	Pi 422016/1*-014	Pi 422016/2*-014					■	
	Pi 422016/1*-015	Pi 422016/2*-015						■
250	Pi 422025/1*-010	Pi 422025/2*-010	■					
	Pi 422025/1*-011	Pi 422025/2*-011		■				
	Pi 422025/1*-012	Pi 422025/2*-012			■			
	Pi 422025/1*-013	Pi 422025/2*-013				■		
	Pi 422025/1*-014	Pi 422025/2*-014					■	
	Pi 422025/1*-015	Pi 422025/2*-015						■
400	Pi 422040/1*-010	Pi 422040/2*-010	■					
	Pi 422040/1*-011	Pi 422040/2*-011		■				
	Pi 422040/1*-012	Pi 422040/2*-012			■			
	Pi 422040/1*-013	Pi 422040/2*-013				■		
	Pi 422040/1*-014	Pi 422040/2*-014					■	
	Pi 422040/1*-015	Pi 422040/2*-015						**LEER**

* Connection variants see type number key 2nd position

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

7.3 Filter elements					
Nominal size NG [l/min]	**Order number**	**Typen designation**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	78261034	Pi 21016 DN PS 3	PS 3	**20**	2530
	77960826	Pi 22016 DN PS 6	PS 6		2530
	77925605	Pi 23016 DN PS 10	PS 10		2530
	78261042	Pi 24016 DN PS 16	PS 16		2530
	78261059	Pi 25016 DN PS 25	PS 25		2530
	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885
250	78227514	Pi 21025 DN PS 3	PS 3	**20**	4020
	77960834	Pi 22025 DN PS 6	PS 6		4020
	77925613	Pi 23025 DN PS 10	PS 10		4020
	78261075	Pi 24025 DN PS 16	PS 16		4020
	78261083	Pi 25025 DN PS 25	PS 25		4020
	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090
400	78227522	Pi 21040 DN PS 3	PS 3	**20**	6770
	77960842	Pi 22040 DN PS 6	PS 6		6770
	77925621	Pi 23040 DN PS 10	PS 10		6770
	78261109	Pi 24040 DN PS 16	PS 16		6770
	78261117	Pi 25040 DN PS 25	PS 25		6770
	77940653	Pi 71040 DN PS vst 3	PSvst 3	**210**	5240
	77960107	Pi 72040 DN PS vst 6	PS vst 6		5240
	77930829	Pi 73040 DN PS vst 10	PS vst 10		5240
	78269821	Pi 74040 DN PS vst 16	PS vst 16		5240
	78260903	Pi 75040 DN PS vst 25	PS vst 25		5240

8. Technical specifications

Design:	in-line filter inlet sideways; outlet optional sideways or on top
Nominal pressure:	400 bar (5690 psi)
Test pressure:	520 bar (7400 psi)
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	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.

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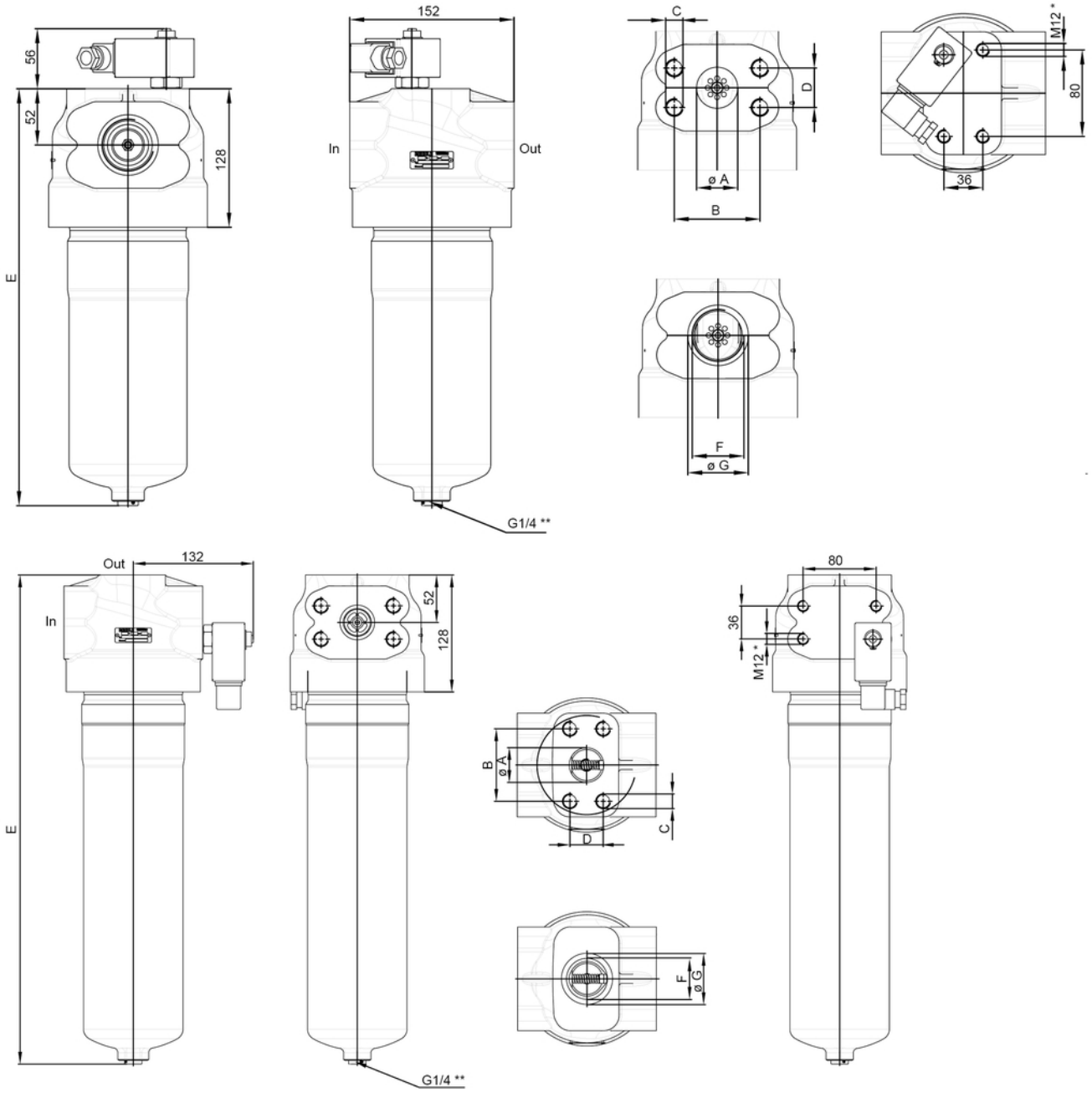
Subject to technical alteration without prior notice.

9. Dimensions



In = Inlet
Out = Outlet
* Thread depth 17 mm
** NG 160 without drain screw

All dimensions except "NG" in mm.

Type	NG	E
Pi 422016/...	150	292
Pi 422025/...	300	385
Pi 422040/...	450	535

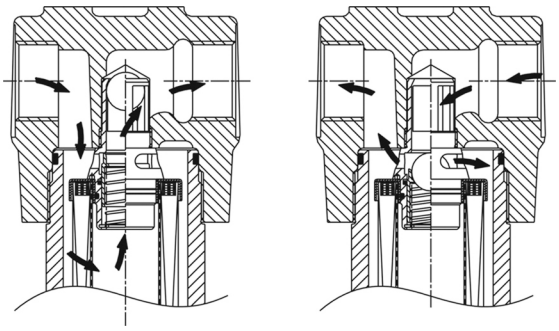
All dimensions except "F" in mm.

Con-nection	ø A	B	C	D	F	ø G
G1¼ *	-	-	-	-	1¼"	56
G1½	-	-	-	-	1½"	56
SAE1¼ *	32	66,6	M12	31,8	-	-
SAE1½	38	79,3	M16	36,8	-	-

* only for inlet sideways/outlet at the top version

10. Execution with reverse flow valve

Filters are normally designed for single- direction flow only. Reverse flows result in destruction of the cartridge. Some applications can require the medium to flow through the filter in both directions, however. The Pi 4220 with a reverse flow valve can be used here. It allows medium flows in both directions, although it only filters in one. The liquid is not filtered in reverse mode. The reverse flow valve can be supplied with or without a bypass function.



Filtration mode | Reverse mode

11. Installation, operating and maintenance instructions

11.1 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.

11.2 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 position to normally closed position or vice versa.

11.3 When should the filter element be replaced?

1. 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.
2. Filters without maintenance indicator: The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

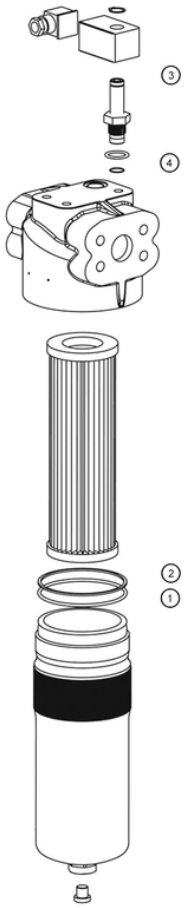
11.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Filter sizes 250 and 400: empty the filter housing by removing the drain plug.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling down carefully.
5. Check o-ring and spigot for damage. Replace, if necessary.
6. 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.
7. Oil the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 160 to 400 = 100 Nm.
8. Check seals of vent drain plug - if necessary, please replace. Torque drain plug 30 Nm.

12. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
① - ②	Seal kit	
	NBR	78383838
	FPM	78383846
	EPDM	78383853
③	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
④	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

.



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High Pressure Filter
Pi 4230

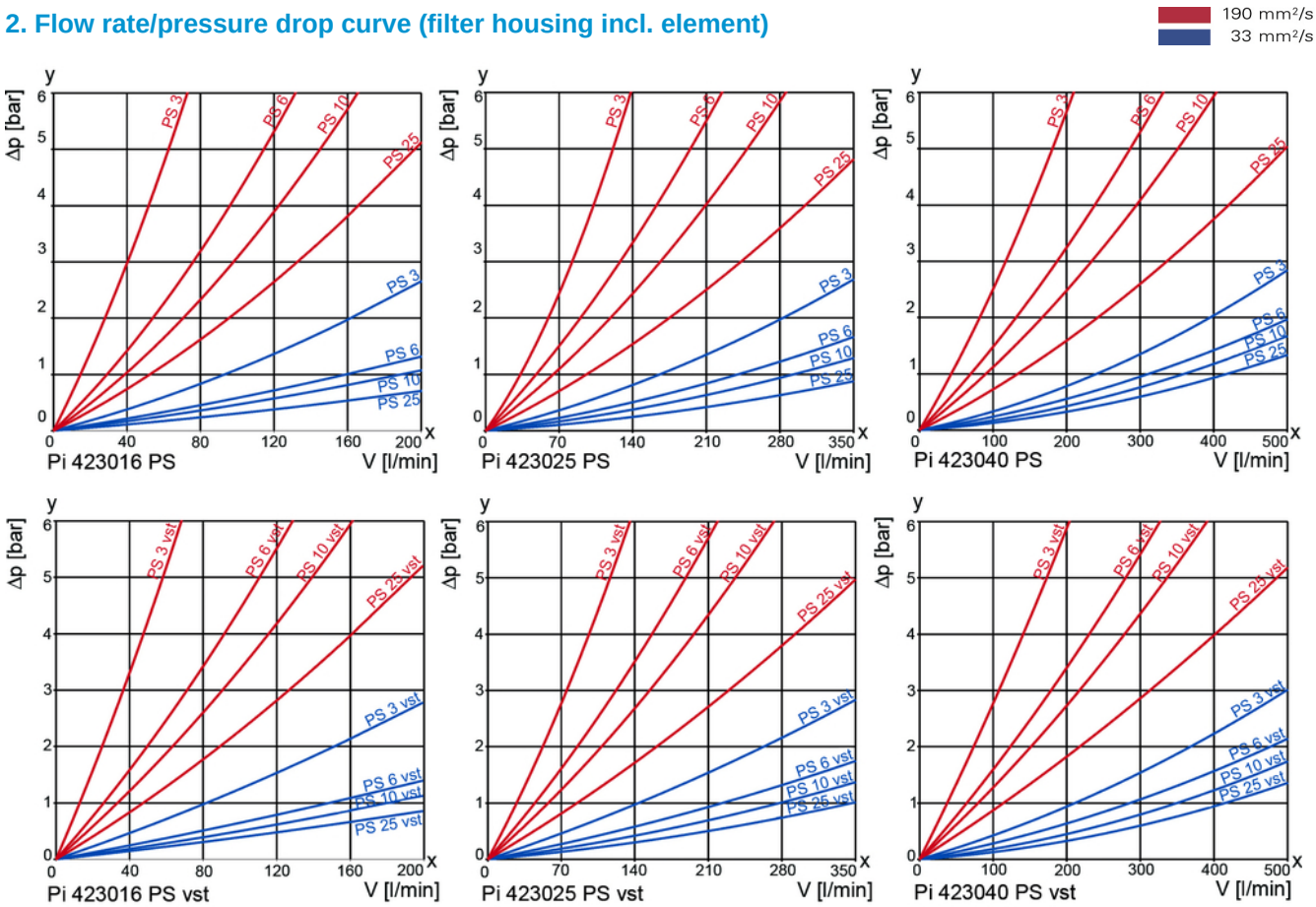
Nominal pressure 315 bar (4570 psi), nominal size 160 to 400
according DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Quality filters, easy to service
- Filter element removal upwards
- 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
- Worldwide distribution

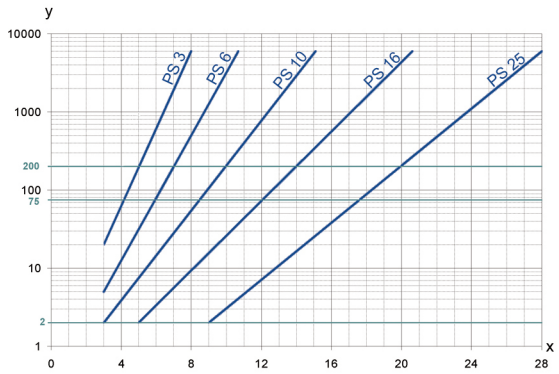
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

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

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

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

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

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

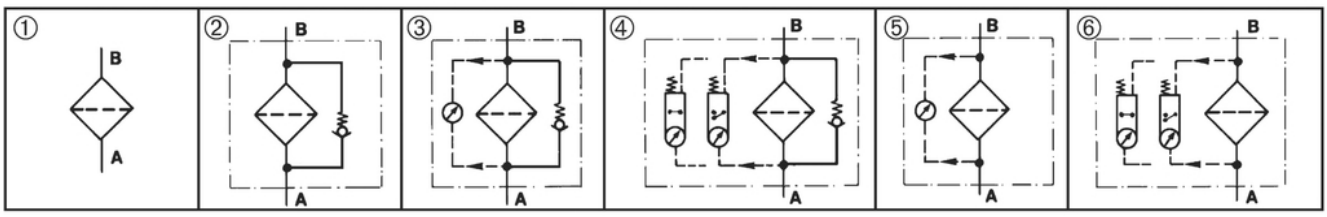
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group 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:

1. Housing design	2. Filter elements
V = 250 l/min, electrical maintenance indicator Type: Pi 423025-015 Order number: 70382542	PS vst 3 Type: Pi 71025 DN PS vst 3 Order number: 77940646

7.1 Housing design

Nominal size NG [l/min]	Order number thread version	Type thread version	Order number flange version	Type flange version	① with indicator cavity	② with bypass valve and indicator cavity	③ with bypass valve and visual indicator	④ with bypass valve and visual/electrical indicator	⑤ with visual indicator	⑥ with visual/electrical indicator
160	70382531	Pi 423016-010	70382566	Pi 423016-010 FL	■					
	70382532	Pi 423016-011	70382567	Pi 423016-011 FL		■				
	70382533	Pi 423016-012	70382568	Pi 423016-012 FL			■			
	70382534	Pi 423016-013	70382569	Pi 423016-013 FL				■		
	70382535	Pi 423016-014	70382570	Pi 423016-014 FL					■	
	70382536	Pi 423016-015	70382571	Pi 423016-015 FL						■
250	70382537	Pi 423025-010	70382572	Pi 423025-010 FL	■					
	70382538	Pi 423025-011	70382573	Pi 423025-011 FL		■				
	70382539	Pi 423025-012	70382574	Pi 423025-012 FL			■			
	70382540	Pi 423025-013	70382575	Pi 423025-013 FL				■		
	70382541	Pi 423025-014	70382576	Pi 423025-014 FL					■	
	70382542	Pi 423025-015	70382577	Pi 423025-015 FL						■
400	70382543	Pi 423040-010	70382578	Pi 423040-010 FL	■					
	70382544	Pi 423040-011	70382579	Pi 423040-011 FL		■				
	70382545	Pi 423040-012	70382580	Pi 423040-012 FL			■			
	70382546	Pi 423040-013	70382581	Pi 423040-013 FL				■		
	70382547	Pi 423040-014	70382582	Pi 423040-014 FL					■	
	70382548	Pi 423040-015	70382583	Pi 423040-015 FL						■

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

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	78261034	Pi 21016 DN PS 3	PS 3	**20**	2530
	77960826	Pi 22016 DN PS 6	PS 6		2530
	77925605	Pi 23016 DN PS 10	PS 10		2530
	78261042	Pi 24016 DN PS 16	PS 16		2530
	78261059	Pi 25016 DN PS 25	PS 25		2530
	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885
250	78227514	Pi 21025 DN PS 3	PS 3	**20**	4020
	77960834	Pi 22025 DN PS 6	PS 6		4020
	77925613	Pi 23025 DN PS 10	PS 10		4020
	78261075	Pi 24025 DN PS 16	PS 16		4020
	78261083	Pi 25025 DN PS 25	PS 25		4020
	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090
400	78227522	Pi 21040 DN PS 3	PS 3	**20**	6770
	77960842	Pi 22040 DN PS 6	PS 6		6770
	77925621	Pi 23040 DN PS 10	PS 10		6770
	78261109	Pi 24040 DN PS 16	PS 16		6770
	78261117	Pi 25040 DN PS 25	PS 25		6770
	77940653	Pi 71040 DN PS vst 3	PS vst 3	**210**	5240
	77960107	Pi 72040 DN PS vst 6	PS vst 6		5240
	77930829	Pi 73040 DN PS vst 10	PS vst 10		5240
	78269821	Pi 74040 DN PS vst 16	PS vst 16		5240
	78260903	Pi 75040 DN PS vst 25	PS vst 25		5240

* a wider range of element types is available on request

8. Technical specifications

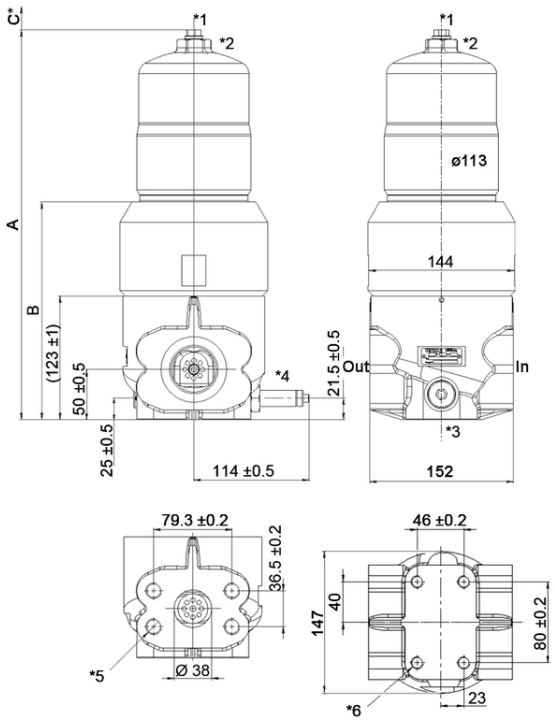
Design:	in-line filter
Nominal pressure:	315 bar (4570 psi)
Test pressure:	410 bar (5940 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE/Cu
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	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 and not 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 our filters in areas governed by the EU Directive 94/9 EG (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 EG Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.



DN 38 according to SAE 1½" 6000 psi
Flanges, bolts, o-rings not included in delivery!

C* = Minimum clearence
In = Inlet
Out = Outlet
*1 = Venting G¼
*2 = SW 30
*3 = Drain G½
*4 = Visual maintenance indicator
*5 = Mounting holes SAE flange 4x M16, 20 mm depth
*6 = Mounting holes 4x M12, 17 mm depth

9. Dimensions

All dimensions except connection "G..." in mm.

Typ	Connection	A ±5	B ±2	C
Pi 423016	G1½	299	-	180
Pi 423016 FL	DN 38			
Pi 423025	G1½	386	224	180
Pi 423025 FL	DN 38			
Pi 423040	G1½	538	376	300
Pi 423040 FL	DN 38			

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 housingl. Preferably the filter should be installed with the filter housing pointing upwards. The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

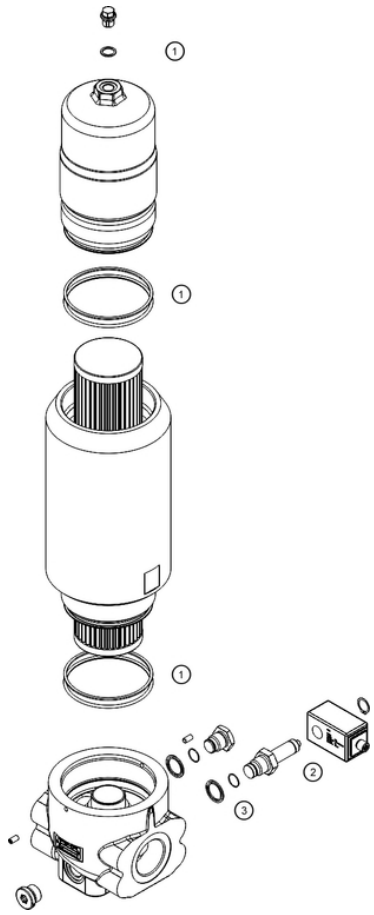
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. 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.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare
   elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Remove vent and drain plug and empty the filter housing.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling up carefully.
5. Check o-ring and spigot for damage. Replace, if necessary.
6. 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.
7. Oil 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.
8. Check seals of vent and drain plug - if necessary, please replace. Vent the filter housing in pressureless status.
   Torque vent plug 30 Nm.
   Torque drain plug 110 Nm.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	
	NBR	70382630
	FPM	70382632
	EPDM	70382634
②	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
③	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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Stainless steel-high pressure filter
Pi 480

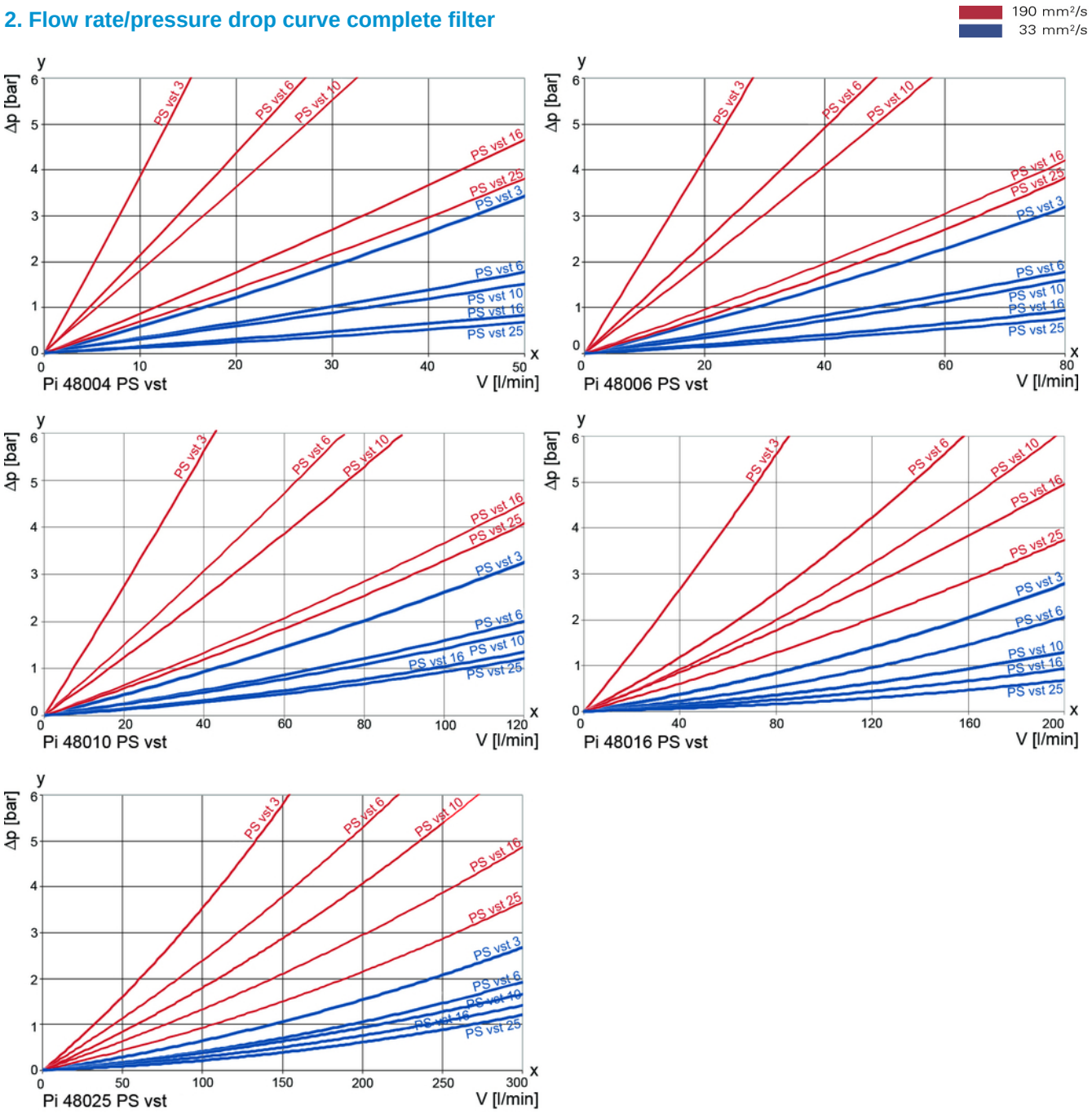
Nominal pressure 450/250 bar (6425/3570 psi), nominal size 40 up to 250

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements according to DIN 24550
- 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

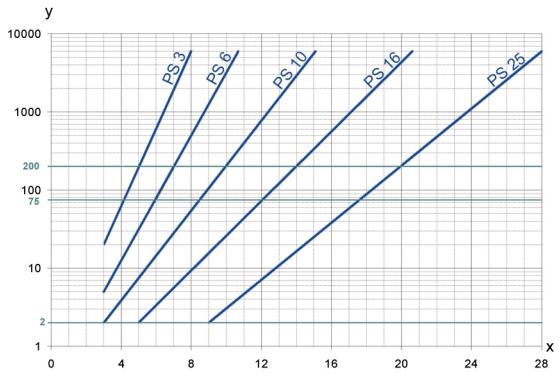
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δ p [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

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

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS vst elements with
max. Δ p 210 bar

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

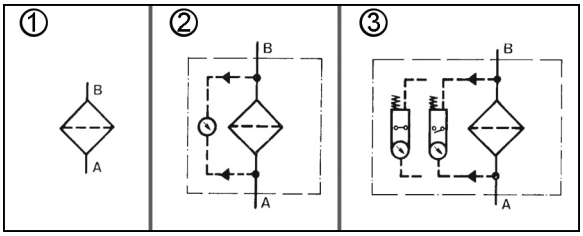
values guaranteed up to 20 bar
differential pressure

5. Quality assurance

Filtration Group 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-multi-passmethod for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V = 100 l/min and electrical maintenance indicator Type: Pi 48010-015 Order number: 79324583	PS vst 6 Type: Pi 71010 DN PS vst 6 Order number: 77960131

7.1 Housing design					
Nominal size NG [l/min]	**Order number**	**Type**	**① no options**	**② with visual indicator**	**③ with electrical indicator**
40	78397556	Pi 48004-060	■		
	78306607	Pi 48004-014		■	
	79343351	Pi 48004-015			■
63	79762295	Pi 48006-060	■		
	79702325	Pi 48006-014		■	
	70368277	Pi 48006-015			■
100	78308660	Pi 48010-060	■		
	79353236	Pi 48010-014		■	
	79324553	Pi 48010-015			■
160	70368297	Pi 48016-060	■		
	70368298	Pi 48016-014		■	
	79353160	Pi 48016-015			■
250	70368299	Pi 48025-060	■		
	70368302	Pi 48025-014		■	
	76109284	Pi 48025-015			■

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	78216079	Pi 71004 DN PS vst 3	PS vst 3	**210**	445
	77960156	Pi 72004 DN PS vst 6	PS vst 6		445
	77925654	Pi 73004 DN PS vst 10	PS vst 10		445
	78216087	Pi 74004 DN PS vst 16	PS vst 16		445
	78216095	Pi 75004 DN PS vst 25	PS vst 25		445
63	78216137	Pi 71006 DN PS vst 3	PS vst 3	**210**	780
	77960149	Pi 72006 DN PS vst 6	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10	PS vst 10		780
	78216145	Pi 74006 DN PS vst 16	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25	PS vst 25		780
100	78227480	Pi 71010 DN PS vst 3	PS vst 3	**210**	1275
	77960131	Pi 72010 DN PS vst 6	PS vst 6		1275
	77925670	Pi 73010 DN PS vst 10	PS vst 10		1275
	78261281	Pi 74010 DN PS vst 16	PS vst 16		1275
	78216160	Pi 75010 DN PS vst 25	PS vst 25		1275
160	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885
250	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090

*a wider range of element types is available on request

8. Technical specifications

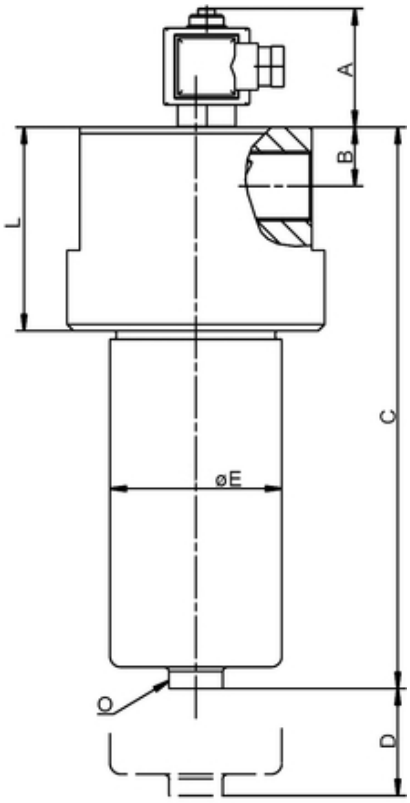
Design:	in-line filter
Nominal pressure:	
	2x 10^6 load changes 450 bar
NG 40 up to 100	(6425 psi)
NG 160 and 250	250 bar (3570 psi)
Test pressure:	
NG 40 up to 100	700 bar (10000 psi)
NG 160 and 250	325 bar (4640 psi)
Connections:	
NG 40 up to 100	G1
NG 160 and 250	G1½
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
	TP 316/TP 316 L
Filter head and housing material:	(1.4401/1.4404)
	(other materials on request)
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
	IP 65 in inserted
Type of protection:	and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

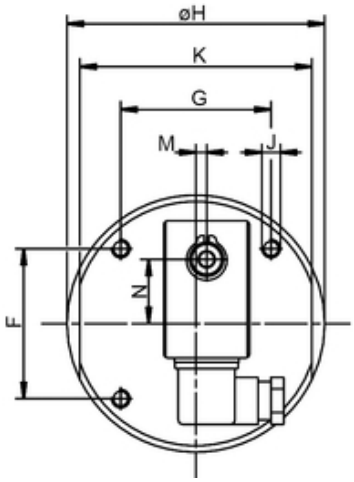
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance 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 and not 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 our filters in areas governed by the EU Directive 94/9 EG (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 EG Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.





9. Dimensions

All dimensions in mm.

Type	A	B	C ± 5	D	E	F	G	H	J	K	L	M	N	O (SW)
Pi 48004	60	27.5	202	100	80	70	70	120	M8	108	95	5	30.0	30
Pi 48006	60	27.5	262	100	80	70	70	120	M8	108	95	5	30.0	30
Pi 48010	60	27.5	352	100	80	70	70	120	M8	108	95	5	30.0	30
Pi 48016	60	42.0	310	130	120	78	78	150	M10	135	145	-	35.5	36
Pi 48025	60	42.0	400	130	120	78	78	150	M10	135	145	-	35.5	36

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 housingl. 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 position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1 . 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.
2 . Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3 . Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1 . Stop system and relieve filter from pressure.
2 . Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
3 . Remove element by pulling down carefully.
4 . Check o-ring and spigot for damage. Replace, if necessary.
5 . 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.
6 . 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.

11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	
	Pi 48004 - 48010	
	NBR	79767443
	FPM	70315096
	EPDM	70303334
	Pi 48016 - 48025	
	NBR	70315097
	FPM	70315098
	EPDM	70368303
②	Maintenance indicator	
	Visual PiS 3193	78308538
	Electrical PiS 3192	78308546
	Electrical upper section only	77536550
③	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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