



Industrial Filtration

**Released parts list
for
assembly unit production
of the chassis, gearbox and engine
of the Volkswagen Group**

AUDI AG	Győr site Ingolstadt site
Skoda Auto	Mlada Boleslav site
Volkswagen AG	Braunschweig site Hanover Foundry site Kassel site Salzgitter site Wolfsburg site
Volkswagen Motor Polska	Polkowice site
Volkswagen Sachsen GmbH	Chemnitz site

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1 Change journal

Version	Datum	Art der Änderung	Seite
0.0	15. June 2007	First edition	all
0.1	09. June 2008	Contact partner	4
		Explanation of file name	5
		Description of the PDF document	5
		Components	6
0.2	30. June 2008	Extension of Hanover Foundry site	1
0.3	18. March 2009	Correction of pressure specifications	5, 16, 17
1.2	07. August 2009	Extension of Wolfsburg site	1
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2 Contact partner

Coordination:

Markus Hesters
Dipl. Ing. (FH)

Central Office
Phone: +49 (0) 5223-1897788
E-mail: markus.hesters@mahle.com

Contact partner at the Öhringen plant:

Hans-Peter Essig
Dipl. Ing.

Department IFFPH
Fax: +49 (0) 7941-67-23429
E-mail: hans-peter.essig@mahle.com

Service partner:

Volkswagen AG

Braunschweig site
Kassel site
Salzgitter site
Wolfsburg site

Volkswagen Sachsen GmbH

Chemnitz site

AUDI AG

Ingolstadt site
Service by MAHLE Industriefiltration GmbH, Öhringen:
Service manager, Werner Kübler
Fax: +49 (0) 7941-67-23429
E-mail: werner.kuebler@mahle.com

VW Polkowice

Service by Robert Jagodzinski
BIBUS MENOS Sp.z.o.o.
Biuro Handlowe Krotoszyn
ul. Mahle 6
63 700 Krotoszyn
Phone: + 48 (0) 62-722 54 26
Fax: + 48 (0) 62-722 54 27
E-mail: rja@bibusmenos.pl

AUDI Győr

Service by Lajos Babics
JANKOVITS HIDRAULIKA Kft
Ipari Park – Juharfa u. 20
9027 Győr
Phone: +36 (0) 96-512060
Fax: +36 (0) 96-419537
E-mail: info@jankovitshidraulika.hu

Skoda Mlada Boleslav

Technical service by Walter Feucht
MAHLE Industriefiltration GmbH
Schleifbachweg 45
74613 Öhringen
Mobile phone: + 49 (0) 172-937 82 83
Fax: + 49 (0) 7941-67-23 392
E-mail: walter.feucht@mahle.com

Commercial service by Michal Charvat
BIBUS s.r.o.
Videnska 125
639 27 Brno
Phone: + 420 (0) 547 12 53 15
Fax: + 420 (0) 547 12 53 10
E-mail: mcharvat@bibus.cz

3 Notes

3.1 Excerpt from the Mechanical Specifications for assembly unit production of the Volkswagen Group (3.5.4 KLH hydraulic system)

3.1 Filter

Hydraulic filter

Only permitted according to DIN 24550

3.1.1 General information

Prescribed oil purity class according to ISO 4406:1999 (hydraulic filter only)
 Prescribed minimum filter service life 6 months (= approx. 3,000 operating hours)

The system manufacturer must agree upon the filter concept with the filter manufacturer in advance so that the required oil purity class and filter service life can be achieved.

A sign with the VW material number for the replacement element and repair kit must be attached directly next to the filter.

Simplex filters are primarily used.

Duplex filters for production-dependent machines and plants.

Bypass filtration is to be provided after consultation with the customer for a total displacement > 100 l/min and when using proportional valves, for large-scale systems, for heavily fluctuating volume flows or hydrostatic bearings.

Use pressure filters before proportional valves **without** bypass.

Suction filters and suction strainers are **not** permitted.

Mini-measurement connections are to be installed before and after the pressure filters as well as before the return-line filters.

3.1.2. Return-line filter according to DIN 24550 as line installation

3.1.2.1 Return-line filter as simplex filter/duplex filter

Filter element has stable differential pressure up to Δp 20 bar according to DIN 24550

Filter **with** bypass valve and visual/electr. maintenance indicator

Field of application: as **return-line filter in the main stream**

Retention rate → Purity class

$\beta_{10(c)} \geq 200$ → 17/15/11 for "normal hydraulic system" and hydraulic systems with proportional valves

$\beta_{5(c)} \geq 200$ → 14/12/9 for hydraulic system with control valves or servo valves

3.1.3. Pressure filter according to DIN 24550/nominal pressure 200/400 bar

3.1.3.1 Pressure filter as simplex filter/duplex filter according to DIN 24550

Field of application: as **working filter in the main stream**

for "general hydraulic system" and hydraulic systems with proportional valves

Filter **without** bypass valve and visual/electr. maintenance indicator

Filter element has stable differential pressure up to 210 bar according to DIN 24550

$\beta_{10(c)} \geq 200 \rightarrow 17/15/11$

for systems with servo valves

Filter **without** bypass valve, with visual/electr. maintenance indicator
Filter element has stable differential pressure up to 210 bar according to DIN 24550

$\beta_{5(c)} \geq 200 \rightarrow 14/12/9$

Line filter as simplex filter in protective filtration section

Filter **without** bypass valve
Filter with visual/electr. maintenance indicator
Filter element has stable differential pressure up to Δp 210 bar according to DIN 24550

Retention rate \rightarrow Purity class

$\beta_{10(c)} \geq 200 \rightarrow 17/15/11$ "general hydraulic system" and hydraulic systems with proportional valves

$\beta_{5(c)} \geq 200 \rightarrow 14/12/9$ for systems with servo valves

3.1.4. Line filter as bypass filter according to DIN 24550

Bypass filters are **always to be used as additional filters** with the existing pressure filters in the system (flow line). The filter capacity is to be selected as equivalent to the volume flows arising in the system.

Field of application: Permanent filtration of hydraulic oils in the bypass flow and for large tank capacities.

Bypass filter always for container > 1000 l

For large-scale systems

For heavily fluctuating volume flows

For total displacement volumes > $Q = 100$ l/min and when using proportional valves, maximum initial Δp 0.15 bar

Filter surface loading of the filter element max. 0.01 l/min cm²

Retention rate \rightarrow Purity class

$\beta_{10(c)} \geq 200 \rightarrow 17/15/11$ "general hydraulic system" and hydraulic systems with proportional valves

$\beta_{5(c)} \geq 200 \rightarrow 14/12/9$ for systems with servo valves

Filter element has stable differential pressure up to Δp 10 bar

Filter without bypass

Filter with visual/electr. maintenance indicator/technical data, see point 5

3.1.5. Ventilation

Breather filters must be fitted with a filling protection unit and a visual maintenance indicator.

Fineness of filter 3 μ m

Filter element replaceable

Initial differential pressure ≤ 0.01 bar in the pure state for a maximum air flow of at least five times the maximum volume change in the tank

Flange connection, bolt circle diameter 73 mm according to DIN 24557

3.1.6. Maintenance indicators

Every filter must be provided with a visual/electrical maintenance indicator.

Maintenance indicator with 2 setting points (75 % / 100 %)
NOC (75 %), NCC (100 %) contact type
LED (ready for operation / 75 % / 100 %)
Connector M 12 x 1

The maintenance indicator is included in the type designations of the complete filter.

Indicators for pressure filter nominal pressure 200/250/315/350/400 bar

PiS 3155/3.7/5.0 bar
Maintenance indicator corresponds to DBL 9666-E

Indicators for return-line filter nominal pressure 25/63 bar

PiS 3154/1.7/2.2 bar
Maintenance indicator corresponds to DBL 9666-E

Indicators for bypass filter nominal pressure 10 bar

PiS 3154/1.7/2.2 bar
Maintenance indicator corresponds to DBL 9666-E

3.2 Excerpt from the Mechanical Specifications for assembly unit production of the Volkswagen Group (3.5.5 KLH lubrication)

3.2. Filter

Lubrication oil filter

Only permitted according to DIN 24550

3.2.1. General information

When designing the filter, the lubricant used, its viscosity and the operating temperature of the planned system must be taken into consideration.

The manufacturer of the lubrication system must agree upon the filter concept with the filter manufacturer so that the required oil purity class can be achieved and the service life of the filter elements correspond with the requirements of the user – generally 3,000 operating hours. The initial Δp of 0.8 – 1.0 must not be exceeded.

The fineness of the filter is specified as $10 \mu\text{m} \rightarrow \beta_{10(c)} \geq 200$.

This leads to an oil purity class according to ISO 4406:1999 of 17/15/11. A sign with the VW material number for the replacement element and the repair kit must be attached directly next to the filter by the system manufacturer.

Simplex filters are primarily used.

DSF are subject to approval.

Systems whose filling capacities amount to > 1,000 litre are to be fitted with bypass filters.

The operator must be consulted about this.

3.2.1.1 Design

Filters may only be fitted after the pump in the pressure line. The differential pressure of the filter elements must be stable up to Δp 210. Every filter must be provided with a visual/electrical indicator. Setting points/indicator setting: 75% = 3.7 bar
100% = 5.0 bar

Filter **without** bypass

Fineness of filter $\beta_{10(c)} \geq 200$ (acc. to BV 1.17)

3.2.2 Lubrication systems

3.2.2.1 Circular lubrication – Discharger - Central lubrication systems

- A characteristic of single line systems is that the main line must be relieved of pressure after the lubricant is added to safeguard the operation of the distributor.
- This occurs via a pressure relief valve with a direct tank connection.
- A pressure relief valve at the filter is not desired.
- Simplex-line filter
- Filter without bypass
- Nominal pressure 63 bar
- Differential pressure of filter element is stable Δp 210 bar
- Visual/electrical indicator

3.2.2.2 Loss lubrication/circular lubrication–multiple line and progressive systems

- Simplex-line filter
- Filter without bypass
- Nominal pressure 63 bar
- Differential pressure of filter element is stable Δp 210 bar
- Visual/electrical indicator

3.2.3. Maintenance indicator **Every filter must be provided with a visual/electrical maintenance indicator.**

For design of maintenance indicator, see hydraulic filter section

3.2.4. Filter design

See hydraulic filter section
Filter types according to lubrication purchased parts list

3.3 --

→Section reserved for internal VW regulations

3.4 --

→Section reserved for internal VW regulations

3.5 --

→Section reserved for internal VW regulations

3.6 --

→Section reserved for internal VW regulations

3.7 Addition to Mechanical Specifications for assembly units for foundry machinery and plants

3.7.1 Filter

The requirements for the hydraulic filter for foundry machinery correspond to the requirements according to 3.1.

Fluid

A flame-resistant liquid from group HFC is prescribed:

Petrofer ULTRA-SAFE 620 VW-Kassel with the following physical data:

Density according to DIN 51757	at 20°C:	1.05
Viscosity according to DIN 51562	at 20°C:	94 mm ² /s
	at 40°C:	43 mm ² /s
	at 50°C:	31 mm ² /s

Viscosity index:	>>150
Burning point according to ISO 2592:	none
Pour point according to ISO 3016:	-50 °C
Ash content:	0.05 %
Spec. heat:	3.20 KJ/KgK
Heat conductivity:	0.38 W/mK

Filter design

Due to the increased specific weight and the increased dirt release capability of this fluid, the recommended volume flows in the selection tables for the return-line filters and the pressure filters are reduced by 20% for use in foundry machinery.

This corresponds to a lower initial Delta-P.

No reduction of the volume flow is provided for the bypass filters.

General design of the filter

Pressure filters with nominal sizes of 250 and 400 according to DIN 24550 are to be designed with elements that can be removed from above. A ventilation option at the highest point and a drain screw must be provided on these filter housings.

If a non-return valve is required to protect the pressure lines from draining, it must be provided by the assembly unit manufacturer.

The maintenance indicators are to be provided without integrated cold start suppression.
(to be implemented by the system manufacturer via the machine controller)

The materials of the filters listed below are resistant to the fluid prescribed.

The number of permitted breather filters must be adapted accordingly for larger oil oscillating volumes in the hydraulic fluid tank.

4 Notes/tables

4.1 Hydraulic filters (3.5.4 KLH)

4.1.1 Return-line filter

4.1.1.1 Return-line filter line installation as simplex filter

- Maximum volume flows at 46 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 17/15/11 $\rightarrow \beta_{10}(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1



NG	Recommended volume flow initial Δp of 0.5 bar	Resistance to collapsing Δp 20 bar replacement element	ND housing	Complete filter designation simplex filter	Document
100	40	Pi 23010 DN Smx 10 Mat. no. 77925597	63	Pi 20010-058/PiS 3154-2,2/Pi 23010 DN Smx 10 Mat. no. 70347162	Pi 2000 to NG 400
160	85	Pi 23016 DN Smx 10 Mat. no. 77925605	25	Pi 20016-058/PiS 3154-2,2/Pi 23016 DN Smx 10 Mat. no. 70347163	Pi 2000 to NG 400
250	120	Pi 23025 DN Smx 10 Mat. no. 77925613	25	Pi 20025-058/PiS 3154-2,2/Pi 23025 DN Smx 10 Mat. no. 76332449	Pi 2000 to NG 400
400	135	Pi 23040 DN Smx 10 Mat. no. 77925621	25	Pi 20040-058/PiS 3154-2,2/Pi 23040 DN Smx 10 Mat. no. 76938880	Pi 2000 to NG 400

- Maximum volume flows at 46 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 14/12/09 $\rightarrow \beta_5(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1

NG	Recommended volume flow initial Δp of 0.5 bar	Resistance to collapsing Δp 20 bar replacement element	ND housing	Complete filter designation simplex filter	Document
100	20	Pi 21010 DN Smx 3 Mat. no. 78227472	63	Pi 20010-058/PiS 3154-2,2/Pi 21010 DN Smx 3 Mat. no. 70347164	Pi 2000 to NG 400
160	45	Pi 21016 DN Smx 3 Mat. no. 78261034	25	Pi 20016-058/PiS 3154-2,2/Pi 21016 DN Smx 3 Mat. no. 70347165	Pi 2000 to NG 400
250	70	Pi 21025 DN Smx 3 Mat. no. 78227514	25	Pi 20025-058/PiS 3154-2,2/Pi 21025 DN Smx 3 Mat. no. 70347167	Pi 2000 to NG 400
400	85	Pi 21040 DN Smx 3 Mat. no. 78227522	25	Pi 20040-058/PiS 3154-2,2/Pi 21040 DN Smx 3 Mat. no. 76952931	Pi 2000 to NG 400

Spare parts list:

Housing type designation	Housing gasket set	Maintenance indicator gasket set	Document
Pi 20006 - Pi 20010	Mat. no. 79328485	Mat. no. 77760309	Pi 2000 to NG 400
Pi 20016 - Pi 20040	Mat. no. 79357617	Mat. no. 77760309	Pi 2000 to NG 400

4.1.1.2 Return-line filter line installation as duplex filter

- Maximum volume flows at 46 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 17/15/11 $\rightarrow \beta_{10}(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1



NG	Recommended volume flow initial Δp of 0.5 bar	Resistance to collapsing Δp 20 bar replacement element	ND housing	Complete filter designation duplex filter	Document
100	40	Pi 23010 DN Smx 10 Mat. no. 77925597	63	Pi 21010-058/PiS 3154-2,2/Pi 23010 DN Smx 10 Mat. no. 76389282	Pi 2100 to NG 400
160	85	Pi 23016 DN Smx 10 Mat. no. 77925605	25	Pi 21016-058/PiS 3154-2,2/Pi 23016 DN Smx 10 Mat. no. 70347169	Pi 2100 to NG 400
250	120	Pi 23025 DN Smx 10 Mat. no. 77925613	25	Pi 21025-058/PiS 3154-2,2/Pi 23025 DN Smx 10 Mat. no. 70347171	Pi 2100 to NG 400
400	135	Pi 23040 DN Smx 10 Mat. no. 77925621	25	Pi 21040-058/PiS 3154-2,2/Pi 23040 DN Smx 10 Mat. no. 70347173	Pi 2100 to NG 400

- Maximum volume flows at 46 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 14/12/09 $\rightarrow \beta_5(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1

NG	Viscosity 33 mm ² /s recommended volume flow initial Δp of 0.5 bar	Resistance to collapsing Δp 20 bar replacement element	ND housing	Complete filter designation duplex filter	Document
100	20	Pi 21010 DN Smx 3 Mat. no. 78227472	63	Pi 21010-058/PiS 3154-2.2/Pi 21010 DN Smx 3 Mat. no. 70347174	Pi 2100 to NG 400
160	45	Pi 21016 DN Smx 3 Mat. no. 78261034	25	Pi 21016-058/PiS 3154-2.2/Pi 21016 DN Smx 3 Mat. no. 70347175	Pi 2100 to NG 400
250	70	Pi 21025 DN Smx 3 Mat. no. 78227514	25	Pi 21025-058/PiS 3154-2.2/Pi 21025 DN Smx 3 Mat. no. 70347176	Pi 2100 to NG 400
400	85	Pi 21040 DN Smx 3 Mat. no. 78227522	25	Pi 21040-058/PiS 3154-2.2/Pi 21040 DN Smx 3 Mat. no. 70347177	Pi 2100 to NG 400

Spare parts list:

Housing type designation	Housing gasket set	Maintenance indicator gasket set	Document
Pi 21006 – Pi 21010	Mat. no. 79774258	Mat. no. 77760309	Pi 2100 to NG 400
Pi 21016 – Pi 21040	Mat. no. 79774282	Mat. no. 77760309	Pi 2100 to NG 400

4.1.2 Pressure filter

4.1.2.1 Pressure filter line installation as simplex filter

- Maximum volume flows at 46 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 17/15/11 $\rightarrow \beta_{10}(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1



NG	Recommended volume flow initial Δp of 1.0 bar	Resistance to collapsing Δp 210 bar replacement element	ND housing	Complete filter designation simplex filter	Document
100	55	Pi 73010 DN Smx vst 10 Mat. no. 77925670	315	Pi 30010-015/PiS 3155-5.0/Pi 73010 DN Smx vst 10 Mat. no. 76333645	Pi 3000 to NG 400
100	55	Pi 73010 DN Smx vst 10 Mat. no. 77925670	400	Pi 40010-015/PiS 3155-5.0/Pi 73006 DN Smx vst 10 Mat. no. 76321723	Pi 4000 to NG 400
160	125	Pi 73016 DN Smx vst 10 Mat. no. 77925688	200	Pi 30016-015/PiS 3155-5.0/Pi 73016 DN Smx vst 10 Mat. no. 76317259	Pi 3000 to NG 400
160	125	Pi 73016 DN Smx vst 10 Mat. no. 77925688	400	Pi 40016-015/PiS 3155-5.0/Pi 73016 DN Smx vst 10 Mat. no. 70348174	Pi 4000 to NG 400
250	180	Pi 73025 DN Smx vst 10 Mat. no. 77925696	200	Pi 30025-015/PiS 3155-5.0/Pi 73016 DN Smx vst 10 Mat. no. 76332431	Pi 3000 to NG 400
250	180	Pi 73025 DN Smx vst 10 Mat. no. 77925696	400	Pi 40025-015/PiS 3155-5.0/Pi 73025 DN Smx vst 10 Mat. no. 76321756	Pi 4000 to NG 400
400	220	Pi 73040 DN Smx vst 10 Mat. no. 77930829	200	Pi 30040-015/PiS 3155-5.0/Pi 73040 DN Smx vst 10 Mat. no. 70347178	Pi 3000 to NG 400
400	220	Pi 73040 DN Smx vst 10 Mat. no. 77930829	400	Pi 40040-015/PiS 3155-5.0/Pi 73040 DN Smx vst 10 Mat. no. 70348175	Pi 4000 to NG 400

Spare parts list:

Housing type designation	Housing gasket set	Maintenance indicator gasket set	Document
Pi 30010	Mat. no. 78383747	Mat. no. 77760275	Pi 3000 to NG 400
Pi 30016 - Pi 30040	Mat. no. 78383770	Mat. no. 77760275	Pi 3000 to NG 400
Pi 40010	Mat. no. 78383804	Mat. no. 77760275	Pi 4000 to NG 400
Pi 40016 - Pi 40040	Mat. no. 78383838	Mat. no. 77760275	Pi 4000 to NG 400

- Maximum volume flows at 46 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 14/12/09 $\rightarrow \beta_5(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1



NG	Recommended volume flow initial Δp of 1.0 bar	Resistance to collapsing Δp 210 bar replacement element	ND housing	Complete filter designation simplex filter	Document
100	35	Pi 71010 DN Smx vst 3 Mat. no. 78227480	315	Pi 30010-015/PiS 3155-5.0/Pi 71010 DN Smx vst 3 Mat. no. 70348167	Pi 3000 to NG 400
100	35	Pi 71010 DN Smx vst 3 Mat. no. 78227480	400	Pi 40010-015/PiS 3155-5.0/Pi 71006 DN Smx vst 3 Mat. no. 70348176	Pi 4000 to NG 400
160	70	Pi 71016 DN Smx vst 3 Mat. no. 77940638	200	Pi 30016-015/PiS 3155-5.0/Pi 71016 DN Smx vst 3 Mat. no. 70348170	Pi 3000 to NG 400
160	70	Pi 71016 DN Smx vst 3 Mat. no. 77940638	400	Pi 40016-015/PiS 3155-5.0/Pi 71016 DN Smx vst 3 Mat. no. 70348177	Pi 4000 to NG 400
250	120	Pi 71025 DN Smx vst 3 Mat. no. 77940646	200	Pi 30025-015/PiS 3155-5.0/Pi 71016 DN Smx vst 3 Mat. no. 70348172	Pi 3000 to NG 400
250	120	Pi 71025 DN Smx vst 3 Mat. no. 77940646	400	Pi 40025-015/PiS 3155-5.0/Pi 71025 DN Smx vst 3 Mat. no. 70348178	Pi 4000 to NG 400
400	180	Pi 71040 DN Smx vst 3 Mat. no. 77940653	200	Pi 30040-015/PiS 3155-5.0/Pi 73040 DN Smx vst 3 Mat. no. 70348173	Pi 3000 to NG 400
400	180	Pi 71040 DN Smx vst 3 Mat. no. 77940653	400	Pi 40040-015/PiS 3155-5.0/Pi 71040 DN Smx vst 3 Mat. no. 70348179	Pi 4000 to NG 400

Spare parts list:

Housing type designation	Housing gasket set	Maintenance indicator gasket set	Document
Pi 30010	Mat. no. 78383747	Mat. no. 77760275	Pi 3000 to NG 400
Pi 30016 - Pi 30040	Mat. no. 78383770	Mat. no. 77760275	Pi 3000 to NG 400
Pi 40010	Mat. no. 78383804	Mat. no. 77760275	Pi 4000 to NG 400
Pi 40016 - Pi 40040	Mat. no. 78383838	Mat. no. 77760275	Pi 4000 to NG 400

4.1.2.2 Pressure filter line installation as duplex filter

- Maximum volume flows at 46 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 17/15/11 $\rightarrow \beta_{10}(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1



NG	Recommended volume flow initial Δp of 1.0 bar	Resistance to collapsing Δp 210 bar replacement element	ND housing	Complete filter designation duplex filter	Document
100	50	Pi 73010 DN Smx vst 10 Mat. no. 77925670	250	Pi 37010-015/PiS 3155-5.0/Pi 73010 DN Smx vst 10 Mat. no. 76938971	Pi 3700 to NG 400
100	50	Pi 73010 DN Smx vst 10 Mat. no. 77925670	350	Pi 47010-015/PiS 3155-5.0/Pi 73006 DN Smx vst 10 Mat. no. 70348194	Pi 4700 to NG 400
160	125	Pi 73016 DN Smx vst 10 Mat. no. 77925688	200	Pi 37016-015/PiS 3155-5.0/Pi 73016 DN Smx vst 10 Mat. no. 70348183	Pi 3700 to NG 400
160	125	Pi 73016 DN Smx vst 10 Mat. no. 77925688	315	Pi 47016-015/PiS 3155-5.0/Pi 73016 DN Smx vst 10 Mat. no. 70348195	Pi 4700 to NG 400
250	180	Pi 73025 DN Smx vst 10 Mat. no. 77925696	200	Pi 37025-015/PiS 3155-5.0/Pi 73016 DN Smx vst 10 Mat. no. 70348185	Pi 3700 to NG 400
250	180	Pi 73025 DN Smx vst 10 Mat. no. 77925696	315	Pi 47025-015/PiS 3155-5.0/Pi 73025 DN Smx vst 10 Mat. no. 70348196	Pi 4700 to NG 400
400	220	Pi 73040 DN Smx vst 10 Mat. no. 77930829	200	Pi 37040-015/PiS 3155-5.0/Pi 73040 DN Smx vst 10 Mat. no. 70348187	Pi 3700 to NG 400
400	220	Pi 73040 DN Smx vst 10 Mat. no. 77930829	315	Pi 47040-015/PiS 3155-5.0/Pi 73040 DN Smx vst 10 Mat. no. 70348197	Pi 4700 to NG 400

Spare parts list:

Housing type designation	Housing gasket set	Maintenance indicator gasket set	Document
Pi 37010	Mat. no. 79322009	Mat. no. 77760275	Pi 3700 to NG 400
Pi 37016 - Pi 37040	Mat. no. 79322033	Mat. no. 77760275	Pi 3700 to NG 400
Pi 47010	Mat. no. 70348203	Mat. no. 77760275	Pi 4700 to NG 400
Pi 47016 - Pi 47040	Mat. no. 70348202	Mat. no. 77760275	Pi 4700 to NG 400

- Maximum volume flows at 46 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 14/12/09 $\rightarrow \beta_5(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1



NG	Recommended volume flow initial Δp of 1.0 bar	Resistance to collapsing Δp 210 bar replacement element	ND housing	Complete filter designation duplex filter	Document
100	35	Pi 71010 DN Smx vst 3 Mat. no. 78227480	250	Pi 37010-015/PiS 3155-5.0/Pi 71010 DN Smx vst 3 Mat. no. 70348188	Pi 3700 to NG 400
100	35	Pi 71010 DN Smx vst 3 Mat. no. 78227480	350	Pi 47010-015/PiS 3155-5.0/Pi 71010 DN Smx vst 3 Mat. no. 70348198	Pi 4700 to NG 400
160	70	Pi 71016 DN Smx vst 3 Mat. no. 77940638	200	Pi 37016-015/PiS 3155-5.0/Pi 71016 DN Smx vst 3 Mat. no. 70348190	Pi 3700 to NG 400
160	70	Pi 71016 DN Smx vst 3 Mat. no. 77940638	315	Pi 47016-015/PiS 3155-5.0/Pi 71016 DN Smx vst 3 Mat. no. 70348199	Pi 4700 to NG 400
250	120	Pi 71025 DN Smx vst 3 Mat. no. 77940646	200	Pi 37025-015/PiS 3155-5.0/Pi 71025 DN Smx vst 3 Mat. no. 70348191	Pi 3700 to NG 400
250	120	Pi 71025 DN Smx vst 3 Mat. no. 77940646	315	Pi 47025-015/PiS 3155-5.0/Pi 71025 DN Smx vst 3 Mat. no. 70348200	Pi 4700 to NG 400
400	180	Pi 71040 DN Smx vst 3 Mat. no. 77940653	200	Pi 37040-015/PiS 3155-5.0/Pi 71040 DN Smx vst 3 Mat. no. 70348192	Pi 3700 to NG 400
400	180	Pi 71040 DN Smx vst 3 Mat. no. 77940653	315	Pi 47040-015/PiS 3155-5.0/Pi 71040 DN Smx vst 3 Mat. no. 70348201	Pi 4700 to NG 400

Spare parts list:

Housing type designation	Housing gasket set	Maintenance indicator gasket set	Document
Pi 37010	Mat. no. 79322009	Mat. no. 77760275	Pi 3700 to NG 400
Pi 37016 - Pi 37040	Mat. no. 79322033	Mat. no. 77760275	Pi 3700 to NG 400
Pi 47010	Mat. no. 70348203	Mat. no. 77760275	Pi 4700 to NG 400
Pi 47016 - Pi 47040	Mat. no. 70348202	Mat. no. 77760275	Pi 4700 to NG 400

4.1.3 Bypass filter line installation as simplex filter

- Recommended volume flows for the circulation pump for bypass filtration:
 - Design viscosity: 46 mm²/s
 - Max. initial Δp : 0.15 bar
- Oil purity according to ISO 4406:1999/purity class 14/12/09 $\rightarrow \beta_5(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1



NG	Recommended circulating performance of the pump Qp in l/min	Tank capacity in litres	Filter area in cm ²	Resistance to collapsing Δp 20 bar replacement element	Complete filter designation	Document
350	20 - 60	>400	13515	1 piece Mat. no. 77924194	Pi 15035/10-069/PiS 3154/-2.2/Pi 21063 RN Smx 3 Mat. no. 76357040	Pi 1500
600	50 - 120	>1000	27030	2 piece Mat. no. 77924194	Pi 15060/10-069/PiS 3154/-2.2/2 x Pi 21063 RN Smx 3 Mat. no. 70348244	Pi 1500

Spare parts list:

Housing type designation	Housing gasket set	Maintenance indicator gasket set	Document
Pi 15035	Mat. no. 77831407	Mat. no. 77760309	Pi 1500
Pi 15060	Mat. no. 77831407	Mat. no. 77760309	Pi 1500

4.1.4 Breather filter with filling protection according to DIN 24557

- for container volumes < 1000 litre



Complete filter designation	NG	Fineness of filter in μm	Oil oscillating volume	Order reference replacement element	Document
Pi 0125 Sm-L/UM-OS Mat. no. 7639169	1000	3	230	852 519 Sm-L 3x package Mat. no. 77643554	Pi 0101-Pi 0185

Spare parts list:

Designation	Document
Cover with maintenance indicator Mat. no. 79343013	Pi 0101-Pi 0185

4.1.5 Filling filter according to DIN 24550

The assembly units must be filled and refilled exclusively via the system filter.
A filling filter is to be provided as a simplex return-line filter of the NG 100 if required.
See point 4.1.1.1.

4.2 Overview of filter for lubrication and drill heads (6.3.5 KLH)

4.2.1 Pressure filter line installation as simplex filter according to DIN 24550

- Oil purity according to ISO 4406:1999/purity class 17/15/11 → $\beta_{10}(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1



NG	Q in l/min	Viscosities Δp					Resistance to collapsing Δp 210 bar replacement element	Complete filter designation simplex filter		Document
		10	22	33	46	68		Nominal pressure 63 bar housing		
		Initial Δp								
40	15	0.04	0.19	0.34	0.51	0.81	Pi 73004 DN Sm-x vst 10 Mat. no. 77925654	Pi 20004-69/PiS 3154/-2,2/ Pi 73004 DN Sm-x vst 10 Mat. no. 70311300	Pi 2000 to NG 400	
40	20	0.05	0.26	0.46	0.7	1.1	Pi 73004 DN Sm-x vst 10 Mat. no. 77925654	Pi 20004-69/PiS 3154/-2,2/ Pi 73004 DN Sm-x vst 10 Mat. no. 70311300	Pi 2000 to NG 400	
40	25	0.06	0.34	0.59	0.89	*)	Pi 73004 DN Sm-x vst 10 Mat. no. 77925654	Pi 20004-69/PiS 3154/-2,2/ Pi 73004 DN Sm-x vst 10 Mat. no. 70311300	Pi 2000 to NG 400	
40	40	0.14	0.26	0.37	0.5	0.72	Pi 73010 DN Sm-x vst 10 Mat. no. 77925670	Pi 20010-69/PiS 3154/1.7-2.2/ Pi 73010 DN Sm-x vst 10 Mat. no. 70344726	Pi 2000 to NG 400	
100	55	0.23	0.39	0.55	0.73	*)	Pi 73010 DN Sm-x vst 10 Mat. no. 77925670	Pi 20010-69/PiS 3154/-2,2/ Pi 73010 DN Sm-x vst 10 Mat. no. 70344726	Pi 2000 to NG 400	
100	70	0.33	0.54	0.74	0.98	*)	Pi 73010 DN Sm-x vst 10 Mat. no. 77925670	Pi 20010-69/PiS 3154/-2,2/ Pi 73010 DN Sm-x vst 10 Mat. no. 70344726	Pi 2000 to NG 400	

*) Nominal sizes for this viscosity are not recommended
Sensible use only with a corresponding nominal size

Spare parts list:

Housing type designation	Housing gasket set	Maintenance indicator gasket set	Document
Pi 20004 - Pi 20010	Mat. no. 79328485	Mat. no. 77760309	Pi 2000 to NG 400

4.2.2 Pressure filter line installation as duplex filter according to DIN 24550

- Oil purity according to ISO 4406:1999/purity class 17/15/11 → $\beta_{10}(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1



NG	Q in l/min	Viscosities Δp					Resistance to collapsing Δp 210 bar replacement element	Complete filter designation duplex filter		Document
		10	22	33	46	68		Nominal pressure 63 bar housing		
		Initial Δp								
40	15	0.13	0.29	0.44	0.62	0.92	Pi 73004 DN Sm-x vst 10 Mat. no. 77925654	Pi 21004-69/PiS 3154-2.2/ Pi 73004 DN Sm-x vst 10 Mat. no. 70344732	Pi 2100 to NG 400	
40	20	0.17	0.4	0.6	0.84	*)	Pi 73004 DN Sm-x vst 10 Mat. no. 77925654	Pi 21004-69/PiS 3154-2.2/ Pi 73004 DN Sm-x vst 10 Mat. no. 70344732	Pi 2100 to NG 400	
40	25	0.22	0.5	0.76	1.1	*)	Pi 73004 DN Sm-x vst 10 Mat. no. 77925654	Pi 21004-69/PiS 3154-2.2/ Pi 73004 DN Sm-x vst 10 Mat. no. 70344732	Pi 2100 to NG 400	
40	40	0.29	0.46	0.6	0.78	*)	Pi 73010 DN Sm-x vst 10 Mat. no. 77925670	Pi 21010-69/PiS 3154-2.2/ Pi 73010 DN Sm-x vst 10 Mat. no. 70344729	Pi 2100 to NG 400	
100	55	0.47	0.7	0.9	*)	*)	Pi 73010 DN Sm-x vst 10 Mat. no. 77925670	Pi 21010-69/PiS 3154-2.2/ Pi 73010 DN Sm-x vst 10 Mat. no. 70344729	Pi 2100 to NG 400	
100	70	0.69	0.98	*)	*)	*)	Pi 73010 DN Sm-x vst 10 Mat. no. 77925670	Pi 21010-69/PiS 3154-2.2/ Pi 73010 DN Sm-x vst 10 Mat. no. 70344729	Pi 2100 to NG 400	

*) Nominal sizes for this viscosity are not recommended
Sensible use only with a corresponding nominal size

Spare parts list:

Housing type designation	Housing gasket set	Maintenance indicator gasket set	Document
Pi 21004 - Pi 21010	Mat. no. 79774258	Mat. no. 77760309	Pi 2100 to NG 400

4.3 Overview of filter elements



Designation	Document
Filter elements for line filter according to DIN 24550	Filter elements for line filter according to DIN 24550

4.4 Overview of maintenance indicators



Designation	Document
Maintenance indicators	PiS 3154-PiS 3155 maintenance indicator

4.5 Tables of the filters for foundry machinery and plants

4.5.1 Return-line filter line installation as simplex filter

- Maximum volume flows at 43 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 17/15/11 $\rightarrow \beta_{10} (c) \geq 200$
- Complete filter designation includes visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M12x1, seals in NBR



NG	Recommended volume flow initial Δp of 0.4 bar	Resistance to collapsing Δp 20 bar replacement element	ND housing	Complete filter designation simplex filter	Document
100	32	Pi 23010 DN Smx 10 Mat. no. 77925597	63	Pi 20010-058/PiS 3154-2.2/Pi 23010 DN Smx 10 Mat. no. 70347162	Pi 2000 to NG 400
160	68	Pi 23016 DN Smx 10 Mat. no. 77925605	25	Pi 20016-058/PiS 3154-2.2/Pi 23016 DN Smx 10 Mat. no. 70347163	Pi 2000 to NG 400
250	96	Pi 23025 DN Smx 10 Mat. no. 77925613	25	Pi 20025-058/PiS 3154-2.2/Pi 23025 DN Smx 10 Mat. no. 76332449	Pi 2000 to NG 400
400	108	Pi 23040 DN Smx 10 Mat. no. 77925621	25	Pi 20040-058/PiS 3154-2.2/Pi 23040 DN Smx 10 Mat. no. 76938880	Pi 2000 to NG 400

- Maximum volume flows at 43 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 14/12/09 $\rightarrow \beta_5 (c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1

NG	Recommended volume flow initial Δp of 0.4 bar	Resistance to collapsing Δp 20 bar replacement element	ND housing	Complete filter designation with M 12x1 simplex filter	Document
100	16	Pi 21010 DN Smx 3 Mat. no. 78227472	63	Pi 20010-058/PiS 3154-2.2/Pi 21010 DN Smx 3 Mat. no. 70347164	Pi 2000 to NG 400
160	36	Pi 21016 DN Smx 3 Mat. no. 78261034	25	Pi 20016-058/PiS 3154-2.2/Pi 21016 DN Smx 3 Mat. no. 70347165	Pi 2000 to NG 400
250	56	Pi 21025 DN Smx 3 Mat. no. 78227514	25	Pi 20025-058/PiS 3154-2.2/Pi 21025 DN Smx 3 Mat. no. 70347167	Pi 2000 to NG 400
400	68	Pi 21040 DN Smx 3 Mat. no. 78227522	25	Pi 20040-058/PiS 3154-2.2/Pi 21040 DN Smx 3 Mat. no. 76952931	Pi 2000 to NG 400

Spare parts list:

Housing type designation	Housing gasket set NBR	Maintenance indicator gasket set NBR	Document
Pi 20006 - Pi 20010	Mat. no. 79328485	Mat. no. 77760309	Pi 2000 to NG 400
Pi 20016 - Pi 20040	Mat. no. 79357617	Mat. no. 77760309	Pi 2000 to NG 400

4.5.2 Pressure filter line installation as simplex filter

- Maximum volume flows at 43 mm²/s; initial Δp of the complete filter in pure state in bar
- Oil purity according to ISO 4406:1999/purity class 17/15/11 $\rightarrow \beta_{10}(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1, seals in NBR



NG	Recommended volume flow initial Δp of 0.8 bar	Resistance to collapsing Δp 210 bar replacement element	ND housing	Complete filter designation simplex filter	Document
100	44	Pi 73010 DN Smx vst 10 Mat. no. 77925670	315	Pi 30010-015/PiS 3155-5.0/Pi 73010 DN Smx vst 10 Mat. no. 76333645	Pi 3000 to NG 400
100	44	Pi 73010 DN Smx vst 10 Mat. no. 77925670	400	Pi 40010-015/PiS 3155-5.0/Pi 73006 DN Smx vst 10 Mat. no. 76321723	Pi 4000 to NG 400
160	100	Pi 73016 DN Smx vst 10 Mat. no. 77925688	200	Pi 30016-015/PiS 3155-5.0/Pi 73016 DN Smx vst 10 Mat. no. 76317259	Pi 3000 to NG 400
160	100	Pi 73016 DN Smx vst 10 Mat. no. 77925688	400	Pi 40016-015/PiS 3155-5.0/Pi 73016 DN Smx vst 10 Mat. no. 70348174	Pi 4000 to NG 400
250	144	Pi 73025 DN Smx vst 10 Mat. no. 77925696	400	Pi 423025-015/PiS 3155-5.0/Pi 73025 DN Smx vst 10 Mat. no. 70390193	Pi 4700 to NG 400
400	176	Pi 73040 DN Smx vst 10 Mat. no. 77930829	400	Pi 423040-015/PiS 3155-5.0/Pi 73040 DN Smx vst 10 Mat. no. 70390194	Pi 4700 to NG 400

- Maximale Volumenströme bei 43 mm²/s; Anfangs- Δp in bar des Kompletfilters im Reinzustand
- Ölrinheit nach ISO 4406:1999/Reinheitsklasse 14/12/09 $\rightarrow \beta_5 (c) \geq 200$
- Filterkomplettbezeichnung beinhaltet opt./elektr. Wartungsanzeige mit LED's, 2 Schaltpunkten 75/100 % und Steckverbindung M 12 x 1

NG	Recommended volume flow initial Δp of 0.8 bar	Resistance to collapsing Δp 210 bar replacement element	ND housing	Complete filter designation simplex filter	Document
100	28	Pi 71010 DN Smx vst 3 Mat. no. 78227480	315	Pi 30010-015/PiS 3155-5.0/Pi 71010 DN Smx vst 3 Mat. no. 70348167	Pi 3000 to NG 400
100	28	Pi 71010 DN Smx vst 3 Mat. no. 78227480	400	Pi 40010-015/PiS 3155-5.0/Pi 71006 DN Smx vst 3 Mat. no. 70348176	Pi 4000 to NG 400
160	56	Pi 71016 DN Smx vst 3 Mat. no. 77940638	200	Pi 30016-015/PiS 3155-5.0/Pi 71016 DN Smx vst 3 Mat. no. 70348170	Pi 3000 to NG 400
160	56	Pi 71016 DN Smx vst 3 Mat. no. 77940638	400	Pi 40016-015/PiS 3155-5.0/Pi 71016 DN Smx vst 3 Mat. no. 70348177	Pi 4000 to NG 400
250	96	Pi 71025 DN Smx vst 3 Mat. no. 77940646	400	Pi 423025-015/PiS 3155-5.0/Pi 71025 DN Smx vst 3 Mat. no. 70390195	Pi 4700 to NG 400
400	144	Pi 71040 DN Smx vst 3 Mat. no. 77940653	400	Pi 423040-015/PiS 3155-5.0/Pi 71040 DN Smx vst 3 Mat. no. 70390196	Pi 4700 to NG 400

Spare parts list:

Housing type designation	Housing gasket set NBR	Maintenance indicator gasket set NBR	Document
Pi 30010	Mat. no. 78383747	Mat. no. 77760275	Pi 3000 to NG 400
Pi 30016 - Pi 30040	Mat. no. 78383770	Mat. no. 77760275	Pi 3000 to NG 400
Pi 40010	Mat. no. 78383804	Mat. no. 77760275	Pi 4000 to NG 400
Pi 40016 - Pi 40040	Mat. no. 78383838	Mat. no. 77760275	Pi 4000 to NG 400
Pi 423016 - Pi 423040	Mat. no. 70382630	Mat. no. 77760275	Pi 4230 to NG 400

4.5.3 Bypass filter line installation as simplex filter

- Recommended volume flows for the circulation pump for bypass filtration:
 - Design viscosity: 43 mm²/s
 - Max. initial Δp : 0.15 bar
- Oil purity according to ISO 4406:1999/purity class 14/12/09 $\rightarrow \beta_5(c) \geq 200$
- The complete filter designation includes the visual/electr. maintenance indicator with LEDs, 2 setting points 75/100 % and connector M 12 x 1



NG	Recommended circulating performance of the pump Qp in l/min	Tank capacity in litres	Filter area in cm ²	Resistance to collapsing Δp 10 bar replacement element	Complete filter designation	Document
350	20 - 60	>400	13515	1 piece Mat. no. 77924194	Pi 15035/10-069/PiS 3154/-2.2/Pi 21063 RN Smx 3 Mat. no. 76357040	Pi 1500
600	50 - 120	>1000	27030	2 piece Mat. no. 77924194	Pi 15060/10-069/PiS 3154/-2.2/2 x Pi 21063 RN Smx 3 Mat. no. 70348244	Pi 1500

Spare parts list:

Housing type designation	Housing gasket set	Maintenance indicator gasket set	Document
Pi 15035/10	Mat. no. 77831407	Mat. no. 77760309	Pi 1500
Pi 15060/10	Mat. no. 77831407	Mat. no. 77760309	Pi 1500

4.5.4 Breather filter according to DIN 24557 with filling protection

- for container volumes < 1000 litre



Complete filter designation	NG	Fineness of filter in µm	Oil oscillating volume	Order reference replacement element	Document
Pi 0125 Sm-L/UM-OS Mat. no. 7639169	1000	3	230	852 519 Sm-L 3x package Mat. no. 77643554	Pi 0101-Pi 0185

Ersatzteilliste:

Designation	Document
Cover with maintenance indicator Mat. no. 79343013	Pi 0101-Pi 0185

4.5.5 Filling filter

The assembly units must be filled and refilled exclusively via the system filter.

A filling filter is to be provided as a simplex return-line filter according to DIN 24550 of the NG 100 if required. See point 4.1.1.1.

5 Data sheets

→ Access data sheets via the respective hyperlink in the relevant tables.