



**Approved Parts List**  
for the  
**Parts Manufacture**  
**Chassis, Transmission, Engine**  
**of the Volkswagen Group**

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

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**1. Index of revisions:**

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		Description of PDF-Documents	5
		Components	6
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		Approved part list renamed:	1
		„Parts Manufacture Chassis, Transmission, Engine“	1
		Extension Wolfsburg site	1
		Componenten in foundry	37

## 2. Contacts:

### Main contact for Volkswagen Group and Volkswagen AG, Volkswagen Sachsen GmbH

HYDAC INTERNATIONAL GmbH  
**Herr Matthias Sievert**  
Außenbüro Nord  
Kirchhorster Str. 39  
30659 Hannover  
Phone: +49 (0) 511 56 3535 18  
Fax.: +49 (0) 511 56 3535 56  
E-Mail: [matthias.sievert@hydac.com](mailto:matthias.sievert@hydac.com)

### Contact for AUDI AG, Hungary

HYDAC INTERNATIONAL GmbH  
**Herr Janos Vig**  
HYDAC Hidraulika és Szűrőtechnika Kft.  
Jász u. 152/A  
1131 Budapest  
Phone: +36 1 359 93 59  
Fax: +36 1 239 73 02  
E-Mail: [hydac@axelero.hu](mailto:hydac@axelero.hu)

### Contact for Volkswagen Kassel, Germany

HYDAC INTERNATIONAL GmbH  
**Herr Jörg Kornhaas**  
Technisches Vertriebsbüro Mitte  
Dieselstraße 9  
64293 Darmstadt  
Phone: +49 (0) 6151 81 45 0  
Fax.: +49 (0) 6151 81 45 22  
E-Mail: [joerg.kornhaass@hydac.com](mailto:joerg.kornhaass@hydac.com)

### Contact for Skoda Auto in Mlada Boleslav

HYDAC INTERNATIONAL GmbH  
**Herr Milan Juza**  
HYDAC spol. s.r.o.  
Chýnovská 535  
39111 Planá nad Luznici  
Phone: +420 361 891412  
Fax.: +420 361 891270  
E-Mail: [juza.milan@hydac.cz](mailto:juza.milan@hydac.cz)

### Contact for Volkswagen Chemnitz, Germany

HYDAC INTERNATIONAL GmbH  
**Herr Stefan Weiser**  
Außenbüro Südost  
Wiesestraße 189  
07551 Gera  
Phone: +49 (0) 73 97 325  
Fax.: +49 (0) 73 97 600  
E-Mail: [stefan.weiser@hydac.com](mailto:stefan.weiser@hydac.com)

### Contact for Volkswagen Motor Polska in Polkowice

HYDAC INTERNATIONAL GmbH  
**Herr Marek Czaban**  
HYDAC Sp. z o.o.  
ul. Grabiszynska 281  
PL 53-234 Wrocław  
Phone: +48 (0) 71 360 91 46  
Fax: +48 (0) 71 360 91 45  
E-Mail: [wroclaw@hydac.com.pl](mailto:wroclaw@hydac.com.pl)

### Contact for AUDI AG, Germany

HYDAC INTERNATIONAL GmbH  
**Herr Detlef Sonntag**  
Außenbüro Nürnberg  
Ginsterweg 4  
91227 Leinburg  
Phone: +49 (0) 9120 18490  
Fax.: +49 (0) 9120 6139  
E-Mail: [detlef.sonntag@hydac.com](mailto:detlef.sonntag@hydac.com)

### **3. Notes:**

The HYDAC components listed here contribute to standardised purchasing and warehousing in the parts manufacturing plants of Volkswagen AG.

For plants using HFC-fluids components have to be selected from appendix 'Componenten in the foundry' (page 37).

The approved parts list is compiled and maintained by the Automotive Fluid Engineering Department within HYDAC International GmbH.

The contents and layout of the approved parts list were compiled in a joint venture between HYDAC and Volkswagen AG.


**4. Overview of the approved components:**

**4.1 HYDRAULICS**


**4.1.1 Energy conversion / Bell pump housings**

**HYDAC ACCESSORIES GmbH – Product group: Bell housings**


**4.1.1.1 Bell housing with flexible pump mounting**

<b>TYPE</b> 	<b>Product description</b>	<b>Part No.</b>	<b>Catalog</b>
Bell housing with flexible pump mounting PT	200 - 660	acc. to type	5.601.14


**4.1.1.2 Rigid bell housing**

<b>TYPE</b> 	<b>Product description</b>	<b>Part No.</b>	<b>Catalog</b>
Rigid bell housing PTS	160 - 800	acc. to type	5.601.14


**4.1.1.3 Bell housing foot brackets**

<b>TYPE</b> 	<b>Product description</b>	<b>Part No.</b>	<b>Catalog</b>
Bell housing foot brackets PF	160 - 660	acc. to type	5.601.14


**4.1.1.4 Damping rails**

<b>TYPE</b> 	<b>Product description</b>	<b>Part No.</b>	<b>Catalog</b>
Damping rails MDS for E-Motor:	071 - 315	acc. to type	5.601.14
Damping rails FDS for bell housing foot brackets	160 - 660	acc. to type	


**4.1.1.5 Damping rings**

<b>TYPE</b> 	<b>Product description</b>	<b>Part No.</b>	<b>Catalog</b>
Damping rings DFR	200 - 660	acc. to type	5.601.14

**4.1.1.6 Torsionally flexible couplings**

<b>TYPE</b> 	<b>Product description</b>	<b>Part No.</b>	<b>Catalog</b>
Coupling	14 - 100	acc. to type	5.601.14

**4.1.1.7 Double cardanic curved-tooth gear coupling**

<b>TYPE</b> 	<b>Product description</b>	<b>Part No.</b>	<b>Catalog</b>
Coupling	14 - 55	acc. to type	5.601.14

All bell housings, couplings and accessories can also be used with HFC fluids.


**4.1.2 Energy conversion**

**4.1.2.1 Hydraulic pressure tanks**

**4.1.2.1.1 Air breather filters**

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

- Tank breather filter BF 7 acc. to DIN 24 557, with filling protection and changeable element
- Visual analog clogging indicator

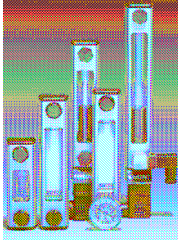
TYPE	Connection	Part No.	Catalog
	Interface acc to DIN 24557/Part2	1283103	7.400
Replacement element: 0007 L 003 P	-	310948	

**4.1.2.1.2 Filling level indicators**

**HYDAC ACCESSORIES GmbH – Product group: Bell housings**

**Fluid indicators with**

- MIN / MAX markings
- Integrated inspection glass for visual monitoring of filling level

<b>TYPE</b> 	<b>Sealing material</b>	<b>Temperature indicator</b>	<b>Mounting</b>	<b>Catalog</b>
FSA-076-1.X/-/12	NBR (1.X) FKM (2.X)	none	M 10 M 12	D 5.050.8/09.03
FSA-127-1.X/-/12	NBR (1.X) FKM (2.X)	none	M 10 M 12	D 5.050.8/09.03
FSA-176-1.X/-/12	NBR (1.X) FKM (2.X)	none	M 10 M 12	D 5.050.8/09.03
FSA-254-1.X/-/12	NBR (1.X) FKM (2.X)	none	M 10 M 12	D 5.050.8/09.03
FSA-381-1.X/-/12	NBR (1.X) FKM (2.X)	none	M 10 M 12	D 5.050.8/09.03


**4.1.2.2 Hydraulics accumulators**

**HYDAC TECHNOLOGY GmbH – Product group: Accumulator Division**

**4.1.2.2.1 Standard bladder accumulators**

**Type:** SB330

- Features:**
- Permissible operating pressure: 330 bar
  - Permissible operating temperature: -10 / +80 °C
  - Material of bladder / accumulator shell: NBR / carbon steel


<b>TYPE</b>  	<b>Nominal volume</b>  <b>V [liters]</b>	<b>Fluid - side connection (internal thread accord. to ISO228)</b>	<b>Max. hydr. flow rate</b>  <b>Q [l/sec]</b>	<b>Part No.</b>  <b>SB330</b>	<b>Catalog</b>
SB330-1A1/112U-330A	1	G 3/4	4	3047162	3.201.
SB330-2.5A1/112U-330A	2.5	G 1 1/4	10	3047165	
SB330-4A1/112U-330A	4	G 1 1/4	10	3047166	
SB330-10A1/112U-330A	10	G 2	15	3047172	
SB330-20A1/112U-330A	20	G 2	15	3047174	
SB330-32A1/112U-330A	32	G 2	15	3047176	

Bladder accumulators SB can also be used with HFC fluids.

**4.1.2.2.2 Standard diaphragm accumulators**

Type: SBO


For workingpiece clamping

TYPE 	Nominal volume  V [liters]	Fluid - side connection (internal thread accord. to ISO228)	Max. hydr. flow rate  Q [l/sec]	Part No.  SBO	Catalog
Diaphragm accumulators < 1 liter and Safety and shut-off blocks for workingpiece clamping have to be used from HYDAC catalog.					3.100. 3.551.

Diaphragm accumulators SB can also be used with HFC fluids.

**Mounting elements for hydraulic accumulators**

Clamps, consoles and rubber support rings  
 for **Bladder accumulators, SB**

<b>TYPE</b> 	<b>Descrip tion</b>	<b>Type/ volume</b>	<b>Qty. (depen ds on accumu lator type)</b>	<b>Part No.  Mounting element</b>	<b>Catalog</b>
HyRac 110-118 ST	SB clamp	SB330 / 1 liter	1	445042	3.502.
HyRac 110-118 ST	SB clamp	SB330 / 2.5 liters	2	445042	
HyRac 167-175 ST	SB clamp	SB330 / 4 liters	1	445043	
HyRac 223-230 ST	SB clamp	SB330 / 10 liters	1	445048	
HyRac 223-230 ST	SB clamp	SB330 / 20 liters	1	445048	
HyRac 223-230 ST	SB clamp	SB330 / 32 liters	2	445048	
KBK 167	SB console	SB330 / 4 liters	1	238526	
G 167 (NBR)	SB rubber support ring	SB330 / 4 liters	1	236997	
KBK 222	SB console	SB330 / 10 - 50 liters	1	3002160	
G 222 (NBR)	SB rubber support ring	SB330 / 10 - 50 liters	1	236996	


HyRac mounting elements can also be used with HFC fluids.

**4.1.2.2.4 Safety and shut-off blocks**

with appropriate S-adaptor


**(Accumulator → SAF) Type: SAF...E**

- Features:**
- Nominal size of main shut-off valve:  
SAF10 = DN10, SAF20 = DN20, SAF32 = DN32
  - Solelloid-operated and manual discharge
  - Max. flow rate of pressure relief valve: 110 l/min. accord. to DGRL 97/23/EG

<p><b>TYPE</b></p> 	<p><b>S-adaptor accumulator → SAF</b></p> <p><b>(Part No. of S-adaptor)</b></p>	<p><b>For accumulator type</b></p>	<p><b>For accumulator type (Pressure range/ volume)</b></p>	<p><b>Part No. SAF</b></p>	<p><b>Catalog</b></p>
<p>SAF10E12Y1T330A</p>	<p>S10 (369479)</p>	<p>Bladder accumulators</p>	<p>330 bar / 1 liter</p>	<p>2122211</p>	<p>3.551.</p>
	<p>S12 (369480)</p>		<p>330 bar / 2.5 – 5 liters</p>		
	<p>S13 (369481)</p>		<p>330 bar / 10 – 50 liters</p>		
<p>SAF20E12Y1T330A</p>	<p>S10 (369479)</p>	<p>Bladder accumulators</p>	<p>330 bar / 1 liter</p>	<p>2120394</p>	
	<p>S12 (369480)</p>		<p>330 bar / 2.5 – 5 liters</p>		
	<p>S13 (369481)</p>		<p>330 bar / 10 – 50 liters</p>		
<p>SAF32E12Y1T330A</p>	<p>S309 (366715)</p>	<p>Bladder accumulators</p>	<p>330 bar / 10 – 50 liters</p>	<p>2120371</p>	

**4.1.2.2.5 Universal charging and testing units**

**Type:** FPU-1

<b>TYPE</b> 	<b>Pressure gauge indication range</b>	<b>Part No.</b>  <b>FPU-1</b>	<b>Catalog</b>
FPU-1-010F2.5A3K	0 – 10 bar	2115365	3.501.
FPU-1-025F2.5A3K	0 – 25 bar	2114305	
FPU-1-100F2.5A3K	0 – 100 bar	2115314	
FPU-1-250F2.5A3K	0 – 250 bar	2114302	
FPU-1-400F2.5A3K	0 – 400 bar	2114307	

Universal charging and testing units FPU can also be used with HFC fluids.

**4.1.2.2 Hydraulic filters**


**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

**4.1.2.3.1 Pressure filters**

**4.1.2.3.1.1 NG 100**



**SINGLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching-point

TYPE		Q (l/min)	Pressure range connection	Part No.	Catalog
	<b>DFN</b>				
FILTER DFN BH/HC 100 S D 3 LZ 1.1 /-AV DFN BH/HC 100 S D 10 LZ 1.1 /-AV		30 55	210 bar G 1	1288815 1285716	7.557
FILTER DFN BH/HC 100 S D 3 LZ 1.1 /-AV DFN BH/HC 100 S D 10 LZ 1.1 /-AV		30 55	315 bar G 1	1288815 1285716	7.557
Replacement element: 0100 DN 003 BH/HC				319494	
Replacement element: 0100 DN 010 BH/HC				319496	

**DOUBLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75 % and 100% switching point.


TYPE	 	Q (l/min)	Pressure range connection	Part No.	Catalog
	<b>FMND</b> <b>DFDKN</b>				
FILTER FMND BH/HC 100 MDD 3 LZ 1.0 /-AV FMND BH/HC 100 MDD 10 LZ 1.0 /-AV		30 55	250 bar G 1	1288818 1288819	7.564
FILTER DFDKN BH/HC 100 QAD 3 LZ 1.0 /-AV DFDKN BH/HC 100 QAD 10 LZ 1.0 /-AV		30 55	315 bar G 1	1288820 1288821	
Replacement element: 0100 DN 003 BH/HC				319494	
Replacement element: 0100 DN 010 BH/HC				319496	

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

**4.1.2.3.1.2 NG 160**



**SIMPLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point

TYPE		Q (l/min)	Pressure range connection	Part No.	Catalog
	<b>DFN</b>				
FILTER		80	210 bar	1288824	7.557
DFN BH/HC 160 L E 3 LZ 1.1 /-AV		125	G 1 ¼	1288825	
DFN BH/HC 160 L E 10 LZ 1.1 /-AV				1268871	
Replacement element: 0160 DN 003 BH/HC				1268873	
Replacement element: 0160 DN 010 BH/HC					

**DOUBLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point


TYPE			Q (l/min)	Pressure range connection	Part No.	Catalog
	<b>FMND</b>	<b>DFDKN</b>				
FILTER			80	210 bar	1282450	7.564
FMND BH/HC 160 LDE 3 LZ 1.0 /-AV			125	G 1 ¼	1282453	
FMND BH/HC 160 LDE 10 LZ 1.0 /-AV					1282451	
FILTER			80	315 bar	1282454	
DFDKN BH/HC 160 QAE 3 LZ 1.0 /-AV			125	G 1 ¼	1282454	
DFDKN BH/HC 160 QAE 10 LZ 1.0 /-AV					1268871	
Replacement element: 0160 DN 003 BH/HC					1268873	
Replacement element: 0160 DN 010 BH/HC						

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

**4.1.2.3.1.3 NG 250**



**SIMPLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point

TYPE	Q (l/min)	Pressure range connection	Part No.	Catalog
 <p><b>DFN</b></p>				
FILTER				7.557
DFN BH/HC 250 S F 3 LZ 1.0 /-AV	120	210 bar	1288828	
DFN BH/HC 250 S F 10 LZ 1.0 /-AV	160	G 1 ½	1288829	
FILTER				7.557
DFN BH/HC 250 S F 3 LZ 1.0 /-AV	120	315 bar	1288828	
DFN BH/HC 250 S F 10 LZ 1.0 /-AV	160	G 1 ½	1288829	
Replacement element: 0250 DN 003 BH/HC			319498	
Replacement element: 0250 DN 010 BH/HC			319500	

**DOUBLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point


TYPE	Q (l/min)	Pressure range connection	Part No.	Catalog
  <p><b>FMND</b>                      <b>DFDKN</b></p>				
FILTER				7.564
FMND BH/HC 250 LDF 3 LZ 1.0 /-AV	120	210 bar	1282456	
FMND BH/HC 250 LDF 10 LZ 1.0 /-AV	160	G 1 ½	1282459	
FILTER				
DFDKN BH/HC 250 QAF 3 LZ 1.0 /-AV	120	315 bar	1282457	
DFDKN BH/HC 250 QAF 10 LZ 1.0 /-AV	160	G 1 ½	1282460	
Replacement element: 0250 DN 003 BH/HC			319498	
Replacement element: 0250 DN 010 BH/HC			319500	

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

**4.1.2.3.1.4 NG 400**


**SINGLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point

TYPE	Q (l/min)	Pressure range connectio n	Part No.	Catalog
 <p style="text-align: center;"><b>DFN</b></p>				
FILTER				7.557
DFN BH/HC 400 L K 3 LZ 1.0 /-AV	170	210 bar	1288832	
DFN BH/HC 400 L K 10 LZ 1.0 /-AV	210	DN 38	1288833	
Replacement element: 0400 DN 003 BH/HC			1265323	
Replacement element: 0400 DN 010 BH/HC			1265325	

**DOUBLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point

TYPE	Q (l/min)	Pressure range connectio n	Part No.	Catalog
 <p style="text-align: center;"><b>FMND</b></p>  <p style="text-align: center;"><b>DFDKN</b></p>				
FILTER				7.564
FMND BH/HC 400 LDK 3 LZ 1.0 /-AV	170	210 bar	1282462	
FMND BH/HC 400 LDK 10 LZ 1.0 /-AV	210	DN 38	1282464	
Replacement element: 0400 DN 003 BH/HC			1265323	
Replacement element: 0400 DN 010 BH/HC			1265325	


**4.1.2.3.2 Return line filters**

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

**4.1.2.3.2.1 NG 100**


**SINGLE FILTERS**

- with bypass valve
- with **low pressure**-stable filter element
- visual/ electronic clogging indicator with 75% and 100% switching point

TYPE	Q (l/min)	Pressure range connection	Part No.	Catalog
 <p style="text-align: center;"><b>LFN</b></p>				
FILTER LFN BN/HC 100 I D 3 LZ 2.0 /-AV-A2.5-B3,5 LFN BN/HC 100 I D 10 LZ 2.0 /-AV-A2.5-B3,5	15 30	25 bar G 1	1290697 1290698	7.557
Replacement element: 0100 DN 003 BN/HC			319482	
Replacement element: 0100 DN 010 BN/HC			319484	

**DOUBLE FILTERS**

- with bypass valve
- with **low pressure**-stable filter element
- visual / electronic clogging indicator with 75% and 100% switching point


TYPE	Q (l/min)	Pressure range connection	Part No.	Catalog
 <p style="text-align: center;"><b>FLND</b></p>				
FILTER FLND BN/HC 100 FDD 3 LZ 1.1 /-AV-A2.5-B3,5 FLND BN/HC 100 FDD 10 LZ 1.1 /-AV-A2.5-B3,5	15 30	63 bar G 1	1290705 1290706	7.561
Replacement element: 0100 DN 003 BN/HC			319482	
Replacement element: 0100 DN 010 BN/HC			319484	

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

**4.1.2.3.2.2 NG 160**


**SINGLE FILTERS**

- **with** bypass valve
- with **low pressure**-stable filter element
- visual / electronic clogging indicator with 75% and 100% switching point

<b>TYPE</b>  <b>FLN</b>	<b>Q (l/min)</b>	<b>Pressure range connectio n</b>	<b>Part No.</b>	<b>Catalog</b>
FILTER FLN BN/HC 160 D E 3 LZ 1.1 /-AV-A2.5-B3,5 FLN BN/HC 160 D E 10 LZ 1.1 /-AV-A2.5-B3,5	40 70	25 bar G 1 ¼	1290707 1290708	7.562
Replacement element: 0160 DN 003 BN/HC			1268867	
Replacement element: 0160 DN 010 BN/HC			1268869	

**DOUBLE FILTERS**

- **without** bypass valve
- with **high pressure**-stable filter element
- visual / electronic clogging indicator with 75% and 100% switching point


<b>TYPE</b>  <b>FLND</b>	<b>Q (l/min)</b>	<b>Pressure range connectio n</b>	<b>Part No.</b>	<b>Catalog</b>
FILTER FLND BN/HC 160 DDE 3 LZ 1.1 /-AV-A2.5-B3,5 FLND BN/HC 160 DDE 10 LZ 1.1 /-AV-A2.5-B3,5	40 70	25 bar G 1 ¼	1290709 1290710	7.561
Replacement element: 0160 DN 003 BN/HC			1268867	
Replacement element: 0160 DN 010 BN/HC			1268869	

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**


**4.1.2.3.2.3 NG 250**

**SINGLE FILTERS**

- **with** bypass valve
- with **low pressure**-stable filter element
- visual / electronic clogging indicator with 75% and 100% switching point

<b>TYPE</b>  <b>FLN</b>	<b>Q (l/min)</b>	<b>Pressure range connectio n</b>	<b>Part No.</b>	<b>Catalog</b>
FILTER FLN BN/HC 250 D F 3 LZ 1.1 /-AV-A2.5-B3,5 FLN BN/HC 250 D F 10 LZ 1.1 /-AV-A2.5-B3,5	55 95	25 bar G 1 ½	1290711 1290712	7.562
Replacement element: 0250 DN 003 BN/HC			319486	
Replacement element: 0250 DN 010 BN/HC			319488	

- **DOUBLE FILTERS with** bypass valve
- with **low pressure**-stable filter element
- visual / electronic clogging indicator with 75% and 100% switching point


<b>TYPE</b>  <b>FLND</b>	<b>Q (l/min)</b>	<b>Pressure range connectio n</b>	<b>Part No.</b>	<b>Catalog</b>
FILTER FLND BN/HC 250 DDF 3 LZ 1.1 /-AV-A2.5-B3,5 FLND BN/HC 250 DDF 10 LZ 1.1 /-AV-A2.5-B3,5	55 95	25 bar G 1 ½	1290713 1290714	7.561
Replacement element: 0250 DN 003 BN/HC			319486	
Replacement element: 0250 DN 010 BN/HC			319488	

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**


**4.1.2.3.2.4 NG 400**

**SINGLE FILTERS**

- **with** bypass valve
- with **low pressure**-stable filter element
- visual / electronic clogging indicator with 75% and 100% switching point

TYPE	Q (l/min)	Pressure range connectio n	Part No.	Catalog
 <b>FLN</b>				
FILTER FLN BN/HC 400 D K 3 LZ 1.1 /-AV-A2.5-B3,5 FLN BN/HC 400 D K 10 LZ 1.1 /-AV-A2.5-B3,5	85 130	25 bar DN 38	1290715 1290716	7.562
Replacement element: 0400 DN 003 BN/HC			1250531	
Replacement element: 0400 DN 010 BN/HC			1250530	

- **DOUBLE FILTERS** with bypass valve
- with **low pressure**-stable filter element
- visual / electronic clogging indicator with 75% and 100% switching point

TYPE	Q (l/min)	Pressure range connectio n	Part No.	Catalog
				
FILTER FLND BN/HC 400 DDK 3 LZ 1.1 /-AV-A2.5-B3,5 FLND BN/HC 400 DDK 10 LZ 1.1 /-AV-A2.5-B3,5	85 130	25 bar DN 38	1290717 1290718	7.561
Replacement element: 0400 DN 003 BN/HC			1250531	
Replacement element: 0400 DN 010 BN/HC			1250530	


**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

**4.1.2.3.3 Off-line filters**

**4.1.2.3.3.1 NG 400**

**SINGLE FILTERS**

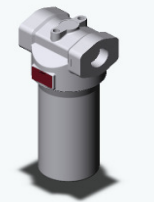
- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point

TYPE		FLN	Q (l/min)	Pressure range connection	Part No.	Catalog
FILTER FLN BN/HC 400 D E 3 LZ 2.0 /-AV Replacement element: 0400 DN 003 BN/HC			<800 l Tank	25 bar G 1 ¼	1282473 1250531	7.562

**4.1.2.3.3.2 NG 630**

**SINGLE FILTERS**

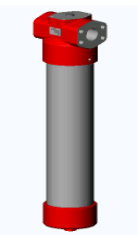
- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point

TYPE		FLN	Q (l/min)	Pressure range connection	Part No.	Catalog
FILTER FLN BN/HC 600 D E 3 LZ 1.0 /-AV Replacement element: 0600 DN 003 BN3HC			<1250 l Tank	25 bar G 1 ¼	1290695 1289052	7.562

**4.1.2.3.3.3 NG 1000**

**SINGLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point


TYPE		DF	Q (l/min)	Pressure range connection	Part No.	Catalog
FILTER DF BN/HC 1500 T L 3 LZ 2.0 /-AV Replacement element: 1500 D 003 BN3HC			<1250 l Tank	420 bar SAEDN 50	1289054 1288553	7.501

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

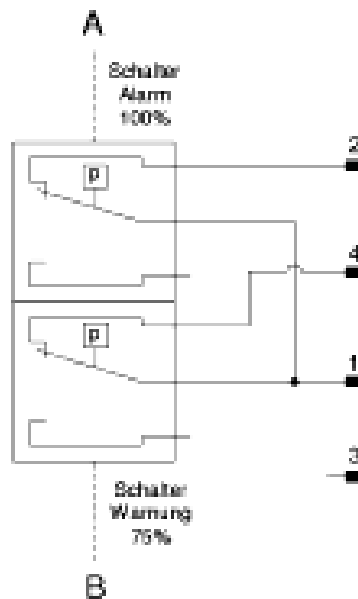
**4.1.2.3.4 Accessories: clogging indicators**

**Visual / electronic clogging indicator LZ**

- Visual, red pin and 1 electrical switch contact at 75% and at 100% of cracking pressure

TYP	Application	Function cracking pressure	Part No.	Catalog
 <p style="text-align: center;"><b>VD</b></p>				
CLOGGING INDICATOR		N/O or N/C contacts		7.050
VD 2,5 LZ.1 /-AV	Return line filter	2,5 bar	1291130	
VD 5 LZ.1 /-AV	Pressure and Off-line filter	5 bar	1267697	
VD 8 LZ.1 /-AV	Pressure filter DFDKN	8 bar	317064	


Clogging indicators LZ can also be used with HFC fluids.



HYDAC COOLING GmbH – Product group: Cooling systems

**4.1.2.4 HEAT EXCHANGERS**

**4.1.2.4.1 Cooling system for motor spindle**

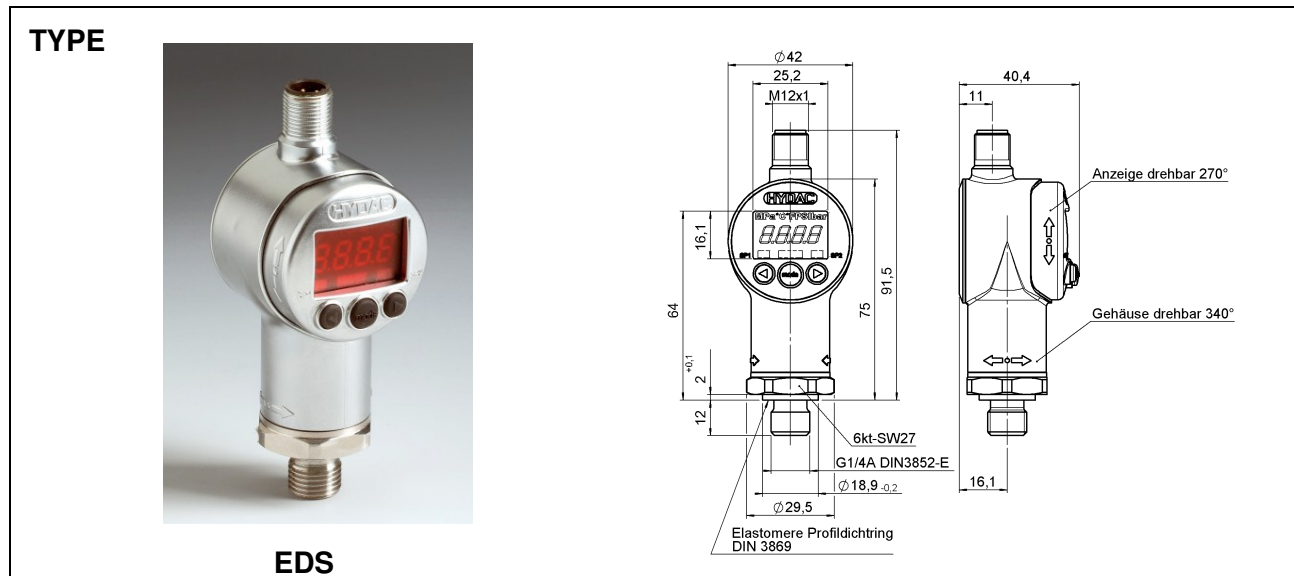
<p><b>TYPE</b></p>  <p><b>FWKS</b></p>	<p><b>Product description</b></p>	<p><b>Part No.</b></p>	<p><b>Catalog</b></p>
<p>FWKS – 2/1.1/W/TP/400-50/WP24-20/3/56(VW)</p>	<p>1 – 20 kW</p>	<p>3222255</p>	<p>on request</p>
<p>FWKS-3/2.0/W/MTH2-6/400-50/615-40/0/56</p>	<p>bis 60 kW</p>	<p>3447086</p>	<p>3447086</p>

**SENSORS AND MEASUREMENT TECHNOLOGY**

**HYDAC ELEKTRONIK GmbH – Product area: Hydraulics**

**4.1.3.1 Pressure switch, electronic**

**Electronic pressure switch EDS 3000**



**DC pnp, 2x Programmable switching contact Type C / Type O**

G1/4 A, 4-digit alphanumeric display, M12 connection

TYPE	Measurement range	Part No.	Catalog
EDS 3446-2-0100-000	0.. 100 bar	908129	D18.060.0
EDS 3446-2-0250-000	0.. 250 bar	908164	D18.060.0
EDS 3446-2-0400-000	0.. 400 bar	908168	D18.060.0

**DC pnp, 1x Programmable switching contact Type C / Type O, 1x 4..20mA / 0..10V analog**

G1/4 A, 4-digit alphanumeric display, M12-connection

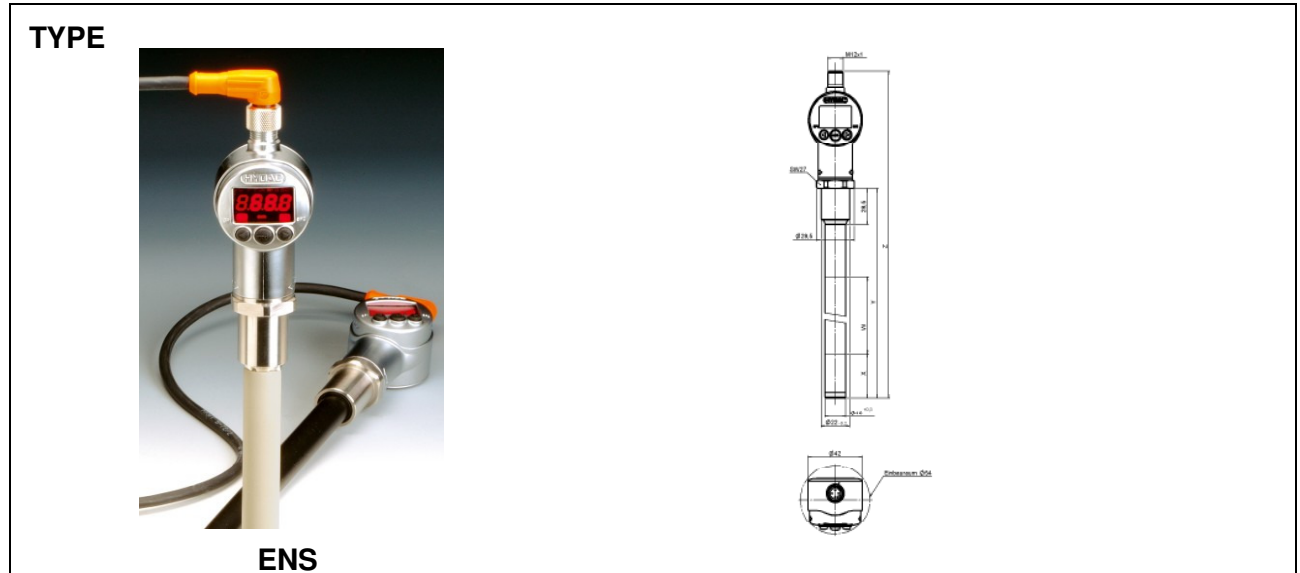
TYPE	Measurement range	Part No.	Catalog
EDS 3446-3-0100-000	0.. 100 bar	908161	D18.060.0
EDS 3446-3-0250-000	0.. 250 bar	908165	D18.060.0
EDS 3446-3-0400-000	0.. 400 bar	908000	D18.060.0

Electronic pressure switches EDS can also be used with HFC fluids.

**HYDAC ELEKTRONIK GmbH - Product area: Hydraulics**

**4.1.3.2 Filling level switch**

**Electronic level switch ENS 3000**



**DC pnp, 2x Programmable switching contact Type C / Type O**

adjustable to oil or water-based fluids, M12 connection 4-pole

TYPE	Sensor length	Part No.	Catalog
ENS 3216-2-0250-000-K	250mm	909207	D18.061.0
ENS 3216-2-0410-000-K	410mm	909213	D18.061.0
ENS 3216-2-0520-000-K	520mm	909219	D18.061.0

**DC pnp, 4x Programmable switching contact Type C / Type O**

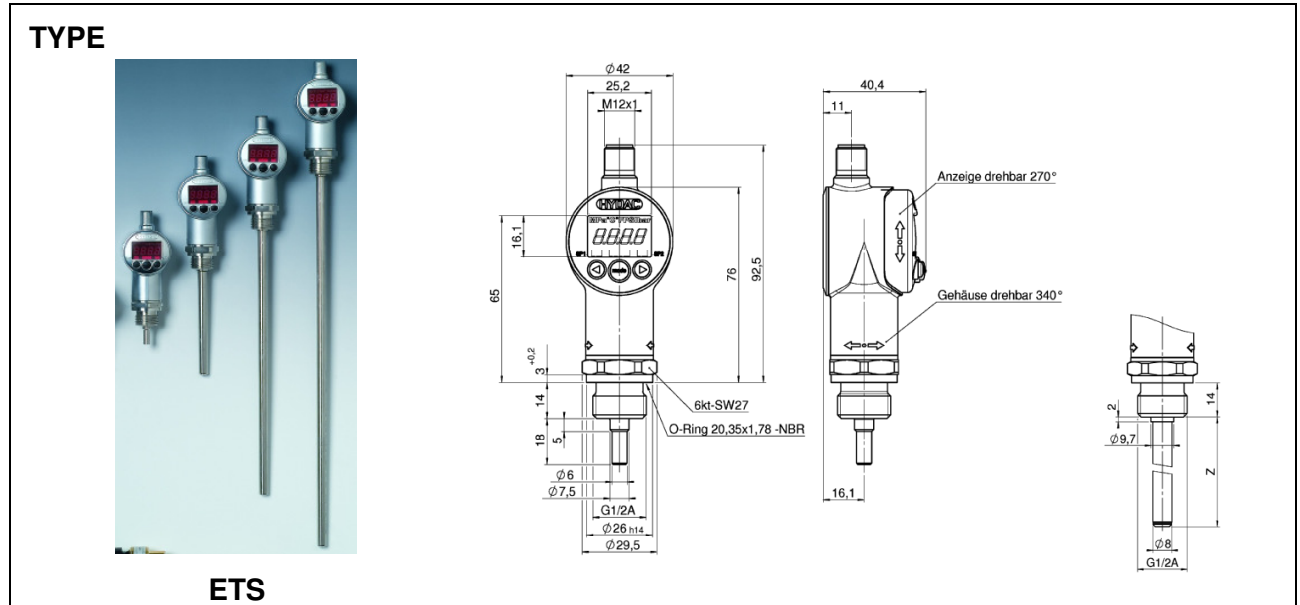
adjustable to oil or water-based fluids, M12 connection 8-pole  
Specified for level sensor technology only!

TYPE	Sensor length	Part No.	Catalog
ENS 311P-8-0250-000-K	250mm	909830	D18.061.0
ENS 311P-8-0410-000-K	410mm	909828	D18.061.0
ENS 311P-8-0520-000-K	520mm	909829	D18.061.0

**HYDAC ELEKTRONIK GmbH - Product area: Hydraulics**

**4.1.3.3 Temperature switch, electronic**

**Electronic temperature switch ETS 3000**



**DC pnp, 2x Programmable switching contact Type C / Type O**

Measurement range: -25...+100 °C, M12 connection 4-pole

TYPE	Sensor length	Part No.	Catalog
ETS 3226-2-100-000	100mm	909618	D18.319.0
ETS 3226-2-250-000	250mm	909619	D18.319.0
ETS 3226-2-350-000	350mm	909620	D18.319.0

Electronic temperature switches ETS can also be used with HFC fluids.


**4.2 LUBRICATION TECHNOLOGY / CENTRAL LUBRICATION UNIT**

**4.2.1 Lubrication oil filter 10 µm absolute**

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

**SINGLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point

TYPE	Q (l/min)	Pressure range connection	Part No.	Catalog
 <b>LFN</b>				
FILTER LFN BN/HC 40 I B 10 LZ 2.0 /-AV Replacement element: 0040 DN 010 BN/HC	15	100 bar G 1/2	1288844 1263637	7.557
FILTER LFN BN/HC 100 I D 10 LZ 2.0 /-AV Replacement element: 0100 DN 010 BN/HC	70	100 bar G 1	1288848 319484	7.557

**Filter design:**


NG	Q in l/min	Viscosities				
		10	22	33	46	68
		Starting-Δp in bar				
		Δp	Δp	Δp	Δp	Δp
40	15	0.07	0.13	0.17	0.23	0.29
	20	0.10	0.17	0.23	0.31	0.39
	25	0.13	0.22	0.30	0.39	0.55
100	40	0.17	0.24	0.30	0.37	0.48
	55	0.27	0.36	0.44	0.54	0.70
	70	0.39	0.50	0.61	0.73	0.93

**Lubrication filters 10 µm absolute**

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

**SINGLE FILTERS**

- without bypass valve
- visual / electronic clogging indicator with 75% and 100% switching point

TYPE	Q (l/min)	Pressure range connection	Part No.	Catalog
 <p><b>FLND</b></p>				
FILTER FLND BN/HC 40 FDB 10 LZ 1.0 /-AV	15	63 bar G 1/2	1282481	7.561
Replacement element: 0040 DN 010 BN/HC			1263637	
FILTER FLND BN/HC 100 FDD 10 LZ 1.0 /-AV	70	63 bar G 1	1282485	7.561
Replacement element: 0100 DN 010 BN/HC			319484	

**Filter design:**

NG	Q in l/min	Viscosities				
		10	22	33	46	68
		Starting-Δp in bar				
		Δp	Δp	Δp	Δp	Δp
40	15	0.10	0.16	0.20	0.26	0.35
	20	0.15	0.22	0.29	0.36	0.49
	25	0.21	0.30	0.37	0.47	0.63
100	40	0.36	0.42	0.48	0.55	0.67
	55	0.61	0.70	0.78	0.87	1.03
	70	0.92	1.03	1.14	*	*


\* Nominal size for this viscosity not recommended.

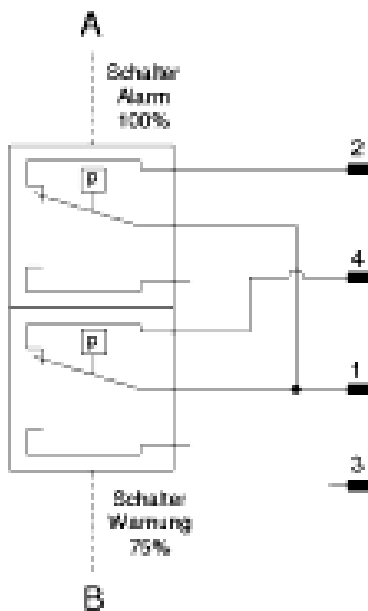
**4.2.2 Accessories: clogging indicators**

**HYDAC FILTERTECHNIK GmbH – Product group: Fluid filters**

**Visual-electrical clogging indicator LZ**

- Visual, red pin and 1 electrical contact at 75%  
And at 100% of the cracking pressure

TYPE	Function cracking pressure	Part No.	Catalog
<div style="text-align: center;">  <p><b>VD</b></p> </div>			
<p>CLOGGING INDICATOR</p> <p>VD 5 LZ.1 /-AV</p>	<p>N/O or N/C contacts</p> <p>5 bar</p>	<p>1267697</p>	<p>7.050</p>

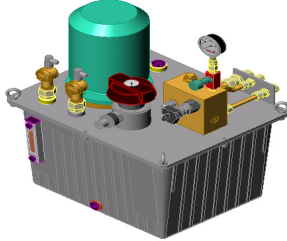


**4.3 Power units**

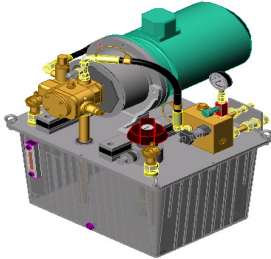
**HYDAC SYSTEM GmbH – Product group: Power units**

**Type:** Power units for continuous operation S1

**4.3.1 Power units with 40 liter-tank / 1.5 to 5.5 kW**

TYPE	Tank	Qmax	pmax	Out put	Required space for motor	Required space	Part No.
 <b>KAVW</b>							
<b>Product description</b>	<b>[l]</b>	<b>[l/min]</b>	<b>[bar]</b>	<b>[kW]</b>		<b>L x T x H</b>	<b>-</b>
KAVW40/Q9/EIPS2-006/90L	40	9.4	75	1.5	90L-4-A1	515x415x655	3250806
KAVW40/Q9/EIPS2-006/100L	40	9.4	160	3	100L-4-A1	600x500x1000	3250807
KAVW40/Q16/EIPS2-0016/100L	40	16	100	3	100L-4-A1	600x500x1000	3250808
KAVW40/Q16/EIPS2-0016/132S	40	16	175	5.5	132S-4-B0	600x500x1000	3250811

**4.3.2 Power units with 60 liter-tank / 4 to 7.5 kW**

TYPE	Tank	Qmax	pmax	Out put	Required space for motor	Required space	Part No.
 <b>KAVW</b>							
<b>Product description</b>	<b>[l]</b>	<b>[l/min]</b>	<b>[bar]</b>	<b>[kW]</b>		<b>L x T x H</b>	<b>-</b>
KAVW60/Q23/EIPS2-0023/112M	60	23.2	80	4	112M-4-B0	700x550x1100	3250812
KAVW60/Q23/EIPS2-0023/132M	60	23.2	175	7.5	132M-4-B1	700x550x1200	3250813
KAVW60/Q21/PVS-0021/100L	60	21	69	3	100L-4-A1	700x650x1000	3250815
KAVW60/Q21/PSP-021/132S	60	21	126	5.5	132S-4-B0	605x690x795	3250817

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HYDAC also builds small power units with 40 litre and 60 litre tanks for operation with HFC fluids, taking into consideration all related demands on pumps, valves and other components.

The power units have the designation HFC on the name plate.

# **Appendix**

for

## **Components**

in the

## **Foundry**

## 5.1. REQUIREMENTS FOR HFC

### 5.1.1 Technical specifications of the HFC fluid

Ultra-Safe 620 VW Kassel from Petrofer

Technical specifications according to product information from Petrofer from 01.09.08

Viscosity at 20°C: 94 mm<sup>2</sup>/s

Viscosity at 40°C: 43 mm<sup>2</sup>/s

Viscosity at 50°C: 31 mm<sup>2</sup>/s

Viscosity index: > 150

Density at 20°C: 1.05 g/cm<sup>3</sup>

pH value: 9.4

Specific heat: 3.20 kJ/kg K

Thermal conductivity: 0.38 W/m K

### 5.1.2 General requirements

"The water content of the HFC fluid is 40 to 50% and must be checked at regular intervals."

"To prevent the water loss from being too high the maximum operating temperature of 40°C must not be exceeded (limit temperature 50°C, emergency shutdown at 55°C). The installation of effective and precisely controlled cooling systems is imperative."

"Larger tank capacities than those used for mineral oil are required (5 to 8 times the maximum pump flow rate)."

"Since HFC fluids age more rapidly (20 to 30 times faster than mineral oil), the pH value of the fluid should be measured twice a year and the fluid replaced after 1 ½ years at the most."

The higher fluid density and the higher contamination removal capacity, compared to mineral oil, leads to increased load on the filter element. For this reason, the max. flow rate Q (l/min) from the general approval list for power unit production must be reduced by 20% (exception: offline).

Element service life: 3000 hours

"Filters must always be fitted with clogging indicators. The display function for cold start is suppressed via the system controls, or in the filter clogging indicator."

"The air which is enriched with the HFC fluid and lies over the fluid surface is aggressive. For this reason, suitable measures must be taken to prevent air pockets in the pipelines and components, e.g. check valves in the return lines, continuous venting of the filter housing, using a hydraulic tank with corrosion protection suitable for HFCs. "

"Do not mix with other HFC fluids and mineral oil, above all with HLPD (residual oil content below 0.1%), since deaeration and fire protection will be reduced and the system could malfunction due to blocked switching pistons (sticky deposits)."

"HFC fluids have limited corrosion protection. For this reason, long downtimes should be avoided."

#### NOTE:

- Cold start suppression on the clogging indicator: system side
- Change-over filters only following approval from the system operator

**5.1.3 Material restrictions**

Description	Can be used without restrictions	Can be used with restrictions	Cannot be used
Metallic materials	<p>Steel</p> <p>Stainless steel</p> <p>Spheroidal graphite cast iron</p> <p>Copper</p> <p>Brass</p>	Anodised aluminium	<p>Zinc</p> <p>Cadmium alloy</p> <p>Magnesium alloy</p> <p>AL alloys with a magnesium percentage <math>\geq 6\%</math></p> <p>Steel parts with zinc-plated surface protection</p>
Seals	<p>NBR, NR, SBR,</p> <p>PTFE, EPDM</p> <p>gaskets in cork rubber with NBR compound</p>	IIR 7 to 70°C	<p>NBR shaft seals,</p> <p>FPM (FKM), AU, PA</p> <p>Leather</p> <p>Cork materials</p>

## 5.2 OVERVIEW OF THE APPROVED HFC COMPONENTS

### 5.2.1 FILTERS

#### 5.2.1.1 AIR FILTERS

Air breather filter up to tank size > 1500 litres



- With flange connection to DIN 24 557
- With exchangeable element
- BF 7 and BF 72 with visual-analogue clogging indicator
- Mounting interface to DIN 24557/Part 2
- With filling protection

Picture	Tank size	Filter type Replacement element Clogging indicator	Order no.	Brochure
1	up to 1000 litres	BF MM 7 F 20 UBM 0.0 /-SO480 0007 L 020 MM /-SO480 (replacement part) VMF 0.035 UBM.0 (replacement part)	1294019 1294020 1279244	BF (E7.408.0/06.07)
2	up to 1500 litres	BF MM 72 F 20 UBM 0.0 /-SO480 0007 L 020 MM /-SO480 (replacement part) VMF 0.035 UBM.0 (replacement part)	1294718 1294722 1279244	BF (E7.408.0/06.07)
3	> 1500 litres	BL P 162 F 10 W 2.0 0160 MU 010 P (replacement part) visual or electrical clogging indicator optionally available	305452 248055	BL (E7.405.0/06.07)

**5.2.1.2 PRESSURE FILTERS**

**Size 100 and 160 with element removal from below**

Pressure filter, inline mounted as single filter without cold start suppression

Filters specifically for HFC fluid can be selected from the following table.



Design	Filter type	Size	Q in l/min (HFC)	
			3 µm	10 µm
Single filter	DFN	100	25	45
Single filter	DFN	160	65	100

The filter types can be found in the mechanical specifications.  
Filter elements designed to additionally filter mineral oil are available as an option (SO214).

**Size 250 and 400 with element removal from top**



- Max. operating pressure: 250 bar
- With vent valve, with check valve in the filter outlet
- With visual/electrical clogging indicator with 75% and 100% switching contact; 5 bar, 2 switching points M12 x 1, without cold start suppression
- Without bypass valve, connection for vent 1/4", for drain 1/2"
- Filter element to filter contamination and residual oil (SO214)

Nom. Size	Filter type Replacement element Clogging indicator	Q in l/min	Pressure level	Connection	Order no.	Brochure
250	DFNF BH/HC 250 L K 10 LZ 3.0	150	250 bar	SAE J 518 C 3000 psi DN 40	1296057	E 70.000.0/02.08
	/-AV-SO214-03335506				1296058	
	0250 DN 010 BH4HC /-SO214 (replacement part) VD 5 LZ.1 /-AV (replacement part)				1267697	
400	DFNF BH/HC 400 L K 10 LZ 3.0	180	250 bar	SAE J 518 C 3000 psi DN 40	1294095	E 70.000.0/02.08
	/-AV-SO214-03335506				1294145	
	0400 DN 010 BH4HC /-SO214 (replacement part) VD 5 LZ.1 /-AV (replacement part)				1267697	

**5.2.1.3 RETURN LINE FILTERS**

Return line filter, inline mounted as single filter without cold start suppression.

Filters specifically for HFC fluid can be selected from the following table.



Design	Filter type	Size	Q in l/min (HFC)	
			3 µm	10 µm
Single filter	LFN	100	11	24
Change-over filter	FLND			
Single filter	LFN	160	32	56
Change-over filter	FLND			
Single filter	LFN	250	44	76
Change-over filter	FLND			
Single filter	LFN	400	68	104
Change-over filter	FLND			

The filter types can be found in the mechanical specifications.  
 Filter elements designed to additionally filter mineral oil are available as an option (SO214).

**5.2.1.4 OFFLINE FILTERS**

**5.2.1.3.1 Offline filters, inline mounted as single filter without cold start suppression**



1



2

- Max. operating pressure: 25 bar
- Filter element dimensions to DIN 24550 (Fig. 1 and 2)
- With visual/electrical clogging indicator with 75% and 100% switching contact (2.5 bar) see point 4.1.2.3.4
- Without bypass valve
- Filter element to filter contamination

NG	Filter type Replacement element Clogging indicator	Fig.	Q in l/min	Oper. pressure	Connection	Tank size	Order no.	Brochure
400	FLN BN/HC 400 D E 3 LZ 2.0 /-AV-A2.5 0400 DN 003 BN4HC (replacement part) VD 2.5 LZ.1 /-AV(replacement part)	1		25 bar	G 1 1/4	< 800 l	1282473 1250531 1291130	FLN (E7.562.2/02.08)
600	FLN BN/HC 600 D E 3 LZ 1.0 /-AV-A2.5 0600 DN 003 BN4HC (replacement part) VD 2.5 LZ.1 /-AV(replacement part)	1		25 bar	G 1 1/4	< 1250 l	1290695 1289052 1291130	FLN (E7562-2-02-08)
1350	NFN BN/HC 1350 D P 3 LZ 2.0 /-KB-AV-SO214 1000 RN 003 BN4HC /- SO214(replacement part) VD 2.5 LZ.1 /-AV(replacement part)	2		25 bar	SAE DN 100	< 1250 l	1296055 1296056 1291130	NF (E7.112.3/02.08)

Filter elements designed to additionally filter mineral oil are available as an option (SO 214).

For filter housing and filter element see mechanical specifications, point 4.1.2.3.3, however the pressure setting of the clogging indicator is 2.5 bar.

**5.2.1.4.2 Offline filters, inline mounted as single filter**



Fixed offline filters  
 with gear pump

Filter type Replacement element	Q in l/min	Tank size	Order no.	Brochure
OLF 15/15-G (with 1 filter element)	15 l/min	2000 l	On request	DEF 7.914.3/02.05
OLF 30/30-G (with 2 filter elements)	30 l/min	4000 l		DEF 7.914.3/02.05
OLF 60/60-G (with 4 filter elements)	60 l/min	8000 l		DEF 7.914.3/02.05
N15DM...				E 7.955.0/04.05



Filter type	Description	Q in l/min	Max. tank size	Order no.	Brochure
MRF	Stainless steel housing with candle filter	up to 160 l/min	> 8000 l	On request	E 70.000.0/02.08

**5.2.1.5 ACCESSORIES FOR CLOGGING INDICATORS**  
**5.2.1.5.1 Clogging indicator with analogue pressure transducer for return line filters and offline**

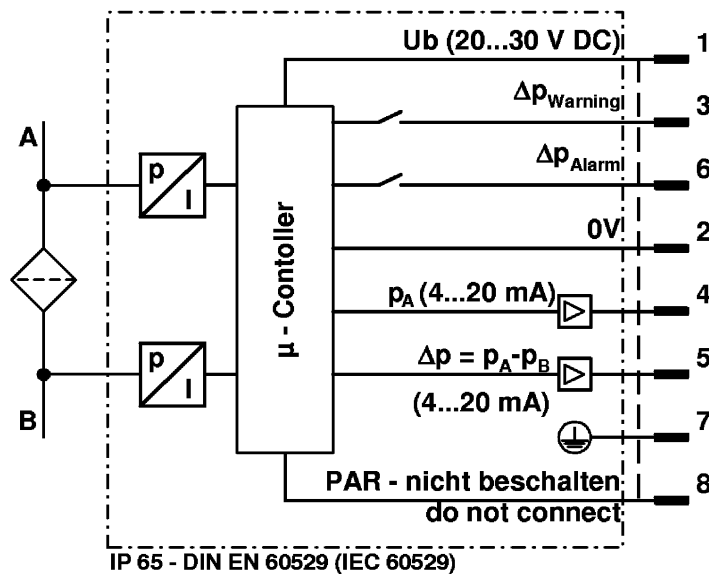


- The indicator has two sensors to measure the inlet pressure and the differential pressure
- Two sensor signals built into one unit
- Early warning signal 75%
- For offline filters (pmax = 25 bar)

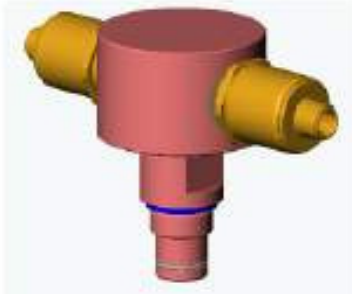
Type	Oper. pressure	Pressure setting	Order no.	Brochure
VL 2 GW.0 /-V-xxx	25 bar	2 bar	acc. to order	VA (E7.050.12/02.08)

**(P)VL..GW../-11X (Standard)**

Schaltausgänge: Schließer  
 kind of switch: NOC-normally open

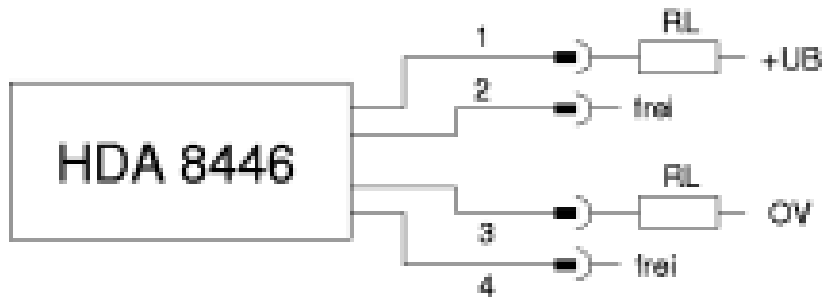


**5.2.1.5.2 Clogging indicator with analogue pressure transducer for pressure filters**



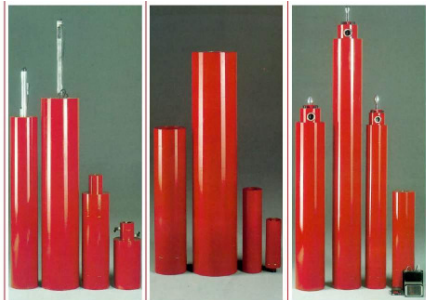
- Max. measuring range: 250 bar
- Overload pressure: 500 bar
- Signal output: 4 .. 20 mA
- Electrical connection: M12 x 1

Type	Oper. pressure	Order no.	Brochure
VD 5 HDA.0 /-03338399	500 bar	1296059	On request
Pressure transducer HDA 8446-A-0250-000		909555	



**5.2.2 HYDRAULIC ACCUMULATORS**  
**5.2.2.1 PISTON ACCUMULATORS**

The piston accumulators are designed in accordance with customer technical inquiry. Instead of Hydac standard connections, another suitable connection or other options can be used, according to the application.



**Type:** SK210 und SK350

- Features:**
- permitted operating pressure: 210 bar to 350 bar
  - permitted operating temperature: -10 / +80 °C
  - accumulator body: NBR / carbon steel

Type	Oper. pressure range bar	Nominal volume V [litres]	Connection on fluid side (Internal thread to ISO228)	Order no.	Brochure
SK210 to SK 350	210 to 350	0.2 to 1200	G 1 1/2" / gas valve	On request	3.301.13

**5.2.2.2 SAFETY AND SHUT-OFF BLOCKS**

Special model for HFC fluids



Type	Adapter accumulator → SAB  (Order no. for adapter)	For accumulator type	For accumulator type (oper. pressure / volume)	Order no.	Brochure
SAB20M22T210A	S30 (369481)	Diaphragm accumulator	< 1 litre	375954 369481	3.551.
	S10 (369479)	Bladder accumulator	330 bar / 1 litre	375954 369479	
	S12 (369480)	Bladder accumulator	330 bar / 2.5 – 5 litre	375954 369480	
	S13 (369481)	Bladder accumulator	330 bar / 10 – 50 litre	3053183	
	S13 (369481) K408 (374931)	Piston accumulator	210, 330 bar /15-100 litre	375954 369481 374931	

In the special model for use with HFC fluids the pressure relief valve is in stainless steel.

According to the application, another suitable connection can be selected after consultation with HYDAC, such as:

Gas safety valve GSV 6, temperature fuse, bursting disc

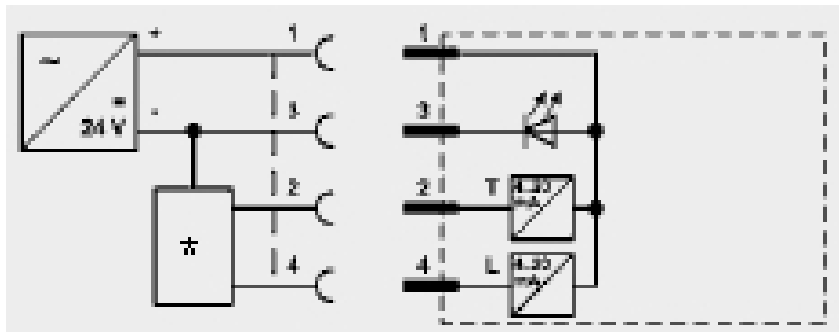
**5.2.3. ELECTRONICS**  
**5.2.3.1 TANK CONDITIONER® TC**

Electronic fluid level & temperature measurement transducer combined with air breather filter and filling connection



- Parts in contact with the fluid are in stainless steel
- Level and temperature measuring range:  
 output signal 4 - 20 mA  
 e.g. for controlling cooling circuits and for forced shutdown of the hydraulic system if the max. operating temperature is exceeded.
- Connection: 2 x M12 x 1
- Length of sensor tube: option of 250, 370 or 520 mm

Type	Order no.	Brochure
TC MM 7 3 F UBM+D 2.0 /-S44-Vxxx-FA34-SO480	On request	E 7.410.1/02.08



**5.2.3.2 ELECTRONIC LEVEL/TEMPERATURE SWITCH AND MEASUREMENT TRANSDUCER ENS**



Temperature range:

-25°C to +100°C  
 (-13°F to + 212°F)

Type	Output / plug	DIN tank size	Order no.	Brochure
ENS 3116-2-0250-000-K	2 switch / M12-4 pin	63, 100, 160, 250, 400	909204	E 18.061.1
ENS 3116-2-0410-000-K	2 switch / M12-4 pin	63, 100, 160, 250, 400	909210	
ENS 3116-2-0520-000-K	2 switch / M12-4 pin	630, 800, 1000, 1200	909216	
ENS 3116-2-0730-000-K	2 switch / M12-4 pin		909717	
ENS 3118-5-0250-000-K	2 switch with analogue / M12-5 pin	63, 100, 160, 250, 400	909206	
ENS 3118-5-0410-000-K	2 switch with analogue / M12-5 pin	63, 100, 160, 250, 400	909212	
ENS 3118-5-0520-000-K	2 switch with analogue / M12-5 pin	630, 800, 1000, 1200	909218	
ENS 3118-5-0730-000-K	2 switch with analogue / M12-5 pin		909476	
ENS 311P-8-0250-000-K	4 switch with 2 analogue / M12-8 pin	63, 100, 160, 250, 400	909830	
ENS 311P-8-0410-000-K	4 switch with 2 analogue / M12-8 pin	63, 100, 160, 250, 400	909828	
ENS 311P-8-0520-000-K	4 switch with 2 analogue / M12-8 pin	630, 800, 1000, 1200	909829	
ENS 311P-8-0730-000-K	4 switch with 2 analogue / M12-8 pin		920518	

**5.2.4 COOLING SYSTEMS**

**5.2.4.1 PUMP-TRANSFER COOLER FILTRATION UNIT UKF**



**UKF**

Type	Filter/ Size/ Rating * [µm]	Cooling capacity ** [kW]	Pressure drop Heat exchanger [bar]	Q [l/min]	Shaft seal
<b>UKF-2</b>					
UKF-2/1.0/P+T/20/0.75/610-20/LF330/20/D	LF/330/20	22	0.2	30	Teflon
UKF-2/1.0/P+T/30/1.5/610-30/LF330/20/D	LF/330/20	26	0.4	45	Teflon
UKF-2/1.0/P+T/40/1.5/610-30/LF330/20/D	LF/330/20	35	0.4	60	Teflon
<b>UKF-3</b>					
UKF-3/1.0/P+T/70/2.2/610-40/LF660/20/D	LF/660/20	61	0.6	105	Teflon
UKF-3/1.0/P+T/100/4/610-70/LF660/20/D	LF/660/20	87	0.5	150	Teflon
	*Also available with 10, 5, 3 µm filtr. rating	** $T_{in, Ultra\ Safe\ 620} = 50\text{ °C}$ and $T_{in, water} = 30\text{ °C}$ $Q_{water} = Q_{Ultra\ Safe\ 620}$			

**5.2.4.2 PLATE HEAT EXCHANGERS HEX**

For use with HFC fluids



**HEX**

Type	Product size	Drawing no.	Order no.	Brochure
HYDAC HEX S	1 – 300 kW	03406737	On request	DEF 5.804.3


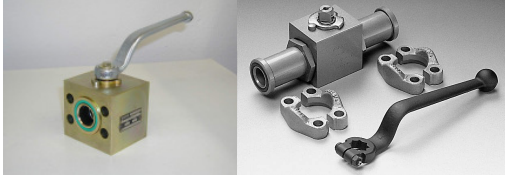
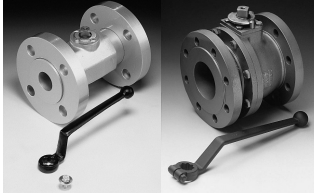
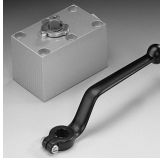
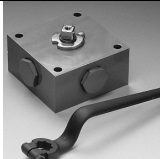
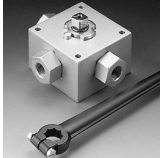


**5.2.5 HFC ACCESSORIES**  
**5.2.5.1 Fluid level gauges (FSA, FSK)**



- FSA and FSK with SO model:  
glass tube M12 connection bore
- FSA: visual thermometer with display in °C and °F
- FSK: switching contact can be N/C, N/O or dual switching model (either N/C or N/O)

Type	Mounting holes	Order no.	Brochure
FSA-076	076 mm	On request	E 5.050.8/09.03
FSA-127	127 mm		
FSA-176	176 mm		
FSA-254	254 mm		
FSA-381	381 mm		
FSK-127	127 mm		
FSK-176	176 mm		
FSK-254	254 mm		
FSK-381	381 mm		

**5.2.5.2 Ball valves**

Type	Connection	Max. press.	Material	Size mm	Description	Brochure DEF 5.500.7/02.05
KHB / KHM / KHB3K / KHMG / KHBG	G – LR – SR – NPT – SAE – JIS – F3 – F6	500 bar (7250 psi)	Steel  Stainless steel	04 – 50		
KHB/M- XX-F3 KHB/M- XX-F6 KHBG – KHMG KHF3/6 KHDF3 – KHDF6	ISO6162 TAB 1 ISO6162 TAB 2  SAE J 518 C	500 bar (7250 psi)	Steel  Stainless steel	16 - 100		
KHBF – KHMFF KHBF- KHMFF	DIN flanges ANSI flanges	500 bar (7250 psi)	Steel  Stainless steel	16 – 300		KHMFF
KHP – KHP3K	Manifold	500 bar (7250 psi)	Steel  Stainless steel	06 – 50		KHP
KH3P – KH4P	Manifold	500 bar (7250 psi)	Steel  Stainless steel	06 – 32		KH4P
KH3 – KH4	G – LR – SR – NPT – SAE – JIS	500 bar (7250 psi)	Steel  Stainless steel	06 – 32		KH4
KHNVN – KHNVS KH3K	G – Rp	140 bar (2000 psi)	Brass  Stainless steel	04 - 100		KHNVN
KHM3S	Welded	64 bar (1000 psi)	Steel /  Stainless steel	10 - 100		KHM3S