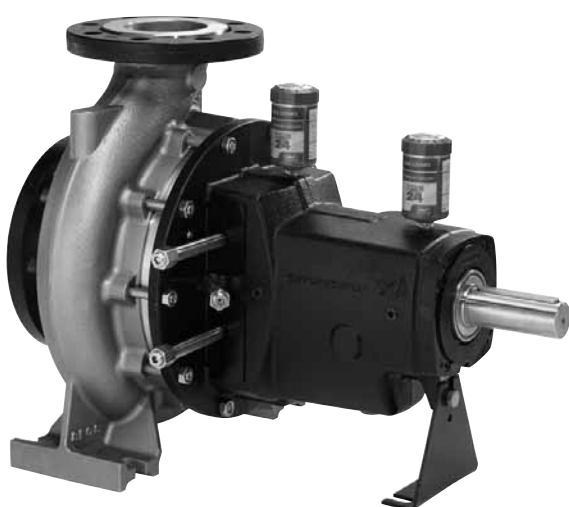


NKG Model B

Double and cartridge seals,
oil or grease lubrication

Service instructions



CONTENTS

	Page
1. Symbols used in this document	2
2. Identification	2
2.1 Nameplate	2
2.2 Type key	3
3. Handling	6
4. General information	6
4.1 Position numbers	6
4.2 Before dismantling	6
4.3 Before assembly	6
4.4 During assembly	6
5. Dismantling and assembly	7
5.1 Pump with double shaft seal mounted back-to-back	7
5.2 Pump with double shaft seal mounted in tandem	9
5.3 Pump with cartridge seal	12
5.4 Bearing bracket	13
5.5 Replacing the wear rings	14
6. Fault finding	15
7. Service tools	17
7.1 Special tools	17
7.2 Standard tools	18
7.3 Torque tools	19
8. Tightening torques and lubricants	20
8.1 Lubrication	21
9. Exploded view	22

1. Symbols used in this document

**Warning**

If these safety instructions are not observed, it may result in personal injury.

2. Identification

2.1 Nameplate

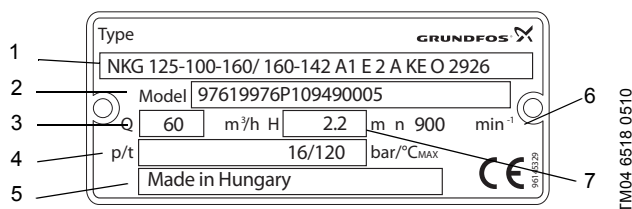


Fig. 1 Nameplate for NKG with double shaft seal

The example shows an NKG 125-100 with these data:

- 160/142 mm impeller (conical).
- Grease-lubricated standard bearing design and standard coupling.
- Table E flange to AS 2129.
- Pressure class: PN 16.
- Pump housing material: EN-GJL-250. Impeller material: EN-GJL-200. Wear ring material: bronze/brass. Shaft material: 1.4021/1.4034.
- O-rings of pump housing cover and seal cover made of FFKM and O-ring of shaft seal housing made of EPDM.
- Double shaft seal mounted back-to-back.
- DQQK primary seal, DQQE secondary seal.

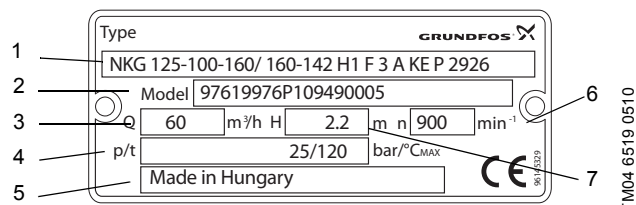


Fig. 2 Nameplate for NKG with double shaft seal and heavy-duty bearing design

The example shows an NKG 125-100 with these data:

- 160/142 mm impeller (conical).
- Grease-lubricated heavy-duty bearing design and standard coupling.
- DIN flange to EN 1092-2.
- Pressure class: PN 25.
- Pump housing material: 1.4408. Impeller material: 1.4408. Wear ring material: 1.4517. Shaft material: 1.4401.
- O-rings of pump housing cover and seal cover made of FFKM and O-ring of shaft seal housing made of EPDM.
- Double shaft seal mounted in tandem.
- DQQK primary seal, DQQE secondary seal.

Pos.	Description
1	Type designation
2	Model
3	Rated flow rate, 50 Hz
4	Maximum pressure/temperature
5	Place of production
6	Speed, 50 Hz
7	Head against closed valve, 50 Hz

2.2 Type key

Example 1 - (pump design according to EN 733)	NK	32	-125	.1	/142	A1	F	1	A	E	S	BAQE
Example 2 - (pump design according to ISO 2858)	NKG	125	-100	-160	/160-142	H2	F	3	N	KE	O	2926
Type range												
Nominal diameter of suction port (DN)												
Nominal diameter of discharge port (DN)												
Nominal impeller diameter [mm]												
Reduced performance = .1												
Actual impeller diameter [mm]												
Code for pump version (the codes may be combined)												
A1 Basic version with grease-lubricated standard bearing design and standard coupling												
A2 Basic version with grease-lubricated standard bearing design and spacer coupling												
B Oversize motor												
E With ATEX approval, certificate or test report (in the case of ATEX-approved pumps, the second character of the code for pump version is an E)												
G1 Grease-lubricated heavy-duty bearing design and standard coupling												
G2 Grease-lubricated heavy-duty bearing design and spacer coupling												
H1 Oil-lubricated heavy-duty bearing design and standard coupling												
H2 Oil-lubricated heavy-duty bearing design and spacer coupling												
I1 Pump without motor, with grease-lubricated standard bearing design and standard coupling												
I2 Pump without motor, with grease-lubricated standard bearing design and spacer coupling												
J1 Pump without motor, with grease-lubricated heavy-duty bearing design and standard coupling												
J2 Pump without motor, with grease-lubricated heavy-duty bearing design and spacer coupling												
K1 Pump without motor, with oil-lubricated heavy-duty bearing design and standard coupling												
K2 Pump without motor, with oil-lubricated heavy-duty bearing design and spacer coupling												
Y Bare shaft pump with grease-lubricated standard bearing design												
W Bare shaft pump with grease-lubricated heavy-duty bearing design												
Z Bare shaft pump with oil-lubricated heavy-duty bearing design												
X Special version (if further customisation than already listed)												
Pipework connection												
E Table E flange to AS 2129												
F DIN flange to EN 1092-2												
Flange pressure rating (PN - nominal pressure)												
1 10 bar												
2 16 bar												
3 25 bar												
4 40 bar												
5 Other pressure rating												

Example 1 - (pump design according to EN 733)

NK 32 -125 .1 /142 A1 F 1 A E S BAQE

Example 2 - (pump design according to ISO 2858)

NKG 125 -100 -160 /160-142 H2 F 3 N KE O 2926

Materials

	Pump housing	Impeller	Wear ring	Shaft
A	EN-GJL-250	EN-GJL-200	bronze/brass	1.4021/1.4034
B	EN-GJL-250	bronze CuSn10	bronze/brass	1.4021/1.4034
C	EN-GJL-250	EN-GJL-200	bronze/brass	1.4401/1.4408
D	EN-GJL-250	bronze CuSn10	bronze/brass	1.4401/1.4408
E	EN-GJL-250	EN-GJL-200	EN-GJL-250	1.4021/1.4034
F	EN-GJL-250	bronze CuSn10	EN-GJL-250	1.4021/1.4034
G	EN-GJL-250	EN-GJL-200	EN-GJL-250	1.4401/1.4408
H	EN-GJL-250	bronze CuSn10	EN-GJL-250	1.4401/1.4408
K	1.4408	1.4408	1.4517	1.4401/1.4408
L	1.4517	1.4517	1.4517	1.4462
M	1.4408	1.4517	1.4517	1.4401/1.4408
N	1.4408	1.4408	PTFE (Graflon®)	1.4401/1.4408
P	1.4408	1.4517	PTFE (Graflon®)	1.4401/1.4408
R	1.4517	1.4517	PTFE (Graflon®)	1.4462
S	EN-GJL-250	1.4408	bronze/brass	1.4401/1.4408
X	Special version			

Rubber parts in pump

The first letter indicates the material of the O-rings of pump housing cover and seal cover (the latter only for double shaft seals)

The second letter indicates the material of the O-ring of shaft seal housing

E	EPDM
F	FXM (Fluoraz®)
K	FFKM (Kalrez®)
M	FEPS (PTFE-sheathed silicone O-ring)
V	FKM (Viton®)
X	HNBR

Shaft seal

S	Single shaft seal
O	Double shaft seal, back-to-back
P	Double shaft seal, tandem
C	Single cartridge seal
D	Double cartridge seal

Codes for mechanical shaft seal

4 letters: Single shaft-seal (e.g. BQQE) or single cartridge seal (e.g. HBQV)

4 digits: Double shaft seal (e.g. 2716 where 27 = DQQV (primary seal) and 16 = BQQV (secondary seal))
or double cartridge seal (e.g. 5150 where 51 = HBQV (primary seal) and 50 = HQQV (secondary seal))

See also section 2.2.1 *Relation between letters and digits of shaft seal codes.*

2.2.1 Relation between letters and digits of shaft seal codes

Digits	Letters	Description
10	BAQE	Single mechanical shaft seal
11	BAQV	Single mechanical shaft seal
12	BBQE	Single mechanical shaft seal
13	BBQV	Single mechanical shaft seal
14	BQBE	Single mechanical shaft seal
15	BQQE	Single mechanical shaft seal
16	BQQV	Single mechanical shaft seal
17	GQQE	Single mechanical shaft seal
18	GQQV	Single mechanical shaft seal
19	AQAE	Single mechanical shaft seal
20	AQAV	Single mechanical shaft seal
21	AQQE	Single mechanical shaft seal
22	AQQV	Single mechanical shaft seal
23	AQQP	Single mechanical shaft seal
24	AQQK	Single mechanical shaft seal
25	DAQF	Single mechanical shaft seal
26	DQQE	Single mechanical shaft seal
27	DQQV	Single mechanical shaft seal
28	DQQP	Single mechanical shaft seal
29	DQQK	Single mechanical shaft seal
50	HQQV	Cartridge seal
51	HBQV	Cartridge seal
	SNEA	Stuffing box, internal barrier fluid, Buraflon [®] packing rings ¹⁾ , EPDM O-rings in pump housing
	SNEB	Stuffing box, internal barrier fluid, Thermoflon [®] packing rings ²⁾ , EPDM O-rings in pump housing
	SNEC	Stuffing box, internal barrier fluid, Buraflon [®] packing rings ¹⁾ , FKM O-rings in pump housing
	SNED	Stuffing box, internal barrier fluid, Thermoflon [®] packing rings ²⁾ , FKM O-rings in pump housing
	SNOA	Stuffing box, without barrier fluid, Buraflon [®] packing rings ¹⁾ , EPDM O-rings in pump housing
	SNOB	Stuffing box, without barrier fluid, Thermoflon [®] packing rings ²⁾ , EPDM O-rings in pump housing
	SNOC	Stuffing box, without barrier fluid, Buraflon [®] packing rings ¹⁾ , FKM O-rings in pump housing
	SNOD	Stuffing box, without barrier fluid, Thermoflon [®] packing rings ²⁾ , FKM O-rings in pump housing
	SNFA	Stuffing box, external barrier fluid, Buraflon [®] packing rings ¹⁾ , EPDM O-rings in pump housing
	SNFB	Stuffing box, external barrier fluid, Thermoflon [®] packing rings ²⁾ , EPDM O-rings in pump housing
	SNFC	Stuffing box, external barrier fluid, Buraflon [®] packing rings ¹⁾ , FKM O-rings in the pump housing
	SNFD	Stuffing box, external barrier fluid, Thermoflon [®] packing rings ²⁾ , FKM O-rings in the pump housing

¹⁾ Buraflon[®]: PTFE-impregnated fibre packing ring.

²⁾ Thermoflon[®]: Graphite-PTFE compound packing rings.

3. Handling



Warning

Pump motors as from 4 kW are supplied with lifting eyes which must not be used for lifting the entire pump unit. See figures 3 and 4.

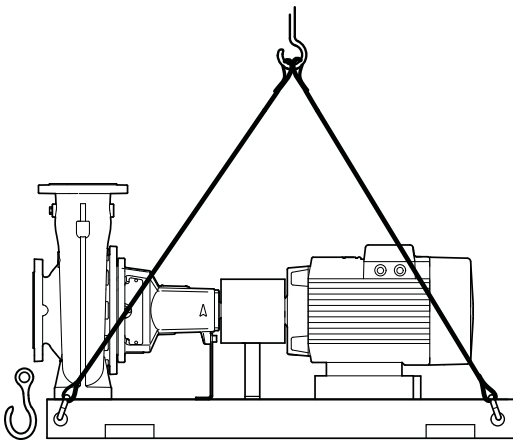
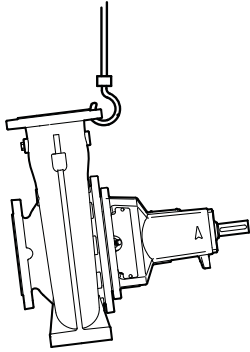


Fig. 3 Correct lifting of pump

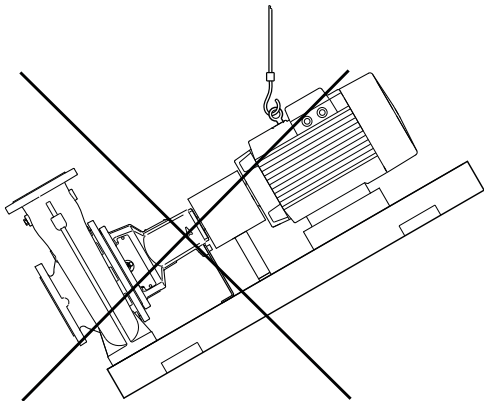


Fig. 4 Incorrect lifting of pump

4. General information

4.1 Position numbers

Position numbers of parts (digits) refer to section 9. Exploded view; position numbers of service tools (letters) refer to section 7. Service tools.

4.2 Before dismantling

- Switch off the power supply to the motor.
- Close the isolating valves, if fitted, to avoid draining the system.
- Disconnect the power supply cable in accordance with local regulations.

4.3 Before assembly

- Clean and check all parts.
- Replace defective parts by new parts.
- Order the necessary service kits.
- Always replace gaskets and O-rings when the pump is serviced.

4.4 During assembly

Lubricate and tighten screws and nuts to the correct torque. See section 8. *Tightening torques and lubricants.*

TM03 3948 1206

TM03 3769 1006

5. Dismantling and assembly

5.1 Pump with double shaft seal mounted back-to-back

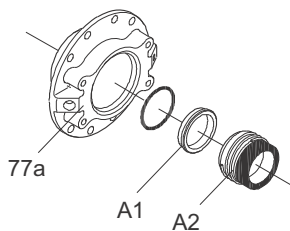
5.1.1 Dismantling the pump

1. Remove extension pipe (pos. 105f) from seal cover and shaft seal housing.
2. Remove screws (pos. 124d).
3. Remove shaft guard (pos. 124c and 124e).
4. Fit a lifting strap between the bearing bracket and lifting equipment.
5. Tighten the lifting strap.
6. Remove nuts (pos. 36).
7. Remove the bearing bracket from the pump housing.
8. Remove impeller (pos. 49).
9. Remove key (pos. 11) from the shaft.

5.1.2 Removing the shaft seal

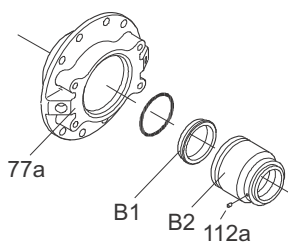
1. Slacken nut (pos. 77e) in shaft seal housing (pos. 58).
2. Loosen pump housing cover (pos. 77) together with seal cover (pos. 77a) using a screwdriver or rubber mallet.
3. Pull pump housing cover (pos. 77) together with seal cover (pos. 77a) off the shaft.
The stationary seal ring of the primary seal is removed at the same time.
4. Remove the primary seal.

MG 12



- Pull rotating shaft seal part (pos. A2) off the shaft.
- Press stationary shaft seal part (pos. A1) out of seal cover (pos. 77a).

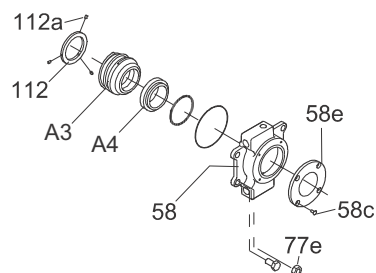
HJ92N, M7N, HJ977N



- Slacken set screws (pos. 112a).
- Pull rotating shaft seal part (pos. B2) off the shaft.
- Pull spacer ring and set screws (pos. 112a) off the shaft.
- Press stationary shaft seal part (pos. B1) out of seal cover (pos. 77a).

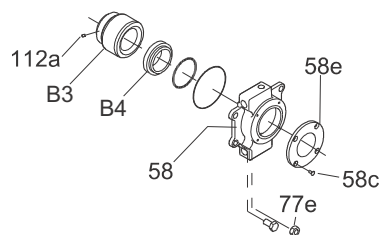
5. Remove the secondary seal.

MG 1



- Slacken set screws (pos. 112a) and remove spacer ring (pos. 112).
- Spray soapy water on the shaft to make rotating shaft seal part (pos. A3) slide more easily off the shaft.
- Remove rotating shaft seal part (pos. A3) with two screwdrivers.
Note: If the shaft seal is to be reused, the screwdrivers must under no circumstances touch the seal faces, but only the spring.
- Remove shaft seal housing (pos. 58) together with stationary shaft seal part.
- Remove the four screws (pos. 58c) of shaft seal housing (pos. 58) and remove washer (pos. 58e).
- Press stationary shaft seal part (pos. A4) out of shaft seal housing (pos. 58).

HJ92N, M7N, HJ977N

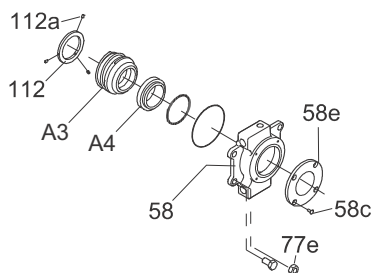


- Slacken set screws (pos. 112a) in rotating shaft seal part (pos. B3).
- Spray soapy water on the shaft to make rotating shaft seal part (pos. B3) slide more easily off the shaft.
- Remove rotating shaft seal part (pos. B3) with two screwdrivers.
Note: If the shaft seal is to be reused, the screwdrivers must under no circumstances touch the seal faces.
- Remove shaft seal housing (pos. 58) together with stationary shaft seal part.
- Remove the four screws (pos. 58c) of shaft seal housing (pos. 58) and remove washer (pos. 58e).
- Press stationary shaft seal part (pos. B4) out of shaft seal housing (pos. 58).

5.1.3 Fitting the shaft seal

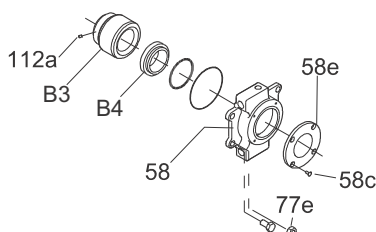
1. Check that protective ring (pos. 58e) on shaft seal housing (pos. 58) is intact.
2. Fit the secondary seal.

MG 1



- Lubricate the inside of shaft seal housing (pos. 58) with soapy water and insert stationary seal ring (A4) loosely with your fingers.
Note: Avoid touching the seal face with your fingers.
- Press stationary seal ring (pos. A4) into shaft seal housing (pos. 58) with a punch (pos. B).
- Fit bush (pos. A) on the shaft.
- Push shaft seal housing (pos. 58) on the bush and shaft.
- Lubricate the shaft and inside of shaft seal (pos. A3) with soapy water.
- Push rotating shaft seal part (A3) on the shaft with a punch (pos. B).
- Fit spacer ring (pos. 112) on the shaft and push it against the shaft seal.
- Remove bush (pos. A).
- Fit spacing pipe (pos. C) and tighten it home with impeller nut (pos. 67).
- Tighten set screws (pos. 112a) in spacer ring (pos. 112). See section 8. *Tightening torques and lubricants*.
- Remove spacing pipe (pos. C).

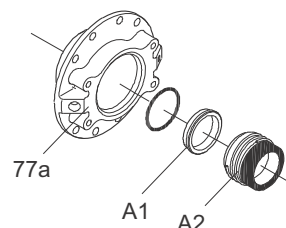
HJ92N, M7N, HJ977N



- Lubricate the inside of shaft seal housing (pos. 58) with soapy water and insert stationary seal ring (B4) loosely with your fingers.
Note: Avoid touching the seal face with your fingers.
- Press stationary seal ring (pos. B4) into shaft seal housing (pos. 58) with a punch (pos. B).
- Fit bush (pos. A) on the shaft.
- Push shaft seal housing (pos. 58) on the bush and shaft.
- Lubricate the shaft and inside of shaft seal (pos. B3) with soapy water.
- Slacken set screws (pos. 112a) in rotating shaft seal part (pos. B3) to prevent them from scratching the bush and shaft during assembly.
- Lubricate the bush and shaft with soapy water.
- Push rotating shaft seal part (Pos. B3) on the shaft with a punch (pos. B).
- Remove bush (pos. A).
- Fit spacing pipe (pos. C) and tighten it home with impeller nut (pos. 67).
- Tighten set screws (pos. 112a) in spacer ring (pos. 112). See section 8. *Tightening torques and lubricants*.
- Remove spacing pipe (pos. C).

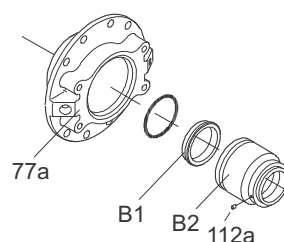
3. Fit the primary seal.

MG 12



- Fit bush (pos. A) on the shaft.
- Lubricate the shaft and inside of rotating shaft seal part (pos. A2) with soapy water. For the shaft, it is advisable to use pure soap or a grease type compatible with the pumped liquid.
- Fit rotating shaft seal part (pos. A2) on the shaft with a punch (pos. B) until it touches the secondary seal.
- Lubricate the inside of seal cover (pos. 77a) with soapy water and insert stationary seal ring (A1) loosely with your fingers.
Note: Avoid touching the seal face with your fingers.
- Press stationary seal ring (pos. A1) into seal cover (pos. 77a) with a punch (pos. B).

HJ92N, M7N, HJ977N



- Fit bush (pos. A) on the shaft.
- Slacken set screws (pos. 112a) in rotating shaft seal part (pos. B2) to prevent them from scratching the bush and shaft during assembly.
- Lubricate the bush and shaft with soapy water.
- Push rotating shaft seal part (pos. B2) on the shaft with a punch (pos. B) until it touches the secondary seal.
- Hold rotating shaft seal part (B2) in position against the secondary seal with a punch and tighten set screws (pos. 112a) in spacer ring (pos. 112). See section 8. *Tightening torques and lubricants*.
- Lubricate the inside of seal cover (pos. 77a) with soapy water and insert stationary seal ring (B1) loosely with your fingers.
Note: Avoid touching the seal face with your fingers.
- Press stationary seal ring (pos. B1) into seal cover (pos. 77a) with a punch (pos. B).

4. Fit pump housing cover (pos. 77) together with seal cover (pos. 77a) against the bearing bracket.
The stationary seal ring of the primary seal is removed at the same time.
5. Cross-tighten nuts (pos. 77e) in shaft seal housing (pos. 58). See section 8. *Tightening torques and lubricants*.
The shaft seal chamber is thus tightened, and the primary and secondary seals obtain correct pretension.

5.1.4 Assembling the pump

1. Fit key (pos. 11) in the shaft.
2. Fit impeller (pos. 49), washer (pos. 66), lock washer (pos. 66a) and nut (pos. 67). Tighten nut (pos. 67) with a torque wrench (pos. V). See section 8. *Tightening torques and lubricants*.
3. Bring bearing bracket and pump housing together.
4. Tighten nuts (pos. 36) on staybolts (pos. 26). See section 8. *Tightening torques and lubricants*.
5. Fit shaft guard (pos. 124c and 124e). See section 8. *Tightening torques and lubricants*.
6. Fit extension pipe (pos. 105f). See section 8. *Tightening torques and lubricants*.

5.2 Pump with double shaft seal mounted in tandem

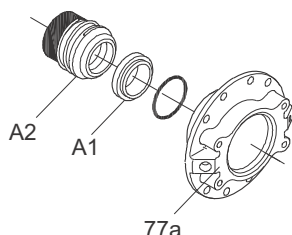
5.2.1 Dismantling the pump

1. Remove extension pipe (pos. 105f) from seal cover and shaft seal housing.
2. Remove screws (pos. 124d).
3. Remove shaft guard (pos. 124c and 124e).
4. Fit a lifting strap between the bearing bracket and lifting equipment.
5. Tighten the lifting strap.
6. Remove nuts (pos. 36).
7. Remove the bearing bracket from the pump housing.
8. Remove impeller (pos. 49).
9. Remove key (pos. 11) from the shaft.

5.2.2 Removing the shaft seal

1. Remove the primary seal.

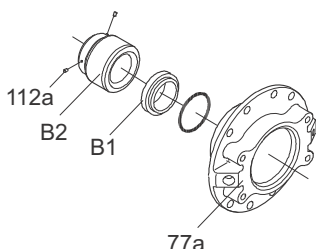
MG 12



- Remove rotating shaft seal part (pos. A2) with two pinch bars (pos. H) or similar tools.

Note: If the shaft seal is to be reused, the pinch bars must under no circumstances touch the seal faces, but only the spring.

HJ92N, M7N, HJ977N

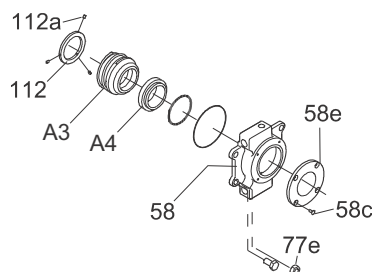


- Slacken set screws (pos. 112a) in the shaft seal.
- Remove rotating shaft seal part (pos. B2) with two pinch bars (pos. H) or similar tools.

Note: If the shaft seal is to be reused, the pinch bars must under no circumstances touch the seal faces.

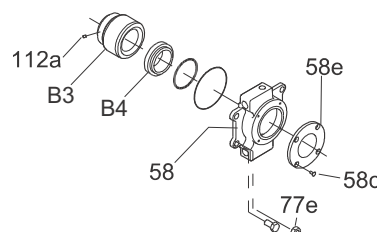
2. Slacken nut (pos. 77e) in shaft seal housing (pos. 58).
3. Loosen pump housing cover (pos. 77) together with seal cover (pos. 77a) using a screwdriver or rubber mallet.
4. Pull pump housing cover (pos. 77) together with seal cover (pos. 77a) off the shaft.
Stationary seal ring of the primary seal is removed at the same time.
5. Remove the secondary seal.

MG 1



- Slacken the three set screws (pos. 112a) and remove spacer ring (pos. 112).
- Spray soapy water on the shaft to make rotating shaft seal part (pos. A3) slide more easily off the shaft.
- Remove rotating shaft seal part (pos. A3) with two screwdrivers.
Note: If the shaft seal is to be reused, the screwdrivers must under no circumstances touch the seal faces, but only the spring.
- Remove shaft seal housing (pos. 58) together with stationary shaft seal part.
- Remove the four screws (pos. 58c) of shaft seal housing (pos. 58) and remove washer (pos. 58e).
- Press stationary shaft seal part (pos. B4) out of shaft seal housing (pos. 58).

HJ92N, M7N, HJ977N

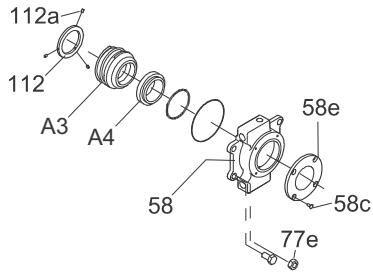


- Slacken set screws (pos. 112a) in rotating shaft seal part (pos. B3).
- Spray soapy water on the shaft to make rotating shaft seal part (pos. B3) slide more easily off the shaft.
- Remove rotating shaft seal part (pos. B3) with two screwdrivers.
Note: If the shaft seal is to be reused, the screwdrivers must under no circumstances touch the seal faces.
- Remove shaft seal housing (pos. 58) together with stationary shaft seal part.
- Remove the four screws (pos. 58c) of shaft seal housing (pos. 58) and remove washer (pos. 58e).
- Press stationary shaft seal part (pos. B4) out of shaft seal housing (pos. 58).

5.2.3 Fitting the shaft seal

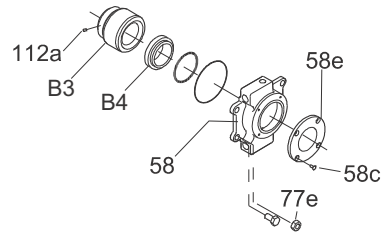
1. Check that protective ring (pos. 58e) on shaft seal housing (pos. 58) is intact.
2. Fit the secondary seal.

MG 1



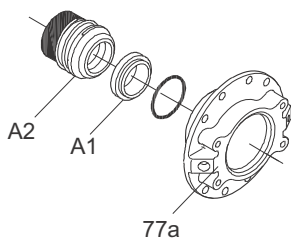
- Lubricate the inside of shaft seal housing (pos. 58) with soapy water and insert stationary seal ring (A4) loosely with your fingers.
Note: Avoid touching the seal face with your fingers.
- Press stationary seal ring (pos. A4) into shaft seal housing (pos. 58) with a punch (pos. B).
- Fit bush (pos. A) on the shaft.
- Push shaft seal housing (pos. 58) on the bush and shaft.
- Lubricate the shaft and inside of shaft seal (pos. A3) with soapy water.
- Push rotating shaft seal part (A3) on the shaft with a punch (pos. B).
- Fit spacer ring (pos. 112) on the shaft and push it against the shaft seal.
- Remove bush (pos. A).
- Fit spacing pipe (pos. C) and tighten it home with impeller nut (pos. 67).
- Tighten set screws (pos. 112a) in spacer ring (pos. 112). See section 8. *Tightening torques and lubricants*.
- Remove spacing pipe (pos. C).

HJ92N, M7N, HJ977N

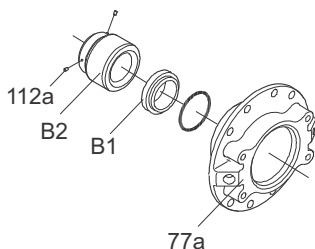


- Lubricate the inside of shaft seal housing (pos. 58) with soapy water and insert stationary seal ring (B4) loosely with your fingers.
Note: Avoid touching the seal face with your fingers.
 - Press stationary seal ring (pos. B4) into shaft seal housing (pos. 58) with a punch (pos. B).
 - Fit bush (pos. A) on the shaft.
 - Push shaft seal housing (pos. 58) on the bush and shaft.
 - Lubricate the shaft and inside of shaft seal (pos. B3) with soapy water.
 - Slacken set screws (pos. 112a) in rotating shaft seal part (pos. B3) to prevent them from scratching the bush and shaft during assembly.
 - Lubricate the bush and shaft with soapy water.
 - Push rotating shaft seal part (Pos. B3) on the shaft with a punch (pos. B).
 - Remove bush (pos. A).
 - Fit spacing pipe (pos. C) and tighten it home with impeller nut (pos. 67).
 - Tighten set screws (pos. 112a) in spacer ring (pos. 112). See section 8. *Tightening torques and lubricants*.
 - Remove spacing pipe (pos. C).
3. Fit pump housing cover (pos. 77) together with seal cover (pos. 77a) against the bearing bracket.
 4. Cross-tighten nuts (pos. 77e) in shaft seal housing (pos. 58). See section 8. *Tightening torques and lubricants*. The shaft seal chamber is thus tightened, and the secondary seal obtains correct pretension.

5. Fit the primary seal.

MG 12

- Fit bush (pos. A) on the shaft.
- Lubricate the bush and shaft with soapy water.
Fit stationary shaft seal part (pos. A1) on the bush and press it home in bearing cover (pos. 77a) with a punch (pos. B).
- Lubricate the bush, shaft and inside of shaft seal (pos. A2) with soapy water. For the shaft, it is advisable to use pure soap or a grease type compatible with the pumped liquid.
- Fit rotating shaft seal part (pos. A2) on the bush and press it home with a punch (pos. B). It must touch the secondary seal.
- Remove bush (pos. A) and punch (pos. B).

HJ92N, M7N, HJ977N

- Fit bush (pos. A) on the shaft.
- Lubricate the bush and shaft with soapy water.
Fit stationary shaft seal part (pos. B1) on the bush and press it home in bearing cover (pos. 77a) with a punch (pos. B).
- Lubricate the bush, shaft and inside of shaft seal (pos. B2) with soapy water. For the shaft, it is advisable to use pure soap or a grease type compatible with the pumped liquid.
- Fit rotating shaft seal part (pos. B2) on the bush and press it home on the shaft with a punch (pos. B).
- Remove bush (pos. A).
- Fit spacing pipe (pos. C) and tighten it home with impeller nut (pos. 67).
- Tighten set screws (pos. 112a) in spacer ring (pos. 112).
See section 8. *Tightening torques and lubricants.*
- Remove spacing pipe (pos. C).

5.2.4 Assembling the pump

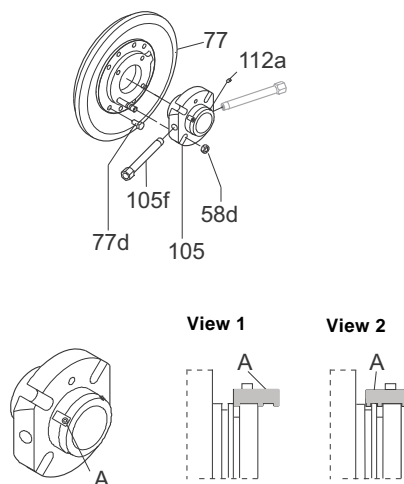
1. Fit key (pos. 11) in the shaft.
2. Fit impeller (pos. 49), washer (pos. 66), lock washer (pos. 66a) and nut (pos. 67). Tighten nut (pos. 67) with a torque wrench (pos. V). See section 8. *Tightening torques and lubricants.*
3. Bring bearing bracket and pump housing together.
4. Tighten nuts (pos. 36) on staybolts (pos. 26).
See section 8. *Tightening torques and lubricants.*
5. Fit shaft guard (pos. 124c and 124e).
6. Fit extension pipe (pos. 105f).

5.3 Pump with cartridge seal

5.3.1 Dismantling the pump

1. Remove extension pipe (pos. 105f) from seal cover and shaft seal housing.
2. Remove screws (pos. 124d).
3. Remove shaft guard (pos. 124c and 124e).
4. Fit a lifting strap between the bearing bracket and lifting equipment.
5. Tighten the lifting strap.
6. Remove nuts (pos. 36).
7. Remove the bearing bracket from the pump housing.

5.3.2 Removing the cartridge seal



1. Slacken the screws in the lock tabs (pos. A, view 1) and turn the four lock tabs 180° so they engage with the grooves in the shaft seal (pos. A, view 2). This locks the shaft seal for further removal. Retighten the screws.
2. Slacken set screws (pos. 112a) in shaft seal (pos. 105).
3. Remove the four nuts (pos. 58d).
4. Press the shaft seal away from the pump housing cover and against the bearing bracket using two pinch bars (pos. H) or similar tools.
5. Remove impeller (pos. 49).
Note: The pump housing cover is now loose. Make sure that it does not drop on the pump shaft.
6. Remove key (pos. 11) from the shaft.
7. Pull pump housing cover (pos. 77) off the bearing bracket and shaft.
8. Spray soapy water on the shaft.
9. The shaft can now be pulled off by hand.

5.3.3 Fitting the cartridge seal

1. Fit bush (pos. A) on the shaft.
2. Lubricate the bush and shaft with soapy water.
3. Fit shaft seal (pos. 105) on the bush and push it in against the bearing bracket.
4. Fit pump housing cover (pos. 77) against the bearing bracket.
Note: Make sure that it does not drop on the pump shaft.
5. Remove bush (pos. A).
6. Fit key (pos. 11) in the shaft.
7. Fit impeller (pos. 49) together with washer (pos. 66), lock washer (pos. 66a) and nut (pos. 67).
Tighten the nut. See section 8. *Tightening torques and lubricants.*
8. Lubricate the O-ring (pos. 72a) with Rocol Sapphire Aqua-Sil and fit it on the pump housing cover.
9. Bring bearing bracket and pump housing together.
10. Tighten nuts (pos. 77f). See section 8. *Tightening torques and lubricants.*
11. Push the shaft seal against the pump housing cover and cross-tighten nuts (pos. 77e).
See section 8. *Tightening torques and lubricants.*
12. Tighten set screws (pos. 112a) in shaft seal (pos. 105).
See section 8. *Tightening torques and lubricants.*
13. Slacken the screws in the lock tabs (pos. A, view 2) and turn the four lock tabs 180° to position A in view 1. Retighten the screws.

5.3.4 Assembling the pump

1. Fit shaft guard (pos. 124c and 124e).
2. Fit extension pipe (pos. 105f).

5.4 Bearing bracket

5.4.1 Removing the bearing bracket (heavy-duty bearing design)

1. Remove retainer for coupling guard (pos. 7b).
2. Loosen bearing cover (pos. 156e) on the drive end of the bearing bracket using two small screwdrivers (pos. M) and remove it.
3. Remove bearing cover (pos. 156a) on the pump end of the bearing bracket. Fit two screws from the pump end cover into extractor holes and tighten them alternately to pull out the end cover.
4. Remove the shaft by pressing or hitting the pump end of the shaft with a rubber mallet (pos. K). It is advisable to fit impeller nut (pos. 67) to protect the thread.
5. Remove the outer roller bearing ring (pos. 54) from the pump end of the bearing bracket.
6. Remove the O-ring from the roller bearing grooves in the bearing bracket.
7. Remove the lock rings with lock-ring pliers (pos. N).

5.4.2 Removing the shaft with roller bearing and two angular contact bearings

1. Place the shaft in soft jaws (pos. D) in a vice.
2. Fit puller (pos. G) between the shaft shoulder and the back edge of the inner roller bearing ring.
3. Fit puller (pos. F) on puller (pos. G) and the shaft, and pull the inner roller bearing ring off the shaft.
4. Bend back the lock washer tab from the shaft nut slot and remove the shaft nut and lock washer.
5. Fit puller (pos. F) on the inner angular contact bearing and the drive end of the shaft, and pull off the angular contact bearings. The inner and outer spacer ring are removed at the same time.

5.4.3 Fitting the shaft with roller bearing and two angular contact bearings

1. Place the shaft in soft jaws (pos. D) in a vice.
2. Heat one angular contact bearing to 110 °C in a heating inductor.

Note: The broad side of the inner bearing ring must face the shaft shoulder.
3. Quickly fit the angular contact bearing home against the shaft shoulder until the inner ring has shrunk and is fixed firmly on the shaft.
4. Fit the small spacer ring on the shaft and home against the inner ring of the angular contact bearing.
5. Slide the large spacer ring (with holes) over the shaft and fit it on the small spacer ring so that it can be fitted together with the other angular contact bearing.
6. Heat the other angular contact bearing to 110 °C in a heating inductor.

Note: The bearing must be in the reverse direction compared to the first bearing.

Quickly fit the angular contact bearing with one hand. At the same time, hold the large spacer ring in position between the angular contact bearings until the inner ring of the angular contact bearing has shrunk and fixed firmly on the shaft.
7. Fit the lock washer on the shaft.
8. Fit shaft nut (pos. 67) and tighten it with hook spanner (pos. T). See section 8. *Tightening torques and lubricants*.
9. Bend one lock washer tab into one of the slots in the shaft nut with a screwdriver.
10. Heat the inner roller bearing ring to 110 °C in a heating inductor.
11. Quickly fit the inner ring home against the shaft shoulder until the inner ring has shrunk and is fixed firmly on the shaft.

5.4.4 Preparation of bearing bracket for oil lubrication

1. Remove the middle plug (1/4") in the side of the bearing bracket.
2. Wrap teflon tape around the thread of the constant-level oiler with teflon tape and screws the constant-level oiler into the tapped hole. It must be in vertical position. Lock the constant-level oiler into position by tightening counter nut (pos. 1g).
3. Remove the filling plug in the top of the bearing bracket.
4. Hinge down the constant-level oiler and pour the oil supplied through the filling hole using a funnel (pos. P) until the oil reaches level (1) in the connection elbow. See fig. 5.
5. Fill the reservoir of the constant-level oiler with oil and snap it back into operating position. Now oil will be filled into the bearing bracket. Air bubbles can be seen in the reservoir during this process. Continue until the correct oil level is reached (2). See fig. 5.
6. When no bubbles appear in the reservoir, refill the reservoir and snap it back into operating position.
7. Fit the filling plug.

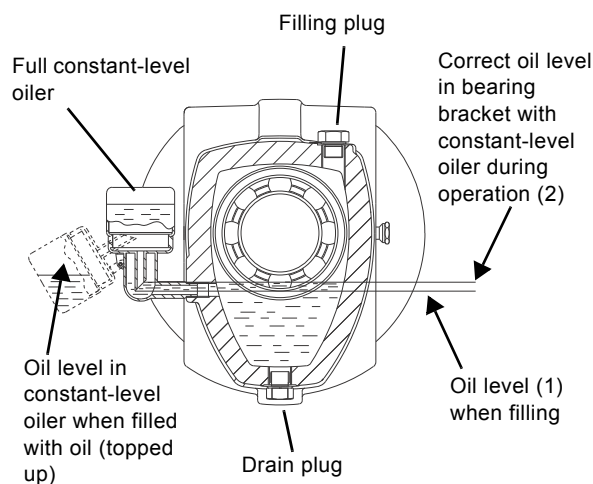


Fig. 5 Filling of oil

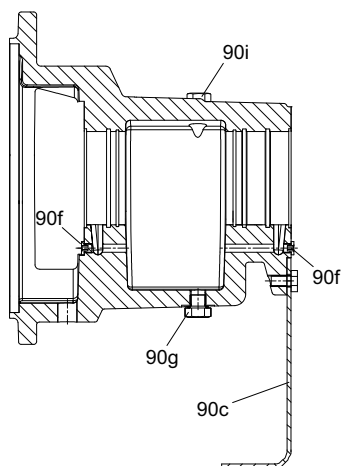
5.4.5 Preparation of bearing bracket for grease lubrication

1. Remove two plugs (1/4") in the top of the bearing bracket.
2. Fit automatic grease lubricators in the holes and set them to empty within 12 months according to the instructions supplied with the lubricators.

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5.4.6 Fitting the bearing bracket (heavy-duty bearing design)

The bearing bracket is equipped with foot (pos. 90c) and four plugs (pos. 90f, pos. 90i and pos. 90g).

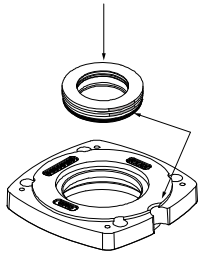


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There are two angular contact bearings, an inner and outer spacer ring as well as a roller bearing on the shaft.

1. Fit lock ring in the bearing bracket (one in the pump end and two in the drive end).
2. Fit lock rings in the bearing bracket (one in the pump end and two in the drive end).
3. Lubricate the bearing seats and O-rings in the bearing bracket with Rocol Sapphire Aqua-Sil.
4. Fit the outer roller bearing ring in the pump end. Push it home so that the bearing part touches the lock ring.
Note: It must be possible to fit it by hand only. See also service video.
5. Lubricate the inner roller bearing ring and outer rings of the angular contact bearings with Rocol Sapphire Aqua-Sil.
6. Fit the shaft through the pump end of the bearing bracket. Be careful when inserting it through the outer roller bearing ring. Push it home so that the bearing part touches the lock ring in the drive end.
Note: It must be possible to fit it by hand only. See also service video.

Preparation and fitting of bearing cover (pos. 156e, drive end) with oil seal

1. Replace the external O-ring (pos. 156d) and two internal O-rings (pos. 159g) in oil seal (pos. 156d).
2. Lubricate the bearing cover and O-ring of the oil seal with soapy water.
3. Place the oil seal on the outside of the bearing cover with the backflow channels in the same direction as the recess in the cover. The oil seal must be fitted so that the backflow channels are above the external O-ring. Press the oil seal home with a flat piece of wood or a plate.

4. Turn the bearing cover, lubricate O-ring (pos. 53a) with Rocol Sapphire Aqua-Sil and fit it inside the cover.
5. Fit the bearing cover together with the oil seal on the drive end of the bearing bracket.
Note: The recess must point downwards. Check that the oil seal does not separate from the cover during assembly. Tighten the screws. See section 8. *Tightening torques and lubricants.*

TM04 6688 0610

Preparation and fitting of bearing cover (pos. 156a, pump end) with oil seal

1. Replace the external O-ring (pos. 156d) and two internal O-rings (pos. 159g) in oil seal (pos. 156a).
2. Lubricate the bearing cover and O-ring of the oil seal with soapy water.
3. Place the oil seal on the outside of the bearing cover with the backflow channels in the same direction as the recess in the cover. The oil seal must be fitted so that the backflow channels are above the external O-ring. Press the oil seal home with a flat piece of wood or a plate.

4. Turn the bearing cover, lubricate O-ring (pos. 156d) with Rocol Sapphire Aqua-Sil and fit it inside the cover.
5. Fit the bearing cover together with the oil seal on the pump end of the bearing bracket.
Note: The recess must point downwards. Check that the oil seal does not separate from the cover during assembly. Tighten the screws. See section 8. *Tightening torques and lubricants.*
6. Fit the retainer for coupling guard on the bearing bracket.
Note: The slot in the cover must point upwards. Tighten the screws. See section 8. *Tightening torques and lubricants.*

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5.5 Replacing the wear rings

Pump with bronze wear rings

1. Insert the hook of puller (pos. C) under wear ring (pos. 45 or 45b).
2. Knock the impact block against the puller end stop. Move the puller to other positions on the circumference of the wear ring.
3. Knock the new wear ring home using a piece of wood as a buffer.
4. Repeat steps 1 to 3 for the second wear ring of the pump.

Pump with stainless-steel wear rings

1. Remove screws (pos. 24 and 24b) of both wear rings (pos. 45 and 45b) and remove the wear rings.
2. Fit new wear rings and tighten the screws.
See section 8. *Tightening torques and lubricants.*

Pump with stainless-steel or carbon-graphite-filled wear rings

1. Remove screws (pos. 24 and 24b) of both wear ring retainers (pos. 65 and 65b) and remove the retainers.
2. Push the carbon-graphite-filled wear rings (pos. 45 and 45b) out of the retainers.
3. Fit new carbon-graphite-filled wear rings in the retainers.
4. Fit new wear rings/wear rings retainers and tighten the screws.
See section 8. *Tightening torques and lubricants.*

6. Fault finding



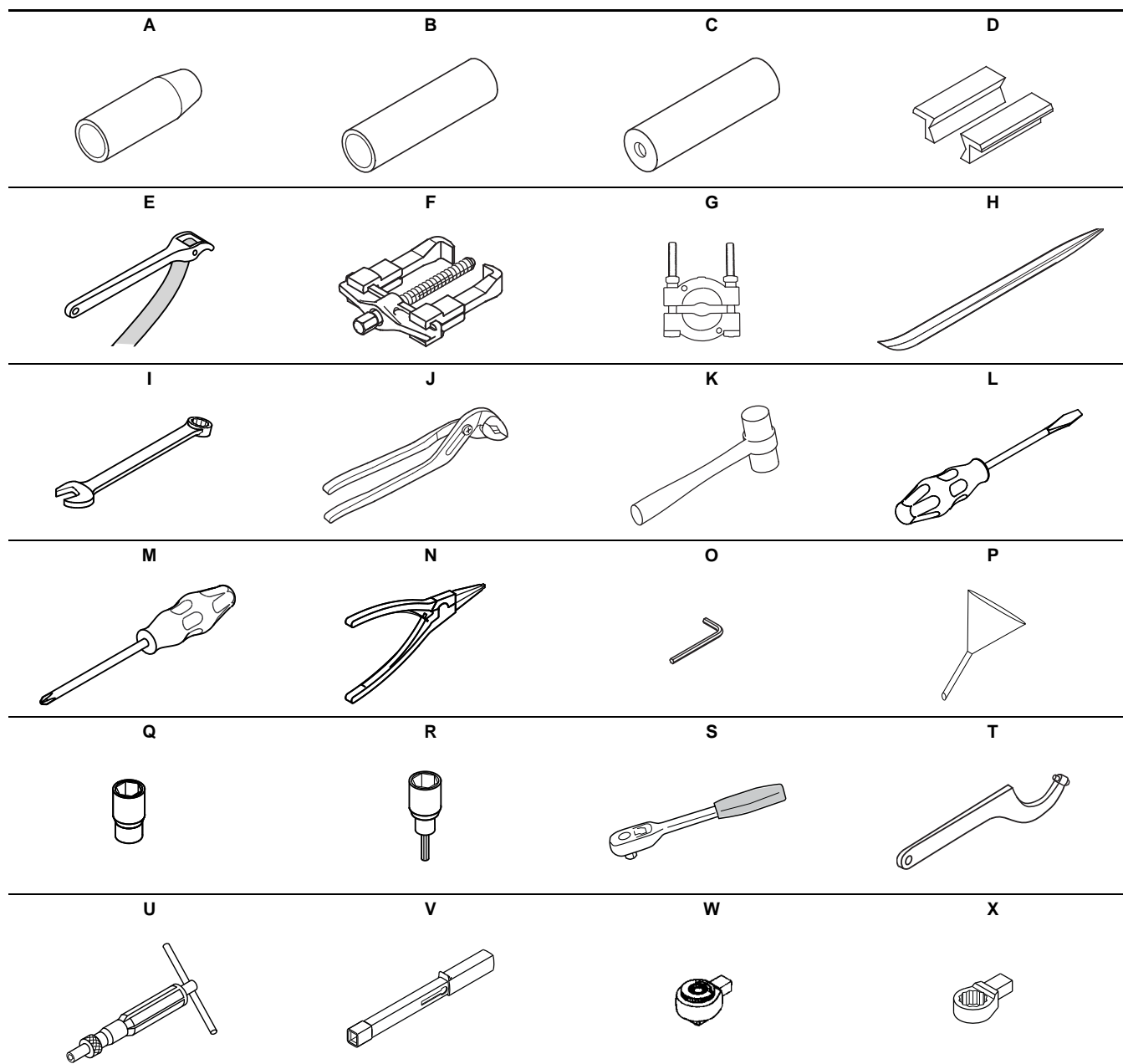
Warning

Before removing the terminal box cover and before any dismantling of the pump, switch off the power supply and make sure that it cannot be accidentally switched on.

Fault	Cause	Remedy
1. The pump delivers no or too little liquid.	a) Wrong electrical connection (two phases).	Check the electrical connection and remedy, if necessary.
	b) Wrong direction of rotation.	Interchange two phases of the mains supply.
	c) Air in suction pipe.	Vent the suction pipe or the pump and replenish.
	d) Counter-pressure too high.	Set the duty point in accordance with the data sheet. Check the system for impurities.
	e) Inlet pressure too low.	Increase the liquid level on the suction side. Open the isolating valve in the suction pipe. See the installation and operating instructions.
	f) Suction pipe blocked, or impurities in impeller.	Clean the pump.
	g) Pump draws in air due to defective seal.	Check the pipeline seals, pump housing gaskets and shaft seals, and replace, if necessary.
	h) Pump draws in air due to low liquid level.	Increase the liquid level on the suction side and keep it as constant as possible.
2. The motor-protective circuit breaker has tripped because the motor is overloaded.	a) Pump blocked by impurities.	Clean the pump.
	b) Pump running above the rated duty point.	Set the duty point in accordance with the data sheet.
	c) Density or viscosity of the liquid is higher than specified when ordering.	If less flow is sufficient, reduce the flow on the discharge side. Or fit a more powerful motor.
	d) The overload setting of the motor-protective circuit breaker is incorrect.	Check the setting of the motor-protective circuit breaker and replace, if necessary.
	e) The motor runs on two phases.	Check the electrical connection. Replace the fuse, if defective.
3. Pump makes too much noise. Pump runs unevenly and vibrates.	a) Inlet pressure too low (cavitation).	Increase the liquid level on the suction side. Open the isolating valve in the suction pipe. See the installation and operating instructions.
	b) Air in suction pipe or pump.	Vent the suction pipe or the pump and replenish.
	c) Counter-pressure is lower than specified.	Set the duty point in accordance with the data sheet.
	d) Pump draws in air due to low liquid level.	Increase the liquid level on the suction side and keep it as constant as possible.
	e) Impeller out of balance (clogged impeller blades).	Clean and check the impeller.
	f) Inner parts worn.	Replace defective parts.
	g) Pump stressed by the pipework (thus causing starting noise).	Mount the pump so that it is not stressed. Support the pipes.
	h) Defective bearings.	Replace the bearings.
	i) Defective motor fan.	Replace the fan.
	j) Defective coupling.	Replace the coupling. Align the coupling. See section 6. <i>Fault finding</i> .
4. Leakage in pump or at connections. Leakage in mechanical shaft seal. Leakage in stuffing box.	k) Foreign bodies in the pump.	Clean the pump.
	l) Frequency converter operation	See the installation and operating instructions.
	a) Pump stressed by the pipework (thus causing leaks in the pump or at connections).	Mount the pump so that it is not stressed. Support the pipes.
	b) Pump housing gaskets and gaskets at connections defective.	Replace pump housing gaskets or gaskets at connections.
	c) Mechanical shaft seal dirty or stuck together.	Check and clean the mechanical shaft seal.
	d) Mechanical shaft seal defective.	Replace the mechanical shaft seal.
e) Stuffing box defective.	Retighten the stuffing box. Repair or replace the stuffing.	
f) Shaft surface or shaft sleeve defective.	Replace the shaft or the shaft sleeve. Replace the packing in the stuffing box.	

Fault	Cause	Remedy
5. Too high temperature in pump or motor.	a) Air in suction pipe or pump.	Vent the suction pipe or the pump and replenish.
	b) Inlet pressure too low.	Increase the liquid level on the suction side. Open the isolating valve in the suction pipe. See the installation and operating instructions.
	c) Bearings lubricated with too little, too much or unsuitable lubricant.	Replenish, reduce or replace lubricant.
	d) Pump with bearing housing stressed by the pipework.	Mount the pump so that it is not stressed. Support the pipes. Check the alignment of the coupling. See section 6. <i>Fault finding</i> .
	e) The axial pressure is too high.	Check the relief holes of the impeller and the seal rings on the suction side.
	f) Motor-protective circuit breaker is defective, or setting is incorrect.	Check the setting of the motor-protective circuit breaker and replace, if necessary.
	g) The motor is overloaded.	Reduce the flow rate.

7. Service tools



7.1 Special tools

Pos.	Description	For pos.	Further information	Part number
A	Bush	105		
B	Punch	105	d28	V7216306
			d38	V7216307
			d48	70007172
			d55	70007173
			d60	70007174
C	Spacing pipe	105	d28	-
			d38	-
			d48	97634451
			d55	-
			d60	-

7.2 Standard tools

Pos.	Description	For pos.	Further information	Part number
D	Jaws			
E	Strap wrench	49	48"	00SV0853
F	Puller	49		
G	Puller	53, 54		
H	Pinch bar	86		SV5201
I	Ring/open-end spanner	36, 36a, 67, 89e, 90d, 90e, 110a	17 mm	SV0056
			19 mm	SV0063
			22 mm	00SV0186
			24 mm	SV0122
			27 mm	
			36 mm	
			41 mm	
			50 mm	
J	Polygrip pliers	11, 11a		SV0150
K	Rubber mallet	156a		SV0349
L	Screwdriver	105		
M	Cross-recess screwdriver	124d		
N	Lock-ring pliers	159f		
O	Hexagon key	89a, 89b, 89c, 89d, 90e, 105	2 mm	SV0276
			3 mm	
			4 mm	SV0278
			5 mm	
			6 mm	SV0196
			8 mm	SV0032
			10 mm	SV0033
			12 mm	
P	Funnel			
Q	Hexagon socket	36, 36a, 67, 89e, 90d, 90e, 110a	17 mm	SV0417
			19 mm	SV0419
			22 mm	SV0422
			24 mm	SV0424
			27 mm	SV0427
			36 mm	
			41 mm	
			50 mm	
R	Hexagon head driver	89a, 89b, 89c, 89d, 90e	4 mm	SV0414
			5 mm	SV0296
			6 mm	SV0297
			8 mm	SV0298
			10 mm	SV0299
			12 mm - 1/2"	SV0394
S	Ratchet handle	Q, R	1/2"	96777072
T	Hook spanner	54b	For KM11	

7.3 Torque tools

Pos.	Description	For pos.	Further information	Part number
U	Torque screwdriver	P	1-6 Nm	SV0438
V	Torque wrench	W, X	9 x 12 mm - 4-20 Nm	SV2092
			9 x 12 mm - 20-100 Nm	SV0269
			14 x 18 mm - 40-200 Nm	SV0400
W	Ratchet insert tool	Q, R	9 x 12 mm - 1/2"	SV0295
			14 x 18 mm	SV0401
X	Ring insert tool	90a	17 mm - 9 x 12 mm	SV0270
			19 mm - 9 x 12 mm	SV0271
			24 mm - 14 x 18 mm	SV0524
			30 mm - 14 x 18 mm	SV0530
			36 mm	SV0536

8. Tightening torques and lubricants

Pos.	Description	Quantity	Dimensions	Torque [Nm]	Lubricant
1d	SPM nipple	2	M8 x 24	10 ± 1	-
1g	Lock nut for constant-level oiler	1		10 ± 1	-
7k	Hexagon socket head cap screw	4	M6 x10	10	-
17	Plug, air vent	1	R 1/8	15 ± 2	Teflon tape
19	Pipe plug	1	3/8"	25 ± 6	-
20	Plug	1	1/2"	30 ± 6	-
24b	Hexagon socket head cap screw	2 x 4	M5 x 10	5 ± 0.5	-
36	Nut	1	M12	80 ± 16	-
53	Angular contact bearing	2	D100/d55	-	Grease lubricator, LAGD 125/HP2 or Shell omala 68 oil
	Deep-groove ball bearing (open bearing)	1	D120/d55	-	
	Deep-groove ball bearing (cover plates)	1	D120/d55	-	
53a	O-ring, FKM	4	D100 x 3.0	-	Rocol Sapphire Aqua-Sil
53d	O-ring	1	D119.5 x 3.0	-	
54	Roller bearing (open bearing)	1	D100/d55	-	Grease lubricator, LAGD 125/HP2 or Shell omala 68 oil
	Deep-groove ball bearing (open bearing)	1	D120/d55	-	
	Deep-groove ball bearing (cover plates)	1	D120/d55	-	
54a	O-ring FKM	2			
54b	Lock nut (D42 shaft)	1	KM11	60	-
58a	Pipe plug	2	R 1/4	15 ± 2	-
58c	Machine screw, torx, countersunk	4	M12	105 ± 10	-
			M16	260 ± 23	-
58d	Nut	4			
67	Nut	1	M24 x 1.5	375 ± 35	-
72a	O-ring, EPDM	1	D278.99 x 3.53	-	
77b	O-ring	1	D129.5 x 3.0	-	
77c	O-ring, FKM	1	D128 x 3.0	-	
77e	Nut	4	M10	60 ± 5	-
77f	Hexagon head screw	8	M10 x 20	60 ± 5	-
90e	Hexagon head screw	1	M12 x 25	80	-
90f	Pipe plug	2	Rp 1/8	15	-
90g	Plug, TSD	1	G 1/2	15 ± 2	-
90h	Pipe plug	2	R 1/4	15 ± 2	-
90i	Plug, TCD	1	G 1/2	5 ± 0.5	-
105	Shaft seal	-			Soapy water
105a	Nipple	2	R 1/8 - R 3/8	25 ± 6	Teflon tape
105e	Pipe plug	2	R 3/8	25 ± 6	Teflon tape
105f	Extension pipe	2	R 3/8	25 ± 6	Teflon tape
110	O-ring, EPDM	1	D83 x 3	-	Soapy water
124d	Screw	4	M5 x 10 mm	8.2 ± 0.6	-
156c	Hexagon socket head cap screw	10	M8 x 25	20	-
156d	O-ring	2	-	-	
159g	O-ring	2	-	-	

Thread-Eze: Product number SV9997 (0.5 l).

8.1 Lubrication

Pump bearings

The pump is provided with maintenance-free, greased-for-life bearings. The pump has no lubricating nipples.

Grease specifications, see section 8.1.1 *Bearing grease*.

Motor bearings

Motors up to and including frame size 160 have maintenance-free, greased-for-life bearings.

Motors of frame sizes larger than 160 should be greased according to the indications on the motor nameplate.

Grease spills from the motor may occur.

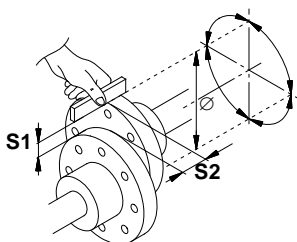
Grease specifications, see section 8.1.1 *Bearing grease*.

8.1.1 Bearing grease

Use lithium-based grease with the following specifications:

- NLGI class 2 or 3.
- Viscosity of basic oil: 70 to 150 mm²/s at +40 °C.
- Temperature range: -30 °C to +140 °C during continuous operation.

Distance between couplings



Coupling diameter [mm]	Standard coupling		Spacer coupling	
	S2 [mm]	Tolerance [mm]	S2 [mm]	Tolerance [mm]
Ø80	-	-	6	0/-1
Ø95	-	-	6	0/-1
Ø110	-	-	6	0/-1
Ø125	4	0/-1	6	0/-1
Ø140	4	0/-1	6	0/-1
Ø160	4	0/-1	6	0/-1
Ø180	4	0/-1	6	0/-1
Ø200	4	0/-1	7	0/-1
Ø224	4	0/-1	7	0/-1
Ø250	4	0/-1	9	0/-1

S2 is to be measured on the whole circumference of the coupling. The largest and smallest measured values must not differ by more than 0.2 mm.

S1 is to be measured on the whole circumference of the coupling and must not exceed 0.2 mm.

9. Exploded view

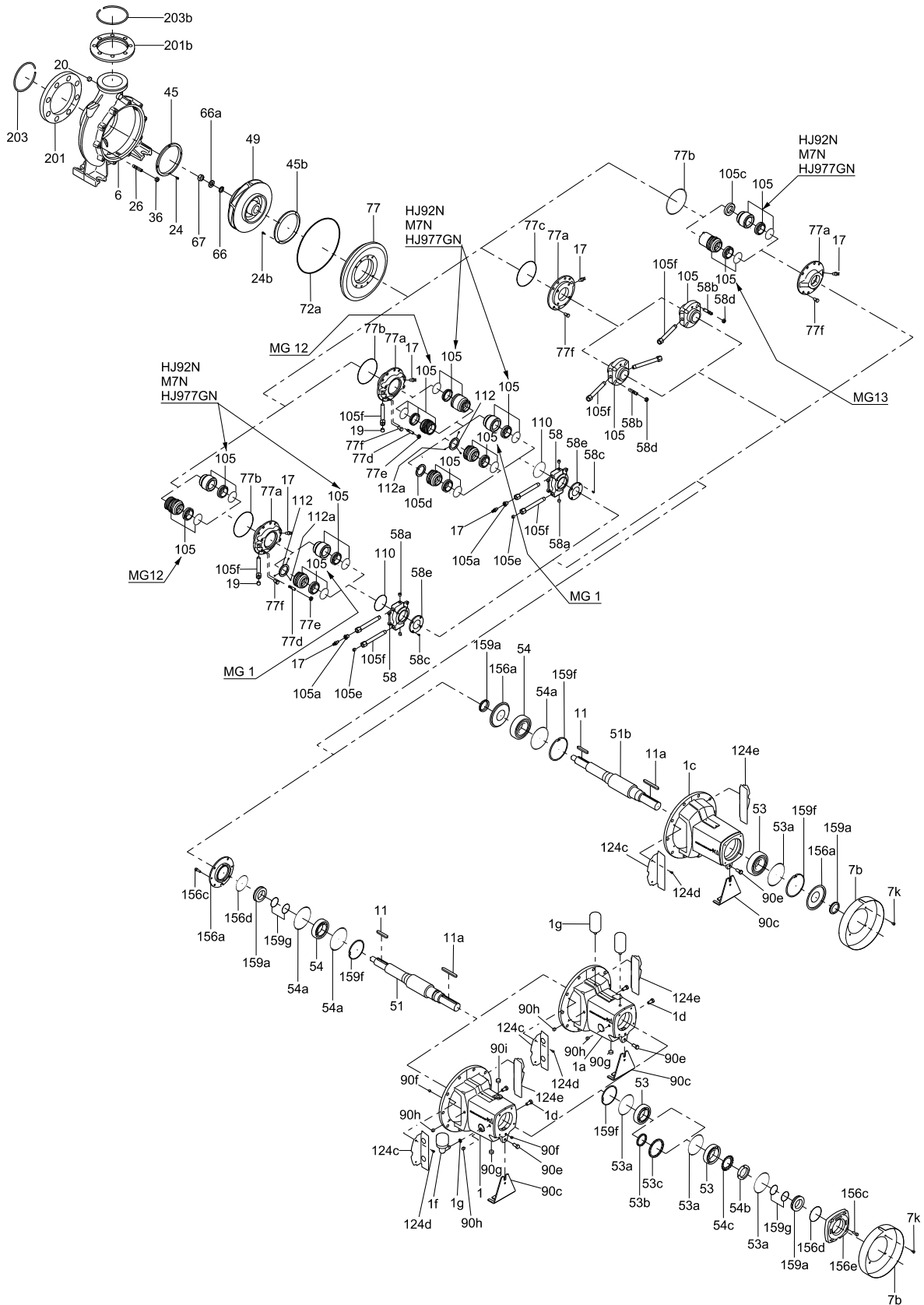


Fig. 6 Exploded view

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