

Standardised Chemical Pump

MegaCPK

Bearing brackets CS40 to CS80

Installation/Operating Manual



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Installation/Operating Manual MegaCPK

Original operating manual

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Glossary

Back pull-out design

The complete back pull-out unit can be pulled out without having to remove the pump casing from the piping.

Back pull-out unit

Pump without pump casing; partly completed machinery

Certificate of decontamination

A certificate of decontamination is enclosed by the customer when returning the product to the manufacturer to certify that the product has been properly drained to eliminate any environmental and health hazards arising from components in contact with the fluid handled.

Discharge line

The line which is connected to the discharge nozzle

Hydraulic system

The part of the pump in which the kinetic energy is converted into pressure energy

Pool of pumps

Pumps which are purchased and stored independently of their later use

Pump

Machine without drive, additional components or accessories

Pump set

Complete pump set consisting of pump, drive, additional components and accessories

Suction lift line/suction head line

The line which is connected to the suction nozzle

1 General

1.1 Principles

This operating manual is supplied as an integral part of the type series and variants indicated on the front cover. The manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series and size, the main operating data, the order number and the order item number. The order number and order item number uniquely identify the pump (set) and serve as identification for all further business processes.

In the event of damage, immediately contact your nearest KSB service centre to maintain the right to claim under warranty.

Noise characteristics (⇒ Section 4.6 Page 19)

1.2 Installation of partly completed machinery

To install KSB partly completed machinery supplied refer to the sub-sections under Servicing/Maintenance. (⇒ Section 7.5.5 Page 56)

1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇒ Section 2.4 Page 9)

1.4 Other applicable documents

Table 1: Overview of other applicable documents

Document	Contents
Data sheet	Description of the technical data of the pump (set)
General arrangement drawing/ outline drawing	Description of mating and installation dimensions for the pump (set), weights
Drawing of auxiliary connections	Description of auxiliary connections
Hydraulic characteristic curve	Characteristic curves showing head, NPSH required, efficiency and power input
General assembly drawing ¹⁾	Sectional drawing of the pump
Sub-supplier product literature ¹⁾	Operating manuals and other product literature describing accessories and integrated machinery components
Spare parts lists ¹⁾	Description of spare parts
Piping layout ¹⁾	Description of auxiliary piping
List of components ¹⁾	Description of all pump components
Drawing for assembly	Sectional drawing of the installed shaft seal


For accessories and/or integrated machinery components observe the relevant manufacturer's product literature.

1.5 Symbols

Table 2: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇒	Result of an action
⇔	Cross-references

¹⁾ If agreed upon in scope of supply

Symbol	Description
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product








2 Safety

All the information contained in this section refers to hazardous situations.



2.1 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	Explosion protection This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EC Directive 94/9/EC (ATEX).
	General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

2.2 General

This manual contains general installation, operating and maintenance instructions that must be observed to ensure safe pump operation and prevent personal injury and damage to property.

The safety information in all sections of this manual must be complied with.

This manual must be read and completely understood by the specialist personnel/operators responsible prior to installation and commissioning.

The contents of this manual must be available to the specialist personnel at the site at all times.

Information attached directly to the pump must always be complied with and be kept in a perfectly legible condition at all times. This applies to, for example:

- Arrow indicating the direction of rotation
- Markings for connections
- Name plate

The operator is responsible for ensuring compliance with all local regulations not taken into account in this manual.

2.3 Intended use

The pump (set) must only be operated within the operating limits described in the other applicable documents. (⇒ Section 1.4 Page 6)

- Only operate pumps/pump sets which are in perfect technical condition.
- Do not operate the pump (set) in partially assembled condition.
- Only use the pump to handle the fluids described in the data sheet or product literature of the pump model.

- Never operate the pump without the fluid handled.
- Observe the minimum flow rates indicated in the data sheet or product literature (to prevent overheating, bearing damage, etc).
- Observe the maximum flow rates indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage, etc).
- Do not throttle the flow rate on the suction side of the pump (to prevent cavitation damage).
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.

Prevention of foreseeable misuse

- Never open discharge-side shut-off elements further than permitted.
 - The maximum flow rate specified in the data sheet or product literature would be exceeded.
 - Risk of cavitation damage
- Never exceed the permissible operating limits specified in the data sheet or product literature regarding pressure, temperature, etc.
- Observe all safety information and instructions in this manual.

2.4 Personnel qualification and training

All personnel involved must be fully qualified to transport, install, operate, maintain and inspect the machinery this manual refers to.

The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.

Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.

Training on the pump (set) must always be supervised by technical specialist personnel.

2.5 Consequences and risks caused by non-compliance with this manual

- Non-compliance with this operating manual will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices
 - Hazard to the environment due to leakage of hazardous substances

2.6 Safety awareness

In addition to the safety information contained in this manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards and laws

2.7 Safety information for the operator/user

- The operator shall fit contact guards for hot, cold and moving parts and check that the guards function properly.
- Do not remove any contact guards during operation.
- Provide the personnel with protective equipment and make sure it is used.
- Contain leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- If shutting down the pump does not increase potential risk, fit an emergency-stop control device in the immediate vicinity of the pump (set) during pump set installation.

2.8 Safety information for maintenance, inspection and installation work

- Modifications or alterations of the pump are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts authorised by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that all maintenance, inspection and installation work is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- The pump casing must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the pump set out of service always adhere to the procedure described in the manual. (⇒ Section 6.1.12 Page 38) (⇒ Section 6.3 Page 40)
- Decontaminate pumps which handle fluids posing a health hazard. (⇒ Section 7.3 Page 47)
- As soon as the work has been completed, re-install and/or re-activate any safety-relevant and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.1 Page 32)

2.9 Unauthorised modes of operation

Never operate the pump (set) outside the limits stated in the data sheet and in this manual.

The warranty relating to the operating reliability and safety of the supplied pump (set) is only valid if the equipment is used in accordance with its intended use. (⇒ Section 2.3 Page 8)

2.10 Explosion protection

Always observe the information on explosion protection given in this section when operating the pump in potentially explosive atmospheres.

Only pumps/pump sets marked as explosion-proof **and** identified as such in the data sheet may be used in potentially explosive atmospheres.

Special conditions apply to the operation of explosion-proof pump sets to EC Directive 94/9/EC (ATEX).

Especially adhere to the sections in this manual marked with the Ex symbol and the following sections (⇒ Section 2.10.1 Page 11) to (⇒ Section 2.10.4 Page 12) .

The explosion-proof status of the pump set is only assured if the pump set is used in accordance with its intended use.



Never operate the pump set outside the limits stated in the data sheet and on the name plate.

Prevent impermissible modes of operation at all times.

2.10.1 Marking

- Pump** The marking on the pump refers to the pump part only.
Example of such marking: II 2 G c TX
Refer to the Temperature Limits table for the temperatures permitted for the individual pump variants.
- Shaft coupling** An EC manufacturer's declaration is required for the shaft coupling; the shaft coupling must be marked accordingly.
- Motor** The motor must be considered separately.

2.10.2 Temperature limits

In normal pump operation, the highest temperatures are to be expected on the surface of the pump casing, at the shaft seal and in the bearing areas.

The surface temperature at the pump casing corresponds to the temperature of the fluid handled. If the pump is heated in addition, the operator of the system is responsible for observing the specified temperature class and fluid temperature (operating temperature).

The table below lists the temperature classes and the resulting theoretical temperature limits of the fluid handled (a possible temperature rise in the shaft seal area has already been taken into account).

The temperature class specifies the maximum permissible temperature at the surface of the pump set during operation.

For the permissible operating temperature of the pump in question refer to the data sheet.

Table 4: Temperature limits

Temperature class to EN 13463-1	Maximum permissible fluid temperature
T1	Maximum 400 °C ²⁾
T2	280 °C
T3	185 °C
T4	120 °C
T5	85 °C
T6	Only after consultation with the manufacturer

Temperature class T5 Based on an ambient temperature of 40 °C and proper maintenance and operation, compliance with temperature class T5 is warranted in the area of the rolling element bearings. If the ambient temperature exceeds 40 °C, contact the manufacturer.

If grease lubrication is used, compliance with temperature class T5 is not possible.

Temperature class T6 A special design is required to comply with the requirements of temperature class T6 in the bearing area.

Misuse, malfunctions or non-compliance with the instructions may result in substantially higher temperatures.

If the pump is to be operated at a higher temperature, if there is no data sheet or if the pump is part of a pool of pumps, contact KSB for the maximum permissible operating temperature.

2.10.3 Monitoring equipment

The pump (set) must only be operated within the limits specified in the data sheet and on the name plate.

If the system operator cannot warrant compliance with these operating limits,

²⁾ Depending on the material variant

appropriate monitoring devices must be used.

Check whether monitoring equipment is required to ensure that the pump set functions properly.

Contact KSB for further information on monitoring equipment.

2.10.4 Operating limits



The minimum flows indicated in (⇒ Section 6.2.3.1 Page 39) refer to water and water-like fluids handled. Longer operating periods with these fluids and at the flow rates indicated will not cause an additional increase in the temperatures at the pump surface. However, if the physical properties of the fluids handled are different from water, it is essential to check whether an additional heat build-up may occur and if the minimum flow rate must therefore be increased. The calculation formula in (⇒ Section 6.2.3.1 Page 39) can be used to check whether additional heat build-up may lead to a dangerous temperature increase at the pump surface.

3 Transport/Temporary Storage/Disposal

3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the supplying dealer (as applicable) and the insurer about the damage in writing immediately.

3.2 Transport

	<div data-bbox="491 533 1450 589"> DANGER</div> <p data-bbox="491 595 1182 651">The pump (set) could slip out of the suspension arrangement Danger to life from falling parts!</p> <ul data-bbox="507 663 1404 880" style="list-style-type: none">▷ Always transport the pump (set) in the specified position.▷ Never attach the suspension arrangement to the free shaft end or the motor eyebolt.▷ Give due attention to the weight data and the centre of gravity.▷ Observe the applicable local health and safety regulations.▷ Use suitable, permitted lifting accessories, e.g. self-tightening lifting tongs.
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To transport the pump/pump set or back pull-out unit suspend it from the lifting tackle as shown below.

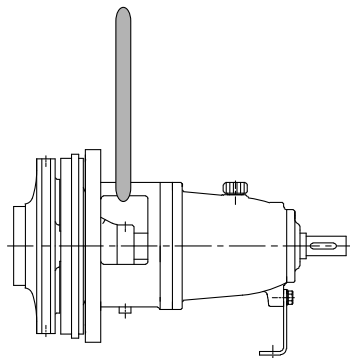


Fig. 1: Transporting the back pull-out unit

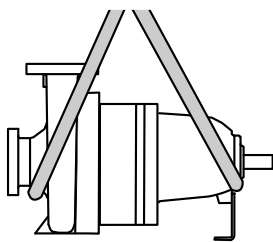


Fig. 2: Transporting the pump

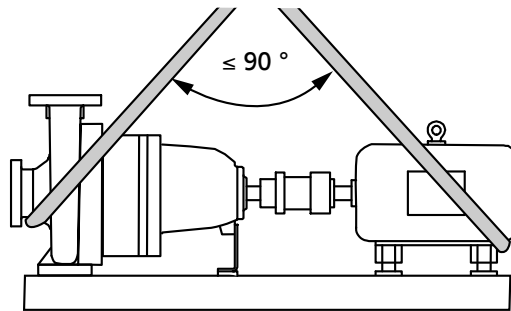


Fig. 3: Transporting the complete pump set

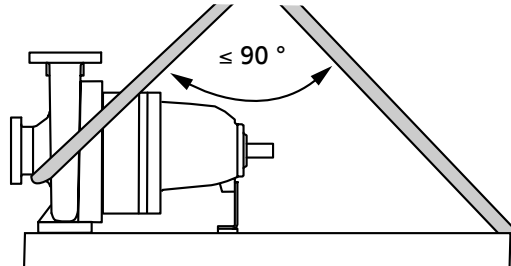




Fig. 4: Transporting the pump on the baseplate

3.3 Storage/preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for pump (set) storage.

	<p>CAUTION</p> <p>Damage during storage by humidity, dirt, or vermin Corrosion/contamination of the pump (set)!</p> <ul style="list-style-type: none"> ▸ For outdoor storage cover the packed or unpacked pump (set) and accessories with waterproof material.
	<p>CAUTION</p> <p>Wet, contaminated or damaged openings and connections Leakage or damage to the pump set!</p> <ul style="list-style-type: none"> ▸ Only remove caps/covers from the openings of the pump set at the time of installation.

Store the pump (set) in a dry, protected room where the atmospheric humidity is as constant as possible.

Rotate the shaft by hand once a month, e.g. via the motor fan.

If properly stored indoors, the pump set is protected for a maximum of 12 months. New pumps/pump sets are supplied by our factory duly prepared for storage.

For storing a pump (set) which has already been operated, observe the instructions in (⇒ Section 6.3.1 Page 40) .

3.4 Return to supplier

1. Drain the pump as per operating instructions. (⇒ Section 7.3 Page 47)
2. Always flush and clean the pump, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pump set has handled fluids whose residues could lead to corrosion in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pump set must also be neutralised, and anhydrous inert gas must be blown through the pump to ensure drying.

4. Always complete and enclose a certificate of decontamination when returning the pump (set).
Always indicate any safety and decontamination measures taken. (⇒ Section 11 Page 69)



NOTE

If required, a blank certificate of decontamination can be downloaded from the KSB web site at: www.ksb.com/certificate_of_decontamination

3.5 Disposal



⚠ WARNING

Fluids, consumables and supplies which are hot and/or pose a health hazard
Hazard to persons and the environment!

- ▷ Collect and properly dispose of flushing fluid and any residues of the fluid handled.
- ▷ Wear safety clothing and a protective mask, if required.
- ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

1. Dismantle the pump (set).
Collect greases and other lubricants during dismantling.
2. Separate and sort the pump materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

4 Description of the Pump (Set)

4.1 General description

- Standardised chemical pump with shaft seal

Pump for handling aggressive liquids in the chemical and petrochemical industries.

4.2 Designation

Example: MCPK 50-32-160 CDhix

Table 5: Key to the designation

Code	Description
MCPK	Type series (full name: MegaCPK)
50	Nominal suction nozzle diameter [mm]
32	Nominal discharge nozzle diameter [mm]
160	Nominal impeller diameter [mm]
C	Casing material, e.g. C = stainless steel
D	Impeller material if different from casing material, e.g. D = duplex
hix	Additional description, e.g. h = heatable, i = inducer, x = special version

4.3 Name plate

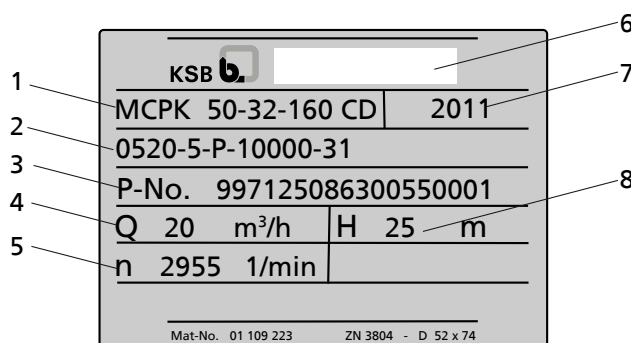


Fig. 5: Name plate (example)

1	Type series, size, material	2	Customer-specific information (optional)
3	KSB order and order item number	4	Flow rate
5	Speed	6	Manufacturer's name and address
7	Year of construction	8	Head

4.4 Design details

Design

- Volute casing pump
- Horizontal installation
- Back pull-out design
- Single-stage
- Meets the technical requirements to ISO 5199
- Dimensions and ratings to ISO 2858
complemented by pumps of nominal diameters DN 25, DN 200 and above

Pump casing

- Single or double volute, depending on the pump size

- Radially split volute casing
- Volute casing with integrally cast pump feet
- Replaceable casing wear rings (as required)

Impeller type

- Closed radial impeller with multiply curved vanes

Shaft seal

- Gland packing
- Commercial single and double mechanical seals
- Commercial cartridge seals
- Shaft fitted with a replaceable shaft protecting sleeve in the shaft seal area

Alternative:

- Version without shaft protecting sleeve, with "wet" shaft (Europe only)

Bearing assembly

Bearings:

- Medium-duty
 - Radial bearing: cylindrical roller bearing
 - Fixed bearing: paired angular contact ball bearings / double-row angular contact ball bearing
- Economy
 - Floating bearing assembly: deep-groove ball bearings

Lubrication:

- Oil lubrication
- Grease lubrication

Bearing bracket designation

Example: CS50E

Table 6: Bearing bracket designation

Designation	Description
CS	Bearing bracket
50	Size code (based on dimensions of seal chamber and shaft end)
E	Bearing design
E	= Economy
- ³⁾	= Medium-duty

Bearings used

Table 7: Standard bearing assembly

Design	Bearing bracket	Rolling element bearings	
		Pump end	Drive end
Medium-duty (oil and grease lubrication)	CS40	NU208-E	3208
	CS50	NU310-E	2 x 7310 ⁴⁾
	CS60	NU312-E	2 x 7312 ⁴⁾
	CS80	NU216-E	2 x 7216 ⁴⁾
Economy (oil lubrication)	CS40E	6208 C3	6208 C3
	CS50E	6310 C3	6310 C3
	CS60E	6312 C3	6312 C3
	CS80E	6216 C3	6216 C3
Economy (grease lubrication)	CS40E	6208-2Z C3	6208-2Z C3
	CS50E	6310-2Z C3	6310-2Z C3

³⁾ Blank

⁴⁾ FAG designation: B-TVP-UA; SKF designation: BECBP

Design	Bearing bracket	Rolling element bearings	
		Pump end	Drive end
	CS60E	6312-2Z C3	6312-2Z C3
	CS80E	6216-2Z C3	6216-2Z C3

4.5 Configuration and function

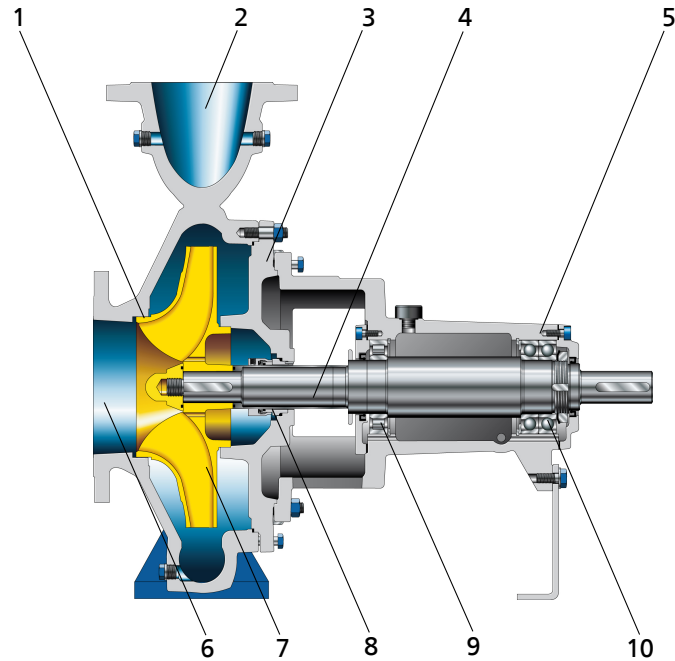


Fig. 6: Sectional drawing

1	Clearance gap	2	Discharge nozzle
3	Casing cover	4	Shaft
5	Bearing bracket	6	Suction nozzle
7	Impeller	8	Shaft seal
9	Rolling element bearing, pump end	10	Rolling element bearing, drive end

Design The pump is designed with an axial fluid inlet and a radial or tangential outlet. The hydraulic system runs in its own bearings and is connected to the motor by a shaft coupling.

Function The fluid enters the pump axially via the suction nozzle (6) and is accelerated outward by the rotating impeller (7). In the flow passage of the pump casing the kinetic energy of the fluid is converted into pressure energy. The fluid is pumped to the discharge nozzle (2), where it leaves the pump. The clearance gap (1) prevents any fluid from flowing back from the casing to the suction nozzle. At the rear side of the impeller, the shaft (4) enters the casing via the casing cover (3). The shaft passage through the cover is sealed to atmosphere with a shaft seal (8). The shaft runs in rolling element bearings (9 and 10), which are supported by a bearing bracket (5) linked with the pump casing and/or casing cover.

Sealing The pump is sealed by a shaft seal (standardised mechanical seal or gland packing).

4.6 Noise characteristics

Table 8: Surface sound pressure level L_{pA} ⁵⁾⁶⁾

Rated power input P_N [kW]	Pump			Pump set		
	960 rpm 760 rpm [dB]	1450 rpm [dB]	2900 rpm [dB]	960 rpm 760 rpm [dB]	1450 rpm [dB]	2900 rpm [dB]
1,5	52	53	54	56	58	63
2,2	53	55	56	58	60	66
3	55	56	57	60	62	68
4	56	58	59	61	63	69
5,5	58	59	61	62	65	71
7,5	59	61	62	64	66	72
11	61	63	64	65	68	74
15	63	65	66	67	69	75
18,5	64	66	67	68	70	76
22	65	67	68	68	71	77
30	66	68	70	70	72	78
37	67	70	71	70	73	79
45	68	71	72	71	74	80
55	69	72	73	72	74	80
75	71	73	75	73	76	81
90	71	74	76	73	76	82
110	72	75	77	74	77	82
132	73	76	78	75	77	83
160	74	77	79	75	78	84
200	75	78	80	76	79	84
250	-	79	81	-	80	85

4.7 Scope of supply

Depending on the model, the following items are included in the scope of supply:

Drive	▪ Pump
Shaft coupling	▪ Surface-cooled IEC frame three-phase squirrel-cage motor
Contact guard	▪ Flexible coupling with or without spacer
Baseplate	▪ Coupling guard
Special accessories	▪ Cast or welded baseplate for the complete unit (pump and motor), in torsion-resistant design
	▪ Channel section steel or folded steel plate
	▪ As required

4.8 Dimensions and weights


For dimensions and weights please refer to the general arrangement drawing/outline drawing of the pump/pump set.

⁵⁾ Spatial average; as per ISO 3744 and EN 12639; valid for pump operation in the $Q/Q_{opt} = 0.8 - 1.1$ range and for non-cavitating operation. If noise levels are to be guaranteed: Add +3 dB for measuring and constructional tolerance.

⁶⁾ Increase for 60 Hz operation: 3500 rpm +3 dB, 1750 rpm +1 dB, 1160 rpm ± 0 dB


5 Installation at Site

5.1 Safety regulations

	<p>⚠ DANGER</p> <p>Improper installation in potentially explosive atmospheres Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▸ Comply with the applicable local explosion protection regulations. ▸ Observe the information in the data sheet and on the name plates of pump and motor.
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5.2 Checks to be carried out prior to installation


Place of installation

	<p>⚠ WARNING</p> <p>Installation on mounting surface which is unsecured and cannot support the load Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▸ Use a concrete of compressive strength class C12/15 which meets the requirements of exposure class XC1 to EN 206-1. ▸ The mounting surface must have set and must be completely horizontal and even. ▸ Observe the weights indicated.
-----------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

1. Check the structural requirements.
All structural work required must have been prepared in accordance with the dimensions stated in the outline drawing/general arrangement drawing.

5.3 Installing the pump set

Always install the pump set in horizontal position.

	<p>⚠ DANGER</p> <p>Excessive temperatures due to improper installation Explosion hazard!</p> <ul style="list-style-type: none"> ▸ Install the pump in horizontal position to ensure self-venting of the pump.
-------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

5.3.1 Installation on the foundation

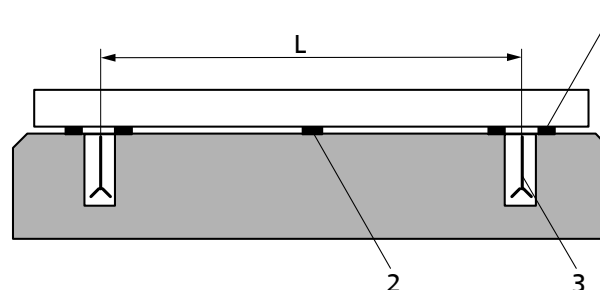


Fig. 7: Fitting the shims

L	Bolt-to-bolt distance	1	Shim
2	Shim if (L) > 800 mm	3	Foundation bolt

- ✓ The foundation has the required strength and characteristics.

- ✓ The foundation has been prepared in accordance with the dimensions given in the outline drawing/general arrangement drawing.
- 1. Position the pump set on the foundation and level it with the help of a spirit level placed on the shaft and discharge nozzle.
Permissible deviation: 0.2 mm/m.
- 2. Use shims (1) for height compensation, if necessary.
Always fit shims, if any, immediately to the left and right of the foundation bolts (3) between the baseplate/foundation frame and the foundation.
For a bolt-to-bolt distance (L) > 800 mm fit additional shims (2) halfway between the bolt holes.
All shims must lie perfectly flush.
- 3. Insert the foundation bolts (3) into the holes provided.
- 4. Use concrete to set the foundation bolts (3) into the foundation.
- 5. Wait until the concrete has set firmly, then level the baseplate.
- 6. Tighten the foundation bolts (3) evenly and firmly.
- 7. Grout the baseplate using low-shrinkage concrete with a standard particle size and a water/cement ratio of ≤ 0.5 .
Produce flowability with the help of a solvent.
Perform secondary treatment of the concrete to DIN 1045.



NOTE

For low-noise operation contact the manufacturer to check whether the pump set can be installed on anti-vibration mounts.



NOTE

Expansion joints can be fitted between the pump and the suction/discharge line.

5.3.2 Installation without foundation (European version)

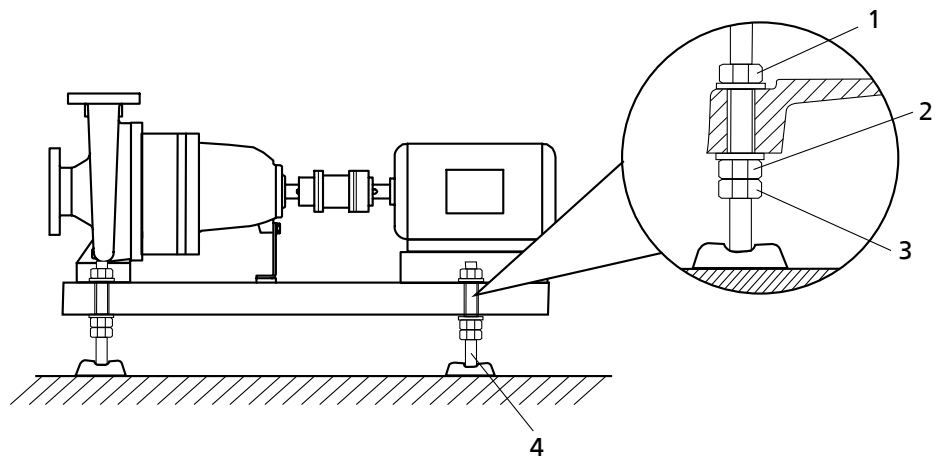


Fig. 8: Adjusting the levelling elements





1, 3	Locknut	2	Levelling nut
4	Levelling element		

- ✓ The installation surface has the required strength and characteristics.
- 1. Position the pump set on the machine bases (4) and align it with the help of a spirit level (on the shaft/discharge nozzle).
- 2. To adjust any differences in height, loosen the bolts and locknuts (1, 3) of the machine bases (4).
- 3. Turn the adjusting nut (2) until any differences in height have been compensated.

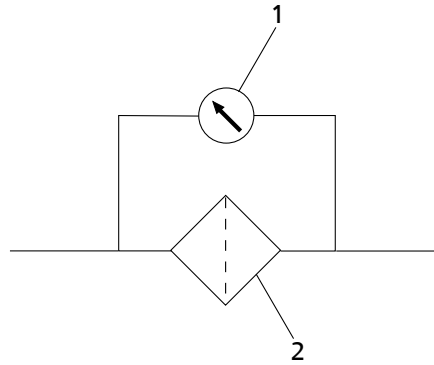
4. Re-tighten the locknuts (1, 3) at the machine bases (4).

5.4 Piping

5.4.1 Connecting the piping

	<div style="background-color: #f4a460; padding: 5px;">⚠ DANGER</div> <p>Impermissible loads acting on the pump nozzles Danger to life from leakage of hot, toxic, corrosive or flammable fluids!</p> <ul style="list-style-type: none"> ▸ Do not use the pump as an anchorage point for the piping. ▸ Anchor the pipelines in close proximity to the pump and connect them without transmitting any stresses or strains. ▸ Observe the permissible forces and moments at the pump nozzles. ▸ Take appropriate measures to compensate thermal expansion of the piping.
	<div style="background-color: #f4d03f; padding: 5px;">CAUTION</div> <p>Incorrect earthing during welding work at the piping Destruction of rolling element bearings (pitting effect)!</p> <ul style="list-style-type: none"> ▸ Never earth the electric welding equipment on the pump or baseplate. ▸ Prevent current flowing through the rolling element bearings.
	<div style="background-color: #2980b9; color: white; padding: 5px;">NOTE</div> <p>It is recommended to install check and shut-off elements in the system, depending on the type of plant and pump. However, such elements must not obstruct proper drainage or hinder disassembly of the pump.</p> <ul style="list-style-type: none"> ✓ The suction lift line has been laid with a rising slope, the suction head line with a downward slope towards the pump. ✓ A flow stabilisation section having a length equivalent to at least twice the diameter of the suction flange has been provided upstream of the suction flange. ✓ The nominal diameters of the pipelines are at least equal to the nominal diameters of the pump nozzles. ✓ Adapters to larger diameters have a diffuser angle of approximately 8° to prevent excessive pressure losses. ✓ The pipelines have been anchored in close proximity to the pump and connected without transmitting any stresses or strains.
	<div style="background-color: #f4d03f; padding: 5px;">CAUTION</div> <p>Welding beads, scale and other impurities in the piping Damage to the pump!</p> <ul style="list-style-type: none"> ▸ Free the piping from any impurities. ▸ If necessary, install a filter. ▸ Comply with the instructions set out in (⇒ Section 7.2.2.3 Page 45) .

1. Thoroughly clean, flush and blow through all vessels, pipelines and connections (especially of new installations).
2. Before installing the pump in the piping, remove the flange covers on the suction and discharge nozzles of the pump.
3. Check that the inside of the pump is free from any foreign objects. Remove any foreign objects.
4. If required, install a filter in the piping (see figure: Filter in the piping).


Fig. 9: Filter in the piping

1	Differential pressure gauge	2	Filter
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NOTE

Use a filter with laid-in wire mesh of 0.5 mm x 0.25 mm (mesh size x wire diameter) made of corrosion-resistant material.
Use a filter with a filter area three times the cross-section of the piping.
Conical filters have proved suitable.

5. Connect the pump nozzles to the piping.


CAUTION

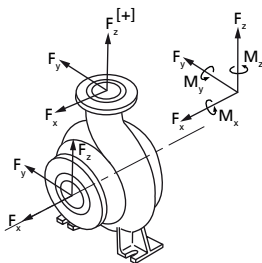
Aggressive flushing and pickling agents
Damage to the pump!

- Match the cleaning operation mode and duration for flushing and pickling service to the casing and seal materials used.

5.4.2 Permissible forces and moments at the pump nozzles

The data on forces and moments apply to static piping loads only. If the limits are exceeded, they must be checked and verified.

If a computerised strength analysis is required, values are available on request only. The values are only applicable if the pump is installed on a completely grouted baseplate and bolted to a rigid and level foundation.


Fig. 10: Forces and moments at the pump nozzles
Table 9: Forces and moments at the pump nozzles for material variant C (1.4408/ A743 GR CF8M)

Size	Suction nozzle								Discharge nozzle							
	DN	F _x [N]	F _y [N]	F _z [N]	ΣF [N]	M _x [Nm]	M _y [Nm]	M _z [Nm]	DN	F _x [N]	F _y [N]	F _z [N]	ΣF [N]	M _x [Nm]	M _y [Nm]	M _z [Nm]
040-025-160	40	970	780	650	1404	845	585	683	25	490	455	600	898	370	390	455
040-025-200	40	970	780	650	1404	845	585	683	25	460	455	600	898	370	390	455
050-032-250.1	50	1240	1010	878	1824	910	650	748	32	650	555	780	1157	715	490	555
050-032-125.1	50	1240	1010	878	1824	910	650	748	32	650	555	780	1157	715	490	555
050-032-160.1	50	1240	1010	878	1824	910	650	748	32	650	555	780	1157	715	490	555
050-032-200.1	50	1240	1010	878	1824	910	650	748	32	650	555	780	1157	715	490	555
050-032-125	50	1240	1010	878	1824	910	650	748	32	650	555	780	1157	715	490	555
050-032-160	50	1240	1010	878	1824	910	650	748	32	650	555	780	1157	715	490	555
050-032-200	50	1240	1010	878	1824	910	650	748	32	650	555	780	1157	715	490	555
050-032-250	50	1240	1010	878	1824	910	650	748	32	650	555	780	1157	715	490	555
065-040-125	65	1600	1300	1105	2339	1050	715	780	40	780	650	1000	1425	845	585	685
065-040-160	65	1600	1300	1105	2339	1050	715	780	40	780	650	1000	1425	845	585	685

Size	Suction nozzle								Discharge nozzle							
	DN	F _x [N]	F _y [N]	F _z [N]	ΣF [N]	M _x [Nm]	M _y [Nm]	M _z [Nm]	DN	F _x [N]	F _y [N]	F _z [N]	ΣF [N]	M _x [Nm]	M _y [Nm]	M _z [Nm]
065-040-160.1	65	1600	1300	1105	2339	1050	715	780	40	780	650	1000	1425	845	585	685
065-040-250.1	65	1600	1300	1105	2339	1050	715	780	40	780	650	1000	1425	845	585	685
065-040-200	65	1600	1300	1105	2339	1050	715	780	40	780	650	1000	1425	845	585	685
065-040-250	65	1600	1300	1105	2339	1050	715	780	40	780	650	1000	1425	845	585	685
065-040-315	65	1600	1300	1105	2339	1050	715	780	40	780	650	1000	1425	845	585	685
080-050-315.1	80	2000	1550	1333	2860	1330	748	1010	50	1000	880	1250	1827	910	650	750
080-050-125	80	2000	1550	1333	2860	1330	748	1010	50	1000	880	1250	1827	910	650	750
080-050-160	80	2000	1550	1333	2860	1330	748	1010	50	1000	880	1250	1827	910	650	750
080-050-200	80	2000	1550	1333	2860	1330	748	1010	50	1000	880	1250	1827	910	650	750
080-050-250	80	2000	1550	1333	2860	1330	748	1010	50	1000	880	1250	1827	910	650	750
080-050-315	80	2000	1550	1333	2860	1330	748	1010	50	1000	880	1250	1827	910	650	750
100-065-125	100	2500	1950	1755	3624	1850	900	1400	65	1300	1105	1600	2339	1050	715	790
100-065-160	100	2500	1950	1755	3624	1850	900	1400	65	1300	1105	1600	2339	1050	715	790
100-065-200	100	2500	1950	1755	3624	1850	900	1400	65	1300	1105	1600	2339	1050	715	790
100-065-250	100	2500	1950	1755	3624	1850	900	1400	65	1300	1105	1600	2339	1050	715	790
100-065-315	100	2500	1950	1755	3624	1850	900	1400	65	1300	1105	1600	2339	1050	715	790
125-080-160	125	3400	2700	2200	4867	2550	1250	1950	80	1550	1335	1950	2826	1350	750	1000
125-080-200	125	3400	2700	2200	4867	2550	1250	1950	80	1550	1335	1950	2826	1350	750	1000
125-080-250	125	3400	2700	2200	4867	2550	1250	1950	80	1550	1335	1950	2826	1350	750	1000
125-080-315	125	3400	2700	2200	4867	2550	1250	1950	80	1550	1335	1950	2826	1350	750	1000
125-080-400	125	3400	2700	2200	4867	2550	1250	1950	80	1550	1335	1950	2826	1350	750	1000
125-100-160	125	3400	2700	2200	4867	2550	1250	1950	100	2000	1755	2500	3651	1850	900	1400
125-100-200	125	3400	2700	2200	4867	2550	1250	1950	100	2000	1755	2500	3651	1850	900	1400
125-100-250	125	3400	2700	2200	4867	2550	1250	1950	100	2000	1755	2500	3651	1850	900	1400
125-100-315	125	3400	2700	2200	4867	2550	1250	1950	100	2000	1755	2500	3651	1850	900	1400
125-100-400	125	3400	2700	2200	4867	2550	1250	1950	100	2000	1755	2500	3651	1850	900	1400
150-125-200	150	4300	3450	2850	6206	3200	1600	2450	125	2700	2200	3400	4867	2550	1300	1900
150-125-250	150	4300	3450	2850	6206	3200	1600	2450	125	2700	2200	3400	4867	2550	1300	1900
150-125-315	150	4300	3450	2850	6206	3200	1600	2450	125	2700	2200	3400	4867	2550	1300	1900
150-125-400	150	4300	3450	2850	6206	3200	1600	2450	125	2700	2200	3400	4867	2550	1300	1900
200-150-200	200	6750	5250	4300	9572	4850	2450	3550	150	3450	2850	4300	6206	3150	1600	2450
200-150-250	200	6750	5250	4300	9572	4850	2450	3550	150	3450	2850	4300	6206	3150	1600	2450
200-150-315	200	6750	5250	4300	9572	4850	2450	3550	150	3450	2850	4300	6206	3150	1600	2450
200-150-400	200	6750	5250	4300	9572	4850	2450	3550	150	3450	2850	4300	6206	3150	1600	2450
200-150-500	200	6750	5250	4300	9572	4850	2450	3550	150	3450	2850	4300	6206	3150	1600	2450
200-200-250	200	6750	5250	4300	9572	4850	2450	3550	200	5250	4300	6750	9572	4850	2450	3550
250-200-315	250	9200	7350	6150	13285	6900	3350	5250	200	5250	4300	6750	9572	4850	2450	3550
250-200-400	250	9200	7350	6150	13285	6900	3350	5250	200	5250	4300	6750	9572	4850	2450	3550
250-200-500	250	9200	7350	6150	13285	6900	3350	5250	200	5250	4300	6750	9572	4850	2450	3550
300-250-315	300	11000	9200	7350	16114	8400	4150	6350	250	7350	6150	9150	13250	6900	3350	5250

Correction coefficients depending on material and temperature (see diagram below).

Correction coefficient

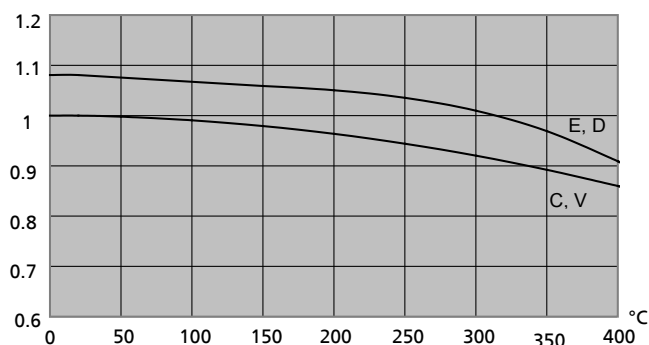


Fig. 11: Temperature correction diagram for "E, D, C, V" variant (1.4408/A743 GR CF8M)

Table 10: Forces and moments at the pump nozzles for "G" variant (JL1040/ A48CL35B)

Size	Suction nozzle								Discharge nozzle							
	DN	F _x [N]	F _y [N]	F _z [N]	ΣF [N]	M _x [Nm]	M _y [Nm]	M _z [Nm]	DN	F _x [N]	F _y [N]	F _z [N]	ΣF [N]	M _x [Nm]	M _y [Nm]	M _z [Nm]
040-025-160	40	450	400	350	696	450	320	370	25	265	250	300	472	315	210	245
040-025-200	40	450	400	350	696	450	320	370	25	265	250	300	472	315	210	245
050-032-125.1	50	580	530	470	916	500	350	400	32	320	300	370	574	390	265	300
050-032-160.1	50	580	530	470	916	500	350	400	32	320	300	370	574	390	265	300
050-032-200.1	50	580	530	470	916	500	350	400	32	320	300	370	574	390	265	300
050-032-250.1	50	580	530	470	916	500	350	400	32	320	300	370	574	390	265	300
050-032-125	50	580	530	470	916	500	350	400	32	320	300	370	574	390	265	300
050-032-160	50	580	530	470	916	500	350	400	32	320	300	370	574	390	265	300
050-032-200	50	580	530	470	916	500	350	400	32	320	300	370	574	390	265	300
050-032-250	50	580	530	470	916	500	350	400	32	320	300	370	574	390	265	300
065-040-125	65	740	650	600	1153	530	390	420	40	400	350	450	696	450	320	370
065-040-160.1	65	740	650	600	1153	530	390	420	40	400	350	450	696	450	320	370
065-040-160	65	740	650	600	1153	530	390	420	40	400	350	450	696	450	320	370
065-040-200	65	740	650	600	1153	530	390	420	40	400	350	450	696	450	320	370
065-040-250.1	65	740	650	600	1153	530	390	420	40	400	350	450	696	450	320	370
065-040-250	65	740	650	600	1153	530	390	420	40	400	350	450	696	450	320	370
065-040-315	65	740	650	600	1153	530	390	420	40	400	350	450	696	450	320	370
080-050-125	80	880	790	720	1385	560	400	460	50	530	470	580	916	500	350	400
080-050-160	80	880	790	720	1385	560	400	460	50	530	470	580	916	500	350	400
080-050-200	80	880	790	720	1385	560	400	460	50	530	470	580	916	500	350	400
080-050-250	80	880	790	720	1385	560	400	460	50	530	470	580	916	500	350	400
080-050-315.1	80	880	790	720	1385	560	400	460	50	530	470	580	916	500	350	400
080-050-315	80	880	790	720	1385	560	400	460	50	530	470	580	916	500	350	400
100-065-125	100	1180	1050	950	1843	620	440	510	65	650	600	740	1153	530	390	420
100-065-160	100	1180	1050	950	1843	620	440	510	65	650	600	740	1153	530	390	420
100-065-200	100	1180	1050	950	1843	620	440	510	65	650	600	740	1153	530	390	420
100-065-250	100	1180	1050	950	1843	620	440	510	65	650	600	740	1153	530	390	420
100-065-315	100	1180	1050	950	1843	620	440	510	65	650	600	740	1153	530	390	420
125-080-160	125	1400	1250	1120	2186	740	530	670	80	790	720	880	1385	560	400	460
125-080-200	125	1400	1250	1120	2186	740	530	670	80	790	720	880	1385	560	400	460
125-080-250	125	1400	1250	1120	2186	740	530	670	80	790	720	880	1385	560	400	460
125-080-315	125	1400	1250	1120	2186	740	530	670	80	790	720	880	1385	560	400	460
125-080-400	125	1400	1250	1120	2186	740	530	670	80	790	720	880	1385	560	400	460
125-100-160	125	1400	1250	1120	2186	740	530	670	100	1050	950	1180	1843	620	440	510
125-100-200	125	1400	1250	1120	2186	740	530	670	100	1050	950	1180	1843	620	440	510
125-100-250	125	1400	1250	1120	2186	740	530	670	100	1050	950	1180	1843	620	440	510
125-100-315	125	1400	1250	1120	2186	740	530	670	100	1050	950	1180	1843	620	440	510
125-100-400	125	1400	1250	1120	2186	740	530	670	100	1050	950	1180	1843	620	440	510
150-125-200	150	1750	1600	1400	2754	880	610	720	125	1250	1120	1400	2186	740	530	670
150-125-250	150	1750	1600	1400	2754	880	610	720	125	1250	1120	1400	2186	740	530	670
150-125-315	150	1750	1600	1400	2754	880	610	720	125	1250	1120	1400	2186	740	530	670
150-125-400	150	1750	1600	1400	2754	880	610	720	125	1250	1120	1400	2186	740	530	670
200-150-200	200	2350	2100	1900	3680	1150	800	930	150	1600	1400	1750	2754	880	610	720
200-150-250	200	2350	2100	1900	3680	1150	800	930	150	1600	1400	1750	2754	880	610	720
200-150-315	200	2350	2100	1900	3680	1150	800	930	150	1600	1400	1750	2754	880	610	720
200-150-400	200	2350	2100	1900	3680	1150	800	930	150	1600	1400	1750	2754	880	610	720
200-150-500	200	2350	2100	1900	3680	1150	800	930	150	1600	1400	1750	2754	880	610	720
200-200-250	200	2350	2100	1900	3680	1150	800	930	200	2100	1900	2350	3680	1150	800	930
250-200-315	250	3340	2980	2700	5227	1780	1260	1460	200	2100	1900	2350	3680	1150	800	930
250-200-400	250	3340	2890	2700	5227	1780	1260	1460	200	2100	1900	2350	3680	1150	800	930
250-200-500	250	3340	2890	2700	5227	1780	1260	1460	200	2100	1900	2350	3680	1150	800	930
300-250-315	300	4000	3580	3220	6260	2420	1720	1980	250	2980	2700	3340	5227	1780	1260	1460

Correction coefficients depending on material and temperature (see diagram below).

Correction coefficient

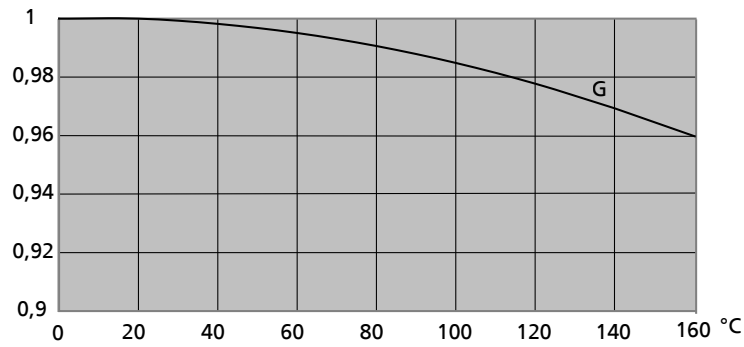







Fig. 12: Temperature correction diagram for "G" variant (JL1040/ A48CL35B)

5.4.3 Auxiliary connections

 	<p>⚠ DANGER</p> <p>Risk of potentially explosive atmosphere by mixing of incompatible fluids in the auxiliary piping Risk of burns! Explosion hazard!</p> <ul style="list-style-type: none"> Make sure that the barrier fluid and quench liquid are compatible with the fluid pumped.
	<p>⚠ WARNING</p> <p>Failure to use or incorrect use of auxiliary connections (e.g. barrier fluid, flushing liquid, etc.) Risk of injury from escaping fluid! Risk of burns! Malfunction of the pump!</p> <ul style="list-style-type: none"> Refer to the general arrangement drawing, the piping layout and pump markings (if any) for the quantity, dimensions and locations of auxiliary connections. Use the auxiliary connections provided.

5.5 Enclosure/insulation

	<p>⚠ DANGER</p> <p>Risk of potentially explosive atmosphere due to insufficient venting Explosion hazard!</p> <ul style="list-style-type: none"> Make sure the space between the casing cover/discharge cover and the bearing cover is sufficiently vented. Never close or cover the perforation of the bearing bracket guards (e.g. by insulation).
	<p>⚠ WARNING</p> <p>The volute casing and casing/discharge cover take on the same temperature as the fluid handled Risk of burns!</p> <ul style="list-style-type: none"> Insulate the volute casing. Fit protective equipment.

	<p>CAUTION</p> <p>Heat build-up in the bearing bracket Damage to the bearing!</p> <ul style="list-style-type: none"> ▶ Never insulate the casing cover and the bearing bracket.
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5.6 Checking the coupling alignment

	<p>DANGER</p> <p>Inadmissible temperatures at the coupling or bearings due to misalignment of the coupling Explosion hazard! Risk of burns!</p> <ul style="list-style-type: none"> ▶ Make sure that the coupling is correctly aligned at all times.
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	<p>CAUTION</p> <p>Misalignment of pump and motor shafts Damage to pump, motor and coupling!</p> <ul style="list-style-type: none"> ▶ Always check the coupling after the pump has been installed and connected to the piping. ▶ Also check the coupling of pump sets supplied with pump and motor mounted on the same baseplate.
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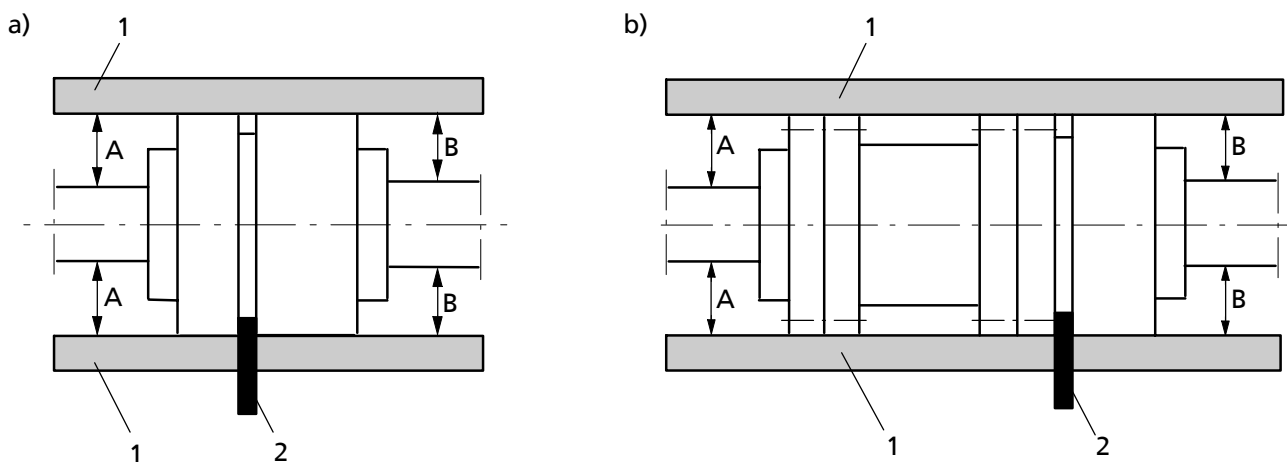


Fig. 13: Checking the coupling alignment: Coupling without spacer sleeve (a) or Coupling with spacer sleeve (b)

1	Straight-edge	2	Gauge
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- ✓ The coupling guard and its footboard, if any, have been removed.
- 1. Loosen the support foot and re-tighten it without transmitting any stresses and strains.
- 2. Place the straight-edge axially on both coupling halves.
- 3. Leave the straight-edge in this position and turn the coupling by hand.
The coupling is aligned correctly if the distances A and B to the respective shafts are the same at all points around the circumference.
The radial and axial deviation between the two coupling halves must not exceed 0.1 mm, during standstill as well as at operating temperature and under inlet pressure.
- 4. Check the distance (dimension see general arrangement drawing) between the two coupling halves around the circumference.
The coupling is correctly aligned if the distance between the two coupling halves is the same at all points around the circumference.

The radial and axial deviation between the two coupling halves must not exceed 0.1 mm, during standstill as well as at operating temperature and under inlet pressure.

5. If alignment is correct, re-install the coupling guard and its footboard, if any.

5.7 Aligning the pump and motor

After having installed the pump set and connected the piping, check the coupling alignment and, if required, re-align the pump set (at the motor).

5.7.1 Motors with adjusting screw

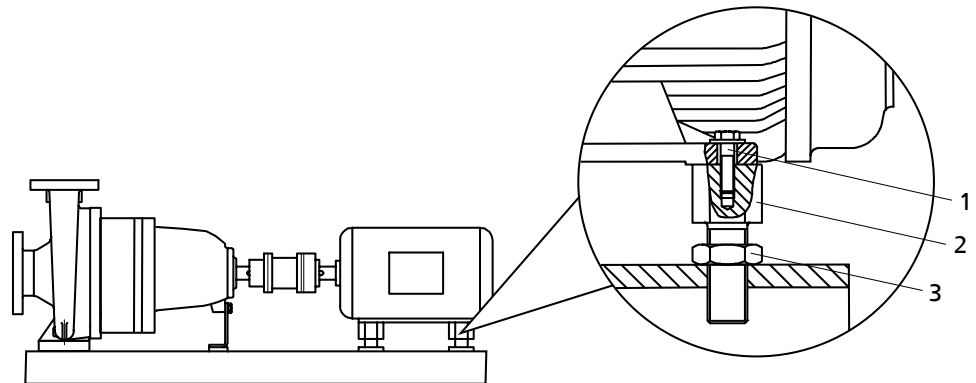


Fig. 14: Motor with adjusting screw

1	Hexagon head bolt	2	Adjusting screw
3	Locknut		

- ✓ The coupling guard and the footboard for the coupling guard, if any, have been removed.
- 1. Check the coupling alignment.
- 2. Unscrew the hexagon head bolts (1) at the motor and the locknuts (3) at the baseplate.
- 3. Turn the adjusting screws (2) by hand or by means of an open-jawed wrench until the coupling alignment is correct and all motor feet rest squarely on the baseplate.
- 4. Re-tighten the hexagon head bolts (1) at the motor and the locknuts (3) at the baseplate.
- 5. Check that the coupling and shaft can easily be rotated by hand.

	⚠ WARNING
	Unprotected rotating coupling Risk of injury by rotating shafts! <ul style="list-style-type: none"> ▷ Always operate the pump set with a coupling guard. If the customer specifically requests not to include a coupling guard in KSB's delivery, then the operator must supply one! ▷ Observe all relevant regulations for selecting a coupling guard.
	⚠ DANGER
	Risk of ignition by frictional sparks Explosion hazard! <ul style="list-style-type: none"> ▷ Choose a coupling guard material that is non-sparking in the event of mechanical contact (see DIN EN 13463-1).

6. Re-install the coupling guard and the footboard for the coupling guard, if any.

7. Check the distance between coupling and coupling guard.
The coupling and coupling guard must not come into contact.

5.7.2 Motors without levelling screw

Any differences in the centreline heights of the pump and motor shafts are compensated by means of shims.

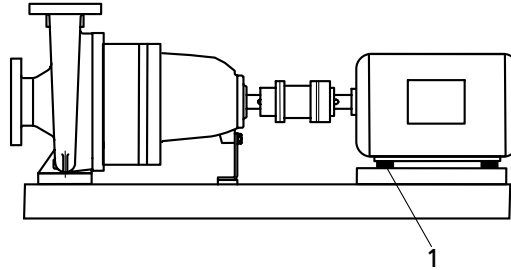




Fig. 15: Pump set with shim


1	Shim
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- ✓ The coupling guard and the footboard for the coupling guard, if any, have been removed.
- 1. Check the coupling alignment.
- 2. Unscrew the hexagon head bolts at the motor.
- 3. Insert shims underneath the motor feet until the difference in shaft centreline height has been compensated.
- 4. Re-tighten the hexagon head bolts.
- 5. Check that the coupling and shaft can easily be rotated by hand.

	⚠ WARNING
	Unprotected rotating coupling Risk of injury by rotating shafts! <ul style="list-style-type: none"> ▷ Always operate the pump set with a coupling guard. If the customer specifically requests not to include a coupling guard in KSB's delivery, then the operator must supply one! ▷ Observe all relevant regulations for selecting a coupling guard.
	⚠ DANGER
	Risk of ignition by frictional sparks Explosion hazard! <ul style="list-style-type: none"> ▷ Choose a coupling guard material that is non-sparking in the event of mechanical contact (see DIN EN 13463-1).

6. Re-install the coupling guard and the footboard for the coupling guard, if any.
7. Check the distance between coupling and coupling guard.
The coupling and coupling guard must not come into contact.

5.8 Electrical connection

	⚠ DANGER
	Incorrect electrical installation Explosion hazard! <ul style="list-style-type: none"> ▷ For electrical installation, also observe the requirements of IEC 60079-14. ▷ Always use a motor protection switch for explosion-proof motors.

	<p>⚠ DANGER</p> <p>Work on the pump set by unqualified personnel Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▷ Always have the electrical connections installed by a trained and qualified electrician. ▷ Observe regulations IEC 60364 and, for explosion-proof models, EN 60079.
	<p>⚠ WARNING</p> <p>Incorrect connection to the mains Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> ▷ Observe the technical specifications of the local energy supply companies.
	<p>NOTE</p> <p>A motor protection device is recommended.</p>

5.8.1 Setting the time relay




	<p>CAUTION</p> <p>Switchover between star and delta on three-phase motors with star-delta starting takes too long. Damage to the pump (set)!</p> <ul style="list-style-type: none"> ▷ Keep switch-over intervals between star and delta as short as possible.
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Table 11: Time relay settings for star-delta starting:

Motor rating	Y time to be set
≤ 30 kW	< 3 s
> 30 kW	< 5 s

5.8.2 Earthing





 	<p>⚠ DANGER</p> <p>Electrostatic charging Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Connect the PE conductor to the earthing terminal provided. ▷ Provide for potential equalisation between the pump set and foundation.
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5.8.3 Connecting the motor

	<p>NOTE</p> <p>In compliance with IEC 60034-8, three-phase motors are always wired for clockwise rotation (looking at the motor shaft stub). The pump's direction of rotation is indicated by an arrow on the pump.</p>
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1. Match the motor's direction of rotation to that of the pump.
2. Observe the manufacturer's product literature supplied with the motor.

5.9 Checking the direction of rotation

	<div style="background-color: #f4a460; padding: 5px;">⚠ DANGER</div> <p>Temperature increase resulting from contact between rotating and stationary components Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Never check the direction of rotation by starting up the unfilled pump set. ▷ Separate the pump from the motor to check the direction of rotation.
	<div style="background-color: #f4a460; padding: 5px;">⚠ WARNING</div> <p>Hands inside the pump casing Risk of injuries, damage to the pump!</p> <ul style="list-style-type: none"> ▷ Always disconnect the pump set from the power supply and secure it against unintentional start-up before inserting your hands or other objects into the pump.
	<div style="background-color: #fff9c4; padding: 5px;">CAUTION</div> <p>Incorrect direction of rotation with non-reversible mechanical seal Damage to the mechanical seal and leakage!</p> <ul style="list-style-type: none"> ▷ Separate the pump from the motor to check the direction of rotation.
	<div style="background-color: #fff9c4; padding: 5px;">CAUTION</div> <p>Drive and pump running in the wrong direction of rotation Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Refer to the arrow indicating the direction of rotation on the pump. ▷ Check the direction of rotation. If required, check the electrical connection and correct the direction of rotation.

The correct direction of rotation of the motor and pump is clockwise (seen from the drive end).

1. Start the motor and stop it again immediately to determine the motor's direction of rotation.
2. Check the direction of rotation.
The motor's direction of rotation must match the arrow indicating the direction of rotation on the pump.
3. If the motor is running in the wrong direction of rotation, check the electrical connection of the motor and switchgear, if any.

6 Commissioning/Start-up/Shutdown

6.1 Commissioning/start-up

6.1.1 Prerequisites for commissioning/start-up

Before commissioning/starting up the pump set, make sure that the following conditions are met:

- The pump set has been mechanically connected as specified.
- The pump set has been properly connected to the electric power supply and is equipped with all protection devices.
- The pump has been primed with the fluid to be handled. The pump has been vented.
- The direction of rotation has been checked. (⇒ Section 5.9 Page 31) «
- All auxiliary connections required are connected and operational.
- The lubricants have been checked.
- After prolonged shutdown of the pump (set), the activities required for returning the pump (set) to service have been carried out. (⇒ Section 6.4 Page 41)

6.1.2 Filling in lubricants

Grease-lubricated bearings

Grease-lubricated bearings have been packed with grease at the factory.

Oil-lubricated bearings

Fill the bearing bracket with lubricating oil.

Oil quality see (⇒ Section 7.2.3.1.2 Page 45)

Oil quantity see - (⇒ Section 7.2.3.1.3 Page 45)

Filling the constant-level oiler with lubricating oil (oil-lubricated bearings only)

- ✓ The constant-level oiler is screwed into the upper tapping hole of the bearing bracket.



NOTE

If no constant level oiler is provided on the bearing bracket, the oil level can be read in the middle of the oil level sight glass arranged at the side of the bearing bracket.



CAUTION

Insufficient quantity of lubricating oil in the reservoir of the constant level oiler
Damage to the bearings!

- ▷ Regularly check the oil level.
- ▷ Always fill the oil reservoir completely.
- ▷ Keep the oil reservoir properly filled at all times.

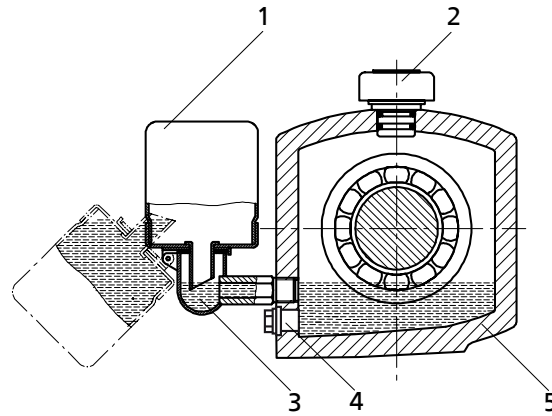


Fig. 16: Bearing bracket with constant-level oiler

1	Constant level oiler	2	Vent plug
3	Connection elbow of the constant level oiler	4	Screw plug
5	Bearing bracket		

1. Pull out the vent plug (2).
2. Hinge down the reservoir of the constant-level oiler (1) from the bearing bracket (5) and hold it in this position.
3. Fill in oil through the hole for the vent plug until the oil reaches the connection elbow of the constant-level oiler (3).
4. Completely fill the reservoir of the constant-level oiler (1).
5. Snap the constant-level oiler (1) back into its operating position.
6. Fit the vent plug (2) again.
7. After approximately 5 minutes, check the oil level in the glass reservoir of the constant-level oiler (1).
The oil reservoir must be properly filled at all times to provide a constant oil level. Repeat steps 1 - 6, if necessary.
8. To check the function of the constant-level oiler (1), slowly drain some oil via the screw plug (4) until air bubbles can be seen in the oil reservoir.



NOTE

An excessively high oil level can lead to a temperature rise and to leakage of the fluid handled or oil.

6.1.3 Shaft seal

Shaft seals are fitted prior to delivery.

Observe the instructions on dismantling (⇒ Section 7.4.6 Page 49) or assembly (⇒ Section 7.5.3 Page 53) .

If applicable, fill the reservoir of non-pressurised external fluid in accordance with the general arrangement drawing.

Prior to starting up the pump, apply barrier pressure as specified in the general arrangement drawing.





Apply the quantities and pressures specified in the data sheet and the general arrangement drawing.

Reservoir of non-pressurised external fluid

Double mechanical seal

External liquid feed

6.1.4 Priming and venting the pump


 	⚠ DANGER Risk of potentially explosive atmosphere by mixing of incompatible fluids in the auxiliary piping Risk of burns! Explosion hazard! ▷ Make sure that the barrier fluid and quench liquid are compatible with the fluid pumped.
	⚠ DANGER Risk of potentially explosive atmosphere inside the pump Explosion hazard! ▷ The pump internals in contact with the fluid to be handled, including the seal chamber and auxiliary systems must be filled with the fluid to be handled at all times. ▷ Provide sufficient inlet pressure. ▷ Provide an appropriate monitoring system.
	⚠ DANGER Shaft seal failure caused by insufficient lubrication Hot or toxic fluid could escape! Damage to the pump! ▷ Before starting up the pump set, vent the pump and suction line and prime both with the fluid to be handled.

1. Vent the pump and suction line and prime both with the fluid to be handled.
2. Fully open the shut-off element in the suction line.
3. Fully open all auxiliary connections (barrier fluid, flushing liquid, etc).

6.1.5 Final check

1. Remove the coupling guard and its footboard, if any.
2. Check the coupling alignment; re-align the coupling, if required. (⇒ Section 5.6 Page 27)
3. Check proper functioning of coupling/shaft.
Check that coupling/shaft can be easily rotated by hand.
4. Fit the coupling guard and its footboard, if any.
5. Check the distance between coupling and coupling guard.
The coupling guard must not touch the coupling.

6.1.6 Water cooling

	CAUTION Deposit-forming, aggressive cooling water Damage to the pump! ▷ Observe the cooling water quality.
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Observe the following quality data of the cooling water:

- Not deposit-forming
- Not aggressive
- Free from suspended solids
- Hardness on average 5 °dH (~1 mmol/l)
- pH > 8

- Conditioned and neutral with regard to mechanical corrosion
- Inlet temperature $t_e=10$ to $30\text{ }^{\circ}\text{C}$
Outlet temperature $t_A=45\text{ }^{\circ}\text{C}$ max.

6.1.7 Cooling of the bearing bracket (special design)

If the pump is permanently heated during standstill (above $185\text{ }^{\circ}\text{C}$) the bearing bracket has to be cooled.

Observe the following values for cooling the bearing bracket:

- Cooling liquid pressure: 6 bar max.
- Cooling liquid quantities: see table below.

Table 12: Cooling liquid quantities for cooling the bearing bracket





Bearing bracket	Cooling liquid quantity [l/min]
CS40	5
CS50	6
CS60	8
CS80	10

6.1.8 Heating (version "h")


The pump can also be heated, if necessary. The volute casing and the casing cover have heating chambers. The heating chambers can be heated with hot water, steam or thermal oil.

The following limits must be observed:

- Max. temperature: $300\text{ }^{\circ}\text{C}$
- Max. pressure: 20 bar

	<p>⚠ DANGER</p> <p>Excessive surface temperature Explosion hazard! Risk of burns!</p> <ul style="list-style-type: none"> ▸ Observe the permissible temperature classes.
	<p>CAUTION</p> <p>Lack of heating medium Damage to the pump!</p> <ul style="list-style-type: none"> ▸ Provide sufficient quantities of a suitable heating medium.
	<p>CAUTION</p> <p>Time for warming up the pump too short Damage to the pump!</p> <ul style="list-style-type: none"> ▸ Check that the pump is sufficiently warmed up throughout.
	<p>CAUTION</p> <p>Impermissibly high temperature of the heating medium Fluid or heating medium could escape!</p> <ul style="list-style-type: none"> ▸ Observe the application limits of the heating media.

6.1.9 Heating up/keeping warm the pump (set)

	<div style="background-color: yellow; padding: 5px;">CAUTION</div> <p>Pump blockage Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Prior to pump start-up, heat up the pump as described in the manual.
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Observe the following when heating up the pump (set) and keeping it warm:

- Make sure that the temperature is increased continuously.
- Max. heating speed: 10 °C/min (10 K/min)


Fluid temperatures above 150 °C


When the pump is used for handling fluids at temperatures above 150 °C make sure that the pump has been heated throughout before starting it up.


Temperature difference

The temperature difference between the pump's surface and the fluid handled must not exceed 100 °C (100 K) when the pump is started up.


6.1.10 Start-up

	<div style="background-color: orange; padding: 5px;">⚠ DANGER</div> <p>Non-compliance with the permissible pressure and temperature limits if the pump is operated with the suction and/or discharge line closed. Explosion hazard! Leakage of hot or toxic fluids!</p> <ul style="list-style-type: none"> ▷ Never operate the pump with the shut-off elements in the suction line and/or discharge line closed. ▷ Only start up the pump set with the discharge-side shut-off element slightly or fully open.
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	<div style="background-color: orange; padding: 5px;">⚠ DANGER</div> <p>Excessive temperatures due to dry running or excessive gas content in the fluid handled Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Never operate the pump set without liquid fill. ▷ Prime the pump as per operating instructions. (⇒ Section 6.1.4 Page 34) ▷ Always operate the pump within the permissible operating range.
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	<div style="background-color: yellow; padding: 5px;">CAUTION</div> <p>Abnormal noises, vibrations, temperatures or leakage Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Switch off the pump (set) immediately. ▷ Eliminate the causes before returning the pump set to service.
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- ✓ The system piping has been cleaned.
- ✓ The pump, suction line and, if applicable, inlet tank have been vented and primed with the fluid to be handled.
- ✓ The lines for priming and venting have been closed.

	<div style="background-color: yellow; padding: 5px;">CAUTION</div> <p>Start-up against open discharge line Motor overload!</p> <ul style="list-style-type: none"> ▷ Make sure the motor has sufficient power reserves. ▷ Use a soft starter. ▷ Use speed control.
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1. Fully open the shut-off element in the suction head/suction lift line.
2. Close or slightly open the shut-off element in the discharge line.
3. Start up the motor.
4. Immediately after the pump has reached full rotational speed, slowly open the shut-off element in the discharge line and adjust it to comply with the duty point.

	CAUTION
	<p>Misalignment of pump and coupling Damage to pump, motor and coupling!</p> <ul style="list-style-type: none"> ▸ When the operating temperature has been reached, switch off the pump set and check the coupling alignment.

5. Check the coupling alignment and re-align the coupling, if required.

6.1.11 Checking the shaft seal

Mechanical seal The mechanical seal only leaks slightly or invisibly (as vapour) during operation. Mechanical seals are maintenance-free.

Gland packing The gland packing must drip slightly during operation.

	⚠ DANGER
	<p>Impermissibly high temperatures at gland packings Explosion hazard!</p> <ul style="list-style-type: none"> ▸ Always use suitable temperature monitoring for gland packings. ▸ Gland packing must be tightened correctly.

Pure graphite packing If a pure graphite packing is used, there must always be some leakage.


Table 13: Leakage rate of the pure graphite packing

Quantity	Values
Minimum	10 cm ³ /min
Maximum	20 cm ³ /min

Adjusting the leakage

- Prior to commissioning**
1. Only lightly tighten the nuts of the gland follower by hand.
 2. Use a feeler gauge to verify that the gland follower is mounted centred and at a right angle to the shaft.
- ⇒ The gland must leak after the pump has been primed.

After five minutes of operation

	⚠ WARNING
	<p>Unprotected rotating parts Risk of personal injury!</p> <ul style="list-style-type: none"> ▸ Do not touch rotating parts. ▸ When the pump is running, perform any work with utmost caution.

The leakage can be reduced.

1. Tighten the nuts on the gland follower by 1/6 turn.
2. Monitor the leakage for another five minutes.

Excessive leakage:

Repeat steps 1 and 2 until the minimum value has been reached.

Not enough leakage:

Slightly loosen the nuts at the gland follower.

No leakage:

Immediately switch off pump set!

Loosen the gland follower and repeat commissioning.


Checking the leakage


After the leakage has been adjusted, monitor the leakage for about two hours at maximum fluid temperature.

Check that enough leakage occurs at the gland packing at minimum fluid pressure.

6.1.12 Shutdown


- ✓ The shut-off element in the suction line is and remains open.
 - ✓ On pump sets with double mechanical seal, apply the required pressure specified in the general arrangement drawing to the mechanical seal chamber also during standstill.
 - ✓ Also ensure quench liquid supply is ON during pump standstill.
1. Close the shut-off element in the discharge line.
 2. Switch off the motor and make sure the pump set runs down smoothly to a standstill.

	<p>NOTE</p> <p>If the discharge line is equipped with a check valve, the shut-off element in the discharge line may remain open, provided the site's requirements and regulations are taken into account and observed.</p>
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	<p>NOTE</p> <p>If shut-off is not possible, the pump will run in reverse direction. The reverse runaway speed must be lower than the rated speed.</p>
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For prolonged shutdown periods:


1. Close the shut-off element in the suction line.
2. Close the auxiliary connections.
If the fluid to be handled is fed in under vacuum, also supply the shaft seal with barrier fluid during standstill.
Only turn off the cooling liquid supply after the pump has cooled down.

	<p>CAUTION</p> <p>Risk of freezing during prolonged pump shutdown periods Damage to the pump!</p> <ul style="list-style-type: none"> ▸ Drain the pump and the cooling/heating chambers (if any) or otherwise protect them against freezing.
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6.2 Operating limits

 	<p>⚠ DANGER</p> <p>Non-compliance with operating limits for pressure, temperature, fluid handled and speed Explosion hazard! Hot or toxic fluid could escape!</p> <ul style="list-style-type: none"> ▸ Comply with the operating data indicated in the data sheet. ▸ Never use the pump for handling fluids it is not designed for. ▸ Avoid prolonged operation against a closed shut-off element. ▸ Never operate the pump at temperatures, pressures or rotational speeds exceeding those specified in the data sheet or on the name plate unless the written consent of the manufacturer has been obtained.
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6.2.1 Ambient temperature



CAUTION

Operation outside the permissible ambient temperature
Damage to the pump (set)!


- Observe the specified limits for permissible ambient temperatures.

Observe the following parameters and values during operation:

Table 14: Permissible ambient temperatures

Permissible ambient temperature	Value
Maximum	50 °C 40 °C ⁷⁾
Minimum	See data sheet

6.2.2 Frequency of starts



⚠ DANGER


Excessive surface temperature of the motor
Explosion hazard!
Damage to the motor!

- In case of explosion-proof motors, observe the frequency of starts specified in the manufacturer's product literature.

The frequency of starts is usually determined by the maximum temperature increase of the motor. This largely depends on the power reserves of the motor in steady-state operation and on the starting conditions (DOL, star-delta, moments of inertia, etc). If the start-ups are evenly spaced over the period indicated, the following limits serve as orientation for start-up with the discharge-side gate valve slightly open:

Table 15: Frequency of starts

Motor rating [kW]	Maximum number of start-ups [Start-ups/hour]
up to 12	15
up to 100	10
more than 100	5



CAUTION

Re-starting while motor is still running down
Damage to the pump (set)!

- Do not re-start the pump set before the pump rotor has come to a standstill.

6.2.3 Fluid handled

6.2.3.1 Flow rate

Unless specified otherwise in the characteristic curves or in the data sheets, the following applies:

- Short-time operation: $Q_{min}^{8)} = 0.15 \times Q_{opt}^{9)}$
- Continuous operation: $Q_{min}^{8)} = 0.3 \times Q_{opt}^{9)}$
- 2-pole operation: $Q_{max}^{10)} = 1.1 \times Q_{opt}^{9)}$

⁷⁾ If compliance with 94/9/EC is required (ATEX-compliant products)

⁸⁾ Minimum permissible flow rate

⁹⁾ Flow rate at best efficiency point

- 4-pole operation: $Q_{\max}^{10)} = 1.25 \times Q_{\text{opt}}^{9)}$
- 6-pole operation: $Q_{\max}^{10)} = 1.25 \times Q_{\text{opt}}^{9)}$

The data refer to water and water-like fluids. Longer operating periods with these fluids and at the flow rates indicated will not cause an additional increase in the temperatures on the pump surface. However, if the physical properties of the fluids handled differ from those of water, the calculation formula below must be used to check if an additional heat build-up may lead to a dangerous temperature increase at the pump surface. If necessary, the minimum flow must be increased.

$$T_o = T_f + \Delta \vartheta$$


$$\Delta \vartheta = \frac{g \times H}{c \times \eta} \times (1 - \eta)$$

Table 16: Key

Symbol	Description	Unit
c	Specific heat capacity	J/kg K
g	Gravitational constant	m/s ²
H	Pump discharge head	m
T _f	Fluid temperature	°C
T _o	Temperature at the casing surface	°C
η	Pump efficiency at duty point	-
Δϑ	Temperature difference	K

6.2.3.2 Density of the fluid handled

The pump input power changes in proportion to the density of the fluid handled.

	<div style="background-color: yellow; padding: 5px;">CAUTION</div> <p>Impermissibly high density of the fluid handled Motor overload!</p> <ul style="list-style-type: none"> ▸ Observe the information on fluid density indicated in the data sheet. ▸ Make sure the motor has sufficient power reserves.
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6.2.3.3 Abrasive fluids

Do not exceed the maximum permissible solids content specified in the data sheet. When the pump handles fluids containing abrasive substances, increased wear of the hydraulic system and shaft seal are to be expected. In this case, reduce the commonly recommended inspection intervals.

6.3 Shutdown/storage/preservation

6.3.1 Measures to be taken for shutdown

The pump (set) remains installed

- ✓ Sufficient fluid is supplied for the operation check run of the pump.
- 1. Start up the pump (set) regularly between once a month and once every three months for approximately five minutes during prolonged shutdown periods. This will prevent the formation of deposits within the pump and the pump intake area.

¹⁰⁾ Maximum permissible flow rate

The pump (set) is removed from the pipe and stored

- ✓ The pump has been properly drained (⇒ Section 7.3 Page 47) and the safety instructions for dismantling the pump have been observed. (⇒ Section 7.4.1 Page 47)
- 1. Spray-coat the inside wall of the pump casing, and in particular the impeller clearance areas, with a preservative.
- 2. Spray the preservative through the suction and discharge nozzles. It is advisable to close the pump nozzles (e.g. with plastic caps or similar).
- 3. Oil or grease all exposed machined parts and surfaces of the pump (with silicone-free oil and grease, food-approved if required) to protect them against corrosion.
Observe the additional instructions (⇒ Section 3.3 Page 14) .



If the pump set is to be stored temporarily, only preserve the wetted components made of low-alloy materials. Commercially available preservatives can be used for this purpose. Observe the manufacturer's instructions for application/removal.

Observe any additional instructions and information provided. (⇒ Section 3 Page 13)

6.4 Returning to service


For returning the pump to service observe the sections on commissioning/start-up (⇒ Section 6.1 Page 32) and the operating limits. (⇒ Section 6.2 Page 38) .



In addition, carry out all servicing/maintenance operations before returning the pump (set) to service. (⇒ Section 7 Page 42)

	<div style="background-color: #f4a460; padding: 5px;">⚠ WARNING</div> <div style="padding: 5px;"> Failure to re-install or re-activate protective devices Risk of personal injury from moving parts or escaping fluid! <ul style="list-style-type: none"> ▷ As soon as the work is complete, re-install and/or re-activate any safety-relevant and protective devices. </div>
	<div style="background-color: #0072bc; color: white; padding: 5px;">NOTE</div> <div style="padding: 5px;"> If the pump has been out of service for more than one year, replace all elastomer seals. </div>


7 Servicing/Maintenance


7.1 Safety regulations


	<div style="background-color: #f4a460; padding: 5px;">⚠ DANGER</div> <p>Sparks produced during servicing work Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Observe the safety regulations in force at the place of installation! ▷ Always perform maintenance work at an explosion-proof pump (set) outside of potentially explosive atmospheres.
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 	<div style="background-color: #f4a460; padding: 5px;">⚠ DANGER</div> <p>Improperly serviced pump set Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Service the pump set regularly. ▷ Prepare a maintenance schedule with special emphasis on lubricants, shaft seal and coupling.
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The operator ensures that all maintenance, inspection and installation work is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

	<div style="background-color: #f4a460; padding: 5px;">⚠ WARNING</div> <p>Unintentional starting of pump set Risk of injury by moving parts!</p> <ul style="list-style-type: none"> ▷ Make sure that the pump set cannot be started up unintentionally. ▷ Always make sure the electrical connections are disconnected before carrying out work on the pump set.
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	<div style="background-color: #f4a460; padding: 5px;">⚠ WARNING</div> <p>Fluids and supplies posing a health hazard and/or hot fluids or supplies Risk of injury!</p> <ul style="list-style-type: none"> ▷ Observe all relevant laws. ▷ When draining the fluid take appropriate measures to protect persons and the environment. ▷ Decontaminate pumps which handle fluids posing a health hazard.
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	<div style="background-color: #f4a460; padding: 5px;">⚠ WARNING</div> <p>Insufficient stability Risk of crushing hands and feet!</p> <ul style="list-style-type: none"> ▷ During assembly/dismantling, secure the pump (set)/pump parts to prevent tipping or falling over.
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A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation of the pump, pump set and pump parts with a minimum of servicing/maintenance expenditure and work.

	<div style="background-color: #0070c0; color: white; padding: 5px;">NOTE</div> <p>All maintenance, service and installation work can be carried out by KSB Service or authorised workshops. Find your contact in the attached "Addresses" booklet or on the Internet at "www.ksb.com/contact".</p>
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Never use force when dismantling and reassembling the pump set.

7.2 Maintenance/inspection



7.2.1 Supervision of operation

	<p>⚠ DANGER</p> <p>Excessive temperatures as a result of bearings running hot or defective bearing seals Explosion hazard! Fire hazard! Damage to the pump set! Risk of burns!</p> <ul style="list-style-type: none"> ▷ Regularly check the lubricant level. ▷ Regularly check the rolling element bearings for running noises.
	<p>⚠ DANGER</p> <p>Incorrectly serviced shaft seal Explosion hazard! Leakage of hot, toxic fluids! Damage to the pump set! Risk of burns! Fire hazard!</p> <ul style="list-style-type: none"> ▷ Regularly service the shaft seal.
	<p>⚠ DANGER</p> <p>Incorrectly serviced barrier fluid system Explosion hazard! Fire hazard! Damage to the pump set! Leakage of hot and/or toxic fluids!</p> <ul style="list-style-type: none"> ▷ Regularly service the barrier fluid system. ▷ Monitor the barrier fluid pressure.
	<p>CAUTION</p> <p>Increased wear due to dry running Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Never operate the pump set without liquid fill. ▷ Never close the shut-off element in the suction line and/or supply line during pump operation.
	<p>CAUTION</p> <p>Impermissibly high temperature of fluid handled Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Prolonged operation against a closed shut-off element is not permitted (heating up of the fluid). ▷ Observe the temperature limits in the data sheet and in the section on operating limits. (⇒ Section 6.2 Page 38)


While the pump is in operation, observe and check the following:

- The pump must run quietly and free from vibrations at all times.
- In case of oil lubrication, ensure the oil level is correct. (⇒ Section 6.1.2 Page 32)
- Check the shaft seal. (⇒ Section 6.1.11 Page 37)
- Check the static seals for leakage.

- Check the rolling element bearings for running noises.
Vibrations, noise and an increase in current input occurring during unchanged operating conditions indicate wear.
- Monitor the correct functioning of any auxiliary connections.
- Cooling system
Take the pump out of service at least once a year to thoroughly clean the cooling system.
- Monitor the stand-by pump.
To make sure that stand-by pumps are ready for operation, start them up once a week.
- Monitor the bearing temperature.
The bearing temperature must not exceed 90 °C (measured on the outside of the bearing bracket).

	<p>CAUTION</p> <p>Operation outside the permissible bearing temperature Damage to the pump!</p> <ul style="list-style-type: none"> ▸ The bearing temperature of the pump (set) must never exceed 90 °C (measured on the outside of the bearing bracket).
	<p>NOTE</p> <p>After commissioning, increased temperatures may occur at grease-lubricated rolling element bearings due to the running-in process. The final bearing temperature is only reached after a certain period of operation (up to 48 hours depending on the conditions).</p>

7.2.2 Inspection work

	<p>⚠ DANGER</p> <p>Excessive temperatures caused by friction, impact or frictional sparks Explosion hazard! Fire hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▸ Regularly check the coupling guard, plastic components and other guards of rotating parts for deformation and sufficient distance from rotating parts.
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7.2.2.1 Checking the coupling

Check the flexible elements of the coupling. Replace the relevant parts in due time if there is any sign of wear and check the alignment.

7.2.2.2 Checking the clearances

To check the clearances, remove the back pull-out unit.


If the clearance is larger than permitted (see the following table), fit a new casing wear ring 502.01 and/or 502.02.

The clearances given refer to the diameter.


Table 17: Clearances between impeller and casing/between impeller and casing wear ring

Impeller material	Clearances	
	New	Maximum permissible enlargement
G, B	0,3 mm	0,9 mm
C, D, E	0,5 mm	1,5 mm

7.2.2.3 Cleaning filters

	<div style="background-color: #FFD700; padding: 5px;">CAUTION</div> <p>Insufficient inlet pressure due to clogged filter in the suction line Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Monitor contamination of filter with suitable means (e.g. differential pressure gauge). ▷ Clean filter at appropriate intervals.
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7.2.3 Lubrication and lubricant change of rolling element bearings

	<div style="background-color: #FF4500; padding: 5px;">⚠ DANGER</div> <p>Excessive temperatures as a result of bearings running hot or defective bearing seals Explosion hazard! Fire hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Regularly check the condition of the lubricant.
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7.2.3.1 Oil lubrication

The rolling element bearings are usually lubricated with mineral oil.

7.2.3.1.1 Intervals

Table 18: Oil change intervals

Temperature at the bearing	First oil change	All subsequent oil changes ¹¹⁾
up to 70 °C	After 300 operating hours	Every 8500 operating hours
70 °C - 80 °C	After 300 operating hours	Every 4200 operating hours
80 °C - 90 °C	After 300 operating hours	Every 2000 operating hours

7.2.3.1.2 Oil quality

Table 19: Oil quality

Description	Characteristics	
Lubricating oil CL46 or CLP46 according to DIN 51517	Kinematic viscosity at 40 °C	46±4 mm²/s
	Flash point (to Cleveland)	+175 °C
	Solidification point (pour point)	-15 °C
	Application temperature ¹²⁾	Higher than permissible bearing temperature

7.2.3.1.3 Oil quantity


Table 20: Oil quantity

Bearing bracket	Oil quantity [l]
CS40	0.2
CS50	0.4
CS60	0.4
CS80	0.7

¹¹⁾ At least once a year

¹²⁾ For ambient temperatures below -10 °C use a different suitable type of lubricating oil. Contact KSB.

7.2.3.1.4 Changing the oil

	⚠ WARNING
	<p>Lubricants posing a health hazard and/or hot lubricants Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ When draining the lubricant take appropriate measures to protect persons and the environment. ▷ Wear safety clothing and a protective mask, if required. ▷ Collect and dispose of any lubricants. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

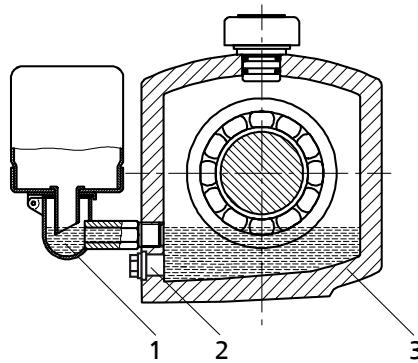


Fig. 17: Bearing bracket with constant level oiler

1	Constant level oiler	2	Screw plug
3	Bearing bracket		

- ✓ A suitable container for the used oil is on hand.
- 1. Place the container underneath the screw plug.
- 2. Undo the screw plug (2) at the bearing bracket (3) and drain the oil.
- 3. Once the bearing bracket (3) has been drained, re-insert and re-tighten the screw plug (2).
- 4. Re-fill with oil. (⇒ Section 6.1.2 Page 32)

7.2.3.2 Grease lubrication

The bearings are supplied packed with high-quality lithium-soap grease.

7.2.3.2.1 Intervals

- Under normal operating conditions the grease-lubricated bearings will run for 25,000 operating hours.
- Under unfavourable operating conditions (e.g. high room temperature, high atmospheric humidity, dust-laden air, aggressive industrial atmosphere, etc.) check the bearings earlier and clean and re-lubricate them, if required.
- Replace the rolling element bearings after 25,000 operating hours or 2 years of continuous operation.

7.2.3.2.2 Grease quality

Table 21: Grease quality to DIN 51825

Soap basis	NLGI grade	Worked penetration at 25 °C in mm/10	Drop point	Temperature range
Lithium	2 to 3	220-295	≥ 175 °C	-30 °C to 120 °C

7.2.3.2.3 Grease quantities

Medium-duty


Table 22: Grease quantities for new grease fill

Bearing bracket	Bearing + cover, pump-end [g]	Bearing+ cover, drive-end [g]
CS40	13	66
CS50	50	135
CS60	72	196
CS80	64	276

Economy


Economy bearing assemblies are greased for life; the grease fill cannot be renewed. If necessary, replace the complete bearing.

7.2.3.2.4 Changing the grease

	CAUTION
	<p>Mixing greases of differing soap bases Changed lubricating qualities!</p> <ul style="list-style-type: none"> Thoroughly clean the bearings. Adjust the re-lubrication intervals to the grease used.

- ✓ The pump has been dismantled for changing the grease. (⇒ Section 7.4 Page 47)
- 1. Only half-fill the bearing cavities with grease.
- 2. Fill the cavities in the bearing cover until they are about 1/3 full.

7.3 Drainage/cleaning


	⚠ WARNING
	<p>Fluids, consumables and supplies which are hot and/or pose a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> Collect and properly dispose of flushing fluid and any residues of the fluid handled. Wear safety clothing and a protective mask, if required. Observe all legal regulations on the disposal of fluids posing a health hazard.

If the pump set has handled fluids whose residues could lead to corrosion in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pump set must be neutralised, and anhydrous inert gas must be blown through the pump to ensure drying.


Use connection 6B to drain the fluid handled (see auxiliary connections).

7.4 Dismantling the pump set

7.4.1 General information/Safety regulations

	⚠ WARNING
	<p>Unqualified personnel performing work on the pump (set) Risk of injury!</p> <ul style="list-style-type: none"> Always have repair and maintenance work performed by specially trained, qualified personnel.

	⚠ WARNING
	Hot surface Risk of injury! <ul style="list-style-type: none"> ▷ Allow the pump set to cool down to ambient temperature.


	⚠ WARNING
	Improper lifting/moving of heavy assemblies or components Personal injury and damage to property! <ul style="list-style-type: none"> ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.

Observe the general safety instructions and information.

For any work on the motor, observe the instructions of the relevant motor manufacturer.

For dismantling and reassembly refer to the general assembly drawing.


In the event of damage you can always contact our service staff.


	⚠ DANGER
	Insufficient preparation of work on the pump (set) Risk of injury! <ul style="list-style-type: none"> ▷ Properly shut down the pump set. (⇒ Section 6.1.12 Page 38) ▷ Close the shut-off elements in suction and discharge line. ▷ Drain the pump and release the pump pressure. (⇒ Section 7.3 Page 47) ▷ Close any auxiliary connections. ▷ Allow the pump set to cool down to ambient temperature.

7.4.2 Preparing the pump set

1. Interrupt the power supply and secure the pump against unintentional start-up.
2. Disconnect and remove all auxiliary pipework.
3. Remove the coupling guard.
4. Remove the coupling spacer, if any.
5. Drain the oil fill of oil-lubricated bearings. (⇒ Section 7.2.3.1.4 Page 46)

7.4.3 Removing the motor


	NOTE On pump sets with spacer-type couplings, the back pull-out unit can be removed while the motor remains bolted to the baseplate.
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	⚠ WARNING
	Motor tipping over Risk of crushing hands and feet! <ul style="list-style-type: none"> ▷ Suspend or support the motor to prevent it from tipping over.

1. Disconnect the motor from the power supply.
2. Unbolt the motor from the baseplate.
3. Shift the motor to separate it from the pump.

7.4.4 Removing the back pull-out unit

- ✓ The notes and steps stated in (⇒ Section 7.4.1 Page 47) to (⇒ Section 7.4.3 Page 48) have been observed/carried out.
- ✓ On pump sets without spacer-type coupling, the motor has been removed.

	<div style="background-color: #f4a460; padding: 5px;">⚠ WARNING</div> <div style="padding: 5px;"> Back pull-out unit tipping over Risk of crushing hands and feet! <ul style="list-style-type: none"> ▷ Suspend or support the bearing bracket at the pump end. </div>
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1. If required, suspend or support bearing bracket 330 to prevent it from tipping over.
2. Unbolt support foot 183 from the baseplate.
3. Undo hexagon nut 920.01 at the volute casing.
4. Pull the back pull-out unit out of the volute casing.
5. Remove and dispose of joint ring 411.10.
6. Place the back pull-out unit on a clean and level surface.

7.4.5 Removing the impeller

- ✓ The notes and steps stated in (⇒ Section 7.4.1 Page 47) to (⇒ Section 7.4.4 Page 49) have been observed/carried out.
 - ✓ The back pull-out unit is kept in a clean and level assembly area.
1. Undo impeller nut 922 (right-hand thread).
 2. Remove impeller 230 with an impeller removal device.
 3. Place impeller 230 on a clean and level surface.
 4. Remove keys 940.01 from shaft 210.
 5. Remove and dispose of joint rings 411.31/411.32.

7.4.6 Removing the shaft seal

7.4.6.1 Removing the mechanical seal - cylindrical casing cover

- ✓ The notes and steps stated in (⇒ Section 7.4.1 Page 47) to (⇒ Section 7.4.5 Page 49) have been observed/carried out.
 - ✓ The back pull-out unit is kept in a clean and level assembly area.
1. Unscrew hexagon nuts 920.02 and push back seal cover 471 (if fitted).
 2. Undo hexagon head bolts 901.22, if any.
 3. Remove casing cover 161 from bearing bracket 330.
 4. Pull complete mechanical seal 433 with shaft protecting sleeve 524.01, seal cover 471 and thrower 507.01 off shaft 210.

7.4.6.2 Removing the mechanical seal - conical casing cover

- ✓ The notes and steps stated in (⇒ Section 7.4.1 Page 47) to (⇒ Section 7.4.5 Page 49) have been observed/carried out.
 - ✓ The back pull-out unit is kept in a clean and level assembly area.
1. Pull shaft sleeve 524.01 with the rotating assembly of mechanical seal 433 off the shaft.
 2. Undo hexagon head bolts 901.22, if any.
 3. Dismantle casing cover 161 with the stationary ring of mechanical seal 433.
 4. Remove thrower 507.01.
 5. Press the stationary ring of mechanical seal 433 out of casing cover 161.

7.4.6.3 Removing the gland packing

- ✓ The notes and steps stated in (⇒ Section 7.4.1 Page 47) to (⇒ Section 7.4.5 Page 49) have been observed/carried out.
- ✓ The back pull-out unit is kept in a clean and level assembly area.
- 1. Undo hexagon nuts 920.02 at gland follower 452 and remove the gland follower.
- 2. Undo hexagon head bolt 901.22, if any.
- 3. Remove casing cover 161 from bearing bracket 330.
- 4. Remove stuffing box ring 454.01 and drip plate 463.01.
- 5. Remove packing rings 461.01 and lantern ring 458.01, if any, from the packing chamber.
- 6. Pull shaft protecting sleeve 524.01 and thrower 507.01 off shaft 210.

7.4.7 Dismantling the bearings

- ✓ The notes and steps stated in (⇒ Section 7.4.1 Page 47) to (⇒ Section 7.4.6 Page 49) have been observed/carried out.
- ✓ The bearing bracket is kept in a clean and level assembly area.
- 1. Unscrew the hexagon socket head cap screw in the coupling hub.
- 2. Pull the coupling half off the pump shaft with a puller.
- 3. Remove key 940.02.
- 4. Undo screws 914.02 and remove drive-end bearing cover 360.02 and joint ring 400.02.
- 5. Undo screws 914.01 and remove pump-end bearing cover 360.01 and joint ring 400.01.

7.4.7.1 Dismantling the medium-duty bearing assembly

- ✓ The notes and steps stated in (⇒ Section 7.4.1 Page 47) to (⇒ Section 7.4.7 Page 50) have been observed/carried out.
- 1. Carefully drive shaft 210 together with angular contact ball bearing 320.02 and the inner ring of cylindrical roller bearing 322.01 out of the bearing bracket towards the drive end.
- 2. Remove support disc 550.23 of angular contact ball bearing 320.02 from bearing bracket 330.
- 3. In case of grease lubrication, remove disc 550.25.
- 4. Remove cylindrical roller bearing 322.01 (roller cage) from bearing bracket 330.
- 5. In case of grease lubrication, remove disc 550.24.
- 6. Bend open lockwasher 931.01 behind keywayed nut 920.21 on shaft 210.
- 7. Unscrew keywayed nut 920.21 (right-hand thread) and remove lockwasher 931.01.



WARNING

Hot surfaces due to heating of components for assembly/dismantling
Risk of burns!

- ▷ Wear heat-resistant protective gloves.
- ▷ Remove flammable substances from the danger zone.


- 8. Heat up angular contact ball bearing 320.02 and the inner ring of cylindrical roller bearing 322.01 to 80 °C, and pull them off shaft 210.
- 9. Dispose of joint rings 400.01/.02.


7.4.7.2 Dismantling the economy bearing assembly

- ✓ The notes and steps stated in (⇒ Section 7.4.1 Page 47) to (⇒ Section 7.4.7 Page 50) have been observed/carried out.
- 1. Carefully push shaft 210 with deep-groove ball bearing 321.01/02 out of the bearing bracket.
- 2. Heat up the deep-groove ball bearing to 80°C and pull it off shaft 210.
On grease-lubricated models, pull deep-groove ball bearing 321.01/02 off the shaft in cold condition.
- 3. Dispose of joint rings 400.01/02.

7.5 Reassembling the pump set

7.5.1 General information/Safety regulations


	<p>⚠ WARNING</p> <p>Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
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	<p>CAUTION</p> <p>Improper reassembly Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Reassemble the pump (set) in accordance with the general rules of sound engineering practice. ▷ Use original spare parts only.
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Sequence Always reassemble the pump in accordance with the corresponding general assembly drawing.

Sealing elements

- **Gaskets**
 - Always use new gaskets, making sure that they have the same thickness as the old ones.
 - Always fit gaskets of asbestos-free materials or graphite without using lubricants (e.g. copper grease, graphite paste).
- **O-rings**
 - Never use O-rings that have been glued together from material sold by the metre.

	<p>CAUTION</p> <p>Contact of O-ring with graphite or similar material Fluid could escape!</p> <ul style="list-style-type: none"> ▷ Do not coat O-ring with graphite or similar material. ▷ Use animal fats or lubricants based on silicone or PTFE.
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- **Assembly adhesives**
 - For gaskets, avoid the use of assembly adhesives, if possible.
 - If assembly adhesives are required, use a commercially available contact adhesive (e.g. "Pattex").
 - Only apply adhesive at selected points and in thin layers.
 - Never use quick-setting adhesives (cyanoacrylate adhesives).
 - Coat the locating surfaces of the individual components and screwed connections with graphite or similar before reassembly.

Tightening torques For reassembly, tighten all screws and bolts as specified in this manual.


7.5.2 Reassembling the bearing assembly

7.5.2.1 Reassembling the medium-duty bearing assembly

- ✓ The individual parts have been placed in a clean and level assembly area.
- ✓ All dismantled parts have been cleaned and checked for wear.
- ✓ Any damaged or worn parts have been replaced by original spare parts.
- ✓ The sealing surfaces have been cleaned.

	<p>⚠ WARNING</p> <p>Hot surfaces due to heating of components for assembly/dismantling Risk of burns!</p> <ul style="list-style-type: none"> ▷ Wear heat-resistant protective gloves. ▷ Remove flammable substances from the danger zone.
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1. Heat up angular contact ball bearing 320.02 and the inner ring of cylindrical roller bearing 322.01 to approx. 80 °C in an oil bath.
2. Slide angular contact ball bearing 320.02 and the inner ring of cylindrical roller bearing 322.01 onto shaft 210 until they will not go any further.

	<p>NOTE</p> <p>Angular contact ball bearings must be installed in back-to-back arrangement. Angular contact ball bearings installed in pairs must always be from the same manufacturer.</p>
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3. Use a C-spanner to tighten slotted round nut 920.21 without lockwasher 931.01.
4. Let angular contact ball bearing 320.01 cool down to approximately 5 °C above ambient temperature.
5. Re-tighten slotted round nut 920.21, then unscrew it again.
6. Apply a few spots of a suitable lubricant (e.g. Molykote) to the contact faces of lockwasher 931.01 and slotted round nut 920.21.
7. Fit lockwasher 931.01.
8. Tighten slotted round nut 920.21.
9. Bend back lockwasher 931.01.
10. Insert circlip 932.01/932.02 into the bearing bracket.
11. On grease-lubricated models, insert disc 550.24.
12. Fit cylindrical roller bearing 322.01 (roller cage) in the bearing bracket.

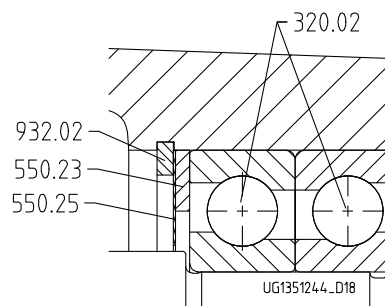



Fig. 18: Reassembling the medium-duty bearing assembly

13. On grease-lubricated models, insert disc 550.25.
14. Insert support disc 550.23 of angular contact ball bearing 320.02 into bearing bracket 330.

15. Carefully insert pre-assembled shaft 210 with angular contact ball bearing 320.02 and the inner ring of cylindrical roller bearing 322.01 into bearing bracket 330 from the drive end.
16. On grease-lubricated models, fill the bearing and bearing cover with grease. Grease lubrication (⇒ Section 7.2.3.2 Page 46)
17. Fit pump-end bearing cover 360.01 with joint ring 400.01; take care not to damage lip seal 421.01.
18. Fit motor-end bearing cover 360.02 with joint ring 400.02; take care not to damage lip seal 421.02.
19. Fit thrower 507.01 and 507.02, if applicable, and align flush with the shaft shoulder.
20. Fit keys 940.02.
21. Slide the coupling hub onto the shaft end.
22. Secure the coupling hub with a set screw.

7.5.2.2 Reassembling the economy bearing assembly

- ✓ The individual parts are kept in a clean and level assembly area.
- ✓ All dismantled parts have been cleaned and checked for wear.
- ✓ Any damaged or worn parts have been replaced by original spare parts.
- ✓ The sealing surfaces have been cleaned.

	<p>⚠ WARNING</p> <p>Hot surfaces due to heating of components for assembly/dismantling Risk of burns!</p> <ul style="list-style-type: none"> ▷ Wear heat-resistant protective gloves. ▷ Remove flammable substances from the danger zone.
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1. **Oil-lubricated models:** Heat up deep-groove ball bearing 321.01/02 in an oil bath to approx. 80°C and slide it onto shaft 210 until it will not go any further. **Grease-lubricated models:** Press deep-groove ball bearing 321.01/02 onto shaft 210 in cold condition until it will not go any further. Only apply force via the inner ring of the deep-groove ball bearings.
2. Carefully slide pre-assembled shaft 210 with deep-groove ball bearing 321.01/02 into bearing bracket 330.
3. Fit pump-end bearing cover 360.01 with joint ring 400.01; take care not to damage lip seal 421.02.
4. Fit drive-end bearing cover 360.02 with joint ring 400.02; take care not to damage lip seal 421.02.
5. Fit throwers 507.01 and 507.02, if any, and align flush with the shaft shoulder.
6. Fit keys 940.02.
7. Pull the coupling hub onto the shaft end.
8. Secure the coupling hub with a set screw.

7.5.3 Fitting the shaft seal

7.5.3.1 Fitting the mechanical seal

The following rules must be observed when installing the mechanical seal:

- For installing the mechanical seal, proceed as shown in the seal installation drawing.
- Work cleanly and accurately.
- Only remove the protective wrapping of the contact faces immediately before installation takes place.

- Prevent any damage to the sealing surfaces or O-rings.
- After inserting the stationary ring of the mechanical seal, check that it is plane-parallel in relation to the casing part.
- The surface of the shaft protecting sleeve must be absolutely clean and smooth, and the sleeve's mounting edge must be chamfered.
- When sliding the rotating assembly onto the shaft protecting sleeve, take appropriate steps to protect the surface of the shaft protecting sleeve from damage.

7.5.3.1.1 Fitting the single mechanical seal – cylindrical casing cover

- ✓ The notes and steps stated in (⇒ Section 7.5.1 Page 51) to (⇒ Section 7.5.2 Page 52) have been observed/carried out.
 - ✓ The bearing assembly and the individual parts of mechanical seal 433 are kept in a clean and level assembly area.
 - ✓ All dismantled parts have been cleaned and checked for wear.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
 - ✓ The sealing surfaces have been cleaned.
1. Fit thrower 507.01, if applicable, and align flush with the shaft shoulder.
 2. Fasten seal cover 471 with inserted O-ring, the stationary ring of the mechanical seal and gasket 411.05 to casing cover 161 with hexagon nut 920.02.
 3. Place casing cover 161 into the locating fit of bearing bracket 330.
 4. Fit and tighten hexagon head bolt 901.22, if any.
 5. Fit the rotating assembly of mechanical seal 433 on shaft protecting sleeve 524.01 (observe distance B - see Supplementary Sheet of the mechanical seal).
 6. Slide pre-assembled mechanical seal 433 and shaft protecting sleeve 524.01 onto shaft 210.

7.5.3.1.2 Fitting the double mechanical seal – cylindrical casing cover

- ✓ The notes and steps stated in (⇒ Section 7.5.1 Page 51) to (⇒ Section 7.5.2 Page 52) have been observed/carried out.
 - ✓ The bearing assembly and the individual parts of mechanical seal 433 are kept in a clean and level assembly area.
 - ✓ All dismantled parts have been cleaned and checked for wear.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
 - ✓ The sealing surfaces have been cleaned.
1. Fit thrower 507.01, if any, and align flush with the shaft shoulder.
 2. Fit the rotating assembly of mechanical seals 433.01 and 433.02 on shaft protecting sleeve 524.01 (observe distance B - see Supplementary Sheet for the mechanical seal).
 3. Position the stationary ring of mechanical seal 433.01 with the O-ring in casing cover 161. Fit ring and circlip, if any.
 4. Position the stationary ring of mechanical seal 433.02 with the O-ring in casing cover 471.01.
 5. Insert pre-assembled mechanical seals 433.01 and 433.02 and shaft protecting sleeve 524.01 in the casing cover.
 6. Fit seal cover 471.01 with gasket 411.15 on the casing cover. Make sure the connection bores are positioned correctly.

7.5.3.1.3 Fitting the mechanical seal – conical casing cover

- ✓ The notes and steps stated in (⇒ Section 7.5.1 Page 51) to (⇒ Section 7.5.2 Page 52) have been observed/carried out.

- ✓ The bearing assembly and the individual parts of mechanical seal 433 are kept in a clean and level assembly area.
 - ✓ All dismantled parts have been cleaned and checked for wear.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
 - ✓ The sealing surfaces have been cleaned.
1. Fit thrower 507.01, if applicable, and align flush with the shaft shoulder.
 2. Carefully press the stationary ring of mechanical seal 433 with O-ring into casing cover 161.
 3. Fit casing cover 161 with the inserted stationary ring of the mechanical seal into bearing bracket 330.
 4. Fit and tighten hexagon head bolt 901.22, if any.
 5. Fit the rotating assembly of mechanical seal 433 and spacer ring, if any, on shaft protecting sleeve 524.01 (observe distance B - see Supplementary Sheet for the mechanical seal).
 6. Slide pre-assembled mechanical seal 433 and shaft protecting sleeve 524.01 onto shaft 210.

7.5.3.2 Fitting the gland packing

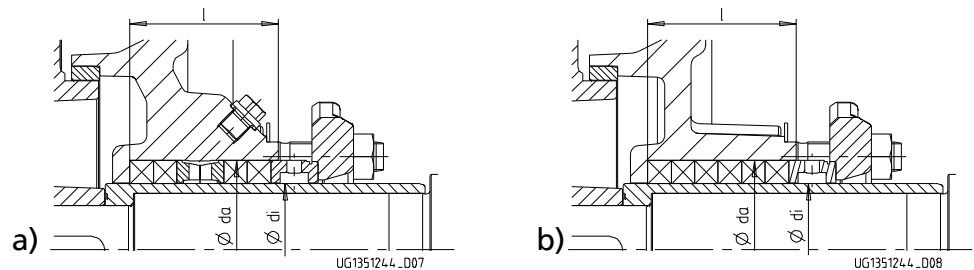


Fig. 19: Gland packing chamber a) with lantern ring and b) without lantern ring

Table 23: Gland packing chamber (dimensions in mm)

Bearing bracket	Gland packing chamber			Packing cross-section	Packing rings
	Ø d _i	Ø d _a	l		
CS40	35	51	53	8×8	4 rings and 1 lantern ring or 6 rings
CS50	45	65	64	10×10	
CS60	55	75	64	10×10	
CS80	70	95	79	12,5×12,5	

Pure graphite packings see supplementary operating instructions.

Always use pre-compressed packing rings.

- ✓ The notes and steps stated in (⇒ Section 7.5.1 Page 51) to (⇒ Section 7.5.2 Page 52) have been observed/carried out.
 - ✓ The bearing assembly as well as the individual parts are kept in a clean and level assembly area.
 - ✓ All dismantled parts have been cleaned and checked for wear.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
 - ✓ The sealing surfaces have been cleaned.
1. Clamp casing cover 161 into a vice.
 2. Insert the first packing ring, ensuring that its cut edge is in horizontal position.
 3. Hold the packing ring in place and slide shaft protecting sleeve 524.01 (chamfered side first) into the gland packing chamber from the pump end.
 4. Slightly expand the inside diameter of the packing ring by moving shaft protecting sleeve 524.01 back and forth. Then pull out shaft protecting sleeve 524.01.
Insert lantern ring 458, if any (see drawing above).

Insert each subsequent packing ring separately with its joint offset by approx. 90° in relation to the previous one. Repeat the expansion procedure for each packing ring.


When the last packing ring has been inserted, shaft protecting sleeve 524.01 remains in the packing chamber.

5. Insert stuffing box ring 454.01 with the drilled hole down.
6. Fit gland follower 452 and lightly fasten it by hand with the two hexagon nuts 920.02; watch discs 550.01.
7. Place the entire casing cover 161 with shaft protecting sleeve 524.01 into the locating fit of bearing bracket 330.
8. Fit and tighten hexagon head bolts 901.22, if any.

7.5.4 Fitting the impeller


- ✓ The notes and steps stated in (⇒ Section 7.5.1 Page 51) to (⇒ Section 7.5.3 Page 53) have been observed/carried out.
 - ✓ The bearing assembly/mechanical seal as well as the individual parts are kept in a clean and level assembly area.
 - ✓ All dismantled parts have been cleaned and checked for wear.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
 - ✓ The sealing surfaces have been cleaned.
 - ✓ Impeller bore, shaft and keyways are clean and free from burrs.
1. Insert keys 940.01 into the shaft keyway.
 2. Insert joint ring 411.08 into shaft protecting sleeve 524.01.
 3. Coat the impeller seat with a suitable lubricant.
 4. Slide impeller 230 onto shaft 210.
 5. Thread impeller nut 922 with inserted joint ring 411.31 onto shaft 210 and tighten. (⇒ Section 7.6.2 Page 58)

7.5.5 Fitting the back pull-out unit

	⚠ WARNING
	Back pull-out unit tipping over Risk of crushing hands and feet! ▷ Suspend or support the bearing bracket at the pump end.

- ✓ The notes and steps stated in (⇒ Section 7.5.1 Page 51) to (⇒ Section 7.5.4 Page 56) have been observed/carried out.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
 - ✓ The sealing surfaces have been cleaned.
 - ✓ For back pull-out units supplied without coupling: Fit the coupling in accordance with the manufacturer's instructions.
1. If required, suspend or support the back pull-out unit to prevent it from tipping over. Then slide it into volute casing 102 with a new gasket 411.10.
 2. Tighten nut 920.01 at the volute casing.
 3. Bolt support foot 183 to the baseplate.

7.5.6 Mounting the motor

	NOTE
	Steps 1 and 2 do not apply to versions with spacer-type coupling.

1. Shift the motor to connect it to the pump via the coupling.
2. Fasten the motor to the baseplate.
3. Align pump and motor. (⇒ Section 5.7 Page 28)
4. Connect the motor to the power supply (refer to manufacturer's product literature).

7.6 Tightening torques

7.6.1 Tightening torques for the pump

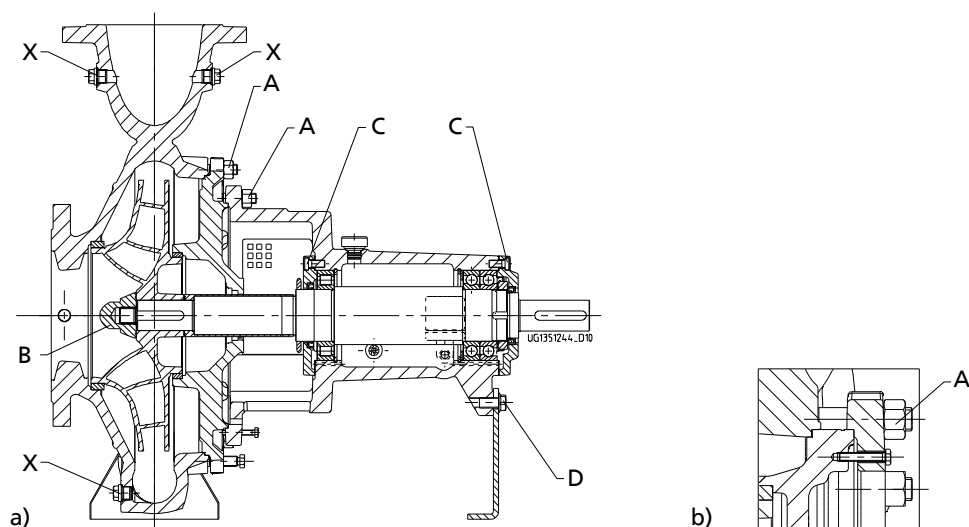


Fig. 20: a) Tightening points at the pump, b) Version with clamped discharge cover

Use a torque wrench to tighten the bolted connections (902.01/920.01) between the volute casing and the bearing bracket.

Table 24: Tightening torques

Position	Thread size	Nominal value [Nm]	
		PN16 (G, C, V) ¹³⁾	PN25 (E, D) ¹³⁾
A	M12	50	65
	M16	125	165
B	M14x1,5 SW21 (CS40)	60	
	M16x1,5 SW24 (CS50)	125	
	M20x1,5 SW30 (CS60)	200	
	M24x1,5 SW36 (CS80)	300	
C	M8	20	
	M10	38	
	M12	55	
D	M12	90	
	M16	210	
X	1/8	25	
	1/4	55	
	3/8	80	
	1/2	130	
	3/4	220	

¹³⁾ Casing material: G = cast iron; C,V = stainless steel; E = unalloyed steel; D = duplex stainless steel

7.6.2 Tightening torques for the pump set

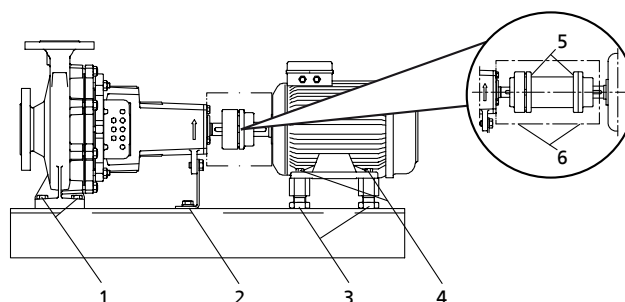


Fig. 21: Tightening points at the pump set

Table 25: Tightening torques

Position	Thread size	Nominal value [Nm]	Comment
1	M12	30	Pump on baseplate
	M16	75	
	M20	75	
	M24	140	
2	M12	30	Levelling screws in baseplate
3	M24x1.5	140	
	M36x1.5	140	
4	M6	10	Motor on levelling screws or bases
	M8	10	
	M10	15	
	M12	30	
	M16	75	
	M20	140	
	M24	140	
5	M6	13	Coupling (only for spacer-type coupling made by Flender)
	M8	18	
	M10	44	
6	M6	10	Coupling guard

7.7 Spare parts stock

7.7.1 Ordering spare parts

Always quote the following data when ordering replacement or spare parts:

- Type series
- Size
- KSB order number
- Material variant
- Year of construction

Refer to the name plate for all data. (⇒ Section 4.3 Page 16)

Also specify the following data:

- Description
- Part No.
- Quantity of spare parts
- Shipping address
- Mode of dispatch (freight, mail, express freight, air freight)

Refer to the general assembly drawing for part numbers and descriptions. (⇒ Section 9.1 Page 64)

7.7.2 Recommended spare parts stock for 2 years' operation to DIN 24296

Table 26: Quantity of spare parts for recommended spare parts stock

Part No.	Description	Number of pumps (including stand-by pumps)						
		2	3	4	5	6 and 7	8 and 9	10 and more
210	Shaft	1	1	1	2	2	2	20 %
230	Impeller	1	1	1	2	2	2	20 %
320.02	Rolling element bearing (set)	1	1	2	2	2	3	25 %
321.01	Radial ball bearing	1	1	2	2	2	3	25 %
321.02	Radial ball bearing	1	1	2	2	2	3	25 %
322.01	Radial roller bearing	1	1	2	2	2	3	25 %
502.01/.02	Casing wear ring	2	2	2	3	3	4	50 %
503.01/.02	Impeller wear ring	2	2	2	3	3	4	50 %
524.01	Shaft protecting sleeve	2	2	2	3	3	4	50 %
-	Sealing elements for pump casing (set)	4	6	8	8	9	12	150 %
-	Torque-transmitting coupling elements (set)	1	1	2	2	3	4	30 %
Versions with mechanical seal:								
433	Mechanical seal, complete	1	1	2	2	2	3	25 %
Versions with gland packing:								
461.01	Gland packing (set)	4	4	6	6	6	8	100 %

7.7.3 Interchangeability of pump components

Components featuring the same number in a column are interchangeable.

Table 27: Interchangeability of pump components

Size	Bearing bracket	Description																		
		Casing cover	Support foot	Shaft, medium-duty	Shaft, economy	Rolling element bearing	Radial ball bearing	Radial ball bearing	Radial roller bearing	Bearing bracket	Casing wear ring ¹⁴⁾	Casing wear ring ¹⁴⁾	Casing wear ring ¹⁵⁾	Impeller wear ring ¹⁵⁾	Casing wear ring ¹⁵⁾	Impeller wear ring ¹⁵⁾	Thrower	Shaft protecting sleeve ¹⁶⁾	Impeller nut	Mechanical seal
		Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
		161	183	210	210	320.01	321.01	321.02	322.01	330	502.01	502.02	502.01	503.01	502.02	503.02	507.01	524.01	922	433
040-025-160	CS40	1	1	1	1	1	1	1	1	1	1	-	1	1	-	-	1	1	1	1
040-025-200	CS40	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
050-032-125.1	CS40	1	3	1	1	1	1	1	1	1	2	-	2	2	-	-	1	1	1	1
050-032-160.1	CS40	1	1	1	1	1	1	1	1	1	2	1	2	2	-	-	1	1	1	1
050-032-200.1	CS40	2	2	1	1	1	1	1	1	1	2	1	2	2	1	1	1	1	1	1
050-032-125	CS40	1	3	1	1	1	1	1	1	1	3	-	3	3	-	-	1	1	1	1
050-032-160	CS40	1	1	1	1	1	1	1	1	1	3	1	3	3	1	1	1	1	1	1
050-032-200	CS40	2	2	1	1	1	1	1	1	1	3	1	4	4	1	1	1	1	1	1
065-040-160.1	CS40	1	1	1	1	1	1	1	1	1	4	1	5	5	1	1	1	1	1	1
065-040-125	CS40	1	3	1	1	1	1	1	1	1	5	-	4	4	-	-	1	1	1	1
065-040-160	CS40	1	1	1	1	1	1	1	1	1	5	1	4	4	1	1	1	1	1	1
065-040-200	CS40	2	2	1	1	1	1	1	1	1	5	1	6	6	1	1	1	1	1	1
080-050-125	CS40	1	1	1	1	1	1	1	1	1	6	1	7	7	1	1	1	1	1	1
080-050-160	CS40	1	2	1	1	1	1	1	1	1	6	1	8	8	1	1	1	1	1	1
080-050-200	CS40	2	2	1	1	1	1	1	1	1	6	1	7	7	1	1	1	1	1	1
100-065-125	CS40	1	2	1	1	1	1	1	1	1	7	1	9	9	1	1	1	1	1	1
050-032-250.1	CS50	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
050-032-250	CS50	3	4	2	2	2	2	2	2	2	3	2	4	4	2	2	2	2	2	2
065-040-250.1	CS50	3	4	2	2	2	2	2	2	2	8	2	10	10	2	2	2	2	2	2
065-040-250	CS50	3	4	2	2	2	2	2	2	2	9	2	11	11	2	2	2	2	2	2
065-040-315	CS50	4	5	2	2	2	2	2	2	2	9	3	11	11	3	3	2	2	2	2
080-050-315.1	CS50	4	6	2	2	2	2	2	2	2	10	3	12	12	3	3	2	2	2	2
080-050-250	CS50	3	4	2	2	2	2	2	2	2	6	2	7	7	2	2	2	2	2	2
080-050-315	CS50	4	6	2	2	2	2	2	2	2	11	3	13	13	3	3	2	2	2	2
100-065-160	CS50	5	7	2	2	2	2	2	2	2	11	4	13	13	4	4	2	2	2	2
100-065-200	CS50	6	4	2	2	2	2	2	2	2	11	4	14	14	4	4	2	2	2	2
100-065-250	CS50	7	5	2	2	2	2	2	2	2	7	3	9	9	3	3	2	2	2	2
125-080-160	CS50	5	4	2	2	2	2	2	2	2	12	4	15	15	4	4	2	2	2	2
125-080-200	CS50	8	4	2	2	2	2	2	2	2	12	3	16	16	3	3	2	2	2	2
125-080-250	CS50	7	6	2	2	2	2	2	2	2	12	3	16	16	3	3	2	2	2	2
125-100-160	CS50	8	5	2	2	2	2	2	2	2	13	3	17	17	3	3	2	2	2	2
125-100-200	CS50	8	5	2	2	2	2	2	2	2	13	3	17	17	3	3	2	2	2	2
100-065-315	CS60	9	6	3	3	3	3	3	3	3	12	3	16	16	3	3	3	3	3	3
125-080-315	CS60	9	8	3	3	3	3	3	3	3	12	3	16	16	3	3	3	3	3	3
125-080-400	CS60	10	9	3	3	3	3	3	3	3	13	5	17	17	5	5	3	3	3	3
125-100-250	CS60	11	6	3	3	3	3	3	3	3	13	3	17	17	3	3	3	3	3	3
125-100-315	CS60	9	8	3	3	3	3	3	3	3	13	3	17	17	3	3	3	3	3	3
125-100-400	CS60	10	9	3	3	3	3	3	3	3	14	5	18	18	5	5	3	3	3	3
150-125-200	CS60	12	8	3	3	3	3	3	3	3	14	6	18	18	6	6	3	3	3	3
150-125-250	CS60	13	8	3	3	3	3	3	3	3	14	6	18	18	6	6	3	3	3	3
150-125-315	CS60	14	9	3	3	3	3	3	3	3	14	5	18	18	5	5	3	3	3	3
150-125-400	CS60	10	10	3	3	3	3	3	3	3	14	5	18	18	5	5	3	3	3	3
200-150-200	CS60	12	9	3	3	3	3	3	3	3	15	6	19	19	6	6	3	3	3	3

¹⁴⁾ On pumps with casing wear ring only

¹⁵⁾ On pumps with casing wear ring and impeller wear ring only

¹⁶⁾ Depending on mechanical seal type


Size	Bearing bracket	Description																		
		Casing cover	Support foot	Shaft, medium-duty	Shaft, economy	Rolling element bearing	Radial ball bearing	Radial ball bearing	Radial roller bearing	Bearing bracket	Casing wear ring ¹⁴⁾	Casing wear ring ¹⁴⁾	Casing wear ring ¹⁵⁾	Impeller wear ring ¹⁵⁾	Casing wear ring ¹⁵⁾	Impeller wear ring ¹⁵⁾	Thrower	Shaft protecting sleeve ¹⁶⁾	Impeller nut	Mechanical seal
		Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
		161	183	210	210	320.01	321.01	321.02	322.01	330	502.01	502.02	502.01	503.01	502.02	503.02	507.01	524.01	922	433
200-150-250	CS60	13	9	3	3	3	3	3	3	3	16	6	20	20	6	6	3	3	3	3
200-150-315	CS80	15	11	4	4	4	4	4	4	4	16	5	20	20	5	5	4	4	4	4
200-150-400	CS80	16	11	4	4	4	4	4	4	4	16	5	20	20	5	5	4	4	4	4
200-150-500	CS80	17	12	4	4	4	4	4	4	4	17	7	21	21	7	7	4	4	4	4
200-200-250	CS80	18	13	4	4	4	4	4	4	4	16	8	22	22	8	8	4	4	4	4
250-200-315	CS80	19	13	4	4	4	4	4	4	4	18	9	23	23	9	9	4	4	4	4
250-200-400	CS80	20	13	4	4	4	4	4	4	4	19	9	24	24	9	9	4	4	4	4
250-200-500	CS80	17	14	4	4	4	4	4	4	4	20	7	25	25	7	7	4	4	4	4
300-250-315	CS80	19	15	5	5	4	4	4	4	4	21	9	26	26	9	9	4	4	4	4

¹⁴⁾ On pumps with casing wear ring only

¹⁵⁾ On pumps with casing wear ring and impeller wear ring only

¹⁶⁾ Depending on mechanical seal type

8 Trouble-shooting

	<div style="background-color: #f4a460; padding: 5px;">⚠ WARNING</div> <p>Improper work to remedy faults Risk of injury!</p> <p>► For any work to remedy faults observe the relevant information in this manual or in the relevant accessory manufacturer's documentation.</p>
-----------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

If problems occur that are not described in the following table, consultation with KSB's customer service is required.

- A** Pump delivers insufficient flow rate
- B** Motor is overloaded
- C** Excessive discharge pressure
- D** Increased bearing temperature
- E** Leakage at the pump
- F** Excessive leakage at the shaft seal
- G** Vibrations during pump operation
- H** Impermissible temperature increase in the pump

Table 28: Trouble-shooting

A	B	C	D	E	F	G	H	Possible cause	Remedy ¹⁷⁾
X								Pump delivers against an excessively high pressure.	Re-adjust to duty point. Check system for impurities. Fit a larger impeller. ¹⁸⁾ Increase speed (turbine, I.C. engine).
X						X	X	Pump or piping are not completely vented or primed.	Vent and/or prime.
X								Supply line or impeller clogged	Remove deposits in the pump and/or piping.
X								Formation of air pockets in the piping	Alter piping layout. Fit vent valve.
X						X	X	Suction lift is too high/NPSH _{available} (positive suction head) is too low.	Check/alter fluid level. Install pump at a lower level. Fully open the shut-off element in the suction line. Change suction line, if the friction losses in the suction line are too high. Check any strainers installed/suction opening. Observe permissible speed of pressure fall.
X								Air intake at the shaft seal	Clean barrier fluid duct, supply external barrier fluid, if necessary, or increase barrier fluid pressure. Replace shaft seal.
X								Wrong direction of rotation	Check the electrical connection of the motor and switchgear, if any.
X								Speed is too low. ¹⁸⁾ - Operation with frequency inverter - Operation without frequency inverter	- Increase voltage/frequency at the frequency inverter in the permissible range. - Check voltage.
X						X		Impeller	Replace worn parts by new ones.
	X					X		Pump back pressure is lower than specified in the purchase order.	Adjust duty point accurately. In the case of persistent overloading, turn down impeller. ¹⁸⁾
	X							Density or viscosity of fluid handled higher than stated in purchase order	Contact KSB.

¹⁷⁾ Pump pressure must be released before attempting to remedy faults on parts which are subjected to pressure.

¹⁸⁾ Contact KSB.

A	B	C	D	E	F	G	H	Possible cause	Remedy ¹⁷⁾
	X				X			Gland follower over-tightened or cocked	Correct.
	X	X						Speed is too high.	Reduce speed. ¹⁸⁾
				X				Defective gasket	Fit new gasket between volute casing and discharge cover.
					X			Worn shaft seal	Fit new shaft seal. Check flushing liquid/barrier fluid.
X					X			Score marks or roughness on shaft protecting sleeve / shaft sleeve	Replace shaft protecting sleeve/shaft sleeve. Fit new shaft seal.
					X			Vibrations during pump operation	Correct suction conditions. Re-align the pump. Re-balance the impeller. Increase pressure at the pump suction nozzle.
			X		X	X		The pump set is misaligned.	Re-align.
			X		X	X		Pump warped or sympathetic vibrations in the piping	Check the piping connections and secure fixing of pump; if required, reduce distances between the pipe clamps. Fix the pipelines using anti-vibration material.
			X			X		Insufficient or excessive quantity of lubricant or unsuitable lubricant.	Top up, reduce or change lubricant.
			X					Non-compliance with specified coupling distance	Correct distance according to general arrangement drawing.
X	X							Motor is running on two phases only.	Replace the defective fuse. Check the electric cable connections.
						X		Rotor out of balance	Clean the impeller. Re-balance the impeller.
						X		Defective bearing	Replace.
						X	X	Flow rate is too low.	Increase minimum flow rate.
					X			Incorrect inflow of circulation liquid	Increase the free cross-section.

¹⁷⁾ Pump pressure must be released before attempting to remedy faults on parts which are subjected to pressure.

9 Related Documents

9.1 General assembly drawing with list of components

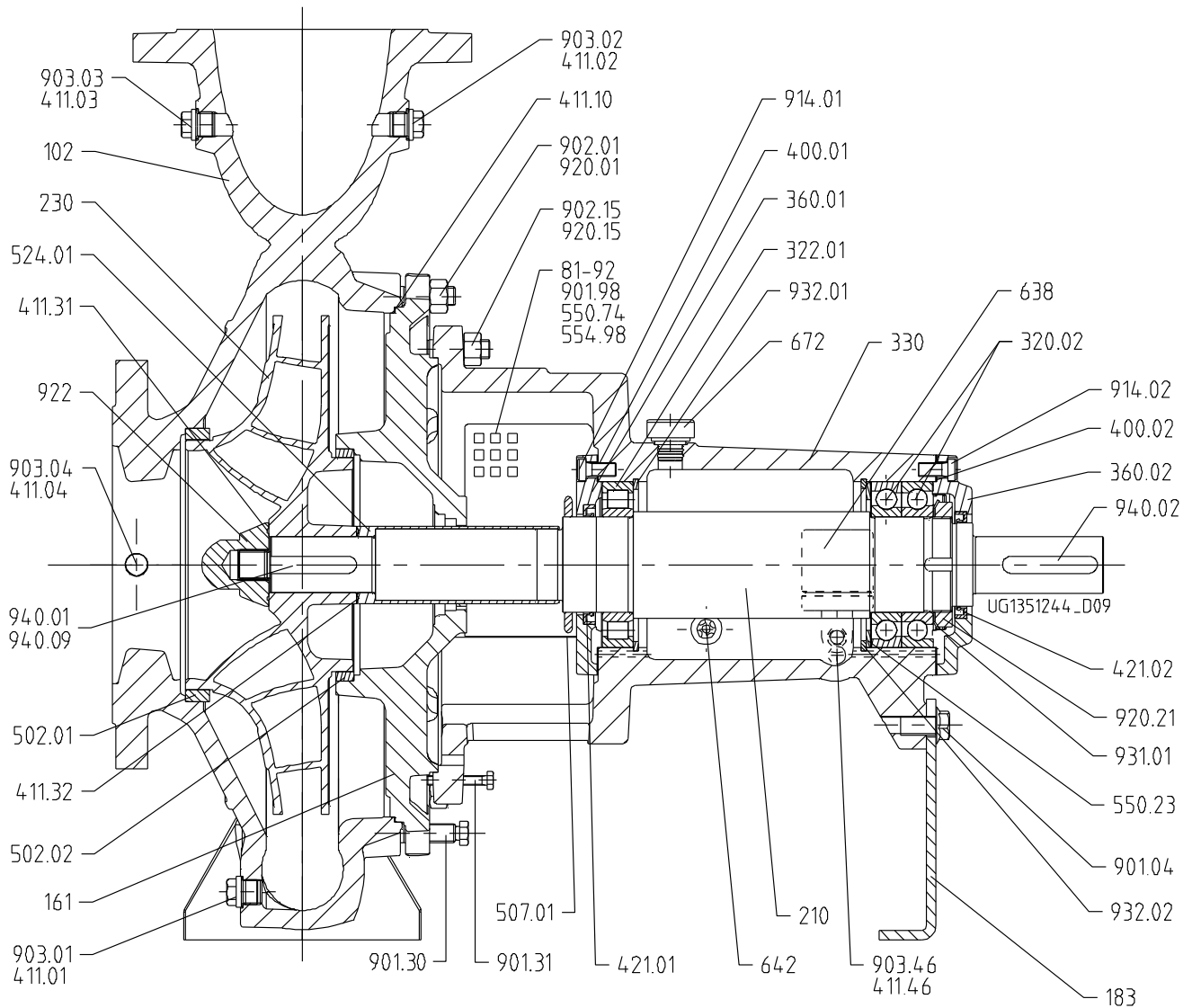
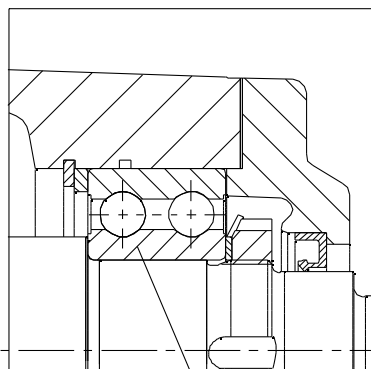


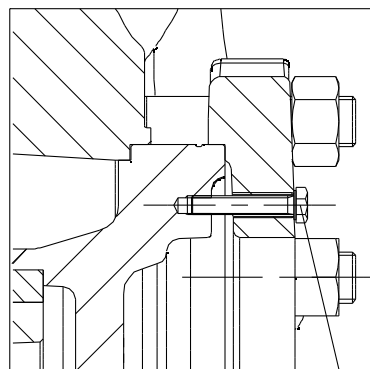
Fig. 22: General assembly drawing of standard version (oil-lubricated)



UG1352026

320.02

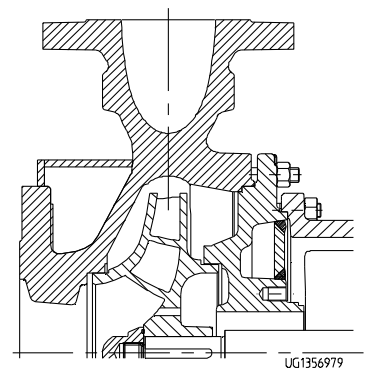
Version with bearing bracket CS40



UG1352026

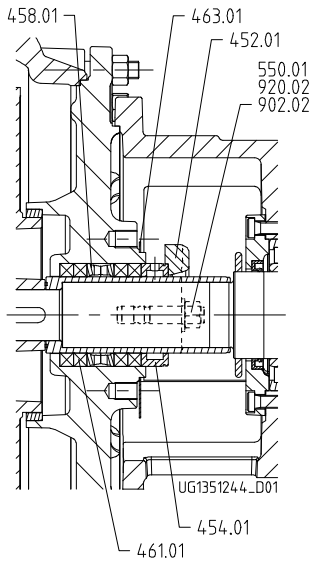
901.22

Version with clamped casing cover

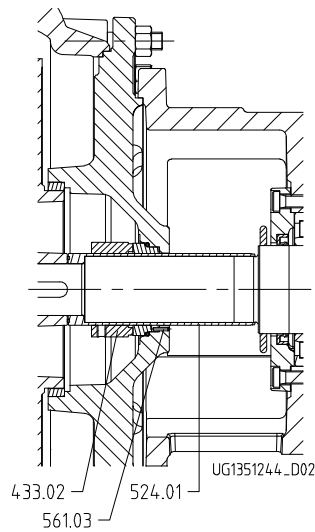


UG1356979

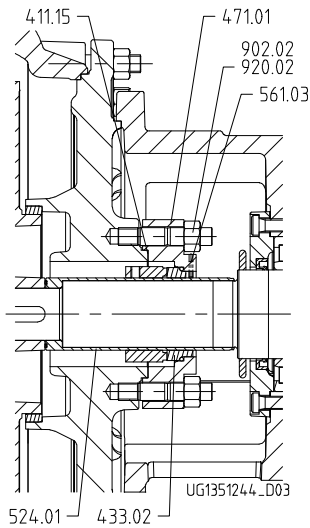
Heatable version ("h" version)



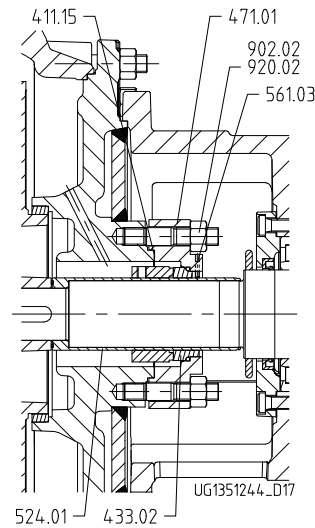
Version with gland packing



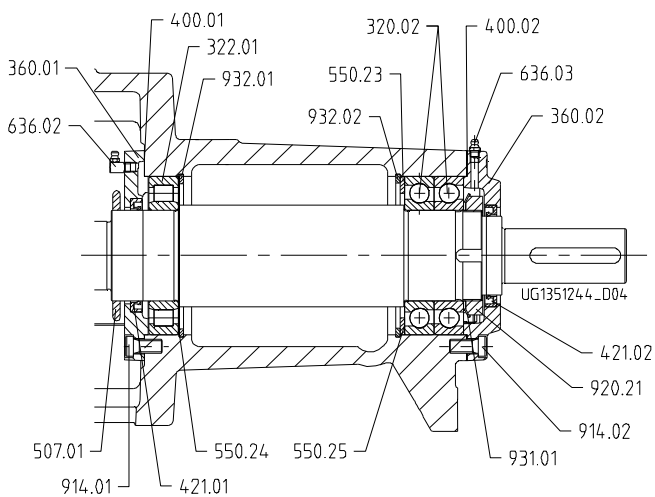
Mechanical seal with conical casing cover



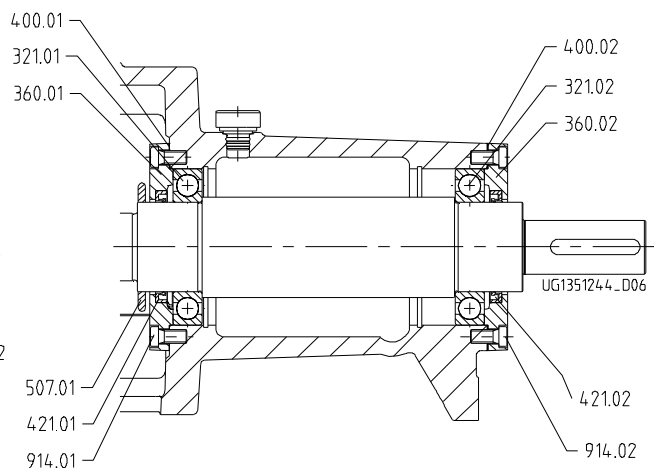
Mechanical seal with cylindrical casing cover



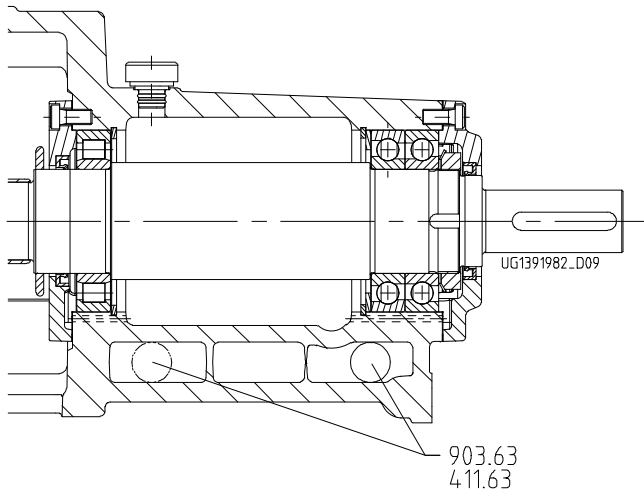
Mechanical seal with cylindrical casing cover (heatable version "h")



Grease-lubricated version (medium-duty bearing assembly)



Oil-lubricated version (economy bearing assembly)



Version with coolable bearing bracket

Table 29: List of components

Part No.	Comprising	Description
102	102	Volute casing
	411.01/.02 ¹⁹⁾ /03 ¹⁹⁾ /.04 ¹⁹⁾ /.10 ²⁰⁾	Joint ring
	502.01 ¹⁹⁾	Casing wear ring
	902.01	Stud
	903.01/.02 ¹⁹⁾ /.03 ¹⁹⁾ /.04 ¹⁹⁾	Screw plug
	920.01	Hexagon nut
161	161	Casing cover
	502.02 ¹⁹⁾	Casing wear ring
	901.22 ²¹⁾ /31	Hexagon head bolt
	902.02	Stud
	920.02	Hexagon nut
183	183	Support foot
210	210	Shaft
	920.21 ²²⁾	Slotted round nut
	931.01 ²²⁾	Lock washer
	940.01/.02/.09 ²³⁾	Key
230	230	Impeller
	503.01/.02 ¹⁹⁾	Impeller wear ring
320.02 ²²⁾	320.02	Angular contact ball bearing (double-row in CS40)
321.01 ²⁴⁾	321.01	Deep groove ball bearing
321.02 ²⁴⁾	321.02	Deep groove ball bearing
322.01 ²²⁾	322.01	Cylindrical roller bearing
330	330	Bearing bracket
360.01	360.01	Bearing cover
360.02	360.02	Bearing cover
400.01	400.01	Gasket
400.02	400.02	Gasket
411.15 ²⁰⁾	411.15	Joint ring
411.31	411.31	Joint ring
411.32	411.32	Joint ring
421.01	421.01	Lip seal

¹⁹⁾ Not on all versions.

²⁰⁾ Joint ring 411.10 (and 411.15 for versions with mechanical seal with seal cover only) depending on the operating temperature. To be ordered separately in spare parts order.

²¹⁾ Only for clamped cover

²²⁾ Not fitted on versions with economy bearing assembly

²³⁾ From CS 60

²⁴⁾ On versions with economy bearing assembly only

Part No.	Comprising	Description
421.02	421.02	Lip seal
433.02	433.02	Mechanical seal (complete)
452.01	452.01	Gland follower
454.01	454.01	Stuffing box ring
458.01	458.01	Lantern ring
461.01	461.01	Gland packing
463.01	463.01	Drip plate
471.01	471.01	Seal cover
502.01 ¹⁹⁾	502.01	Casing wear ring
502.02 ¹⁹⁾	502.02	Casing wear ring
503.01 ¹⁹⁾	503.01	Impeller wear ring
503.02 ¹⁹⁾	503.02	Impeller wear ring
507.01	507.01	Thrower
524.01	524.01	Shaft protecting sleeve
550.01	550.01	Disc
550.23	550.23	Disc
550.24 ²⁵⁾	550.24	Disc
550.25 ²⁵⁾	550.25	Disc
550.74	550.74	Disc
554.98	554.98	Washer
561.03	561.03	Grooved pin
636.02 ²⁵⁾	636.02	Lubricating nipple
636.03 ²⁵⁾	636.03	Lubricating nipple
638 ²⁶⁾	638	Constant level oiler
642 ²⁶⁾	642	Oil level sight glass
672 ²⁶⁾	672	Vent plug
81-92	81-92	Cover plate
99-9	411.01/.02/.03/.04/.10/.15/31/.32/.46	Joint ring
	400.01/02	Gasket
901.04	901.04	Hexagon head bolt
901.30	901.30	Hexagon head bolt
901.31	901.31	Hexagon head bolt
901.32	901.32	Hexagon head bolt
901.98	901.98	Hexagon head bolt
902.15	902.15	Stud
903.46	903.46	Screw plug
914.01	914.01	Hexagon socket head cap screw
914.02	914.02	Hexagon socket head cap screw
920.15	920.15	Hexagon nut
922	922	Impeller nut
932.01	932.01	Circlip
932.02	932.02	Circlip

The relevant version is indicated in the documentation supplied.

²⁵⁾ On grease-lubricated versions only

²⁶⁾ Not applicable for grease-lubricated versions

10 EC Declaration of Conformity

Manufacturer: **KSB Aktiengesellschaft**
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

The manufacturer herewith declares that the product:

MegaCPK (MCPK)

KSB order number:

- is in conformity with the provisions of the following Directives as amended from time to time:
 - Pump (set): Machinery Directive 2006/42/EC

The manufacturer also declares that

- the following harmonised international standards have been applied:
 - ISO 12100
 - EN 809
- Applied national technical standards and specifications, in particular:
 - DIN EN ISO 5199

Person authorised to compile the technical file:

Name
Function
Address (company)
Address (Street, No.)
Address (post or ZIP code, city) (country)

The EC Declaration of Conformity was issued in/on:

Place, date

.....²⁷⁾.....

Name
Function
Company
Address

²⁷⁾ A signed, legally binding declaration of conformity is supplied with the product.

11 Certificate of Decontamination

Type:
Order number/
Order item number²⁸⁾:

Delivery date:

Field of application:

Fluid handled²⁸⁾:

Please tick where applicable²⁸⁾:



☐ Radioactive



☐ Explosive



☐ Corrosive



☐ Toxic



☐ Harmful



☐ Bio-hazardous



☐ Highly flammable



☐ Safe

Reason for return²⁸⁾:

Comments:

.....

The product/accessories have been carefully drained, cleaned and decontaminated inside and outside prior to dispatch/ placing at your disposal.

We herewith declare that this product is free from hazardous chemicals, biological and radioactive substances.

On seal-less pumps, the rotor has been removed from the pump for cleaning.

- ☐ No special safety precautions are required for further handling.
☐ The following safety precautions are required for flushing fluids, fluid residues and disposal:

.....

.....

We confirm that the above data and information are correct and complete and that dispatch is effected in accordance with the relevant legal provisions.

.....
Place, date and signature

.....
Address

.....
Company stamp

²⁸⁾ Required fields

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