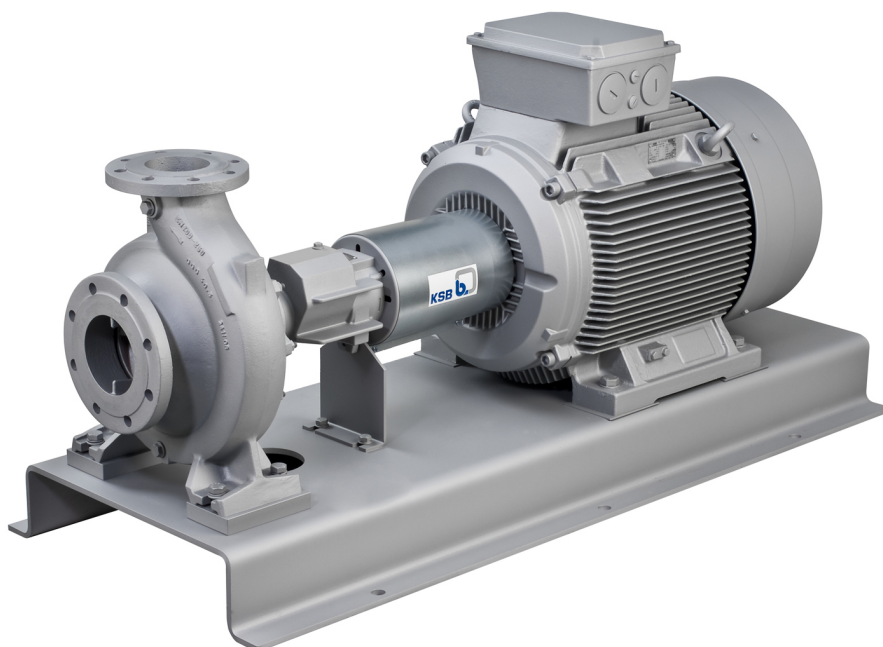




Etanorm SYT

SI Units, Imperial Units

Installation/Operating Manual



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Installation/Operating Manual Etanorm SYT

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

If a product is to be returned to the manufacturer, the customer declares in a certificate of decontamination 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 pipeline 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

Customers/operators' pumps which are purchased and stored regardless 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 pipeline which is connected to the suction nozzle

1 General

1.1 Principles

This operating manual is valid for 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 clearly identify the pump set and serve as identification for all further business processes.

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

1.2 Installation of partly completed machinery

To install partly completed machinery supplied by KSB refer to the sub-sections under Servicing/Maintenance.

1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇒ Section 2.3, 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 dimensions 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
Assembly drawing ¹⁾	Sectional drawing of the installed shaft seal

For accessories and/or integrated machinery components observe the product literature of the corresponding manufacturer.

¹ If included in agreed scope of supply

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

1.6 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 EU Directive 2014/34/EU (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 Safety

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

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 General

- This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.
- Comply with all the safety instructions given in the individual sections of this operating manual.
- The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.
- The contents of this operating manual must be available to the specialist personnel at the site at all times.
- Information and markings attached directly to the product must always be complied with and 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 which are not taken into account.

2.2 Intended use

- The pump (set) must only be operated in the fields of application and within the use limits which are described in the other applicable documents.
- 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 (set) to handle the fluids described in the data sheet or product literature of the pump variant.
- Never operate the pump (set) without the fluid to be handled.
- Observe the minimum flow rate and maximum flow rate indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage).
- Always operate the pump (set) in the direction of rotation it is intended for.
- 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.
- Etanorm SYT with fan impeller and guard to ZN 79 is not approved for ATEX applications.

2.3 Personnel qualification and personnel 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 sufficiently trained specialist personnel training and instructing the personnel who will carry out the respective tasks. 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.

2.4 Consequences and risks caused by non-compliance with these operating instructions

- Non-compliance with these operating instructions 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

2.5 Safety awareness

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

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

2.6 Safety information for the operator/user

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly.
- Do not remove any protective equipment (e.g. 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 stopping 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.

2.7 Safety information for maintenance, inspection and installation

- Modifications or alterations of the pump (set) are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts/components authorized by the manufacturer. The use of other parts/components can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation is performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- Only perform work on the pump set when it has been disconnected from the power supply (de-energized).
- The pump (set) 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 6.1.8, Page 45) (⇒ Section 6.3, Page 49)
- Decontaminate pumps which handle fluids posing a health hazard. (⇒ Section 7.3, Page 55)
- As soon as the work has been completed, re-install and re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.1, Page 41)

2.8 Unauthorized modes of operation

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

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

2.9 Explosion protection

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

Pumps / pump sets must not be used in potentially explosive atmospheres unless marked as explosion-proof **and** identified as such in the data sheet.

Special conditions apply to the operation of explosion-proof pump sets in accordance with EU Directive 2014/34/EU (ATEX).

Especially adhere to the sections in this manual marked with the symbol opposite and the following sections, (⇒ Section 2.9.1, Page 11) to (⇒ Section 2.9.4, Page 13)

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

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

Prevent impermissible modes of operation at all times.



2.9.1 Marking

Pump The marking on the pump refers to the pump part only.

Example of such marking:

II 2G Ex h IIC T5-T1 Gb

Refer to the Temperature limits table for the maximum temperatures permitted for the individual pump variants.

The pump complies with the requirements of Constructional Safety "c" type of protection to ISO 80079-37.

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.

2.9.2 Temperature limits

In normal pump operation, the highest temperatures are to be expected at 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 (⇒ Table 4) lists the temperature classes and the resulting maximum permissible temperature limits of the fluid handled. The values shown correspond to the theoretical limits. They include only a general safety margin for the mechanical seal. For single mechanical seals, the safety margin required for specific operating conditions and mechanical seal designs may be substantially higher. If operating conditions differ from

those stated on the data sheet, or if different mechanical seals are used, the actual safety margin required needs to be determined individually. If in doubt please contact the manufacturer.

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, SI units

Temperature class to ISO 80079-36	Maximum permissible fluid temperature ²⁾
T1	Temperature limit of the pump
T2	280 °C
T3	185 °C
T4	120 °C
T5	85 °C
T6	Only after consultation with the manufacturer

Table 5: Temperature limits, imperial units

Temperature class to ISO 80079-36	Maximum permissible fluid temperature ²⁾
T1	Temperature limit of the pump
T2	536 °F
T3	365 °F
T4	248 °F
T5	185 °F
T6	Only after consultation with the manufacturer

In the following cases, and if ambient temperatures are higher, consult the manufacturer.

Temperature class T5 Based on an ambient temperature of 40 °C [104 °F] 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 [104 °F], consult the manufacturer.

Temperature class T6 If temperature class T6 must be complied with, special measures may be required with regard to bearing temperature.

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, the data sheet is missing or if the pump is part of a "Pool of pumps" contact KSB for the maximum permissible operating temperature.

2.9.3 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, appropriate monitoring devices must be used.

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

For further information on monitoring equipment contact KSB .

² Subject to further limitations for mechanical seal temperature rise

2.9.4 Operating limits

The minimum flow rates indicated in (⇒ Section 6.2.3.1, Page 48) 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 48) can be used to check whether an additional heat build-up may lead to a dangerous temperature increase at the pump surface.

3 Transport/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 distributor and the insurance company about the damage in writing immediately.

3.2 Transport

	 DANGER The pump (set) could slip out of the suspension arrangement Danger to life from falling parts! ▷ Only transport the pump (set) in the position indicated. ▷ Never attach the suspension arrangement to the free shaft end or the motor eyebolt. ▷ Pay attention to the weight data, center of gravity and fastening points. ▷ Comply with the applicable local accident prevention regulations. ▷ Use suitable, permitted lifting accessories, e.g. self-tightening lifting tongs.
---	--

Suspend and transport the pump//pump set or back pull-out unit suspend it from the lifting tackle as shown.

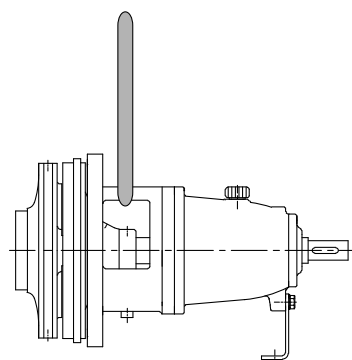


Fig. 1: Transporting the back pull-out unit

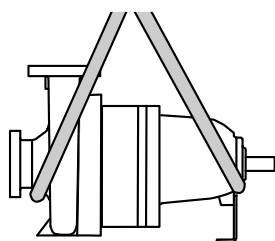


Fig. 2: Transporting the pump

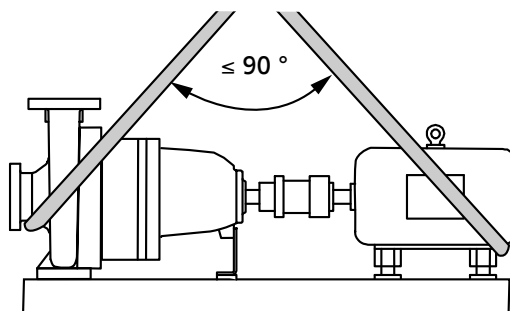


Fig. 3: Transporting the pump set

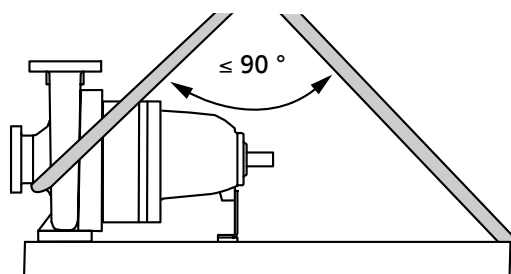


Fig. 4: Transporting the pump on the baseplate

3.3 Storage/preservation

	CAUTION Damage during storage due to humidity, dirt or vermin Corrosion/contamination of the pump (set)! ► For outdoor storage cover the pump (set) or the packaged pump (set) and accessories with waterproof material.
	CAUTION Wet, contaminated or damaged openings and connections Leakage or damage to the pump! ► Clean and cover pump openings and connections as required prior to putting the pump into storage.

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

- 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 equipment 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 measures to be taken for shutdown. (⇒ Section 6.3.1, Page 49)

3.4 Return to supplier

1. Drain the pump as per operating instructions. (⇒ Section 7.3, Page 55)
2. Flush and clean the pump, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pump has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pump must also be neutralized, 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.
Indicate any safety measures and decontamination measures taken.
(⇒ Section 11, Page 91)

	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 handled, consumables and operating supplies which are hot or pose a health hazard Hazard to persons and the environment! ▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled. ▷ Wear protective 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

Pump for handling liquids in heat transfer systems (DIN 4754) or for hot water circulation

4.2 Product information

4.2.1 Product information as per Regulation No. 547/2012 (for water pumps with a maximum shaft power of 150 kW) implementing "Ecodesign" Directive 2009/125/EC

- This product is designed for use above 120 °C [248 °F] only.
- Further technical data see data sheet.

4.2.2 Product information as per Regulation No. 1907/2006 (REACH)

For information as per European chemicals regulation (EC) No. 1907/2006 (REACH) see <https://www.ksb.com/en-global/company/corporate-responsibility/reach>.

4.3 Designation

Table 6: Designation example

Position																																				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
E	T	N	Y	0	5	0	-	0	3	2	-	1	2	5	1	S	G	S	D	B	0	8	L	D	2	0	0	7	5	2	B	P	D	2	E	
See name plate and data sheet																										See data sheet										

Table 7: Designation key

Position	Code	Description
1-4	Pump type	
	ETNY	Etanorm SYT
5-16	Size, e.g.	
	050	Nominal suction nozzle diameter [mm]
	032	Nominal discharge nozzle diameter [mm]
	1251	Nominal impeller diameter [mm]
17	Pump casing material	
	E	Cast steel GP240GH+N / A216 Gr. WCB
	S	Nodular cast iron EN-GJS-400-15
18	Impeller material	
	C	Stainless steel 1.4408 / A743 CF8M
	G	Cast iron EN-GJL-250 / A48 Cl. 35B
19	Design	
	D	DNV
	S	Standard
	X	Non-standard (BT3D, BT3)
	Y	Marine version (e.g. to BV or ABS)
20	Casing cover	
	D	Casing cover
21	Shaft seal type	
	B	Dead-end arrangement
22-23	Seal code, single mechanical seal	
	08	AQ1V7GG NU033M0-4EYS
	66	Q7Q7EGG NU033M0-4EYS
	Seal code, double mechanical seal in tandem arrangement	

Position	Code	Description
22-23	25	AQ1V7GG KU033M0-4EYT
		AQ1V7GG KU033M0-4EYT
24	Bearing bracket	
	L	Version for heat transfer fluid, with leakage barrier
	Y	Version for heat transfer fluid
25	Scope of supply	
	A	Pump only (Fig. 0)
	B	Pump, baseplate
	C	Pump, baseplate, coupling, coupling guard
	D	Pump, baseplate, coupling, coupling guard, motor
	E	Back pull-out unit
26	Shaft unit	
	2	Shaft unit 25, bearing bracket LS (standard)
	3	Shaft unit 35, bearing bracket LS (standard)
	5	Shaft unit 55, bearing bracket LS (standard)
27-30	Motor rating P_N [kW]	
	0075	0.75
	...	...
	1320	132.00
31	Number of motor poles	
32	Product generation	
	B	Etanorm SYT 2014
33-36	Design	
	-	Fixed speed version
	PD2	Variable speed version, with PumpDrive 2
	PD2E	Variable speed version, with PumpDrive 2 Eco

4.4 Name plate

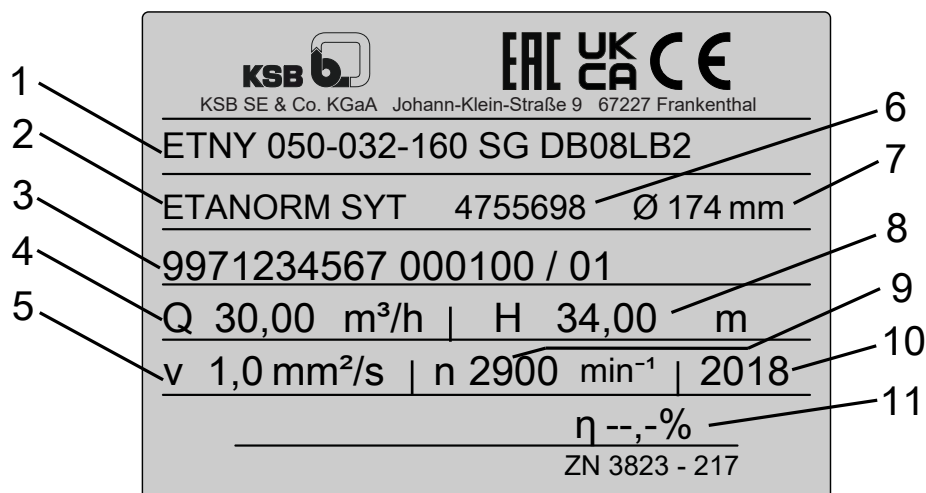


Fig. 5: Name plate (example)

1	Type series code, size and version	2	Type series
3	KSB order No., order item No. and consecutive No.	4	Flow rate
5	Kinematic viscosity of the fluid handled	6	Material number (if applicable)
7	Impeller diameter	8	Head
9	Speed	10	Year of construction
11	Efficiency (see data sheet)		

4.5 Design details

Design

- Volute casing pump
- Horizontal installation
- Back pull-out design
- Single-stage
- Dimensions and ratings to EN 733

Pump casing

- Radially split volute casing
- Volute casing with integrally cast pump feet
- Replaceable casing wear rings

Shaft seal

- KSB single mechanical seal
- KSB double mechanical seal
- To EN 12756

Impeller type

- Closed radial impeller with multiply curved vanes

Bearings

Drive end:

- Grease-packed deep groove ball bearing

Pump end:

- Carbon bearing / SiC/SiC bearing lubricated by fluid handled

Automation

Automation options:

- PumpDrive (motor-mounted model)³⁾
- PumpDrive (mounting variants: wall-mounted, cabinet-mounted)⁴⁾
- KSB SuPremE

Bearings used

Table 8: Overview

Version	Bearing bracket	Pump end	Drive end
Standard plain bearing (lubricated by fluid handled)	WS_25_LS	Carbon (KHK)	-
	WS_35_LS	Carbon (KHK)	-
	WS_55_LS	Carbon (KHK)	-
Optional plain bearing (lubricated by fluid handled)	WS_25_LS	SiC / SiC	-
	WS_35_LS	SiC / SiC	-
	WS_55_LS	SiC / SiC	-
Rolling element bearing (grease-packed for life, Klüber Asonic HQ 72-102)	WS_25_LS	-	DIN 625
	WS_35_LS	-	DIN 625
	WS_55_LS	-	DIN 625

Static sealing elements

between:

- Volute casing and discharge cover
- Discharge cover and bearing bracket

³ Only for fluid temperature ≤ 140 °C [≤ 284 °F]

⁴ Only for fluid temperature > 140 °C [> 284 °F]

4.6 Configuration and function

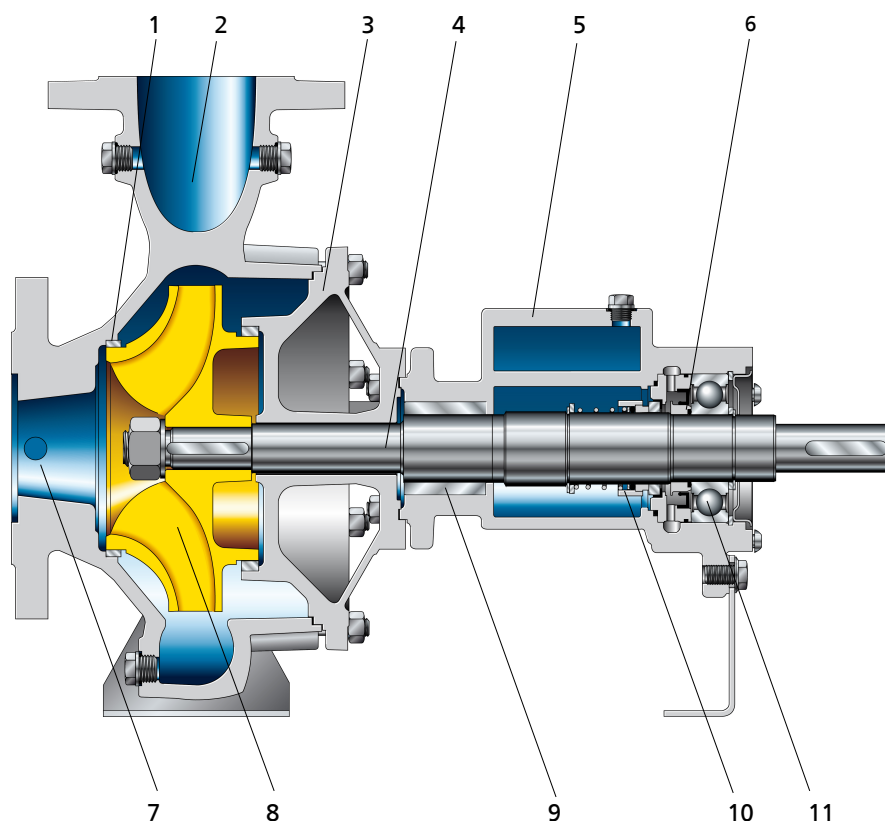


Fig. 6: Sectional drawing

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

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

Function The fluid handled enters the pump axially via the suction nozzle (7) and is accelerated outward by the rotating impeller (8). 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 into 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 bearing bracket is sealed to atmosphere with a shaft seal (10). The shaft runs in a plain bearing and a rolling element bearing (9 and 11); the bearings are supported by a bearing bracket (5) joined to the pump casing and/or casing cover.

Sealing The pump is sealed by a reinforced mechanical seal with standardized installation dimensions.

If the pump is fitted with a double mechanical seal, the pump is connected to a quench pot. The quench liquid supplied from the quench pot serves to prevent any leakage of the fluid handled to atmosphere. It also prevents any contact between the fluid and the lubricating grease of the rolling element bearing, especially for fluids which have a tendency to creep.

4.7 Noise characteristics

Table 9: Surface sound pressure level $L_{pA}^{5) 6)}$, SI units

Rated power input P_N [kW]	Pump			Pump set		
	960 rpm [dB]	1450 rpm [dB]	2900 rpm [dB]	960 rpm [dB]	1450 rpm [dB]	2900 rpm [dB]
0.55	46	47	48	54	55	64
0.75	48	48	50	56	57	64
1.1	49	50	52	59	60	64
1.5	51	52	54	59	60	69
2.2	53	54	56	63	64	69
3	54	55	57	63	64	71
4	56	57	59	61	62	73
5.5	58	59	61	67	68	72
7.5	59	60	62	67	68	72
11	61	62	64	68	69	75
15	63	64	66	68	69	75
18.5	64	65	67	69	70	75
22	65	66	68	71	72	78
30	66	67	70	70	71	79
37	67	68	71	70	71	79
45	68	69	72	71	73	79
55	69	70	73	72	74	79
75	-	72	75	-	75	82
90	-	73	76	-	76	82
110	-	74	77	-	77	82

Table 10: Surface sound pressure level $L_{pA}^{5) 7)}$, imperial units

Rated power input P_N [hp]	Pump			Pump set		
	960 rpm [dB]	1450 rpm [dB]	2900 rpm [dB]	960 rpm [dB]	1450 rpm [dB]	2900 rpm [dB]
0.74	46	47	48	54	55	64
1.01	48	48	50	56	57	64
1.48	49	50	52	59	60	64
2.01	51	52	54	59	60	69
2.95	53	54	56	63	64	69
4.02	54	55	57	63	64	71
5.36	56	57	59	61	62	73
7.38	58	59	61	67	68	72
10.06	59	60	62	67	68	72
14.75	61	62	64	68	69	75
20.12	63	64	66	68	69	75
24.81	64	65	67	69	70	75
29.50	65	66	68	71	72	78

5 Surface sound pressure level to ISO 3744 and DIN EN ISO 20361, valid for a pump operating range of $Q/Q_{BEP} = 0.8-1.1$ and 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

7 Increase for 60 Hz operation: 3500 rpm +3 dB; 1750 rpm +1 dB

Rated power input P_N [hp]	Pump			Pump set		
	960 rpm [dB]	1450 rpm [dB]	2900 rpm [dB]	960 rpm [dB]	1450 rpm [dB]	2900 rpm [dB]
40.23	66	67	70	70	71	79
49.61	67	68	71	70	71	79
60.35	68	69	72	71	73	79
73.76	69	70	73	72	74	79
100.58	-	72	75	-	75	82
120.69	-	73	76	-	76	82
147.51	-	74	77	-	77	82

4.8 Dimensions and weights

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

4.9 Scope of supply

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

- Pump
- Baseplate
- Coupling
- Coupling guard
- Drive
- Fan impeller (optional)
- Quench pot with pipework (optional)
- Other accessories on request

5 Installation at Site

5.1 Checks to be carried out prior to installation

Place of installation

	WARNING
	Installation on mounting surfaces which are unsecured and cannot support the load Personal injury and damage to property! ▷ Use a concrete of compressive strength class C12/15 which meets the requirements of exposure class XS1 to EN 206 . ▷ The mounting surface must be set, even, and level. ▷ 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.

5.2 Installing the pump set

Always install the pump set in a horizontal position.

	DANGER
	Excessive temperatures due to improper installation Explosion hazard! ▷ Install the pump in a horizontal position to ensure self-venting of the pump.
	DANGER
	Electrostatic charging due to insufficient potential equalization Explosion hazard! ▷ Make sure that the connection between pump and baseplate is electrically conductive.

5.2.1 Installation on a foundation

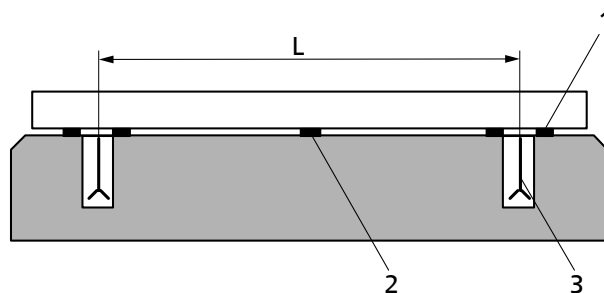


Fig. 7: Fitting the shims

L	Bolt-to-bolt clearance	1	Shim
2	Shim if (L) > 800 mm [31.50 in]	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 [0.0079 in/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 [31.50 in] 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 align the baseplate.
6. Tighten the foundation bolts (3) evenly and firmly.

	NOTE For optimum smooth running, baseplates should be grouted with non-shrinking concrete in the following cases: - For all vibration-critical applications - Baseplates with a width > 400 mm [>15.75 in] - Baseplates made of gray cast iron
	NOTE For low-noise operation contact KSB 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 line or discharge line .

5.2.2 Installation without foundation

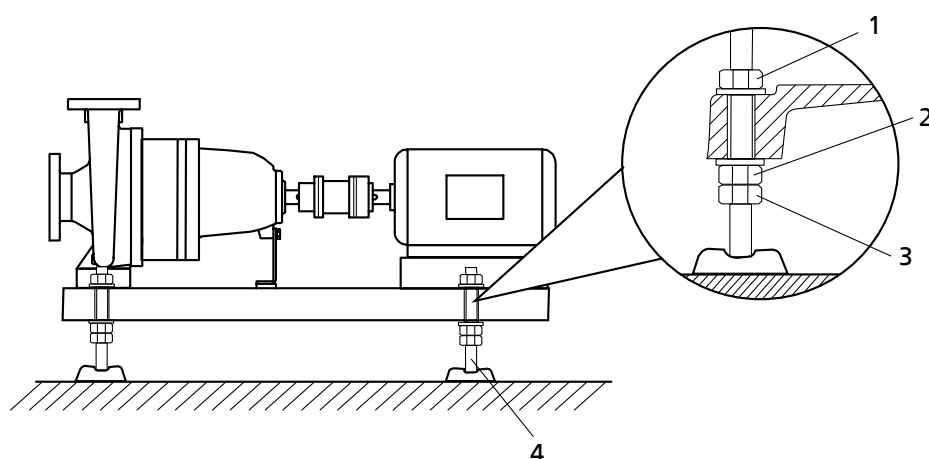


Fig. 8: Adjusting the leveling elements

1, 3	Locknut	2	Adjusting nut
4	Machine mount		

- ✓ The installation surface has the required strength and characteristics.
1. Position the pump set on the machine mounts (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 locknuts (1, 3) of the machine mounts (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 mounts (4).

5.3 Piping

5.3.1 Connecting the piping

	! DANGER Impermissible loads acting on the pump nozzles Danger to life from leakage of hot, toxic, corrosive or flammable fluids! ▷ Do not use the pump as an anchorage point for the piping. ▷ Anchor the pipelines in close proximity to the pump and connect them properly without transmitting any stresses or strains. ▷ Observe the permissible forces and moments at the pump nozzles. ▷ Take appropriate measures to compensate for thermal expansion of the piping.
	! WARNING Incorrect sealing element between suction flange and piping Risk of injury from improper sealing! ▷ Never use spiral wound gasket type ASME B16.20 at the suction-side DN 80 [NPS 3] flange drilled to ASME/NPS 4.
	CAUTION Incorrect grounding during welding work on the piping Destruction of rolling element bearings (pitting effect)! ▷ Never ground the electric welding equipment on the pump or baseplate. ▷ Prevent current flowing through the rolling element bearings.
	NOTE Installing check valves and shut-off elements in the system is recommended, depending on the type of plant and pump. Install the pump without any obstructions to its drainage or removal.

- ✓ Suction lift lines have been laid with a rising slope, suction head lines with a downward slope towards the pump.
 - ✓ A flow stabilization 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 pipes are equal to or greater than the nominal diameters of the pump nozzles.
 - ✓ Adapters to larger nominal diameters are designed with a diffuser angle of approx. 8° to avoid excessive pressure losses.
 - ✓ The pipelines have been anchored in close proximity to the pump and connected without transmitting any stresses or strains.
1. Thoroughly clean, flush and blow through all vessels, pipes 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.

	CAUTION Welding beads, scale and other impurities in the piping Damage to the pump! ▸ Remove any impurities from the piping. ▸ If necessary, install a filter. ▸ Observe the instructions in (⇒ Section 7.2.2.3, Page 54) .
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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 drawing: Filter in the piping).

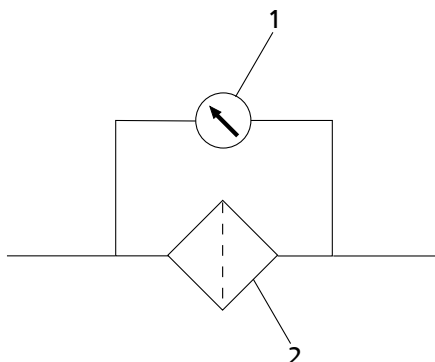


Fig. 9: Filter in the piping

1	Differential pressure gage	2	Filter
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	NOTE Installing a fine filter made of corrosion-resistant material for the run-in phase of the system is recommended. Use a filter with a filter area three times the cross-section of the piping. Conical filters have proved suitable.
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	NOTE Use a filter with laid-in wire mesh (mesh width 0.5 mm [0.02 in] × wire diameter 0.25 mm [0.01 in]) of corrosion-resistant material. Use a filter with a filter area three times the cross-section of the piping. Conical filters have proved suitable.
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5. Connect the pump nozzles to the piping.

	CAUTION Aggressive flushing liquids and pickling agents Damage to the pump! ▸ Match the cleaning operation mode and duration of flushing and pickling to the casing materials and seal materials used.
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5.3.2 Permissible forces and moments at the pump nozzles

The data on forces and moments apply to static piping loads only. The values are only applicable if the pump is installed on a baseplate and bolted to a rigid and level/even foundation.

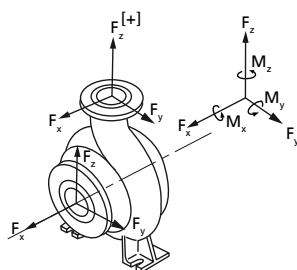


Fig. 10: Forces and moments at the pump nozzles

Table 11: Forces and moments at the pump nozzles for pump casing material JS 1030 / A536 Gr. 60-40-18, SI units

Size	Suction nozzle								Discharge nozzle							
	DN	Fx	Fy	Fz	ΣF	Mx	My	Mz	DN	Fx	Fy	Fz	ΣF	Mx	My	Mz
		[N]	[N]	[N]	[N]	[Nm]	[Nm]	[Nm]		[N]	[N]	[N]	[N]	[Nm]	[Nm]	[Nm]
040-025-160	40	553	492	430	856	553	393	455	25	325	307	369	580	387	258	301
040-025-200	40	553	492	430	856	553	393	455	25	325	307	369	580	387	258	301
050-032-125.1	50	713	651	578	1126	615	430	492	32	393	369	455	706	479	325	369
050-032-160.1	50	713	651	578	1126	615	430	492	32	393	369	455	706	479	325	369
050-032-200.1	50	713	651	578	1126	615	430	492	32	393	369	455	706	479	325	369
050-032-160	50	713	651	578	1126	615	430	492	32	393	369	455	706	479	325	369
050-032-200	50	713	651	578	1126	615	430	492	32	393	369	455	706	479	325	369
050-032-250	50	713	651	578	1126	615	430	492	32	393	369	455	706	479	325	369
065-040-160	65	910	799	738	1418	651	479	516	40	492	430	553	856	553	393	455
065-040-200	65	910	799	738	1418	651	479	516	40	492	430	553	856	553	393	455
065-040-250	65	910	799	738	1418	651	479	516	40	492	430	553	856	553	393	455
065-040-315	65	910	799	738	1418	651	479	516	40	492	430	553	856	553	393	455
065-050-160	65	910	799	738	1418	651	479	516	50	651	578	713	1126	615	437	492
065-050-200	65	910	799	738	1418	651	479	516	50	651	578	713	1126	615	437	492
065-050-250	65	910	799	738	1418	651	479	516	50	651	578	713	1126	615	437	492
065-050-315	65	910	799	738	1418	651	479	516	50	651	578	713	1126	615	437	492
080-065-160	80	1082	971	885	1703	688	492	565	65	799	738	910	1418	651	479	516
080-065-200	80	1082	971	885	1703	688	492	565	65	799	738	910	1418	651	479	516
080-065-250	80	1082	971	885	1703	688	492	565	65	799	738	910	1418	651	479	516
080-065-315	80	1082	971	885	1703	688	492	565	65	799	738	910	1418	651	479	516
100-080-160	100	1451	1291	1168	2266	762	541	627	80	971	885	1082	1703	688	492	565
100-080-200	100	1451	1291	1168	2266	762	541	627	80	971	885	1082	1703	688	492	565
100-080-250	100	1451	1291	1168	2266	762	541	627	80	971	885	1082	1703	688	492	565
100-080-315	100	1451	1291	1168	2266	762	541	627	80	971	885	1082	1703	688	492	565
125-100-160	125	1722	1537	1377	2688	910	651	824	100	1291	1168	1451	2266	762	541	627
125-100-200	125	1722	1537	1377	2688	910	651	824	100	1291	1168	1451	2266	762	541	627
125-100-250	125	1722	1537	1377	2688	910	651	824	100	1291	1168	1451	2266	762	541	627
125-100-315	125	1722	1537	1377	2688	910	651	824	100	1291	1168	1451	2266	762	541	627
150-125-200	150	2152	1968	1722	3387	1082	750	885	125	1537	1377	1722	2688	910	651	824
150-125-250	150	2152	1968	1722	3387	1082	750	885	125	1537	1377	1722	2688	910	651	824
150-125-315	150	2152	1968	1722	3387	1082	750	885	125	1537	1377	1722	2688	910	651	824
150-125-400	150	2152	1968	1722	3387	1082	750	885	125	1537	1377	1722	2688	910	651	824
200-150-315	200	2890	2583	2337	4526	1414	984	1143	150	1968	1722	2152	3387	1082	750	885
200-150-400	200	2890	2583	2337	4526	1414	984	1143	150	1968	1722	2152	3387	1082	750	885

Table 12: Forces and moments at the pump nozzles for pump casing material JS 1030 / A536 Gr. 60-40-18, imperial units

Size	Suction nozzle								Discharge nozzle							
	DN	Fx	Fy	Fz	ΣF	Mx	My	Mz	DN	Fx	Fy	Fz	ΣF	Mx	My	Mz
		[lbf]	[lbf]	[lbf]	[lbf]	[lbf ft]	[lbf ft]	[lbf ft]		[lbf]	[lbf]	[lbf]	[lbf]	[lbf ft]	[lbf ft]	[lbf ft]
040-025-160	NPS 1 1/2	124.3	110.6	96.7	192.4	407.9	289.9	335.6	NPS 1	73.1	69.0	83.0	130.4	285.4	190.3	222.0
040-025-200	NPS 1 1/2	124.3	110.6	96.7	192.4	407.9	289.9	335.6	NPS 1	73.1	69.0	83.0	130.4	285.4	190.3	222.0
050-032-125.1	NPS 2	160.3	146.3	129.9	253.1	453.6	317.1	362.9	NPS 1 1/4	88.3	83.0	102.3	158.7	353.3	239.7	272.2
050-032-160.1	NPS 2	160.3	146.3	129.9	253.1	453.6	317.1	362.9	NPS 1 1/4	88.3	83.0	102.3	158.7	353.3	239.7	272.2
050-032-200.1	NPS 2	160.3	146.3	129.9	253.1	453.6	317.1	362.9	NPS 1 1/4	88.3	83.0	102.3	158.7	353.3	239.7	272.2
050-032-160	NPS 2	160.3	146.3	129.9	253.1	453.6	317.1	362.9	NPS 1 1/4	88.3	83.0	102.3	158.7	353.3	239.7	272.2
050-032-200	NPS 2	160.3	146.3	129.9	253.1	453.6	317.1	362.9	NPS 1 1/4	88.3	83.0	102.3	158.7	353.3	239.7	272.2
050-032-250	NPS 2	160.3	146.3	129.9	253.1	453.6	317.1	362.9	NPS 1 1/4	88.3	83.0	102.3	158.7	353.3	239.7	272.2
065-040-160	NPS 2 1/2	204.6	179.6	165.9	318.8	480.1	353.3	380.6	NPS 1 1/2	110.6	96.7	124.3	192.4	407.9	289.9	335.6
065-040-200	NPS 2 1/2	204.6	179.6	165.9	318.8	480.1	353.3	380.6	NPS 1 1/2	110.6	96.7	124.3	192.4	407.9	289.9	335.6
065-040-250	NPS 2 1/2	204.6	179.6	165.9	318.8	480.1	353.3	380.6	NPS 1 1/2	110.6	96.7	124.3	192.4	407.9	289.9	335.6
065-040-315	NPS 2 1/2	204.6	179.6	165.9	318.8	480.1	353.3	380.6	NPS 1 1/2	110.6	96.7	124.3	192.4	407.9	289.9	335.6
065-050-160	NPS 2 1/2	204.6	179.6	165.9	318.8	480.1	353.3	380.6	NPS 2	146.3	129.9	160.3	253.1	453.6	322.3	362.9
065-050-200	NPS 2 1/2	204.6	179.6	165.9	318.8	480.1	353.3	380.6	NPS 2	146.3	129.9	160.3	253.1	453.6	322.3	362.9
065-050-250	NPS 2 1/2	204.6	179.6	165.9	318.8	480.1	353.3	380.6	NPS 2	146.3	129.9	160.3	253.1	453.6	322.3	362.9
065-050-315	NPS 2 1/2	204.6	179.6	165.9	318.8	480.1	353.3	380.6	NPS 2	146.3	129.9	160.3	253.1	453.6	322.3	362.9
080-065-160	NPS 3	243.2	218.3	199.0	382.8	507.4	362.9	416.7	NPS 2 1/2	179.6	165.9	204.6	318.8	480.1	353.3	380.6
080-065-200	NPS 3	243.2	218.3	199.0	382.8	507.4	362.9	416.7	NPS 2 1/2	179.6	165.9	204.6	318.8	480.1	353.3	380.6
080-065-250	NPS 3	243.2	218.3	199.0	382.8	507.4	362.9	416.7	NPS 2 1/2	179.6	165.9	204.6	318.8	480.1	353.3	380.6
080-065-315	NPS 3	243.2	218.3	199.0	382.8	507.4	362.9	416.7	NPS 2 1/2	179.6	165.9	204.6	318.8	480.1	353.3	380.6
100-080-160	NPS 4	326.2	290.3	262.6	509.4	562.0	399.0	462.4	NPS 3	218.3	199.0	243.2	382.8	507.4	362.9	416.7
100-080-200	NPS 4	326.2	290.3	262.6	509.4	562.0	399.0	462.4	NPS 3	218.3	199.0	243.2	382.8	507.4	362.9	416.7
100-080-250	NPS 4	326.2	290.3	262.6	509.4	562.0	399.0	462.4	NPS 3	218.3	199.0	243.2	382.8	507.4	362.9	416.7
100-080-315	NPS 4	326.2	290.3	262.6	509.4	562.0	399.0	462.4	NPS 3	218.3	199.0	243.2	382.8	507.4	362.9	416.7
125-100-160	NPS 5	387.1	345.5	309.6	604.3	671.2	480.1	607.7	NPS 4	290.2	262.6	326.2	509.4	562.0	399.0	462.4
125-100-200	NPS 5	387.1	345.5	309.6	604.3	671.2	480.1	607.7	NPS 4	290.2	262.6	326.2	509.4	562.0	399.0	462.4
125-100-250	NPS 5	387.1	345.5	309.6	604.3	671.2	480.1	607.7	NPS 4	290.2	262.6	326.2	509.4	562.0	399.0	462.4
125-100-315	NPS 5	387.1	345.5	309.6	604.3	671.2	480.1	607.7	NPS 4	290.2	262.6	326.2	509.4	562.0	399.0	462.4
150-125-200	NPS 6	483.8	442.4	387.1	761.4	798.0	553.2	652.7	NPS 5	345.5	309.6	387.1	604.3	671.2	480.1	607.7
150-125-250	NPS 6	483.8	442.4	387.1	761.4	798.0	553.2	652.7	NPS 5	345.5	309.6	387.1	604.3	671.2	480.1	607.7
150-125-315	NPS 6	483.8	442.4	387.1	761.4	798.0	553.2	652.7	NPS 5	345.5	309.6	387.1	604.3	671.2	480.1	607.7
150-125-400	NPS 6	483.8	442.4	387.1	761.4	798.0	553.2	652.7	NPS 5	345.5	309.6	387.1	604.3	671.2	480.1	607.7
200-150-315	NPS 8	649.7	580.7	525.4	1017.5	1043	725.8	843.0	NPS 6	442.4	387.1	483.8	761.4	798.0	553.2	652.7
200-150-400	NPS 8	649.7	580.7	525.4	1017.5	1043	725.8	843.0	NPS 6	442.4	387.1	483.8	761.4	798.0	553.2	652.7

Correction coefficients by temperature (see the following diagram)

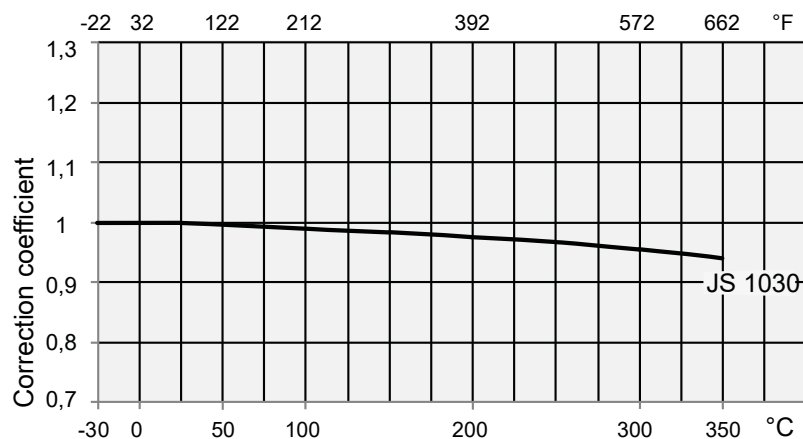

Fig. 11: Temperature correction diagram for pump casing material JS 1030

Table 13: Forces and moments at the pump nozzles for casing material GP 240 GH+N, SI units

Size	Suction nozzle								Discharge nozzle							
	DN	Fx	Fy	Fz	ΣF	Mx	My	Mz	DN	Fx	Fy	Fz	ΣF	Mx	My	Mz
		[N]	[N]	[N]	[N]	[Nm]	[Nm]	[Nm]		[N]	[N]	[N]	[N]	[Nm]	[Nm]	[Nm]
040-025-160	40	1047	842	702	1516	540	302	442	25	496	442	648	928	399	199	302
040-025-200	40	1047	842	702	1516	540	302	442	25	496	442	648	928	399	199	302
050-032-125.1	50	1339	1090	896	1946	702	345	540	32	702	540	842	1222	448	248	345
050-032-160.1	50	1339	1090	896	1946	702	345	540	32	702	540	842	1222	448	248	345
050-032-200.1	50	1339	1090	896	1946	702	345	540	32	702	540	842	1222	448	248	345
050-032-160	50	1339	1090	896	1946	702	345	540	32	702	540	842	1222	448	248	345
050-032-200	50	1339	1090	896	1946	702	345	540	32	702	540	842	1222	448	248	345
050-032-250	50	1339	1090	896	1946	702	345	540	32	702	540	842	1222	448	248	345
065-040-160	65	1728	1404	1134	2499	1134	594	842	40	842	691	1080	1534	540	302	448
065-040-200	65	1728	1404	1134	2499	1134	594	842	40	842	691	1080	1534	540	302	448
065-040-250	65	1728	1404	1134	2499	1134	594	842	40	842	691	1080	1534	540	302	448
065-040-315	65	1728	1404	1134	2499	1134	594	842	40	842	691	1080	1534	540	302	448
065-050-160	65	1728	1404	1134	2499	1134	594	842	50	1080	896	1350	1947	702	345	540
065-050-200	65	1728	1404	1134	2499	1134	594	842	50	1080	896	1350	1947	702	345	540
065-050-250	65	1728	1404	1134	2499	1134	594	842	50	1080	896	1350	1947	702	345	540
065-050-315	65	1728	1404	1134	2499	1134	594	842	50	1080	896	1350	1947	702	345	540
080-065-160	80	2160	1674	1404	3072	1436	745	1090	65	1404	1134	1728	2499	1134	594	853
080-065-200	80	2160	1674	1404	3072	1436	745	1090	65	1404	1134	1728	2499	1134	594	853
080-065-250	80	2160	1674	1404	3072	1436	745	1090	65	1404	1134	1728	2499	1134	594	853
080-065-315	80	2160	1674	1404	3072	1436	745	1090	65	1404	1134	1728	2499	1134	594	853
100-080-160	100	2700	2106	1728	3835	1998	972	1512	80	1674	1404	2106	3034	1458	745	1080
100-080-200	100	2700	2106	1728	3835	1998	972	1512	80	1674	1404	2106	3034	1458	745	1080
100-080-250	100	2700	2106	1728	3835	1998	972	1512	80	1674	1404	2106	3034	1458	745	1080
100-080-315	100	2700	2106	1728	3835	1998	972	1512	80	1674	1404	2106	3034	1458	745	1080
125-100-160	125	3672	2916	2376	5256	2700	1404	2106	100	2160	1728	2700	3865	1998	972	1512
125-100-200	125	3672	2916	2376	5256	2700	1404	2106	100	2160	1728	2700	3865	1998	972	1512
125-100-250	125	3672	2916	2376	5256	2700	1404	2106	100	2160	1728	2700	3865	1998	972	1512
125-100-315	125	3672	2916	2376	5256	2700	1404	2106	100	2160	1728	2700	3865	1998	972	1512
150-125-200	150	4644	3726	3078	6702	3456	1728	2646	125	2916	2376	3672	5256	2754	1404	2052
150-125-250	150	4644	3726	3078	6702	3456	1728	2646	125	2916	2376	3672	5256	2754	1404	2052
150-125-315	150	4644	3726	3078	6702	3456	1728	2646	125	2916	2376	3672	5256	2754	1404	2052
150-125-400	150	4644	3726	3078	6702	3456	1728	2646	125	2916	2376	3672	5256	2754	1404	2052
200-150-315	200	7290	5670	4644	10337	5238	2646	3834	150	3726	3078	4644	6702	3402	1728	2646
200-150-400	200	7290	5670	4644	10337	5238	2646	3834	150	3726	3078	4644	6702	3402	1728	2646

Table 14: Forces and moments at the pump nozzles for casing material GP 240 GH+N, imperial units

Size	Suction nozzle								Discharge nozzle							
	DN	Fx	Fy	Fz	ΣF	Mx	My	Mz	DN	Fx	Fy	Fz	ΣF	Mx	My	Mz
		[N]	[N]	[N]	[N]	[Nm]	[Nm]	[Nm]		[N]	[N]	[N]	[N]	[Nm]	[Nm]	[Nm]
040-025-160	NPS 11/2	235.4	189.3	157.8	340.8	398.3	222.7	326.0	NPS 1	111.5	99.4	145.7	208.6	294.3	146.8	222.7
040-025-200	NPS 11/2	235.4	189.3	157.8	340.8	398.3	222.7	326.0	NPS 1	111.5	99.4	145.7	208.6	294.3	146.8	222.7
050-032-125.1	NPS 2	301.0	245.0	201.4	437.5	517.8	254.5	398.3	NPS 11/4	157.8	121.4	189.3	274.7	330.4	182.9	254.5
050-032-160.1	NPS 2	301.0	245.0	201.4	437.5	517.8	254.5	398.3	NPS 11/4	157.8	121.4	189.3	274.7	330.4	182.9	254.5
050-032-200.1	NPS 2	301.0	245.0	201.4	437.5	517.8	254.5	398.3	NPS 11/4	157.8	121.4	189.3	274.7	330.4	182.9	254.5
050-032-160	NPS 2	301.0	245.0	201.4	437.5	517.8	254.5	398.3	NPS 11/4	157.8	121.4	189.3	274.7	330.4	182.9	254.5
050-032-200	NPS 2	301.0	245.0	201.4	437.5	517.8	254.5	398.3	NPS 11/4	157.8	121.4	189.3	274.7	330.4	182.9	254.5
050-032-250	NPS 2	301.0	245.0	201.4	437.5	517.8	254.5	398.3	NPS 11/4	157.8	121.4	189.3	274.7	330.4	182.9	254.5

Size	Suction nozzle								Discharge nozzle							
	DN	Fx	Fy	Fz	ΣF	Mx	My	Mz	DN	Fx	Fy	Fz	ΣF	Mx	My	Mz
		[N]	[N]	[N]	[N]	[Nm]	[Nm]	[Nm]		[N]	[N]	[N]	[N]	[Nm]	[Nm]	[Nm]
065-040-160	NPS 2 1/2	388.5	315.6	254.9	561.8	836.4	438.1	621.0	NPS 1 1/2	189.3	155.3	242.8	344.9	398.3	222.7	330.4
065-040-200	NPS 2 1/2	388.5	315.6	254.9	561.8	836.4	438.1	621.0	NPS 1 1/2	189.3	155.3	242.8	344.9	398.3	222.7	330.4
065-040-250	NPS 2 1/2	388.5	315.6	254.9	561.8	836.4	438.1	621.0	NPS 1 1/2	189.3	155.3	242.8	344.9	398.3	222.7	330.4
065-040-315	NPS 2 1/2	388.5	315.6	254.9	561.8	836.4	438.1	621.0	NPS 1 1/2	189.3	155.3	242.8	344.9	398.3	222.7	330.4
065-050-160	NPS 2 1/2	388.5	315.6	254.9	561.8	836.4	438.1	621.0	NPS 2	242.8	201.4	303.5	437.7	517.8	254.4	398.3
065-050-200	NPS 2 1/2	388.5	315.6	254.9	561.8	836.4	438.1	621.0	NPS 2	242.8	201.4	303.5	437.7	517.8	254.5	398.3
065-050-250	NPS 2 1/2	388.5	315.6	254.9	561.8	836.4	438.1	621.0	NPS 2	242.8	201.4	303.5	437.7	517.8	254.5	398.3
065-050-315	NPS 2 1/2	388.5	315.6	254.9	561.8	836.4	438.1	621.0	NPS 2	242.8	201.4	303.5	437.7	517.8	254.5	398.3
080-065-160	NPS 3	485.6	376.3	315.6	690.6	1059.1	549.5	803.9	NPS 2 1/2	315.6	254.9	388.5	561.8	836.4	438.1	629.1
080-065-200	NPS 3	485.6	376.3	315.6	690.6	1059.1	549.5	803.9	NPS 2 1/2	315.6	254.9	388.5	561.8	836.4	438.1	629.1
080-065-250	NPS 3	485.6	376.3	315.6	690.6	1059.1	549.5	803.9	NPS 2 1/2	315.6	254.9	388.5	561.8	836.4	438.1	629.1
080-065-315	NPS 3	485.6	376.3	315.6	690.6	1059.1	549.5	803.9	NPS 2 1/2	315.6	254.9	388.5	561.8	836.4	438.1	629.1
100-080-160	NPS 4	607.0	473.4	388.5	862.1	1473.6	716.9	1115.2	NPS 3	376.3	315.6	473.4	682.1	1075.4	549.5	796.6
100-080-200	NPS 4	607.0	473.4	388.5	862.1	1473.6	716.9	1115.2	NPS 3	376.3	315.6	473.4	682.1	1075.4	549.5	796.6
100-080-250	NPS 4	607.0	473.4	388.5	862.1	1473.6	716.9	1115.2	NPS 3	376.3	315.6	473.4	682.1	1075.4	549.5	796.6
100-080-315	NPS 4	607.0	473.4	388.5	862.1	1473.6	716.9	1115.2	NPS 3	376.3	315.6	473.4	682.1	1075.4	549.5	796.6
125-100-160	NPS 5	825.5	655.5	534.1	1181.6	1991.4	1035.5	1553.3	NPS 4	485.6	388.5	607.0	868.9	1473.6	716.9	1115.2
125-100-200	NPS 5	825.5	655.5	534.1	1181.6	1991.4	1035.5	1553.3	NPS 4	485.6	388.5	607.0	868.9	1473.6	716.9	1115.2
125-100-250	NPS 5	825.5	655.5	534.1	1181.6	1991.4	1035.5	1553.3	NPS 4	485.6	388.5	607.0	868.9	1473.6	716.9	1115.2
125-100-315	NPS 5	825.5	655.5	534.1	1181.6	1991.4	1035.5	1553.3	NPS 4	485.6	388.5	607.0	868.9	1473.6	716.9	1115.2
150-125-200	NPS 6	1044.0	837.6	692.0	1506.7	2549.0	1274.5	1951.6	NPS 5	655.5	534.1	825.5	1181.6	2031.2	1035.5	1513.5
150-125-250	NPS 6	1044.0	837.6	692.0	1506.7	2549.0	1274.5	1951.6	NPS 5	655.5	534.1	825.5	1181.6	2031.2	1035.5	1513.5
150-125-315	NPS 6	1044.0	837.6	692.0	1506.7	2549.0	1274.5	1951.6	NPS 5	655.5	534.1	825.5	1181.6	2031.2	1035.5	1513.5
150-125-400	NPS 6	1044.0	837.6	692.0	1506.7	2549.0	1274.5	1951.6	NPS 5	655.5	534.1	825.5	1181.6	2031.2	1035.5	1513.5
200-150-315	NPS 8	1638.9	1274.7	1044.0	2323.8	3863.3	1951.6	2827.8	NPS 6	837.6	692.0	1044.0	1506.7	2509.2	1274.5	1951.6
200-150-400	NPS 8	1638.9	1274.7	1044.0	2323.8	3863.3	1951.6	2827.8	NPS 6	837.6	692.0	1044.0	1506.7	2509.2	1274.5	1951.6

Correction coefficients by temperature (see the following diagram)

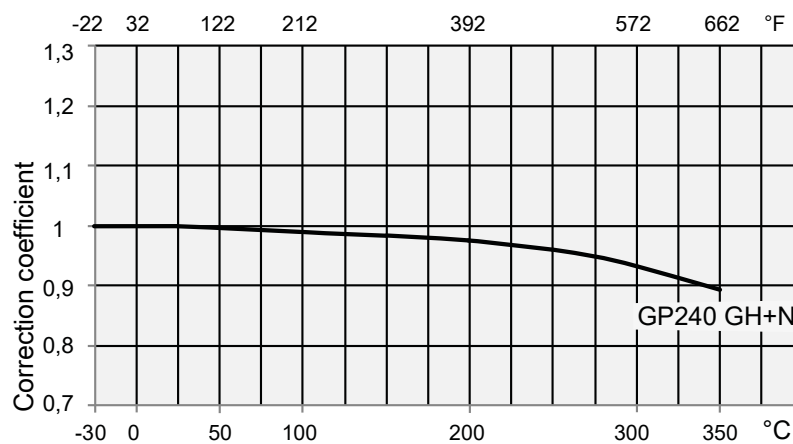


Fig. 12: Temperature correction diagram for pump casing material GP240 GH+N

5.3.3 Vacuum balance line

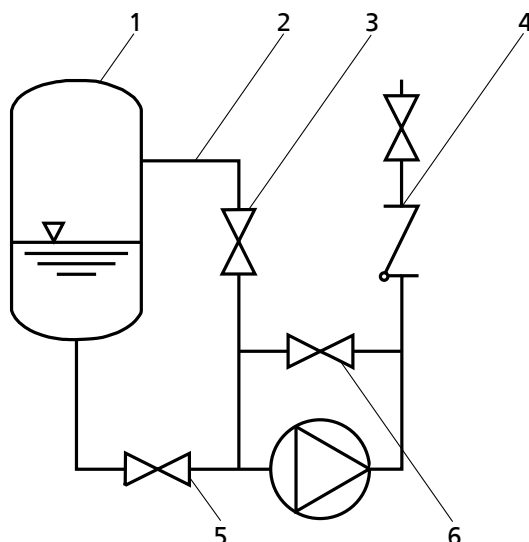


NOTE

Where fluid has to be pumped out of a vessel under vacuum, installing a vacuum balance line is recommended.

The following rules apply to vacuum balance lines:

- Minimum nominal line diameter 25 mm [0.98 in]
- The line extends above the highest permissible fluid level in the tank.


Fig. 13: Vacuum balance line

1	Vessel under vacuum	2	Vacuum balance line
3	Shut-off element	4	Swing check valve
5	Main shut-off element	6	Vacuum-tight shut-off element



NOTE

An additional line fitted with a shut-off valve (from the pump discharge nozzle to the balance line) facilitates venting of the pump before start-up.

5.3.4 Auxiliary connections



DANGER

Risk of potentially explosive atmosphere due to mixing incompatible fluids in auxiliary piping

Risk of burns!

Explosion hazard!

- Make sure that the barrier fluid or quench liquid are compatible with the fluid handled.



WARNING

Failure to use or incorrect use of auxiliary connections (e. g. barrier fluid, flushing liquid etc.)

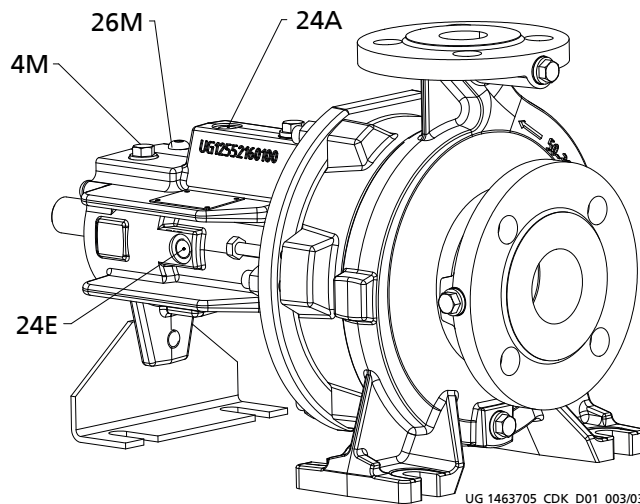
Risk of injury from escaping fluid!

Risk of burns!

Malfunction of the pump!

- Refer to the general arrangement drawing, the piping layout and pump markings (if any) for the number, dimensions and locations of auxiliary connections.
- Use the auxiliary connections provided.

Double mechanical seal and monitoring equipment



UG 1463705_CDK_D01_003/03

Fig. 14: Connections 24E, 24A, 4M and 26M

24A	Quench liquid outlet	24E	Quench liquid inlet
4M	Temperature measurement	26M	Shock pulse measurement

For designs with double mechanical seal and monitoring equipment, use connections 24A and 24E to connect the pump set to the unpressurized quench system and connections 4M and 26M to connect the pump set to the monitoring equipment. Connect the quench system and the monitoring equipment in accordance with the manufacturers' instructions.

Single mechanical seal and monitoring equipment

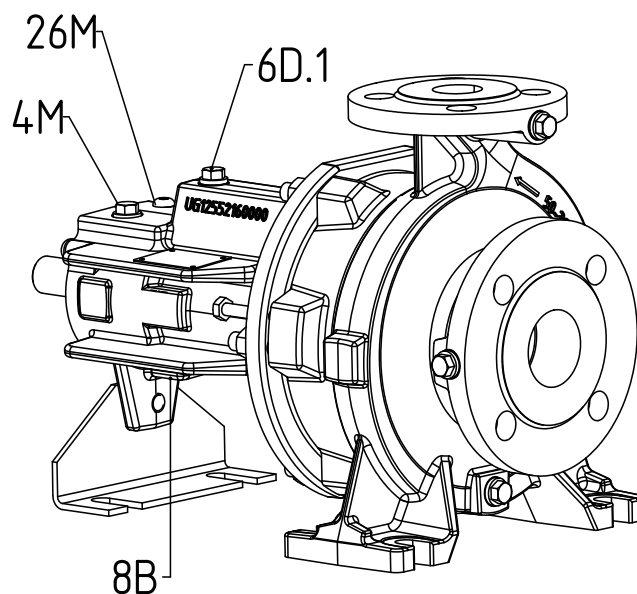


Fig. 15: Connections 4M and 26M

4M	Temperature measurement	26M	Shock pulse measurement
8B	Leakage drain		

For designs with single mechanical seal and monitoring equipment, use connections 4M and 26M to connect the pump set to the monitoring equipment. Connect the monitoring equipment in accordance with the manufacturer's instructions.



NOTE

Connecting a pipe to connection 8B (leakage drain) is recommended to drain the mechanical seal leakage into a collecting container.

5.3.5 Quench piping

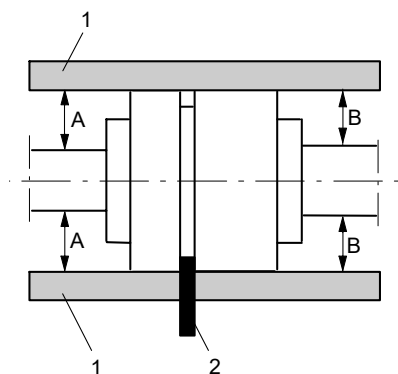
	NOTE Insulating the rising pipe of the quench system is recommended to prevent the rising quench fluid from cooling down and to maintain the thermosyphon effect.
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5.4 Enclosure/insulation

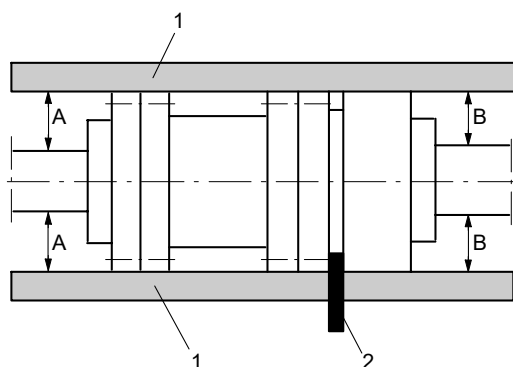
	⚠ DANGER Risk of potentially explosive atmosphere due to insufficient ventilation Explosion hazard! ▸ Ensure ventilation of the space between the casing cover/discharge cover and the bearing cover.
	⚠ WARNING Volute casing and casing cover / discharge cover take on the same temperature as the fluid handled. Risk of burns! ▸ Insulate the volute casing. ▸ Fit protective equipment.
	CAUTION Heat build-up in the bearing bracket Damage to the bearings! ▸ Never insulate the bearing bracket / bearing bracket lantern and casing cover.
	NOTE Pump casings handling fluids at temperatures below freezing point may be insulated at the site, subject to the manufacturer's prior approval.

5.5 Checking the coupling alignment

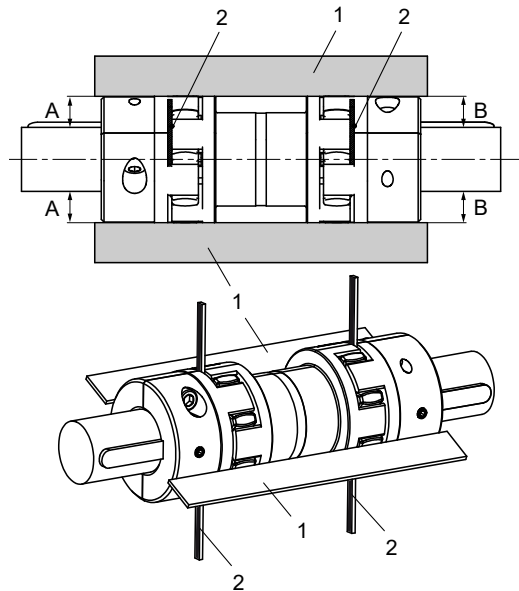
 	⚠ DANGER Inadmissible temperatures at the coupling or bearings due to misalignment Explosion hazard! Risk of burns! ▸ Make sure that the coupling is correctly aligned at all times.
	CAUTION Misalignment of pump and motor shafts Damage to pump, motor and coupling! ▸ Always check the coupling after the pump has been installed and connected to the piping. ▸ Also check the coupling if pump sets are supplied with pump and motor mounted on the same baseplate.


Fig. 16: Non-spacer-type coupling, checking the coupling alignment

1	Straight edge	2	Gage
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Fig. 17: Spacer-type coupling, checking the coupling alignment

1	Straight edge	2	Gage
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Fig. 18: Double Cardan spacer-type coupling, checking the coupling alignment

1	Straight edge	2	Gage
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Table 15: Permissible alignment offset of coupling halves

Coupling type	Radial offset		Axial offset	
	[mm]	[inch]	[mm]	[inch]
Non-spacer-type coupling (⇒ Fig. 16)	≤ 0.1	≤ 0.0039	≤ 0.1	≤ 0.0039
Spacer-type coupling (⇒ Fig. 17)	≤ 0.1	≤ 0.0039	≤ 0.1	≤ 0.0039
Double Cardan coupling (⇒ Fig. 18)	≤ 0.5	≤ 0.0197	≤ 0.5	≤ 0.0197

- ✓ The coupling guard and footboard for coupling guard, 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.
Observe the permissible radial offset in coupling half alignment (⇒ Table 15) both during standstill and at operating temperature as well as under inlet pressure.
 4. Check the distance between the two coupling halves around the circumference; refer to the general arrangement drawing for the dimensions.
The coupling is correctly aligned if the distance between the two coupling halves is the same at all points around the circumference.
Observe the permissible axial offset in coupling half alignment (⇒ Table 15) both during standstill and at operating temperature as well as under inlet pressure.

	! DANGER Risk of ignition by frictional sparks Explosion hazard ▷ Choose a coupling guard material that is non-sparking in the event of mechanical contact.
	! WARNING Unprotected rotating coupling Risk of injury by rotating shafts! ▷ 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.

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

Checking the coupling alignment with a laser tool

Coupling alignment may also be checked with a laser tool. Observe the documentation provided by the manufacturer of the measuring instrument.

5.6 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).

5.6.1 Motors with adjusting screw

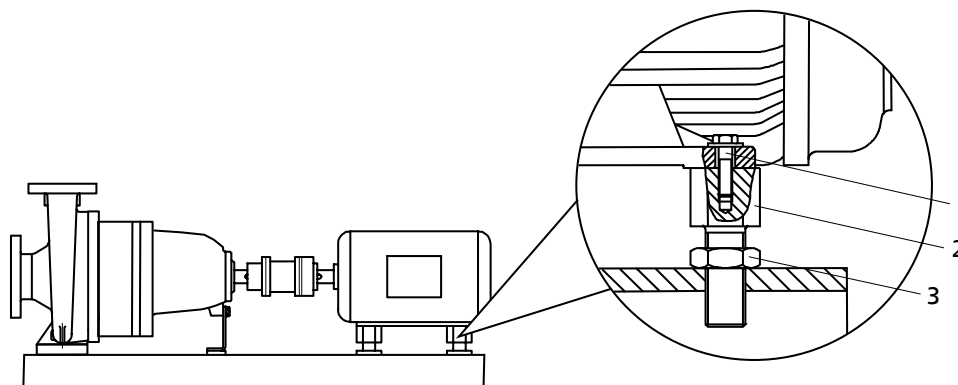


Fig. 19: Motor with adjusting screw

1	Hexagon head bolt	2	Adjusting screw
3	Locknut		

✓ The coupling guard and its footboard, if fitted, have been removed.

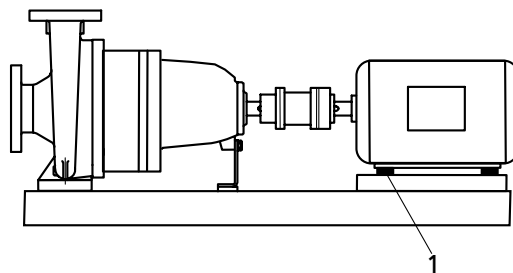
1. Check the coupling alignment.
2. Unscrew the hexagon head bolts (1) at the motor and the locknuts (3) at the baseplate.
3. Turn the adjusting screws (2) by hand or by means of an open-end wrench until the coupling alignment is correct and all motor feet rest squarely on the baseplate.
4. Re-tighten the hexagon head bolts (1) at the motor and the locknuts (3) at the baseplate.
5. Check proper functioning of coupling/shaft.
Check that coupling/shaft can easily be rotated by hand.

	⚠ WARNING Unprotected rotating coupling Risk of injury by rotating shafts! ▷ 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! ▷ Choose a coupling guard material that is non-sparking in the event of mechanical contact.

6. Fit the coupling guard and its footboard if applicable.
7. Check the distance between coupling and coupling guard.
The coupling guard must not touch the coupling.

5.6.2 Motors without levelling screw

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


Fig. 20: Pump set with shim

1	Shim
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✓ The coupling guard and its footboard, if fitted, have been removed.

1. Check the coupling alignment.
2. Loosen the hexagon head bolts at the motor.
3. Insert shims underneath the motor feet until the difference in shaft centerline height has been compensated.
4. Re-tighten the hexagon head bolts.
5. Check proper functioning of coupling/shaft.
Check that coupling/shaft can easily be rotated by hand.

	⚠ WARNING
	Unprotected rotating coupling Risk of injury by rotating shafts! ▷ 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! ▷ Choose a coupling guard material that is non-sparking in the event of mechanical contact.

6. Fit the coupling guard and its footboard if applicable.
7. Check the distance between coupling and coupling guard.
The coupling guard must not touch the coupling.

5.7 Connection to power supply

 	⚠ DANGER
	Electrical connection work by unqualified personnel Danger of death from electric shock and explosion! ▷ Always have the electrical connections installed by an electrically qualified person. ▷ Observe regulations IEC 60364 and, for explosion-proof models, EN 60079.
	⚠ WARNING
	Incorrect connection to the mains Damage to the power supply network, short circuit! ▷ Observe the technical specifications of the local energy supply companies.

1. Check the available mains voltage against the data on the motor name plate.
2. Select an appropriate start-up method.

	NOTE
	Installing a motor protection device is recommended.

5.7.1 Setting the time relay

	CAUTION
	Excessively long switch-over intervals between star and delta for three-phase motors Damage to the pump (set)! ▷ Keep switch-over intervals between star and delta as short as possible.

Table 16: Time relay settings for star-delta starting

Motor rating		Time to be set
[kW]	[hp]	[s]
≤ 30	≤ 40.23	< 3
> 30	> 40.23	< 5

5.7.2 Grounding

	⚠ DANGER
	Electrostatic charging Explosion hazard! Damage to the pump set! ▷ Connect the PE conductor to the grounding terminal provided. ▷ Provide potential equalization between the pump set and the foundation.

5.7.3 Connecting the motor

	CAUTION
	Excessive temperatures due to insufficient cooling Damage to the pump set! ▷ Only use electric motors whose cooling air flows in axial direction towards the pump end. ▷ Ensure an air velocity ≥ 3 m/s [9.84 ft/s], measured in the area of the bearing end plate on the drive side. ▷ If the pump is driven by a combustion engine, only use engines whose cooling air is sucked in or blown out via the coupling/flywheel.

	NOTE
	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.

1. Match the motor's direction of rotation to that of the pump.
2. Observe the manufacturer's product literature supplied with the motor.

5.8 Checking the direction of rotation

	! DANGER Temperature increase resulting from contact between rotating and stationary components Explosion hazard! Damage to the pump set! ▷ 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.
	! WARNING Hands inside the pump casing Risk of injuries, damage to the pump! ▷ Never insert your hands or any other objects into the pump if the pump has not been de-energized and secured against unintentional start-up.
	CAUTION Incorrect direction of rotation of pump with non-reversible mechanical seal Damage to the mechanical seal and leakage! ▷ Separate the pump from the motor to check the direction of rotation.
	CAUTION Drive and pump running in the wrong direction of rotation Damage to the pump! ▷ 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 impeller rotates in the wrong direction of rotation, check and correct the electrical connection of the motor and the control system, if applicable.

6 Commissioning/Start-up/Shutdown

6.1 Commissioning/start-up

6.1.1 Prerequisites for commissioning/start-up

Prior to commissioning, make sure that the following conditions are met:

- The pump set has been properly connected mechanically.
- The pump and the bearing bracket have been primed with the fluid to be handled. (⇒ Section 6.1.3, Page 41)
- The pump set has been properly connected to the power supply and is equipped with all protection devices. (⇒ Section 5.7, Page 38)
- If applicable, the quench system is filled with quench fluid.
- The direction of rotation has been checked. (⇒ Section 5.8, Page 40)
- All auxiliary feed lines required are connected and operational. (⇒ Section 5.3.4, Page 32)
- The lubricants have been checked. (⇒ Section 7.2.3, Page 54)
- After prolonged shutdown of the pump (set), the activities required for returning the equipment to service have been carried out. (⇒ Section 6.4, Page 49)

6.1.2 Quench liquid supply

Permissible quench liquids

The quench liquid must be compatible with and suitable for mixing with the fluid handled.

For synthetic heat transfer oils, using a mineral oil based thermal fluid or another mineral oil as the quench liquid is mandatory.

Heat transfer oils of the diphyll group are not suitable for use as quench liquids.

6.1.3 Priming and venting the pump

	 DANGER Potentially explosive atmosphere forming inside the pump Explosion hazard! ▸ The pump's interior 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 Risk of potentially explosive atmosphere due to mixing incompatible fluids in auxiliary piping Risk of burns! Explosion hazard! ▸ Make sure that the barrier fluid or quench liquid are compatible with the fluid handled.

	! 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.
	CAUTION Increased wear due to dry running Damage to the pump set! ▶ 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.
	NOTE In the run-in phase of the system, venting the pump repeatedly via the screw plug on the bearing bracket is recommended. 1. Remove screw plug 903.85 (connection 6D.1) to prime the bearing housing. Fill the bearing housing with the fluid. Then fit and tighten screw plug 903.85. 2. To vent the bearing housing, slowly open screw plug 903.85 (connection 6D.1) by no more than half a turn to a full turn. Leave the screw plug open until the gas has left the bearing housing and liquid starts to escape. Then, tighten screw plug 903.85 again. 3. Vent the pump and suction line and prime both with the fluid to be handled. The pump can be primed with the fluid to be handled from the system via the inlet line. 4. Fully open the shut-off element in the suction line. 5. Fully open all auxiliary feed lines (barrier fluid, flushing liquid, etc.), if any. 6. Fully open the shut-off element in the vacuum balance line, if any. Also, if applicable, close the vacuum-tight shut-off element. (⇒ Section 5.3.3, Page 31)
	! DANGER Hot fluid spurting out of the vent chamber Burns, scalding! ▶ Always use utmost caution and wear appropriate protective gear for the venting process.
	! WARNING Hot fluid handled spurting out when vent plug is opened Risk of electric shock! Risk of scalding! ▶ Protect electrical components from fluid handled spurting out. ▶ Wear protective clothing (e.g. gloves).



NOTE

For design-inherent reasons, the existence of some volume not filled with fluid handled after the pump has been primed prior to commissioning cannot be excluded. Once the motor is started up the pumping effect will immediately fill this volume with the fluid handled.

7. Close the vent hole (connection 6D.1) with screw plug 903.85.

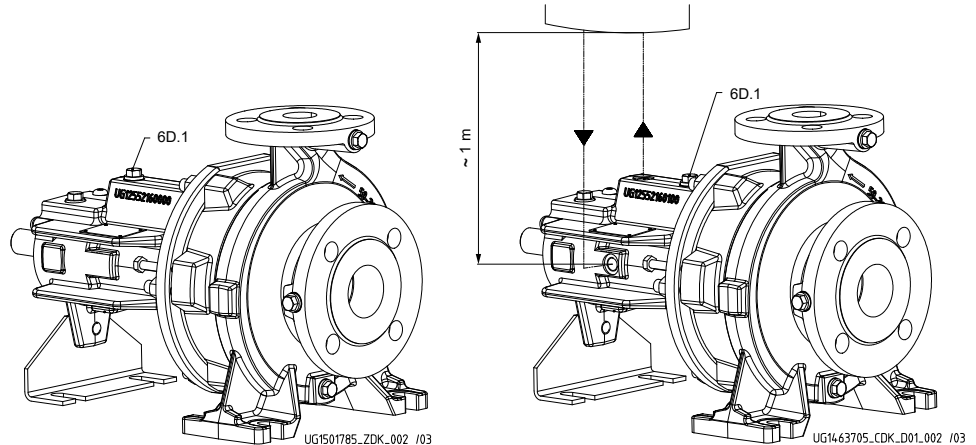


Fig. 21: Auxiliary connection 6D.1

6D.1	Screw plug 903.85
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NOTE

Replacing the screw plug with a globe valve and vent line is recommended, so that gases and hot fluids handled can be drained safely during the venting process.

Venting during operation

1. Switch off the pump and let it run down to a standstill.
2. This allows the gases to escape reliably.
3. Close the shut-off elements as required by the system configuration.
4. To vent the bearing bracket open screw plug 903.85 by 1/2 turn to maximum 1 turn until no more gas escapes.
5. When no more gas escapes, close the screw plug again.

Excessive venting

1. Prevent excessive venting.
 - ⇒ Hot fluid handled will flow from the piping system through the volute casing into the mechanical seal chamber and result in an inadmissible heat build-up in the mechanical seal.
2. When no more gas escapes, close the screw plug again.

6.1.4 Final check

1. Remove the coupling guard and its footboard if applicable.
2. Check the coupling alignment; re-align the coupling if required.
(⇒ Section 5.5, Page 34)
3. Check proper functioning of coupling/shaft.
Make sure that the coupling/shaft can easily be rotated by hand.
4. Fit the coupling guard and its footboard if applicable.
5. Check the distance between coupling and coupling guard.
The coupling guard must not touch the coupling.

	NOTE
	The coupling alignment check must be repeated after the pump has reached operating temperature.

6.1.5 Keeping warm / heating up the pump (set)

	CAUTION
	Pump blockage Damage to the pump! ▸ Prior to pump start-up, heat up the pump as described in the operating instructions.

Observe the following when heating up the pump (set) and keeping it warm:

- Make sure that the temperature is increased continuously.
- Heating rate: max. 5 °C/min [41 °F/min]

Fluid temperatures above 150 °C [302 °F]

When the pump is used for handling fluids at temperatures above 150 °C [302 °F] 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 [212 °F] when the pump is started up.

6.1.6 Start-up

	⚠ DANGER
	Non-compliance with the permissible pressure and temperature limits if the pump is operated with the suction and/or discharge lines closed. Explosion hazard! Leakage of hot or toxic fluids! ▸ 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 shut-off element slightly or fully open.

	⚠ DANGER
	Excessive temperatures due to dry running or excessive gas content in the fluid handled Explosion hazard! Damage to the pump set! ▸ Never operate the pump set without liquid fill. ▸ Prime the pump as per operating instructions. ▸ Always operate the pump within the permissible operating range.

	CAUTION
	Abnormal noises, vibrations, temperatures or leakage Damage to the pump! ▸ Switch off the pump (set) immediately. ▸ Eliminate the causes before returning the pump set to service.

- ✓ The system piping has been cleaned.
- ✓ The pump, suction line and inlet tank, if any, have been vented and primed with the fluid to be handled.

✓ The priming and venting lines have been closed.

	CAUTION
	Start-up against open discharge line Motor overload! ▷ Make sure the motor has sufficient power reserves. ▷ Use a soft starter. ▷ Use speed control.

1. Fully open the shut-off element in the suction head line / 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
	Shaft misalignment between pump and coupling Damage to pump, motor and coupling! ▷ When the operating temperature has been reached, switch off the pump set and check the coupling alignment.

5. Check the coupling alignment. Re-align the coupling if required.

6.1.7 Checking the shaft seal

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

	NOTE
	Mechanical seal failure may result in the fluid handled penetrating into the rolling element bearing, where it may damage the grease fill. Whenever fluid leakage occurs, the rolling element bearing and the shaft seal ring should therefore also be replaced as a precaution. This is particularly important when the pump is handling synthetic heat transfer fluids.

6.1.8 Shutdown

	CAUTION
	Heat build-up in the pump Damage to the shaft seal! ▷ Depending on the system, the pump set requires sufficient after-run time for the fluid temperature to drop after the heat source has been switched off.

	CAUTION
	Backflow of fluid handled is not permitted Motor and/or winding damage! Mechanical seal damage! ▷ Close the shut-off elements.

✓ The shut-off element in the suction line is and remains open.

1. Close the shut-off element in the discharge line.

2. Switch off the motor and make sure it runs down smoothly to a standstill.

	NOTE If the discharge line is equipped with a non-return or check valve, the shut-off element may remain open provided that the system conditions and system regulations are considered and observed.
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For prolonged shutdown periods:

1. Close the shut-off element in the suction line.
2. Close any auxiliary lines.
If the fluid to be handled is fed in under vacuum, also supply the shaft seal with barrier fluid during standstill.

	CAUTION Risk of freezing during prolonged pump shutdown periods Damage to the pump! ▷ Drain the pump and cooling/heating chambers (if any) or protect them against freezing.
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6.2 Operating limits

	⚠ DANGER Non-compliance with operating limits for pressure, temperature, fluid handled and speed Explosion hazard! Hot or toxic fluid could escape! ▷ Comply with the operating data specified 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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	⚠ DANGER Formation of a potentially explosive atmosphere inside the pump Explosion hazard! ▷ When draining tanks and/or reservoirs take suitable measures to prevent dry running of the pump (e.g. fill level monitoring).
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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.
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Observe the following parameters and values during operation:

Table 17: Permissible ambient temperatures for operation with fan impeller

	Permissible ambient temperature	
	[°C]	[°F]
Maximum, Etanorm SYT without fan impeller	40	104
Maximum, Etanorm SYT with fan impeller	45	113
Minimum	See data sheet	

Table 18: Permissible ambient temperature DNV-GL (marine)

	Permissible ambient temperature DNV-GL (marine)	
	[°C]	[°F]
Maximum	45 at a fluid temperature of 300 °C max.	113 at a fluid temperature of 572 °F max.
Minimum	See data sheet	

6.2.2 Frequency of starts




DANGER

Excessive surface temperature of the motor

Explosion hazard!
Damage to the motor!

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

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

Table 19: Frequency of starts

Impeller material	Maximum number of starts
	[Starts/hour]
G (JL1040/ A48CL35B)	15
C (1.4408/ A743 Gr. CF8M)	6



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

Table 20: Flow rate

Temperature range (t)	Minimum flow rate	Maximum flow rate
-30 to +350 °C	≈ 25 % of $Q_{BEP}^{8)}$	See hydraulic characteristic curves

Table 21: Flow rate

Temperature range (t)	Minimum flow rate	Maximum flow rate
-22 to +662 °F	≈ 25 % of $Q_{BEP}^{8)}$	See hydraulic characteristic curves

The following calculation formula can be used to check whether an additional heat build-up may lead to a dangerous temperature increase at the pump surface.

$$T_O = T_f + \Delta \vartheta$$

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

Table 22: 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	-
$\Delta \vartheta$	Temperature difference	K

6.2.3.2 Density of the fluid handled

	CAUTION
	Impermissibly high density of fluid handled Motor overload! ▷ Observe the information on fluid density in the data sheet. ▷ Make sure the motor has sufficient power reserves.

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

6.2.3.3 Abrasive fluids

When the pump handles fluids containing abrasive substances, increased wear of the hydraulic system and shaft seal is to be expected. In this case, reduce the commonly recommended inspection intervals.

If further information on the permissible limits is required, contact the manufacturer.

6.2.4 Permissible speed

Table 23: Permissible speed for pump control systems with continuously variable speed adjustment

$n_{\min}$ [rpm]	$n_{\max}$ [rpm]
800	-

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. For prolonged shutdown periods, start up the pump set regularly between once a month and once every three months for approximately five minutes.
 - ⇒ This will prevent the formation of deposits within the pump and the pump intake area.

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

- ✓ The pump has been properly drained. (⇒ Section 7.3, Page 55)
- ✓ The safety instructions for dismantling the pump have been observed. (⇒ Section 7.4.1, Page 55)
- ✓ The permissible ambient temperature for storing the pump is observed.
 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 nozzle and discharge nozzle. It is advisable to then close the pump nozzles (e.g. with plastic caps)
 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 on preservation. (⇒ Section 3.3, Page 15)

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.

6.4 Returning to service after storage

For returning the equipment to service observe the sections on commissioning/startup and the operating limits. (⇒ Section 6.1, Page 41) (⇒ Section 6.2, Page 46)

In addition, carry out all servicing/maintenance operations before returning the pump (set) to service. (⇒ Section 7, Page 50)

	! WARNING Failure to re-install or re-activate protective equipment/devices Risk of personal injury from moving parts or escaping fluid! ▷ As soon as the work is completed, re-install and/or re-activate any safety-relevant devices and protective devices.
	NOTE If the pump has been out of service for more than one year, replace all elastomer seals.

7 Servicing/Maintenance

7.1 Safety regulations

	 DANGER Improper cleaning of coated pump surfaces Explosion hazard by electrostatic discharge! ▸ When cleaning coated pump surfaces in atmospheres of Explosion group IIC, use suitable anti-static equipment.
	 DANGER Sparks produced during maintenance work Explosion hazard! ▸ 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.
 	 DANGER Improperly serviced pump set Explosion hazard! Damage to the pump set! ▸ Service the pump set regularly. ▸ Prepare a maintenance schedule with special emphasis on lubricants, shaft seal and coupling.

The operator ensures that all maintenance, all inspections and all installation work is performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.

	 WARNING Unintentional starting of pump set Risk of injury by moving components and shock currents! ▸ 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.
	 WARNING Fluids handled, consumables and operating supplies which are hot or pose a health hazard Risk of personal injury! ▸ 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.

	! WARNING
	Insufficient stability Risk of crushing hands and feet! ▸ During assembly/dismantling, secure the pump (set)/pump parts against tilting or tipping over.

A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation of the pump (set) with a minimum of maintenance expenditure and work.

	NOTE
	All maintenance work, service work and installation work can be carried out by KSB Service or authorized workshops. Find your contact in the attached Addresses booklet or visit https://www.ksb.com/en-global/contact .

Never use force when dismantling and reassembling the pump set.

7.2 Maintenance/inspection

7.2.1 Supervision of operation

	! DANGER
	Potentially explosive atmosphere forming inside the pump Explosion hazard! ▸ The pump's interior 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
	Incorrectly serviced shaft seal Explosion hazard! Leakage of hot, toxic fluids! Damage to the pump set! Risk of burns! Fire hazard! ▸ Service the shaft set regularly.

 	! DANGER
	Excessive temperatures as a result of bearings running hot or defective bearing seals Explosion hazard! Fire hazard! Damage to the pump set! ▸ Regularly check the rolling element bearings for running noises.

	CAUTION Increased wear due to dry running Damage to the pump set! ▷ 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.
	CAUTION Impermissibly high temperature of fluid handled Damage to the pump! ▷ 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 46)

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

- The pump must run quietly and free from vibrations at all times.
- Check the shaft seal.
- Check the static sealing elements for leakage.
- Check the rolling element bearings for running noises.
Vibrations, noises and an increase in current input occurring during unchanged operating conditions indicate wear.
- Monitor the correct functioning of any auxiliary connections.
- Monitor the stand-by pump.
To make sure that stand-by pumps are ready for operation, start them up once a week.
- Check the quench liquid level.
Make sure the quench pot always contains sufficient quench liquid.

	NOTE If the liquid level in the quench pot rises, fluid from the pump has mixed with the quench liquid, which indicates leakage at the pump-end mechanical seal. During start-up it is normal for the liquid level in the quench pot to rise until the operating temperature has been reached.
	NOTE If the liquid level in the quench pot drops rapidly, this indicates leakage at the drive-end mechanical seal. In this case, the quench liquid could mix with the grease of rolling element bearing 321 and affect lubrication. Check the rolling element bearing and replace it if required.

- Monitor the temperature of the rolling element bearings.
Set the alert temperature of the bearing monitoring equipment to 115 °C [239 °F]. At a bearing temperature of 120 °C [248 °F] switch off the pump.

	CAUTION Operation outside the permissible bearing temperature Damage to the pump! ▷ The rolling element bearing temperature of the pump (set) must not continuously exceed 115 °C [239 °F] (measured on the outside of the bearing bracket).
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	NOTE After commissioning, increased temperatures may occur at grease-packed 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).
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7.2.2 Inspection work

	⚠ DANGER Excessive temperatures caused by friction, impact or frictional sparks Explosion hazard! Fire hazard! Damage to the pump set! ▷ Regularly check the coupling guard, plastic components and other guards of rotating parts for deformation and sufficient distance from rotating parts.
	⚠ DANGER Electrostatic charging due to insufficient potential equalization Explosion hazard! ▷ Make sure that the connection between pump and baseplate is electrically conductive.

7.2.2.1 Checking the coupling

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

7.2.2.2 Checking the clearances

Clearances between impeller and casing

If the clearances need to be checked, remove the impeller. If the clearance gap is larger or smaller than permitted (see the following table), replace casing wear rings 502.01 and/or 502.02.

The clearances given refer to the diameter.

Table 24: Clearances between impeller and casing / between impeller and casing cover, SI units

Impeller material	Permissible clearance [mm]	
	New	Maximum
G (JL1040/ A48CL35B)	0.3	0.9
C (1.4408/ A743 Gr. CF8M)	0.5	1.5

Table 25: Clearances between impeller and casing / between impeller and casing cover, imperial units

Impeller material	Permissible clearance [in]	
	New	Maximum
G (JL1040/ A48CL35B)	0.012	0.035
C (1.4408/ A743 Gr. CF8M)	0.020	0.059



NOTE

If the clearance given is exceeded by more than 1 mm [0.039 in] (referring to the diameter) replace the affected components or restore the original clearance by means of a casing wear ring.
Consult KSB.

Plain bearing clearances

Table 26: Plain bearing clearances, SI units

Bearing bracket	Permissible clearance [mm]	
	New	Maximum permissible enlargement
WS_25_LS	0.08 - 0.13	0.35
WS_35_LS	0.08 - 0.13	0.4
WS_55_LS	0.08 - 0.13	0.4

Table 27: Plain bearing clearances, imperial units

Bearing bracket	Permissible clearance [in]	
	New	Maximum permissible enlargement
WS_25_LS	0.0031 - 0.0051	0.0138
WS_35_LS	0.0031 - 0.0051	0.0158
WS_55_LS	0.0031 - 0.0051	0.0158

7.2.2.3 Cleaning filters



CAUTION

Insufficient inlet pressure due to clogged filter in the suction line

Damage to the pump!

- ▷ Monitor contamination of filter with suitable means (e.g. differential pressure gage).
- ▷ Clean filters in appropriate intervals.

7.2.3 Lubricating the rolling element bearing



DANGER

Excessive temperatures as a result of bearings running hot or defective bearing seals

Explosion hazard!

Fire hazard!

Damage to the pump set!

- ▷ Regularly check the bearing seals.

The bearings are delivered grease-packed for life with a special high-temperature grease.

7.2.3.1 Grease quality

The pump may only be operated with Klüber Asonic HQ 72-102 high-temperature grease. Other grease qualities are not approved for use.

Under unfavorable operating conditions, e.g.:

- High room temperature
- High atmospheric humidity
- Dust-laden air
- Aggressive atmosphere
- etc.

the bearings must be checked earlier and replaced if required.

7.2.3.2 Intervals

Under normal conditions the grease-lubricated bearings will run for 15,000 operating hours or 2 years. Under unfavorable operating conditions (e.g. high room temperature, high atmospheric humidity, dust-laden air, aggressive industrial atmosphere, etc.), check the rolling element bearing earlier and replace it, if required.

7.2.4 Lubricating the plain bearing

The pump-end plain bearing is lubricated by the fluid handled. It is maintenance-free.

7.3 Drainage/cleaning

	! WARNING Fluids handled, consumables and operating supplies which are hot or pose a health hazard Hazard to persons and the environment! ▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled. ▷ Wear protective clothing and a protective mask if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.
--	--

1. Use connection 6B to drain the fluid handled (see auxiliary connections).
2. Always flush the pump if it has been used for handling noxious, explosive, hot or other hazardous fluids.
Always flush and clean the pump before transporting it to the workshop. Provide a certificate of decontamination for the pump. (⇒ Section 11, Page 91)

7.4 Dismantling the pump set

7.4.1 General information/Safety regulations

	! DANGER Insufficient preparation of work on the pump (set) Risk of injury! ▷ Properly shut down the pump set. (⇒ Section 6.1.8, Page 45) ▷ Close the shut-off elements in the suction line and discharge line. ▷ Drain the pump and release the pump pressure. (⇒ Section 7.3, Page 55) ▷ Shut off any auxiliary feed lines. ▷ Allow the pump set to cool down to ambient temperature.
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	 WARNING Unqualified personnel performing work on the pump (set) Risk of personal injury! ▷ Always have repair work and maintenance work performed by specially trained, qualified personnel.
	 WARNING Hot surface Risk of personal injury! ▷ 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! ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.

Always observe the safety instructions and information. (⇒ Section 7.1, Page 50)

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

For dismantling and reassembly observe the exploded views and the general assembly drawing.

In the event of damage you can always contact the service departments.

	NOTE All maintenance work, service work and installation work can be carried out by KSB Service or authorized workshops. Find your contact in the attached Addresses booklet or visit https://www.ksb.com/en-global/contact.
	NOTE After a prolonged period of operation the individual components may be hard to pull off the shaft. If this is the case, use a brand name rust penetrating agent and/or - if possible - an appropriate puller.

7.4.2 Preparing the pump set

1. Interrupt the power supply and secure the pump set against unintentional start-up.
2. Disconnect and remove all auxiliary pipework.
3. Remove the coupling guard.
4. Remove the coupling spacer if fitted.

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.
---	---



! WARNING

Motor tilting

Risk of squashing hands and feet!

- ▷ Suspend or support the motor to secure it.

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 in (⇒ Section 7.4.1, Page 55) to (⇒ Section 7.4.3, Page 56) have been observed/carried out.
- ✓ On pump sets without spacer-type coupling, the motor has been removed.



! WARNING

Back pull-out unit tipping over

Risk of squashing hands and feet!

- ▷ Suspend or support the bearing bracket at the pump end.

1. If required, suspend or support bearing bracket 330 to prevent it from tilting.
2. Unbolt support foot 183 from the baseplate.
3. Undo nuts 920.01 at the volute casing.
4. Use forcing screws 901.30 to remove the back pull-out unit from its seat in the volute casing. Pull the back pull-out unit completely out of the volute casing.
5. Remove and dispose of joint ring 411.10.



! WARNING

Thin metal foil used as carrier material in joint rings

Risk of injury (cuts)!

- ▷ Wear protective clothing.
- ▷ Always use an appropriate tool to remove joint rings.

6. Place the back pull-out unit on a clean and level/even surface.

7.4.5 Removing the impeller

- ✓ The notes and steps in (⇒ Section 7.4.1, Page 55) to (⇒ Section 7.4.4, Page 57) have been observed/carried out.
 - ✓ The back pull-out unit has been placed in a clean and level/even assembly area.
1. Undo impeller nut 920.95 (right-hand thread).
 2. Remove impeller 230 with an impeller removal tool.
 3. Place impeller 230 on a clean and level/even surface.
 4. Remove keys 940.01 and 940.09 (if any) from shaft 210.

7.4.6 Dismantling the coupling

- ✓ The notes and steps in (⇒ Section 7.4.1, Page 55) to (⇒ Section 7.4.5, Page 57) have been observed/carried out.
 - ✓ Bearing bracket 330 has been placed in a clean and level/even assembly area.
1. Undo the grub screw in the coupling hub.

2. Pull the coupling hub off pump shaft 210 with a puller or, for split-hub coupling designs, undo the screws and take off the hub halves.
3. Remove key 940.02.

7.4.7 Removing the shaft seal

7.4.7.1 Removing the shaft assembly from the bearing bracket (all bearing bracket sizes)

- ✓ The notes and steps in (⇒ Section 7.4.1, Page 55) to (⇒ Section 7.4.5, Page 57) have been observed/carried out.
- ✓ The back pull-out unit has been placed in a clean and level/even assembly area.
 1. Undo nuts 920.15.
 2. Pull bearing bracket 330 out of casing cover 161.

	 WARNING
	Thin metal foil used as carrier material in joint rings Risk of injury (cuts)! ▷ Wear protective clothing. ▷ Always use an appropriate tool to remove joint rings.

3. Remove and dispose of joint ring 411.15.
4. Unscrew hexagon socket head cap screws 914.33, if fitted, from bearing cover 360.
5. Remove bearing cover 360.
6. Remove circlip 932.02.
7. Press shaft 210 out of bearing bracket 330.

7.4.7.1.1 Removing single mechanical seals — bearing brackets WS_25_LS and WS_35_LS

- ✓ The notes and steps in (⇒ Section 7.4.1, Page 55) to (⇒ Section 7.4.7.1, Page 58) have been observed/carried out.
 1. Remove circlip 932.80 and disc 550.21.
 2. Pull radial ball bearing 321 off shaft 210.
 3. Remove mating ring carrier 476 with the mating ring of mechanical seal 433, O-ring 412.48/.55, lip seal 421.55 and spacer ring 504.01 with O-ring 412.69 completely from shaft 210.
 4. Remove lip seal 421.55 from mating ring carrier 476 and dispose of it.
 5. Remove O-ring 412.69 from spacer ring 504.01 and dispose of it.
 6. Remove O-ring 412.48/.55 from mating ring carrier 476 and dispose of it.
 7. Press the mating ring of mechanical seal 433 out of mating ring carrier 476.
 8. Undo the grub screws of mechanical seal 433.
 9. Remove the rotating assembly of mechanical seal 433 (primary ring) from shaft 210.

7.4.7.1.2 Removing single mechanical seals — bearing bracket WS_55_LS

- ✓ The notes and steps in (⇒ Section 7.4.1, Page 55) to (⇒ Section 7.4.7.1, Page 58) have been observed/carried out.
 1. Remove circlip 932.17 and disc 550.53.
 2. Undo the grub screws of mechanical seal 433.
 3. Remove the rotating assembly of mechanical seal 433 (primary ring) from shaft 210.
 4. Remove mating ring carrier 476 with the mating ring of mechanical seal 433, O-ring 412.48/.55 and lip seal 421.55 completely from shaft 210.

5. Remove O-ring 412.48/.55 from mating ring carrier 476 and dispose of it.
6. Remove lip seal 421.55 from mating ring carrier 476 and dispose of it.
7. Press the mating ring of mechanical seal 433 out of mating ring carrier 476.

7.4.7.1.3 Removing double mechanical seals — bearing brackets WS_25_LS and WS_35_LS

- ✓ The notes and steps in (⇒ Section 7.4.1, Page 55) to (⇒ Section 7.4.7.1, Page 58) have been observed/carried out.
1. Remove circlip 932.80 and disc 550.21.
 2. Pull radial ball bearing 321 off shaft 210.
 3. Remove mating ring carrier 476.02 with the mating ring of mechanical seal 433.02, O-ring 412.48/.55, lip seal 421.55 and spacer ring 504.01 with O-ring 412.69 completely from shaft 210.
 4. Remove lip seal 421.55 from mating ring carrier 476.02 and dispose of it.
 5. Remove O-ring 412.69 from spacer ring 504.01 and dispose of it.
 6. Remove O-ring 412.48/.55 from mating ring carrier 476.02 and dispose of it.
 7. Press the mating ring of mechanical seal 433.02 out of mating ring carrier 476.02.
 8. Remove spacer sleeve 525.
 9. Undo the grub screws of mechanical seal 433.02.
 10. Remove the rotating assembly of mechanical seal 433.02 (primary ring) from shaft 210.
 11. Remove circlip 932.54 and disc 550.54.
 12. Remove mating ring carrier 476.01 with O-ring 412.52.
 13. Remove O-ring 412.52 from mating ring carrier 476.01 and dispose of it.
 14. Press the mating ring of mechanical seal 433.01 out of mating ring carrier 476.01.
 15. Undo the grub screws of mechanical seal 433.01.
 16. Remove the rotating assembly of mechanical seal 433.01 (primary ring) from shaft 210.

7.4.7.1.4 Removing double mechanical seals — bearing bracket WS_55_LS

- ✓ The notes and steps in (⇒ Section 7.4.1, Page 55) to (⇒ Section 7.4.7.1, Page 58) have been observed/carried out.
1. Remove circlip 932.17 and disc 550.53.
 2. Undo the grub screws of mechanical seal 433.01.
 3. Remove the rotating assembly of mechanical seal 433.01 (primary ring) from shaft 210.
 4. Remove mating ring carrier 476.01 with the mating ring of mechanical seal 433.01 and O-ring 412.52.
 5. Press the mating ring of mechanical seal 433.01 out of mating ring carrier 476.01.
 6. Remove O-ring 412.52 from the mating ring carrier and dispose of it.
 7. Remove spacer sleeve 525.
 8. Remove circlip 932.54 and disc 550.54.
 9. Undo the grub screws of mechanical seal 433.02.
 10. Remove the rotating assembly of mechanical seal 433.02 (primary ring) from shaft 210.
 11. Remove mating ring carrier 476.02 with the mating ring of mechanical seal 433.02, O-ring 412.48/.55 and lip seal 421.55 completely from the shaft.
 12. Remove lip seal 421.55 from mating ring carrier 476.02 and dispose of it.
 13. Remove O-ring 412.48/.55 from mating ring carrier 476.02 and dispose of it.

14. Press the mating ring of mechanical seal 433.02 out of mating ring carrier 476.02.

7.4.8 Removing the plain bearing

Removing the carbon bearing

- ✓ The notes and steps in (⇒ Section 7.4.1, Page 55) to (⇒ Section 7.4.7.1, Page 58) have been observed/carried out.
- 1. Press plain bearing 310 out of bearing bracket 330 from the drive end.

Removing the SiC bearing

- ✓ The notes and steps in (⇒ Section 7.4.1, Page 55) to (⇒ Section 7.4.7.1, Page 58) have been observed/carried out.
- 1. Remove circlip 932.20.
- 2. Pull bearing sleeve 529 off shaft 210.
- 3. Remove circlip 932.04.
- 4. Press bush 540.01 and bearing cartridge 381 out of bearing bracket 330 from the drive end.
- 5. For bearing bracket WS_35_LS: Remove bush 540.02 from bearing bracket 330.

7.4.9 Dismantling the fan impeller

7.4.9.1 Dismantling the fan impeller (if applicable) on pumps with guard to ZN 79

1. Undo hexagon socket head cap screws⁹⁾ 914. Remove guard 680.99 and ring 500.99.
2. Remove coupling and key 940.02.
3. Undo grub screw 904 (1 pc. on shaft unit 25 and shaft unit 35, 2 pcs on shaft unit 55). Pull fan impeller 831 off shaft 210.
4. Hexagon socket head cap screws¹⁰⁾ 914.2 (2 pcs on shaft unit 25, 3 pcs on shaft unit 35 and shaft unit 55) from bearing bracket 330. Take off adapter 145.99.

7.4.9.2 Dismantling the fan impeller (if applicable) on pumps with guard to ZN 3230

1. Undo guard to ZN 3230 from the baseplate and remove.
2. Remove coupling and key 940.02.
3. Undo grub screw 904 (1 pc. on shaft unit 25 and shaft unit 35, 2 pcs on shaft unit 55). Pull fan impeller 831 off shaft 210.

7.5 Reassembling the pump set

7.5.1 General information/Safety regulations

	⚠ WARNING Improper lifting/moving of heavy assemblies or components Personal injury and damage to property! ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
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⁹ Screw type: pan head screw

¹⁰ Screw type: half-round head screw

	CAUTION Improper reassembly Damage to the pump! ▸ 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 or exploded view.

Sealing elements Check O-rings for any damage and replace by new O-rings if required.
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).

Assembly aids Avoid the use of assembly adhesives if possible.
Should an assembly adhesive be required after all, use a commercially available contact adhesive (e.g. Pattex) or sealant (e.g. HYLOMAR or Eppl 33).
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 with graphite or similar before reassembly.
Prior to reassembly, screw back any forcing screws or alignment screws.

Tightening torques For reassembly, tighten all screws and bolts as specified in this manual.
(⇒ Section 7.6, Page 67)

7.5.2 Fitting the plain bearings

Fitting the carbon bearing

- ✓ The individual parts have been placed in a clean and level/even 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. Press plain bearing 310 carefully into bearing bracket 330 until it will not go any further.

Fitting the SiC bearing

- ✓ The individual parts have been placed in a clean and level/even 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. Slide bearing sleeve 529 onto shaft 210.
 2. Fit circlip 932.20.
 3. Fit O-rings 412.45 at both sides of bearing cartridge 381.
 4. For bearing bracket WS_35_LS: Fit bush 540.02.
 5. Carefully press bearing bush 381 into bearing bracket 330.
 6. Fit bush 540.01.
 7. Fit circlip 932.04.

7.5.3 Installing the shaft seal

	⚠ DANGER Excessive temperatures caused by defective bearing seal Explosion hazard! ▷ Grease lip seal 421.55 with the Klüber Asonic HQ 72-102 grease supplied. (⇒ Section 7.5.3.1, Page 62) to (⇒ Section 7.5.3.4, Page 64)
	CAUTION Use of non-original spare parts Damage to the pump set! Loss of warranty! ▷ Only use original KSB spare parts. This applies especially to the replacement of the bearing, mechanical seals, static sealing elements and lip seal.

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

- 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.

	CAUTION Elastomers in contact with oil/grease Shaft seal failure! ▷ Use Anticorit BML3 as assembly lubricant. ▷ Never use oil or grease as assembly lubricant.
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7.5.3.1 Installing single mechanical seals — bearing brackets WS_25_LS and WS_35_LS

1. Clean the mating ring location of the mechanical seal and the lip seal location in mating ring carrier 476.
2. Grease the face of spacer ring 504.01 that will be in contact with lip seal 421.55 with the supplied grease (Klüber Asonic HQ 72-102).
3. Insert spacer ring 504.01 in mating ring carrier 476.
4. Wet the outside diameter of lip seal 421.55 with a water/soap mixture. Grease the sealing lip with the grease supplied (Klüber Asonic HQ72-102).
5. Press lip seal 421.55 into mating ring carrier 476.
6. Wet the mating ring location of the mechanical seal in mating ring carrier 476 with a water/soap mixture.
7. Clean the seal face of the mating ring of mechanical seal 433 with a clean cloth.
8. Applying uniform pressure, carefully press the mating ring of mechanical seal 433 into mating ring carrier 476.
9. Clean O-rings 412.48/.55 with a clean cloth. Check for any damage.
10. Fit O-rings 412.48/.55 in mating ring carrier 476.
11. Apply the remaining grease (Klüber Asonic HQ 72-102) between spacer ring 504.01 and the rear of lip seal 421.55. Make sure that no grease enters the O-ring groove in spacer ring 504.01.
12. Clean O-ring 412.69 with a clean cloth. Check for any damage.
13. Pull O-ring 412.69 onto spacer ring 504.01.
14. **For WS 35_LS:** Fit circlip 932.17 and disc 550.53.

15. Clean the primary ring of mechanical seal 433 with a clean cloth.
16. Slide the rotating assembly of mechanical seal 433 onto shaft 210.
17. Slide mating ring carrier 476 with the mating ring of mechanical seal 433, lip seal 421.55, O-rings 412.48/.55 and spacer ring 504.01 incl. O-ring 412.69 onto shaft 210.
18. Press radial ball bearing 321 onto shaft 210 and secure it with disc 550.21 and circlip 932.80.
19. Tighten the grub screws of mechanical seal 433. Observe the tightening torques.

7.5.3.2 Installing single mechanical seals — bearing bracket WS_55_LS

- ✓ Deep groove ball bearing 321, discs 550.21/.90 and circlips 932.01/.80 have been fitted on shaft 210.
1. Clean the mating ring location of the mechanical seal and the lip seal location in mating ring carrier 476.
 2. Wet the outside diameter of lip seal 421.55 with a water/soap mixture. Grease the sealing lip with the grease supplied (Klüber Asonic HQ72-102).
 3. Press lip seal 421.55 into mating ring carrier 476.
 4. Clean O-ring 412.48 with a clean cloth. Check for any damage.
 5. Pull O-ring 412.48 onto mating ring carrier 476.
 6. Wet the mating ring location of the mechanical seal in mating ring carrier 476 with a water/soap mixture.
 7. Clean the seal face of the mating ring of mechanical seal 433 with a clean cloth.
 8. Applying uniform pressure, carefully press the mating ring of mechanical seal 433 into mating ring carrier 476.
 9. Clean O-ring 412.55 with a clean cloth. Check for any damage.
 10. Pull O-ring 412.55 onto mating ring carrier 476.
 11. Apply the remaining grease (Klüber Asonic HQ 72-102) to the lower area on the rear side of lip seal 421.55.
 12. Slide mating ring carrier 476 with the mating ring of mechanical seal 433, lip seal 421.55 and O-rings 412.48/.55 onto shaft 210.
 13. Clean the primary ring of mechanical seal 433 with a clean cloth.
 14. Slide the rotating assembly of mechanical seal 433 onto shaft 210.
 15. Fit disc 550.53 and circlip 932.17.
 16. Tighten the grub screws of mechanical seal 433. Observe the tightening torques.

7.5.3.3 Installing double mechanical seals — bearing brackets WS_25_LS and WS_35_LS

1. Clean the mating ring location of the mechanical seal and the lip seal location in mating ring carrier 476.01/.02.
2. Grease the face of spacer ring 504.01 that will be in contact with lip seal 421.55 with the supplied grease (Klüber Asonic HQ 72-102).
3. Insert spacer ring 504.01 in mating ring carrier 476.02.
4. Wet the outside diameter of lip seal 421.55 with a water/soap mixture. Grease the sealing lip with the grease supplied (Klüber Asonic HQ72-102).
5. Press lip seal 421.55 into mating ring carrier 476.02.
6. Wet the mating ring location of the mechanical seal in mating ring carrier 476.02 with a water/soap mixture.
7. Clean the seal face of the mating ring of mechanical seal 433.02 with a clean cloth.
8. Applying uniform pressure, carefully press the mating ring of mechanical seal 433.02 into mating ring carrier 476.02.
9. Clean O-rings 412.48/.55 with a clean cloth. Check for any damage.

10. Fit O-rings 412.48/.55 in mating ring carrier 476.02.
11. Apply the remaining grease (Klüber Asonic HQ 72-102) between spacer ring 504.01 and the rear of lip seal 421.55. Make sure that no grease enters the O-ring groove in spacer ring 504.01.
12. Clean O-ring 412.69 with a clean cloth. Check for any damage.
13. Pull O-ring 412.69 onto spacer ring 504.01.
14. Wet the mating ring location of the mechanical seal in mating ring carrier 476.01 with a water/soap mixture.
15. Clean the seal face of the mating ring of mechanical seal 433.01 with a clean cloth.
16. Applying uniform pressure, carefully press the mating ring of mechanical seal 433.01 into mating ring carrier 476.01.
17. Clean O-ring 412.52 with a clean cloth. Check for any damage.
18. Pull O-ring 412.52 onto mating ring carrier 476.01.
19. **For WS 35_LS:** Fit circlip 932.17 and disc 550.53.
20. Clean the primary ring of mechanical seal 433.01 with a clean cloth.
21. Slide the rotating assembly of mechanical seal 433.01 onto shaft 210.
22. Fit mating ring carrier 476.01 with the mating ring of mechanical seal 433.01 and O-ring 412.52.
23. Fit circlip 932.54 and disc 550.54.
24. Tighten the grub screws of mechanical seal 433.01. Observe the tightening torques.
25. Clean the primary ring of mechanical seal 433.02 with a clean cloth.
26. Slide the rotating assembly of mechanical seal 433.02 onto shaft 210.
27. Tighten the grub screws of mechanical seal 433.02. Observe the tightening torques.
28. Fit spacer sleeve 525.
29. Slide mating ring carrier 476.02 with the mating ring of mechanical seal 433.02, lip seal 421.55, O-rings 412.48/.55 and spacer ring 504.01 incl. O-ring 412.69 onto shaft 210.
30. Press radial ball bearing 321 onto shaft 210 and secure it with disc 550.21 and circlip 932.80.

7.5.3.4 Installing double mechanical seals — bearing bracket WS_55_LS

- ✓ Deep groove ball bearing 321, discs 550.21/.90 and circlips 932.01/.80 have been fitted on shaft 210.
1. Clean the mating ring location of the mechanical seal and the lip seal location in mating ring carrier 476.01/.02.
 2. Wet the outside diameter of lip seal 421.55 with a water/soap mixture. Grease the sealing lip with the grease supplied (Klüber Asonic HQ72-102).
 3. Press lip seal 421.55 into mating ring carrier 476.02.
 4. Clean O-ring 412.48 with a clean cloth. Check for any damage.
 5. Pull O-ring 412.48 onto mating ring carrier 476.02.
 6. Wet the mating ring location of the mechanical seal in mating ring carrier 476.02 with a water/soap mixture.
 7. Clean the seal face of the mating ring of mechanical seal 433.02 with a clean cloth.
 8. Applying uniform pressure, carefully press the mating ring of mechanical seal 433.02 into mating ring carrier 476.02.
 9. Clean O-ring 412.55 with a clean cloth. Check for any damage.
 10. Pull O-ring 412.55 onto mating ring carrier 476.02.
 11. Apply the remaining grease (Klüber Asonic HQ 72-102) to the lower area on the rear side of lip seal 421.55.

12. Slide mating ring carrier 476.02 with the mating ring of mechanical seal 433.02, lip seal 421.55 and O-rings 412.48/.55 onto shaft 210.
13. Clean the primary ring of mechanical seal 433.02 with a clean cloth.
14. Slide the rotating assembly of mechanical seal 433.02 onto shaft 210.
15. Fit disc 550.54 and circlip 932.54.
16. Tighten the grub screws of mechanical seal 433.02. Observe the tightening torques.
17. Fit spacer sleeve 525.
18. Wet the mating ring location of the mechanical seal in mating ring carrier 476.01 with a water/soap mixture.
19. Clean the seal face of the mating ring of mechanical seal 433.01 with a clean cloth.
20. Applying uniform pressure, carefully press the mating ring of mechanical seal 433.01 into mating ring carrier 476.01.
21. Clean O-ring 412.52 with a clean cloth. Check for any damage.
22. Pull O-ring 412.52 onto mating ring carrier 476.01.
23. Slide mating ring carrier 476.01 with the mating ring of mechanical seal 433.01 and O-ring 412.52 onto the shaft.
24. Fit disc 550.53 and circlip 932.17.
25. Tighten the grub screws of mechanical seal 433.01. Observe the tightening torques.

7.5.3.5 Installing the shaft assembly in the bearing bracket (all bearing bracket sizes)

1. Carefully press the shaft assembly into bearing bracket 330.
2. Fit circlip 932.02.
3. Fit bearing cover 360.
4. If applicable, fasten bearing cover 360 to bearing bracket 330 with hexagon socket head cap screws 914.33. Observe the tightening torques.

7.5.4 Fitting the impeller

- ✓ The notes and steps stated in (⇒ Section 7.5.1, Page 60) to (⇒ Section 7.5.3, Page 62) have been observed/carried out.
 - ✓ The assembled bearing bracket as well as the individual parts have been placed in a clean and level/even 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. Insert keys 940.01 and 940.09¹¹⁾. Slide impeller 230 onto shaft 210.
 2. Fasten impeller nut 920.95, spring washer 930.95 and disc 550.95, if any. Observe the tightening torques.

7.5.5 Fitting the fan impeller

7.5.5.1 Fitting the fan impeller (if applicable) on pumps with guard to ZN 79

1. Fasten adapter 145.99 with hexagon socket head cap screws¹²⁾ 914.2 (2 pcs on shaft unit 25, 3 pcs on shaft unit 35 and shaft unit 55) at bearing bracket 330.
2. Slide fan impeller 831 onto the shoulder of shaft 210. Fasten by tightening grub screw 904 (1 pc. on shaft unit 25 and shaft unit 35, 2 pcs on shaft unit 55).

¹¹ If fitted

¹² Screw type: half-round head screw

3. Fit guard 680.99 and ring 500.99. Fasten with hexagon socket head cap screws¹³⁾ 914.

⇒ Make sure there is no mechanical contact between the fan impeller and the guard to ZN 79.

7.5.5.2 Fitting the fan impeller (if applicable) on pumps with guard to ZN 3230

1. Slide fan impeller 831 onto the shoulder of shaft 210. Fasten by tightening grub screw 904 (1 pc. on shaft unit 25 and shaft unit 35, 2 pcs on shaft unit 55).
 2. Slide the guard to ZN 3230 onto bearing bracket 330 and fit it on the baseplate.
- ⇒ Make sure there is not mechanical contact between the fan impeller and the guard to ZN 3230.

7.5.6 Fitting the coupling

- ✓ The notes and steps in (⇒ Section 7.5.1, Page 60) to (⇒ Section 7.5.4, Page 65) have been observed/carried out.
 - ✓ The individual parts have been placed in a clean and level/even assembly area.
 - ✓ All dismantled parts have been cleaned and checked for wear.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
1. Insert key 940.02.
 2. Fit the coupling hub on pump shaft 210. For split-hub coupling designs, fit the hub halves on pump shaft 210. Fit and tighten the screws clamping the hub halves together. Observe the tightening torques. (⇒ Section 7.6, Page 67)
 3. Secure the coupling hub with a grub screw.

7.5.7 Installing the back pull-out unit

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

- ✓ The notes and steps in (⇒ Section 7.5.1, Page 60) to (⇒ Section 7.5.4, Page 65) 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 without coupling, fit the coupling in accordance with the manufacturer's instructions.
1. Insert new joint ring 411.10 into volute casing 102.
 2. Loosen but do not remove forcing screws 901.30.
 3. If required, prevent the back pull-out unit from tipping over, e.g. by suspending or supporting it. Then guide it into volute casing 102.
 4. Tighten nut 920.01 at the volute casing. Observe the tightening torques.
 5. Bolt support foot 183 to the baseplate.

¹³ Screw type: pan head screw

7.5.8 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 the pump and motor. (⇒ Section 5.6, Page 36)
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

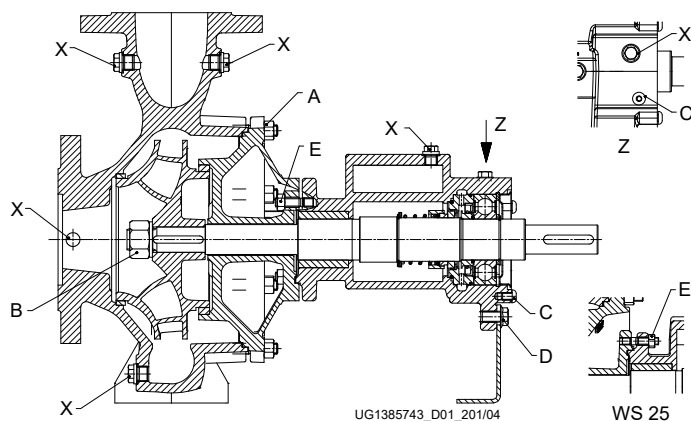


Fig. 22: Tightening points at the pump

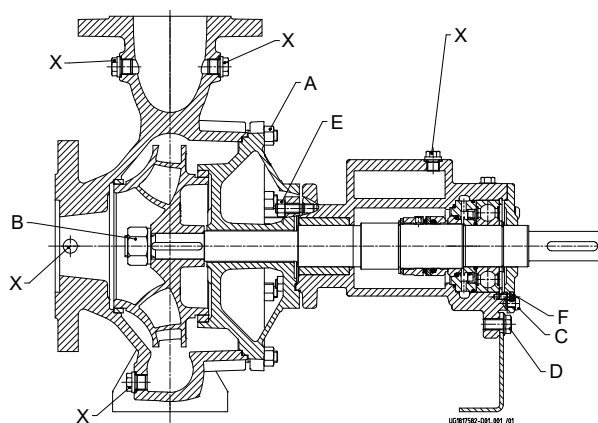


Fig. 23: Tightening points at the pump (special design)

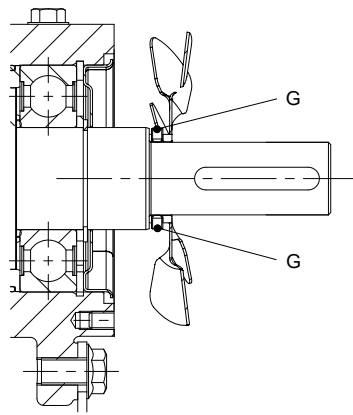


Fig. 24: Tightening points at the fan impeller

Table 28: Tightening torques, SI units, imperial units

Position	Thread	Tightening torques	
		[Nm]	[lbf ft]
A	M12	55	40.57
	M16	130	95.88
B	M12×1.5	55	40.57
	M24×1.5	200	147.51
	M30×1.5	300	221.27
C	M8	20	14.75
	M10	38	28.03
D	M12	90	66.38
G	M5	5	3.69
	M6	7	5.16
E	M8	20	14.75
	M10	38	28.03
F	M6	10	7.38
X	1/4	55	40.57
	3/8	80	59.01
	1/2	130	95.88

7.6.2 Tightening torques for the pump set

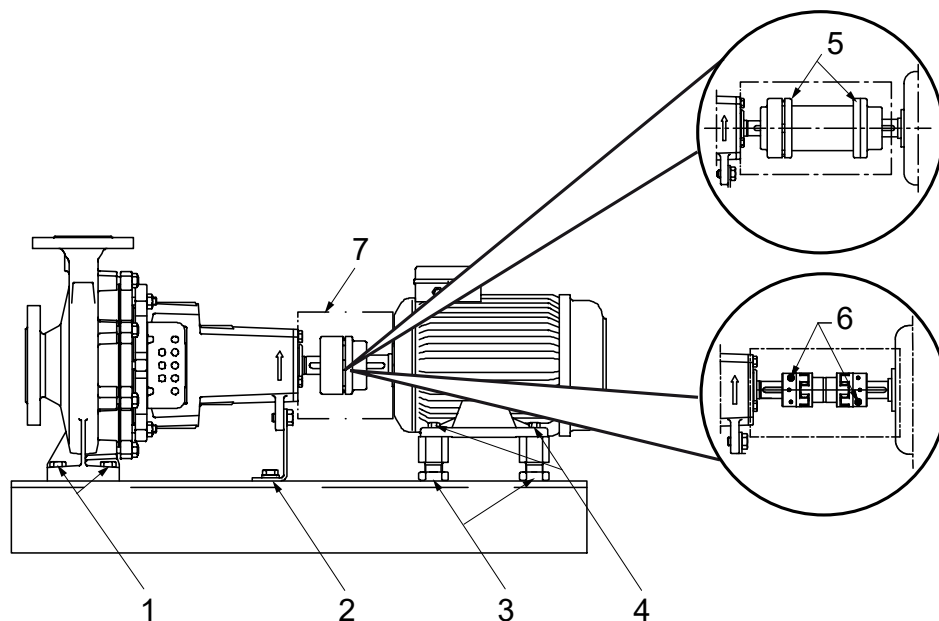


Fig. 25: Position of bolts/screws at the pump set

Table 29: Tightening torques for bolted/screwed connections at the pump set, SI units, imperial units

Position	Thread size	Tightening torque		Notes
		[Nm]	[lbf ft]	
1	M12	30	22.13	Pump on baseplate
	M16	75	55.32	
	M20	75	55.32	
2	M12	30	22.13	Adjusting screws in baseplate
3	M24 × 1.5	140	103.26	
	M36 × 1.5	140	103.26	
4	M6	10	7.38	Motor on baseplate or motor on adjusting screws or bases
	M8	10	7.38	
	M10	15	11.06	
	M12	30	22.13	
	M16	75	55.32	
	M20	140	103.26	
	M24	140	103.26	
3	M24 × 1.5	140	103.26	Adjusting screws in baseplate
	M36 × 1.5	140	103.26	
4	M6	10	7.38	Motor on baseplate or motor on adjusting screws or bases
	M8	10	7.38	
	M10	15	11.06	
	M12	30	22.13	
	M16	75	55.32	
	M20	140	103.26	
	M24	140	103.26	
5	M6	13	9.59	Coupling (only for spacer-type coupling made by Flen-der)
	M8	18	13.28	
	M10	44	32.45	

Position	Thread size	Tightening torque		Notes
		[Nm]	[lbf ft]	
6	M8	34	25.08	Coupling (only for double Cardan spacer-type coupling and split-hub coupling design, make: KTR)
	M10	67	49.42	
	M12	115	84.82	
	M16	290	213.89	
	M20	560	413.04	
7	M6	10	7.38	Coupling guard

7.6.3 Tightening torques for the mechanical seal

Table 30: Tightening torques for bolted/screwed connections at the mechanical seal, SI units, imperial units

Thread	Type of mechanical seal	Tightening torques	
		[Nm]	[lbf ft]
M5	-	4	2.95
M6	4EYS033	5	3.69
	4EYS048	7	5.16
	4EYT033	5	3.69
	4EYT048	7	5.16
M8	-	15	11.06
M10	-	20	14.75
M12	-	25	18.44

7.7 Spare parts stock

7.7.1 Ordering spare parts

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

- Order number
- Order item number
- Consecutive number
- Type series
- Size
- Material variant
- Seal code
- Year of construction

Refer to the name plate for all data.

Also supply the following data:

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

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

DANGER

Use of non-authorized spare parts

Explosion hazard!

Damage to the pump set!

Damage will not be covered by the scope of warranty!

► Only use original KSB spare parts. This applies especially to the replacement of the bearing, mechanical seal, static sealing elements and lip seal.

Table 31: Quantity of spare parts for recommended spare parts stock

Part number	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 %
310	Plain bearing	2	3	4	5	7	9	100 %
321	Radial ball bearing	1	1	2	2	2	3	25 %
330	Bearing bracket ¹⁴⁾	-	-	-	-	-	1	2
433	Mechanical seal ¹⁵⁾	1	1	2	2	2	3	25 %
502.01/.02	Casing wear ring	2	2	2	3	3	4	50 %
411.10/.15	Joint ring	4	6	8	8	9	12	150 %
412.48/.52 ¹⁶⁾ /.55/69	O-ring	4	6	8	8	9	10	100 %
421.55	Lip seal	4	6	8	8	9	10	100 %
-	Torque-transmitting coupling elements (set)	1	1	2	2	3	4	30 %

7.7.3 Interchangeability of pump components

Components featuring the same number in a line are interchangeable.

Table 32: Symbols key

Symbol	Description
O	Components differ
X	Component not fitted

14 Complete bearing bracket WS_35_LS. Example of a pump set with single mechanical seal and carbon plain bearing comprising: shaft 210, plain bearing 310, radial ball bearing 321, bearing bracket 330, bearing cover 360, joint ring 411.85, O-ring 412.48/.55/.69, lip seal 421.55, mechanical seal 433, mating ring carrier 476, spacer ring 504.01, disc 550.21/.53, stud 902.15, screw plug 903.85, pan head screw 914, hexagon nut 920.15/.95, Nordlock washer 930.95, circlip 932.02/.17/.80, key 940.01/.02

15 For double mechanical seals double the quantity.

16 For double mechanical seal add 412.52.

Table 33: Interchangeability of pump components

Size	Bearing bracket	Description											
		Casing cover	Support foot	Shaft	Impeller	Plain bearing	Deep groove ball bearing	Bearing bracket	Lip seal	Mechanical seal ¹⁷⁾	Mating ring carrier	Casing wear ring, suction side	Casing wear ring, discharge side
		Part No.											
		161	183	210	230	310	321	330	421.55	433	476	502.01	502.02
040-025-160	WS_25_LS	1	2	1	0	1	1	1	1	1	1	10	X
040-025-200	WS_25_LS	2	3	1	0	1	1	1	1	1	1	10	3
050-032-125.1	WS_25_LS	1	1	1	0	1	1	1	1	1	1	1	X
050-032-160.1	WS_25_LS	1	2	1	0	1	1	1	1	1	1	1	X
050-032-200.1	WS_25_LS	2	3	1	0	1	1	1	1	1	1	1	3
050-032-160	WS_25_LS	1	2	1	0	1	1	1	1	1	1	11	X
050-032-200	WS_25_LS	2	3	1	0	1	1	1	1	1	1	11	3
050-032-250	WS_25_LS	3	4	1	0	1	1	1	1	1	1	11	10
065-040-160	WS_25_LS	1	2	1	0	1	1	1	1	1	1	12	3
065-040-200	WS_25_LS	2	3	1	0	1	1	1	1	1	1	12	3
065-040-250	WS_25_LS	3	4	1	0	1	1	1	1	1	1	2	10
065-040-315	WS_35_LS	7	7	2	0	2	2	2	2	2	2	2	13
065-050-160	WS_25_LS	1	3	1	0	1	1	1	1	1	1	3	3
065-050-200	WS_25_LS	2	3	1	0	1	1	1	1	1	1	3	3
065-050-250	WS_25_LS	3	4	1	0	1	1	1	1	1	1	3	10
065-050-315	WS_35_LS	7	7	2	0	2	2	2	2	2	2	4	11
080-065-160	WS_25_LS	4	3	1	0	1	1	1	1	1	1	4	5
080-065-200	WS_25_LS	0	4	1	0	1	1	1	1	1	1	4	5
080-065-250	WS_35_LS	6	5	2	0	2	2	2	2	2	2	5	11
080-065-315	WS_35_LS	7	7	2	0	2	2	2	2	2	2	6	11
100-080-160	WS_25_LS	4	4	1	0	1	1	1	1	1	1	6	5
100-080-200	WS_35_LS	5	0	2	0	2	2	2	2	2	2	6	11
100-080-250	WS_35_LS	6	5	2	0	2	2	2	2	2	2	6	11
100-080-315	WS_35_LS	7	6	2	0	2	2	2	2	2	2	6	11
125-100-160	WS_35_LS	5	5	2	0	2	2	2	2	2	2	7	11
125-100-200	WS_35_LS	5	5	2	0	2	2	2	2	2	2	7	11
125-100-250	WS_35_LS	6	7	2	0	2	2	2	2	2	2	7	11
125-100-315	WS_35_LS	7	6	2	0	2	2	2	2	2	2	7	11
150-125-200	WS_35_LS	0	6	2	0	2	2	2	2	2	2	8	9
150-125-250	WS_35_LS	0	6	2	0	2	2	2	2	2	2	8	9
150-125-315	WS_55_LS	8	9	3	0	2	3	3	3	2	3	8	12
150-125-400	WS_55_LS	9	8	3	0	2	3	3	3	2	3	8	12

1227.83/01-EN-US

¹⁷ Single mechanical seal 433 not interchangeable with double mechanical seal 433.01/02

Size	Bearing bracket	Description											
		Casing cover	Support foot	Shaft	Impeller	Plain bearing	Deep groove ball bearing	Bearing bracket	Lip seal	Mechanical seal ¹⁷⁾	Mating ring carrier	Casing wear ring, suction side	Casing wear ring, discharge side
		Part No.											
		161	183	210	230	310	321	330	421.55	433	476	502.01	502.02
200-150-315	WS_55_LS	8	9	3	0	2	3	3	3	2	3	9	12
200-150-400	WS_55_LS	10	8	3	0	2	3	3	3	2	3	9	12

8 Trouble-shooting

	 WARNING
	Improper remedial work Risk of personal injury! ► For any work performed in order to remedy faults observe the relevant information given in this operating manual and/or the product literature provided by the accessories manufacturers.

If problems occur that are not described in the following table, consultation with KSB Service is required.

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

Table 34: Trouble-shooting

A	B	C	D	E	F	G	H	Possible cause	Remedy ¹⁸⁾
X	-	-	-	-	-	-	-	Pump delivers against an excessively high pressure.	Re-adjust to duty point. Check system for impurities. Fit a larger impeller. ¹⁹⁾ Increase the speed (turbine, I.C. engine).
X	-	-	-	-	-	X	X	Pump and/or piping are not completely vented or primed.	Vent or prime. Clean vent hole.
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 a vent valve.
X	-	-	-	-	-	X	X	Suction lift is too high / NPSH _{available} (positive suction head) is too low.	Check/alter liquid level. Install pump at a lower level. Fully open the shut-off element in the inlet line. Change suction/inlet line, if the friction losses in the suction/inlet line are too high. Check any strainers installed/suction opening. Observe permissible speed of pressure fall.
X	-	-	-	-	-	-	-	Wrong direction of rotation	Interchange two of the phases of the power cable.
X	-	-	-	-	-	-	-	Speed is too low. - Operation with frequency inverter - Operation without frequency inverter	Increase voltage/frequency at the frequency inverter in the permissible range. Check voltage.
X	-	-	-	-	-	X	-	Wear of internal components	Replace worn parts with new ones.
-	X	-	-	-	-	X	-	Pump back pressure is lower than specified in the purchase order.	Re-adjust to duty point. In the case of persistent overloading, turn down impeller. ¹⁹⁾
-	X	-	-	-	-	-	-	Density and viscosity of the fluid handled is higher than stated in the purchase order.	Consult us.
-	X	X	-	-	-	-	-	Speed is too high.	Reduce the speed. ¹⁹⁾

¹⁸ Pump pressure must be released before attempting to remedy faults on parts which are subjected to pressure.

¹⁹ Consult us.

A	B	C	D	E	F	G	H	Possible cause	Remedy ¹⁸⁾
-	-	-	-	X	-	-	-	Defective gasket	Fit new gasket between volute casing and discharge cover and/or between discharge cover and bearing bracket.
-	-	-	-	X	-	-	-	Gasket not pre-loaded sufficiently	Increase pre-loading of gasket at operating temperature: 1. Close the valves on the discharge and suction side. 2. Allow the pump set to cool down to a temperature below the boiling point of the fluid handled. 3. Re-tighten hexagon nuts 920.01 and 920.15 at the discharge cover. 4. Start up the pump set.
-	-	-	-	-	X	-	-	Worn shaft seal	Fit new shaft seal. Check flushing liquid/barrier fluid.
-	-	-	-	-	X	-	-	Vibrations during pump operation	Correct the suction conditions. Align the pump set. Re-balance the impeller. Increase the pressure at the pump suction nozzle.
-	-	-	X	-	X	X	-	Pump set is misaligned.	Align the pump set.
-	-	-	X	-	X	X	-	Pump is warped or sympathetic vibrations in the piping.	Check pipeline connections and secure fixing of pump; if required, reduce the distances between the pipe clamps. Fix the pipelines using anti-vibration material.
-	-	-	X	-	-	-	-	Increased axial thrust ¹⁹⁾	Clean balancing holes in the impeller. Fit new casing wear rings.
-	-	-	X	-	-	-	-	Non-compliance with specified coupling distance	Correct distance according to the 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(s)	Replace.
-	-	-	X	-	-	X	X	Flow rate is too low.	Increase the minimum flow rate.

9 Related Documents

9.1 Exploded views with lists of components

9.1.1 Version with bearing bracket WS 25 LS

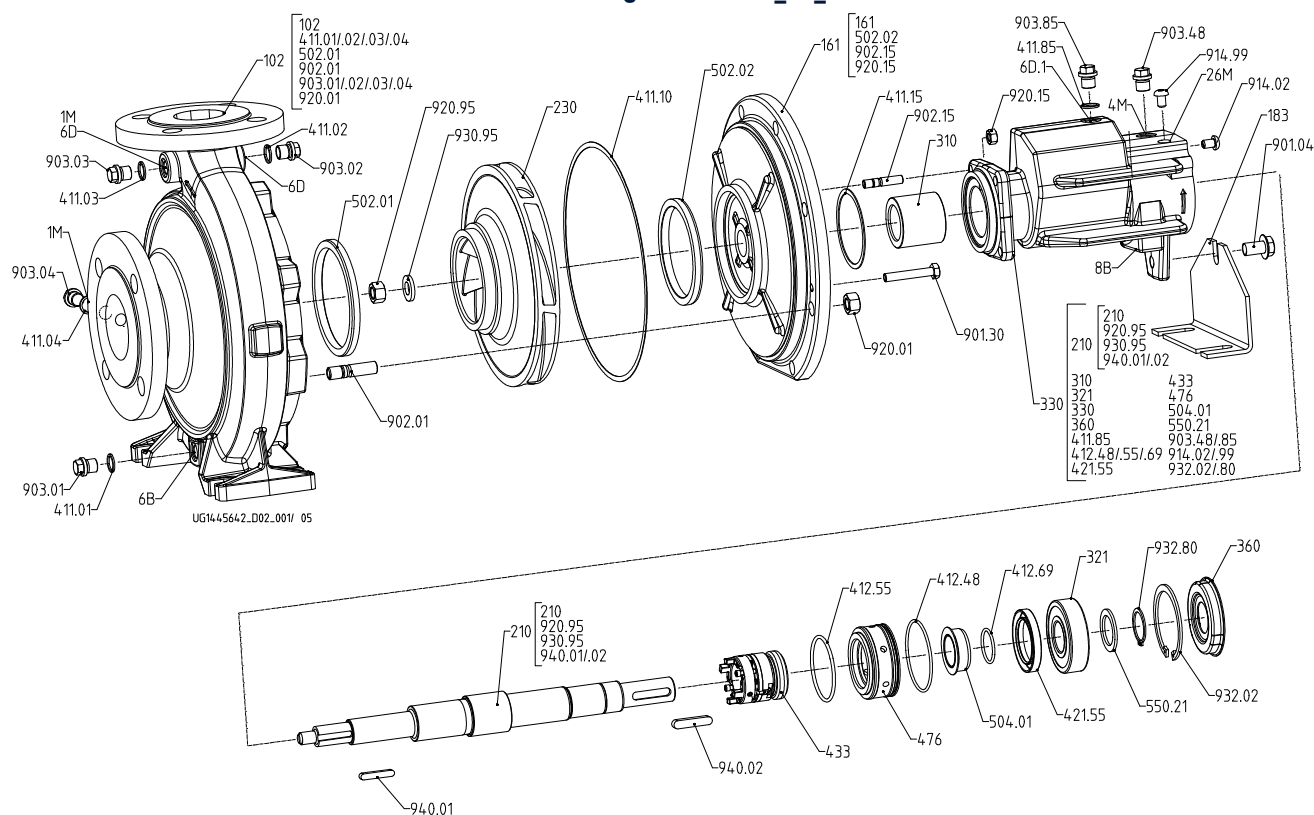


Fig. 26: Exploded view of Etanorm SYT, bearing bracket WS_25_LS

Table 35: List of components

Part No.	Description	Part No.	Description
102	Volute casing	476	Mating ring carrier
161	Casing cover	502.01/.02 ²⁰⁾	Casing wear ring
183	Support foot	504.01	Spacer ring
210	Shaft	550.21	Disc
230	Impeller	901.04/.30	Hexagon head bolt
310	Plain bearing	902.01/.15	Stud
321	Radial ball bearing	903.01/.02/.03/.04/.48/.85	Screw plug
330	Bearing bracket	914.02/.99	Hexagon socket head cap screw
360	Bearing cover	920.01/.15/.95	Nut
411.01/.02/.03/.04/.10/.15/.85	Joint ring	930.95	Safety device
412.48/.55/.69	O-ring	932.02/.80	Circlip
421.55	Lip seal	940.01/.02	Key
433	Mechanical seal		

20 502.02 not fitted on sizes 040-025-160, 050-032-125.1, 050-032-160, 050-032-160.1

9.1.2 Version with bearing bracket WS_25_LS (special design)

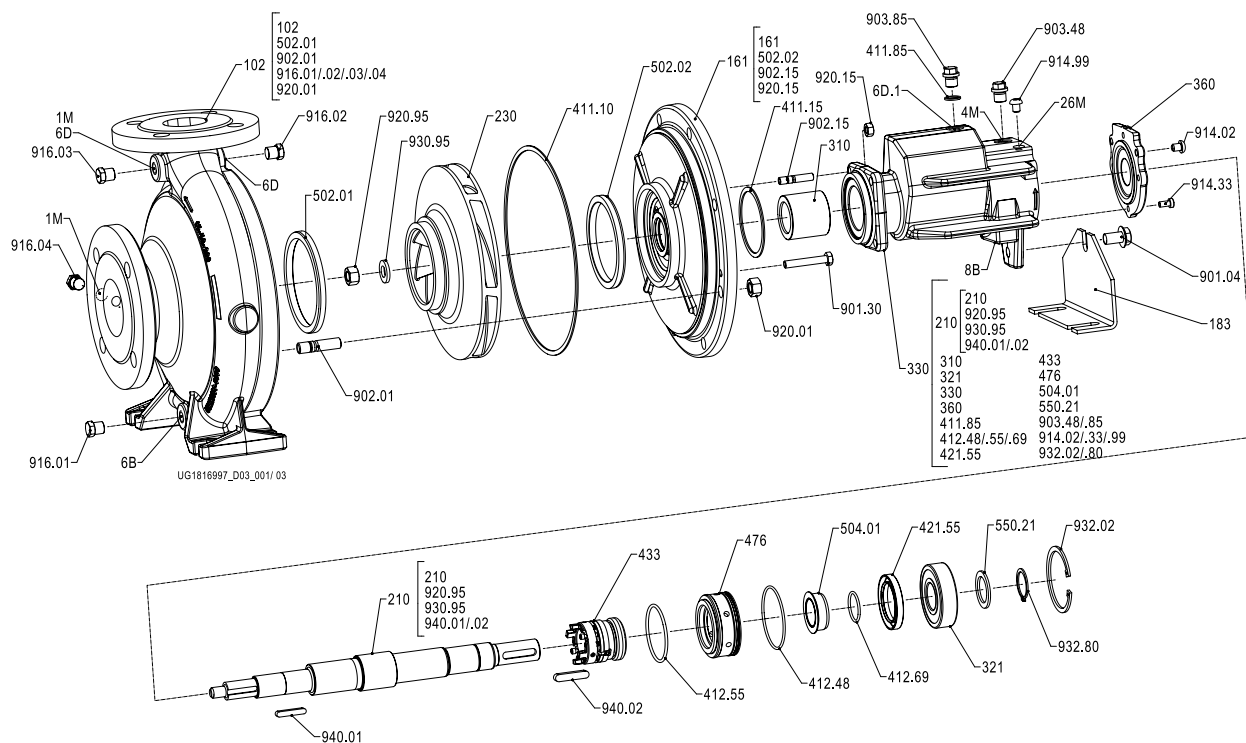


Fig. 27: Exploded view of an Etanorm SYT, bearing bracket WS_25_LS (special design)

Table 36: List of components

Part No.	Description	Part No.	Description
102	Volute casing	476	Mating ring carrier
161	Casing cover	502.01/.02 ²¹⁾	Casing wear ring
183	Support foot	504.01	Spacer ring
210	Shaft	550.21	Disc
230	Impeller	901.04/.30	Hexagon head bolt
310	Plain bearing	902.01/.15	Stud
321	Radial ball bearing	903.48/.85	Screw plug
330	Bearing bracket	914.02/.33/.99	Hexagon socket head cap screw
360	Bearing cover	916.01/.02/.03/.04	Plug
411.10/.15/.85	Joint ring	920.01/.15/.95	Nut
412.48/.55/.69	O-ring	930.95	Safety device
421.55	Lip seal	932.02/.80	Circlip
433	Mechanical seal	940.01/.02	Key

²¹ 502.02 not fitted on sizes 040-025-160, 050-032-125.1, 050-032-160, 050-032-160.1

9.1.3 Version with bearing bracket WS_25_LS with double mechanical seal

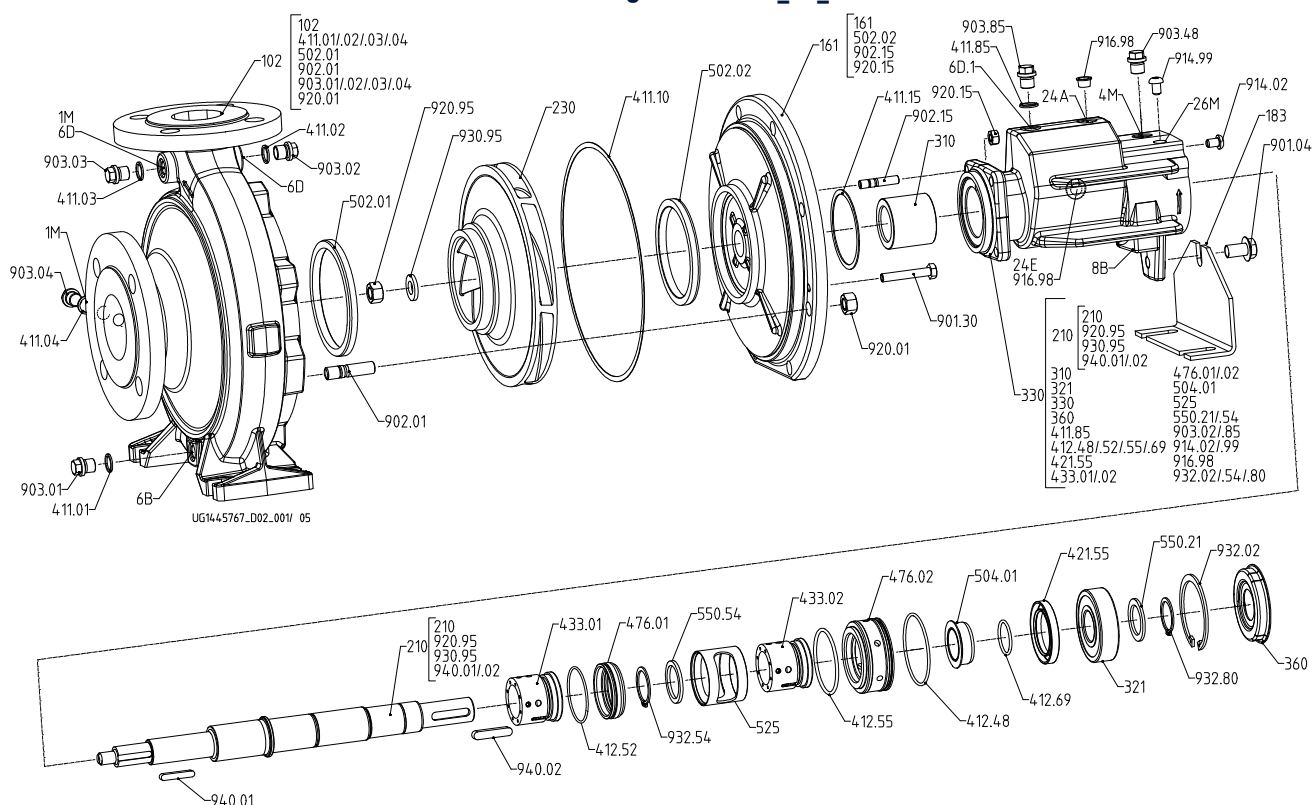


Fig. 28: Exploded view of Etanorm SYT; bearing bracket WS_25_LS with double mechanical seal

Table 37: List of components

Part No.	Description	Part No.	Description
102	Volute casing	502.01/.02 ²²⁾	Casing wear ring
161	Casing cover	504.01	Spacer ring
183	Support foot	525	Spacer sleeve
210	Shaft	550.21/.54	Disc
230	Impeller	901.04/.30	Hexagon head bolt
310	Plain bearing	902.01/.15	Stud
321	Radial ball bearing	903.01/.02/.03/.04/.48/.85	Screw plug
330	Bearing bracket	914.02/.99	Hexagon socket head cap screw
360	Bearing cover	916.98	Plug
411.01/.02/.03/.04/.10/.15/.85	Joint ring	920.01/.15/.95	Nut
412.48/.52/.55/.69	O-ring	930.95	Safety device
421.55	Lip seal	932.02/.54/.80	Circlip
433.01/.02	Mechanical seal	940.01/.02	Key
476.01/.02	Mating ring carrier		

²² 502.02 not fitted on sizes 040-025-160, 050-032-125.1, 050-032-160, 050-032-160.1

9.1.4 Version with bearing bracket WS_25_LS with double mechanical seal (special design)

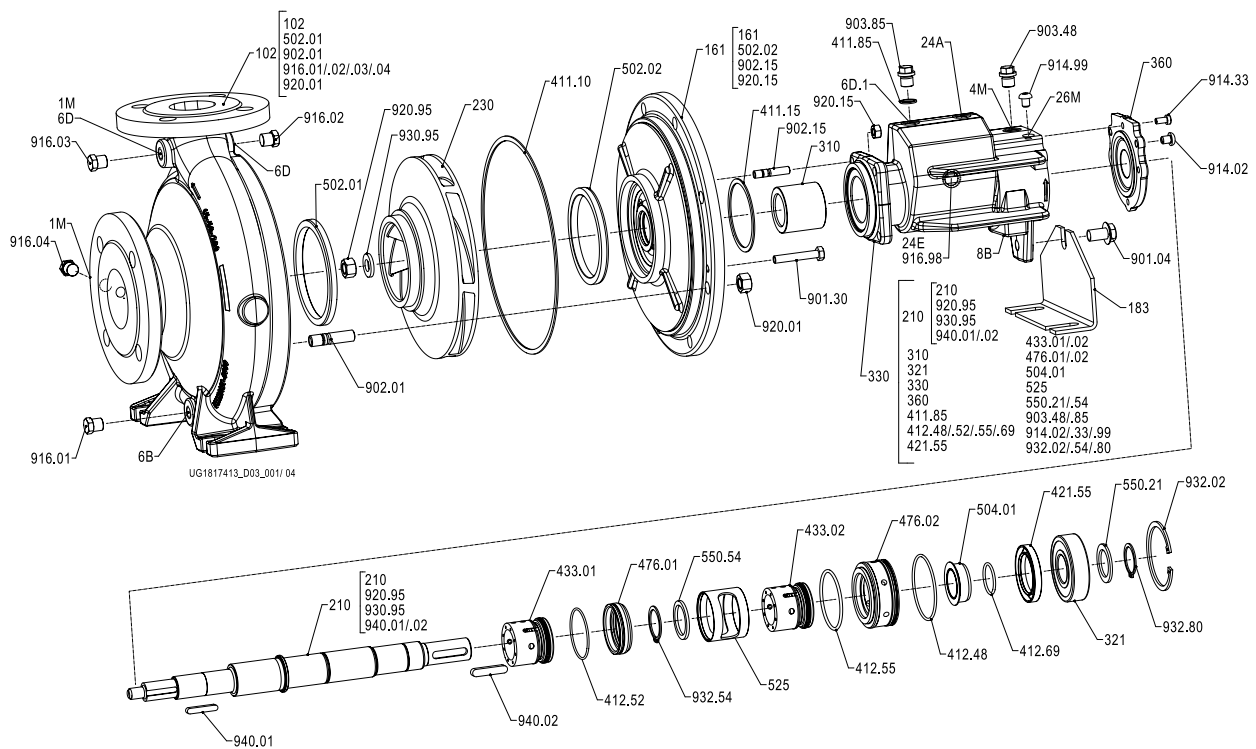


Fig. 29: Exploded view of an Etanorm SYT; bearing bracket WS_25_LS with double mechanical seal (special design)

Table 38: List of components

Part No.	Description	Part No.	Description
102	Volute casing	502.01/.02 ²³⁾	Casing wear ring
161	Casing cover	504.01	Spacer ring
183	Support foot	525	Spacer sleeve
210	Shaft	550.21/.54	Disc
230	Impeller	901.04/.30	Hexagon head bolt
310	Plain bearing	902.01/.15	Stud
321	Radial ball bearing	903.48/.85	Screw plug
330	Bearing bracket	914.02/.33/.99	Hexagon socket head cap screw
360	Bearing cover	916.01/.02/.03/.04/.98	Plug
411.10/.15/.85	Joint ring	920.01/.15/.95	Nut
412.48/.52/.55/.69	O-ring	930.95	Safety device
421.55	Lip seal	932.02/.54/.80	Circlip
433.01/.02	Mechanical seal	940.01/.02	Key
476.01/.02	Mating ring carrier		

²³ 502.02 not fitted on sizes 040-025-160, 050-032-125.1, 050-032-160, 050-032-160.1

9.1.5 Version with bearing brackets WS_35_LS / WS_55_LS

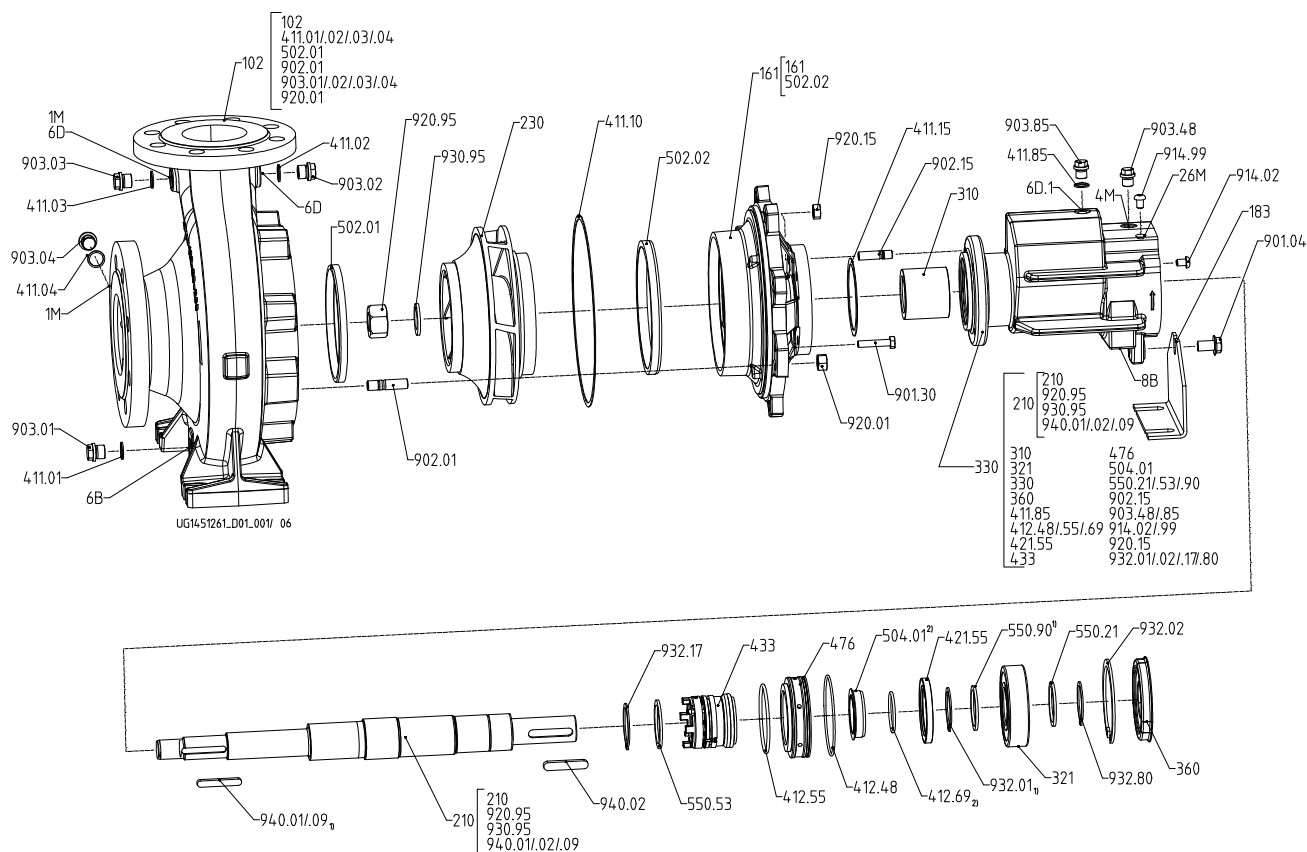


Fig. 30: Exploded view of Etanorm SYT; bearing brackets WS_35_LS / WS_55_LS

¹⁾ For WS 55 only

2) For WS 35 only

Table 39: List of components

Part No.	Description	Part No.	Description
102	Volute casing	476	Mating ring carrier
161	Casing cover	502.01/.02	Casing wear ring
183	Support foot	504.01 ⁽²⁴⁾	Spacer ring
210	Shaft	550.21/.53/.90 ⁽²⁵⁾	Disc
230	Impeller	901.04/.30	Hexagon head bolt
310	Plain bearing	902.01/.15	Stud
321	Radial ball bearing	903.01/.02/.03/.04/.48/.85	Screw plug
330	Bearing bracket	914.02/.99	Hexagon socket head cap screw
360	Bearing cover	920.01/.15/.95	Nut
411.01/.02/.03/.04/.10/.15/.85	Joint ring	930.95	Safety device
412.48/.55/.69	O-ring	932.01 ⁽²⁶⁾ /.02/.17/.80	Circlip
421.55	Lip seal	940.01/.02/.09 ⁽²⁷⁾	Key
433	Mechanical seal		

24 504.01 for bearing bracket WS_35_LS only

25 550.90 for bearing bracket WS 55 LS only

26 932.01 for bearing bracket WS 55 LS only

27 940.09 for bearing bracket WS_55_LS only

9.1.6 Version with bearing brackets WS_35_LS / WS_55_LS (special design)

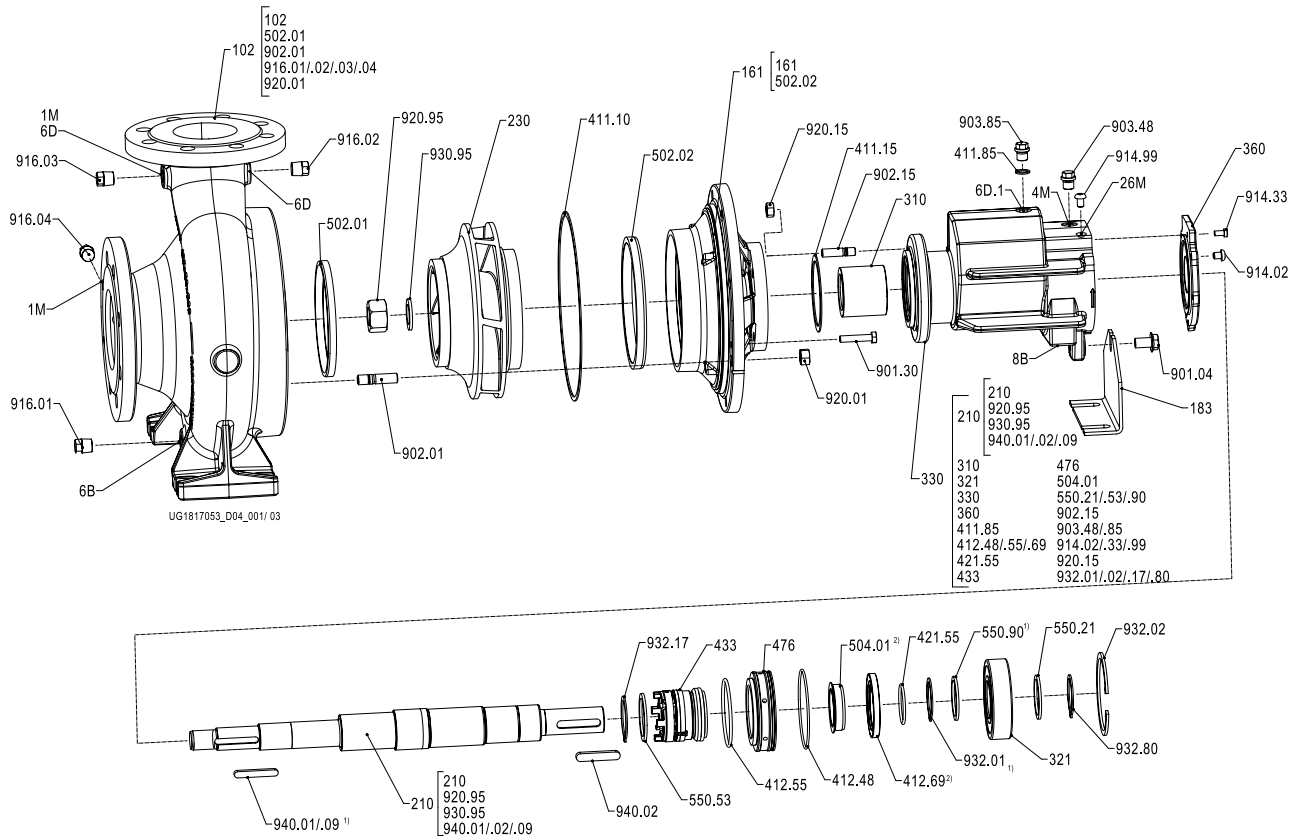


Fig. 31: Exploded view of Etanorm SYT; bearing bracket WS_35_LS / WS_55_LS (special design)

¹⁾WS_55 only

²⁾ WS_35 only

Table 40: List of components

Part No.	Description	Part No.	Description
102	Volute casing	476	Mating ring carrier
161	Casing cover	502.01/.02	Casing wear ring
183	Support foot	504.01 ²⁸⁾	Spacer ring
210	Shaft	550.21/.53/.90 ²⁹⁾	Disc
230	Impeller	901.04/.30	Hexagon head bolt
310	Plain bearing	902.01/.15	Stud
321	Radial ball bearing	903.48/.85	Screw plug
330	Bearing bracket	914.02/.33/.99	Hexagon socket head cap screw
360	Bearing cover	916.01/.02/.03/.04	Plug
411.10/.15/.85	Joint ring	920.01/.15/.95	Nut
412.48/.55/.69	O-ring	930.95	Safety device
421.55	Lip seal	932.01 ³⁰⁾ /.02/.17/.80	Circlip
433	Mechanical seal	940.01/.02/.09 ³¹⁾	Key

28 504.01 for bearing bracket WS_35_LS only

29 550.90 for bearing bracket WS_55_LS only

30 932.01 for bearing bracket WS_55_LS only

31 940.09 for bearing bracket WS_55_LS only

9.1.7 Version with bearing brackets WS_35_LS / WS_55_LS with double mechanical seal

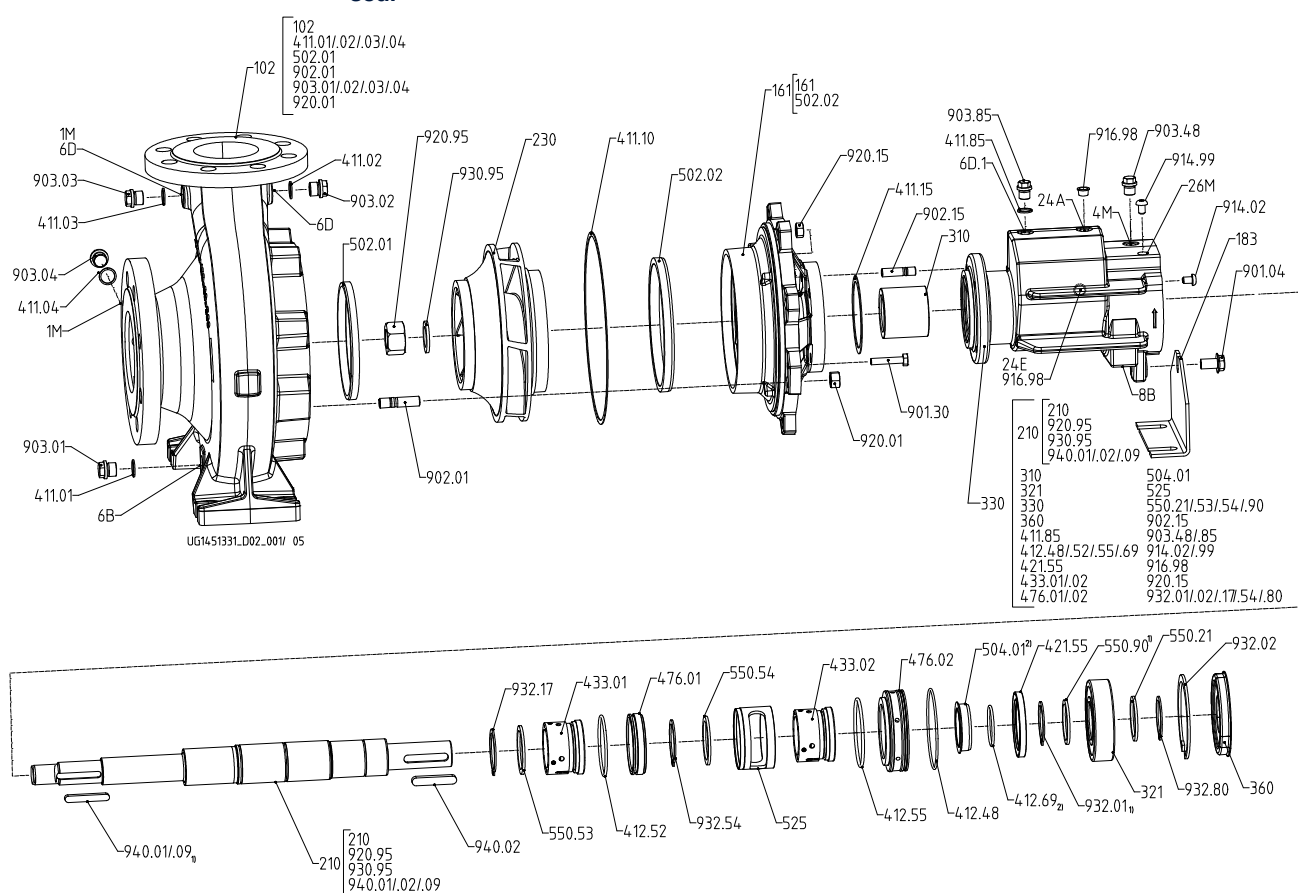


Fig. 32: Exploded view of Etanorm SYT; bearing bracket WS_35_LS / WS_55_LS with double mechanical seal

¹⁾ WS_55 only

²⁾ WS_35 only

Table 41: List of components

Part No.	Description	Part No.	Description
102	Volute casing	502.01/02	Casing wear ring
161	Casing cover	504.01 ³²⁾	Spacer ring
183	Support foot	525	Spacer sleeve
210	Shaft	550.21/53/54/90 ³³⁾	Disc
230	Impeller	901.04/30	Hexagon head bolt
310	Plain bearing	902.01/15	Stud
321	Radial ball bearing	903.01/02/03/04/48/85	Screw plug
330	Bearing bracket	914.02/99	Hexagon socket head cap screw
360	Bearing cover	916.98	Plug
411.01/02/03/04/10/15/85	Joint ring	920.01/15/95	Nut
412.48/52/55/69 ³⁴⁾	O-ring	930.95	Safety device
421.55	Lip seal	932.01 ³⁵⁾ /02/17/54/80	Circlip
433.01/02	Mechanical seal	940.01/02/09 ³⁶⁾	Key
476.01/02	Mating ring carrier		

32 504.01 for bearing bracket WS_35_LS only

33 550.90 for bearing bracket WS_55_LS only

34 412.69 for bearing bracket WS_35_LS only

35 932.01 for bearing bracket WS_55_LS only

36 940.09 for bearing bracket WS_55_LS only

9.1.8 Version with bearing brackets WS_35_LS / WS_55_LS with double mechanical seal (special design)

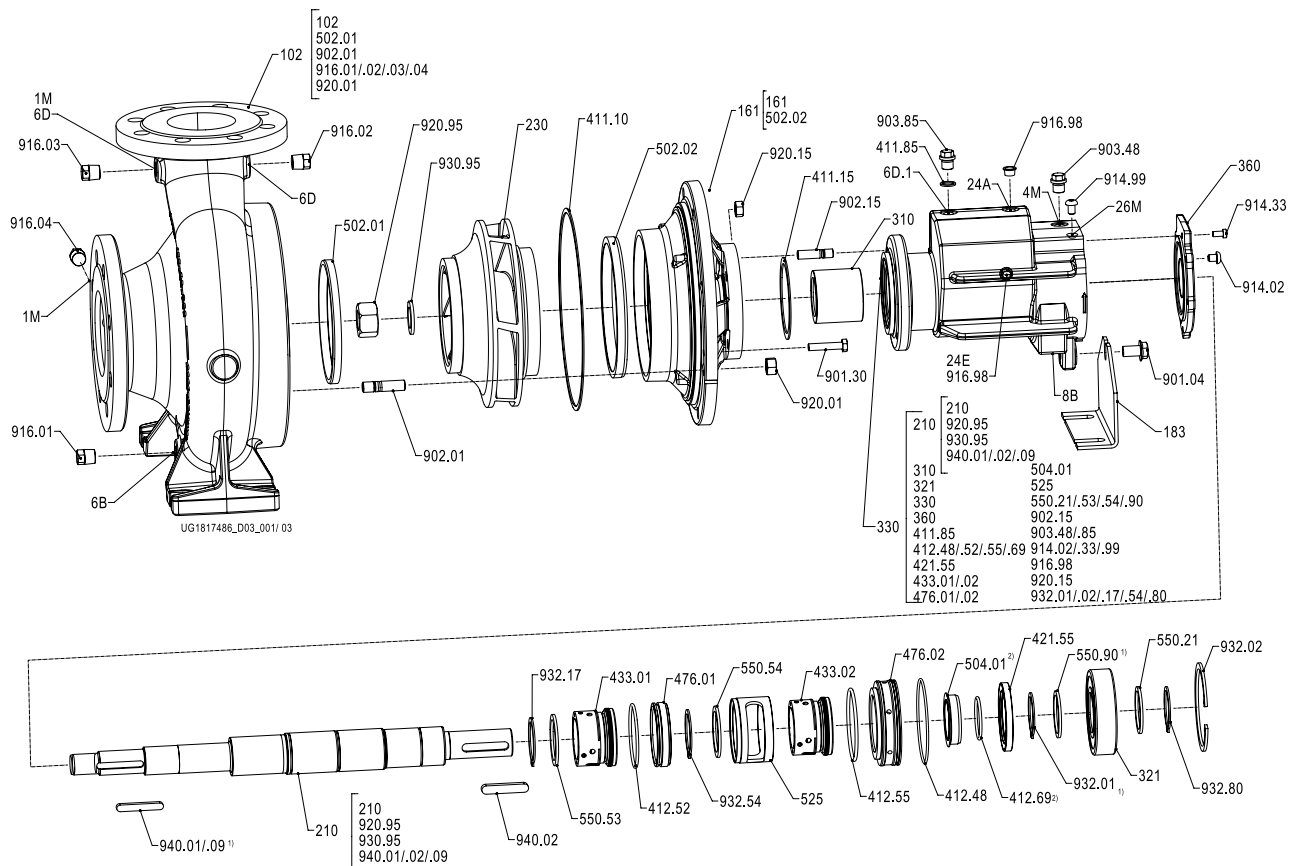


Fig. 33: Exploded view of Etanorm SYT; bearing bracket WS_35_LS / WS_55_LS with double mechanical seal (special design)

¹⁾ For WS_55 only

²⁾ For WS_35 only

Table 42: List of components

Part No.	Description	Part No.	Description
102	Volute casing	502.01/.02	Casing wear ring
161	Casing cover	504.01 ³⁷⁾	Spacer ring
183	Support foot	525	Spacer sleeve
210	Shaft	550.21/.53/.54/.90 ³⁸⁾	Disc
230	Impeller	901.04/.30	Hexagon head bolt
310	Plain bearing	902.01/.15	Stud
321	Radial ball bearing	903.48/.85	Screw plug
330	Bearing bracket	914.02/.33/.99	Hexagon socket head cap screw
360	Bearing cover	916.01/.02/.03/.04/.98	Plug
411.10/.15/.85	Joint ring	920.01/.15/.95	Nut
412.48/.52 ³⁹⁾ /.55/.69	O-ring	930.95	Safety device
421.55	Lip seal	932.01 ⁴⁰⁾ /.02/.17/.54/.80	Circlip

37 504.01 for bearing bracket WS_35_LS only

38 550.90 for bearing bracket WS_55_LS only

39 412.69 for bearing bracket WS_35_LS only

40 932.01 for bearing bracket WS_55_LS only

Part No.	Description	Part No.	Description
433.01/.02	Mechanical seal	940.01/.02/.09 ⁴¹⁾	Key
476.01/.02	Mating ring carrier		

9.1.9 Version with bearing brackets WS_25_LS / WS_55_LS with SiC plain bearing

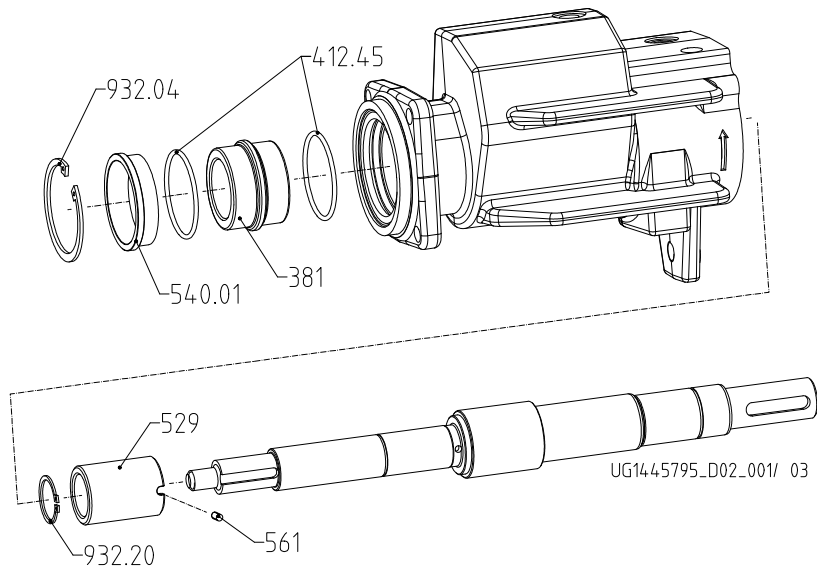


Fig. 34: Exploded view of Etanorm SYT, bearing brackets WS_25_LS / WS_55_LS with SiC plain bearing

Table 43: List of components

Part No.	Description	Part No.	Description
381	Bearing cartridge	540.01	Bush
412.45	O-ring	561	Grooved pin
529	Bearing sleeve	932.04/.20	Circlip

9.1.10 Version with bearing bracket WS_35_LS with SiC plain bearing

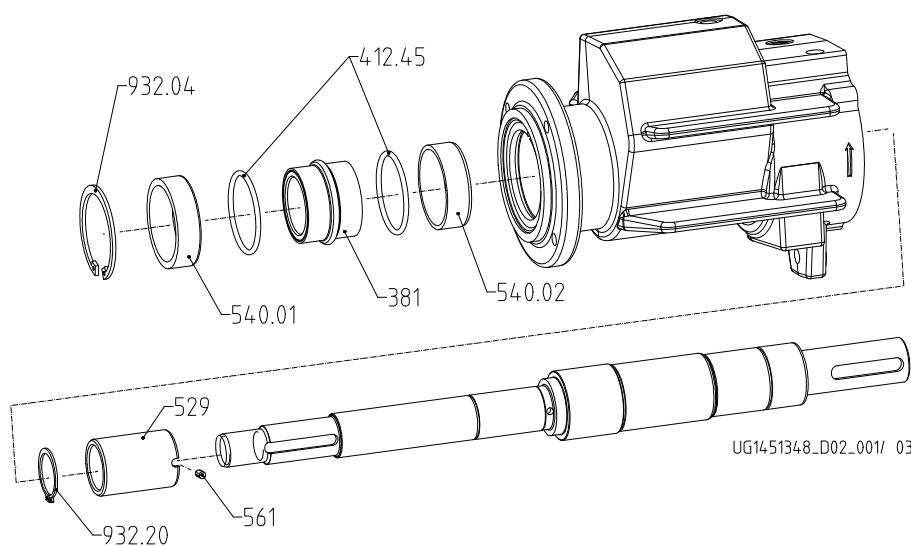


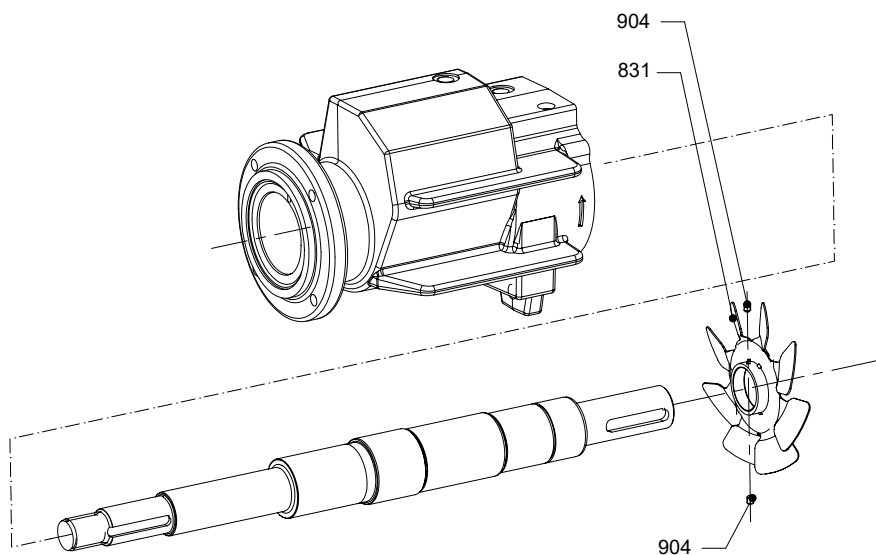
Fig. 35: Exploded view of Etanorm SYT, bearing bracket WS_35_LS with SiC plain bearing

⁴¹ 940.09 for bearing bracket WS_55_LS only

Table 44: List of components

Part No.	Description	Part No.	Description
381	Bearing cartridge	540.01/.02	Bush
412.45	O-ring	561	Grooved pin
529	Bearing sleeve	932.04/.20	Circlip

9.1.11 Etanorm SYT version with fan impeller



UG2223191_D07_001/03

Fig. 36: Exploded view of Etanorm SYT with fan impeller

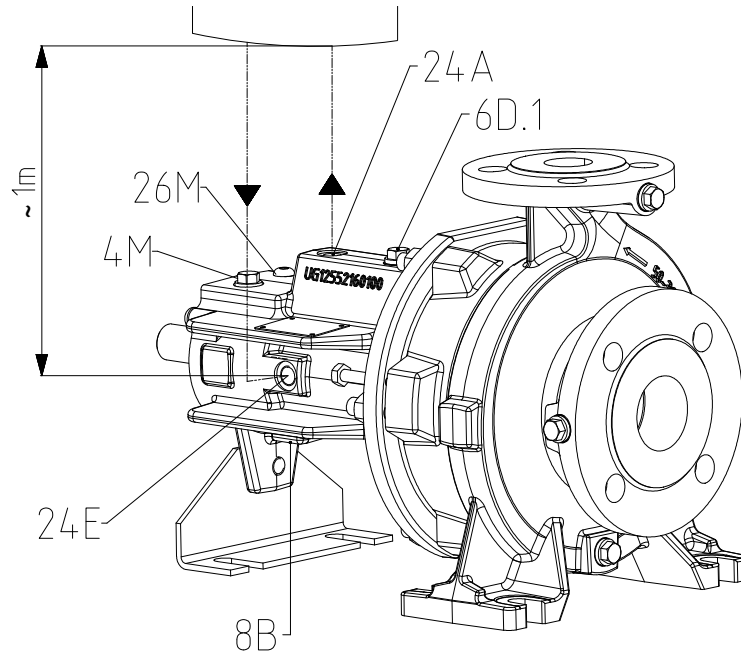
Table 45: List of components

Part No.	Description	Part No.	Description
831	Fan impeller	904 ⁴²⁾	Grub screw

⁴² 904 for bearing bracket WS_25_LS / WS_35_LS (1x), for bearing bracket WS_55_LS (2x)

9.2 Mechanical seal connection examples

9.2.1 Connections for double mechanical seal and monitoring equipment



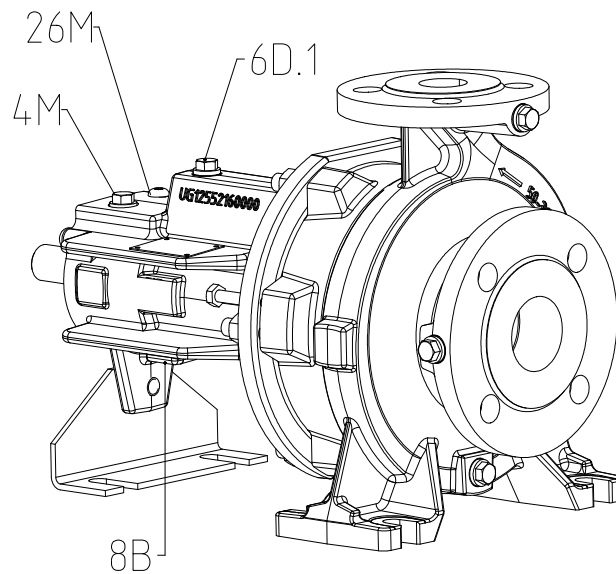
UG1463705_CDK_D01_002 /03

Fig. 37: Connections for double mechanical seal and monitoring equipment

Table 46: Overview

Connection	Design
4M	Temperature measurement
6D.1	Fluid priming and venting
8B	Leakage drain
24A	Quench liquid outlet
24E	Quench liquid inlet
26M	Shock pulse measurement

9.2.2 Connections for single mechanical seal and monitoring equipment



UG1501785_ZDK_002 /03

Fig. 38: Connections for single mechanical seal and monitoring equipment

Table 47: Overview

Connection	Design
4M	Temperature measurement
6D.1	Fluid priming and venting
8B	Leakage drain
26M	Shock pulse measurement

9.3 Spare parts list

	CAUTION
	Use of non-original spare parts Damage to the pump set! Loss of warranty! ► Only use original KSB spare parts. This applies especially to the replacement of the bearing, mechanical seals, static sealing elements and lip seal.

Regions

- A = Europe, Middle East, North Africa
 - A1 = Default material variant
 - A2 = Optional material variant
- B = India
 - B1 = Default material variant
 - B2 = Optional material variant

Table 48: Purchase order specifications for mechanical seal

Mechanical seal	Bearing bracket	KSB Mat. No.	Region
Single mechanical seal	WS_25_LS	01909209	A, B
	WS_35_LS	01888678	A, B
	WS_55_LS	01888678	A, B
Double mechanical seal	WS_25_LS	01909212	A, B
	WS_35_LS	01909211	A, B
	WS_55_LS	01909211	A, B

Table 49: Purchase order specifications for rolling element bearing

Bearing	Bearing bracket	KSB Mat. No.	Region
Rolling element bearing: grease-packed for life (Klüber Asonic HQ 72-102)	WS_25_LS	01718585	A, B
	WS_35_LS	01718586	A, B
	WS_55_LS	01718587	A, B

Table 50: Purchase order specifications for joint ring

Size	Shaft unit	KSB Mat. No. for joint ring		Region	KSB Mat. No. for joint ring		Region
		Volute casing / discharge cover	Discharge cover / bear- ing bracket		Volute casing / discharge cover	Discharge cover / bear- ing bracket	
040-025-160	WS_25_LS	01140539	01185070	A	01236497	01340727	B
040-025-200	WS_25_LS	01140541	01185070	A	01236491	01340727	B
050-032-125.1	WS_25_LS	01140539	01185070	A	01236497	01340727	B
050-032-160.1	WS_25_LS	01140539	01185070	A	01236497	01340727	B
050-032-200.1	WS_25_LS	01140541	01185070	A	01236491	01340727	B
050-032-160	WS_25_LS	01140539	01185070	A	01236497	01340727	B
050-032-200	WS_25_LS	01140541	01185070	A	01236491	01340727	B
050-032-250	WS_25_LS	01140542	01185070	A	01236494	01340727	B
065-040-160	WS_25_LS	01140539	01185070	A	01236497	01340727	B
065-040-200	WS_25_LS	01140541	01185070	A	01236491	01340727	B
065-040-250	WS_25_LS	01140542	01185070	A	01236494	01340727	B
065-040-315	WS_35_LS	01140543	01185071	A	01236493	01375365	B
065-050-160	WS_25_LS	01140539	01185070	A	01236497	01340727	B
065-050-200	WS_25_LS	01140541	01185070	A	01236491	01340727	B

Size	Shaft unit	KSB Mat. No. for joint ring		Region	KSB Mat. No. for joint ring		Region
		Volute casing / discharge cover	Discharge cover / bear- ing bracket		Volute casing / discharge cover	Discharge cover / bear- ing bracket	
065-050-250	WS_25_LS	01140542	01185070	A	01236494	01340727	B
065-050-315	WS_35_LS	01140543	01185071	A	01236493	01375365	B
080-065-160	WS_25_LS	01140539	01185070	A	01236497	01340727	B
080-065-200	WS_25_LS	01140541	01185070	A	01236491	01340727	B
080-065-250	WS_35_LS	01140542	01185071	A	01236494	01375365	B
080-065-315	WS_35_LS	01140543	01185071	A	01236493	01375365	B
100-080-160	WS_25_LS	01140539	01185070	A	01236497	01340727	B
100-080-200	WS_35_LS	01140541	01185071	A	01236491	01375365	B
100-080-250	WS_35_LS	01140542	01185071	A	01236494	01375365	B
100-080-315	WS_35_LS	01140543	01185071	A	01236493	01375365	B
125-100-160	WS_35_LS	01140541	01185071	A	01236491	01375365	B
125-100-200	WS_35_LS	01140541	01185071	A	01236491	01375365	B
125-100-250	WS_35_LS	01140542	01185071	A	01236494	01375365	B
125-100-315	WS_35_LS	01140543	01185071	A	01236493	01375365	B
150-125-200	WS_35_LS	01140541	01185071	A	01236491	01375365	B
150-125-250	WS_35_LS	01140542	01185071	A	01236494	01375365	B
150-125-315	WS_55_LS	01140543	01140538	A	01236493	01375366	B
150-125-400	WS_55_LS	01140544	01140538	A	01236492	01375366	B
200-150-315	WS_55_LS	01140543	01140538	A	01236493	01375366	B
200-150-400	WS_55_LS	01140544	01140538	A	01236492	01375366	B

Table 51: Purchase order specifications for lip seal and grease

Bearing bracket	KSB Mat. No.		Region
	Lip seal	Grease (Klüber Asonic HQ 72-102)	
WS_25_LS	01193174	01719747	A, B
WS_35_LS	01654740	01719747	A, B
WS_55_LS	00143831	01719747	A, B

10 EU Declaration of Conformity

Manufacturer:

KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

The manufacturer herewith declares that **the product**:

Etabloc, Etabloc SYT, Etaline, Etaline SYT, Etaline Z, Etachrom B, Etachrom L, Etanorm, Etanorm SYT, Etanorm V, Etaprime L, Etaprime B

KSB order number:

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

The manufacturer also declares that

- the following harmonized international standards⁴³⁾ have been applied:
 - ISO 12100
 - EN 809

Responsible for compiling the technical documentation

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

The EU Declaration of Conformity was issued in/on:

Place, Date

.....⁴⁴⁾.....

Name
Function
Company
Address

⁴³ Apart from the standards listed here referring to the Machinery Directive, further standards are observed for explosion-proof versions (ATEX Directive) as applicable and are listed in the legally binding EU Declaration of Conformity.

⁴⁴ A signed, legally binding EU Declaration of Conformity is supplied with the product.

11 Certificate of Decontamination

Type:

Order number/

Order item number⁴⁵⁾:

Delivery date:

Field of application:

Fluid handled⁴⁵⁾:

Please check where applicable⁴⁵⁾:


☐

Corrosive


☐

Oxidizing


☐

Flammable


☐

Explosive


☐

Hazardous to health


☐

Seriously hazardous to health


☐

Toxic


☐

Radioactive


☐

Hazardous to the environment


☐

Safe

Reason for return⁴⁵⁾:

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.

For mag-drive pumps, the inner rotor unit (impeller, casing cover, bearing ring carrier, plain bearing, inner rotor) has been removed from the pump and cleaned. In cases of leakage at the stator can, the stator space has been examined for fluid leakage; if fluid handled has penetrated the stator space, it has been removed.

For canned motor pumps, the rotor and plain bearing have been removed from the pump for cleaning. In cases of leakage at the stator can, the stator space has been examined for fluid leakage; if fluid handled has penetrated the stator space, it has been removed.

- ☐ 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 shipping is effected in accordance with the relevant legal provisions.

.....

Place, date and signature

.....

Address

.....

Company stamp

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