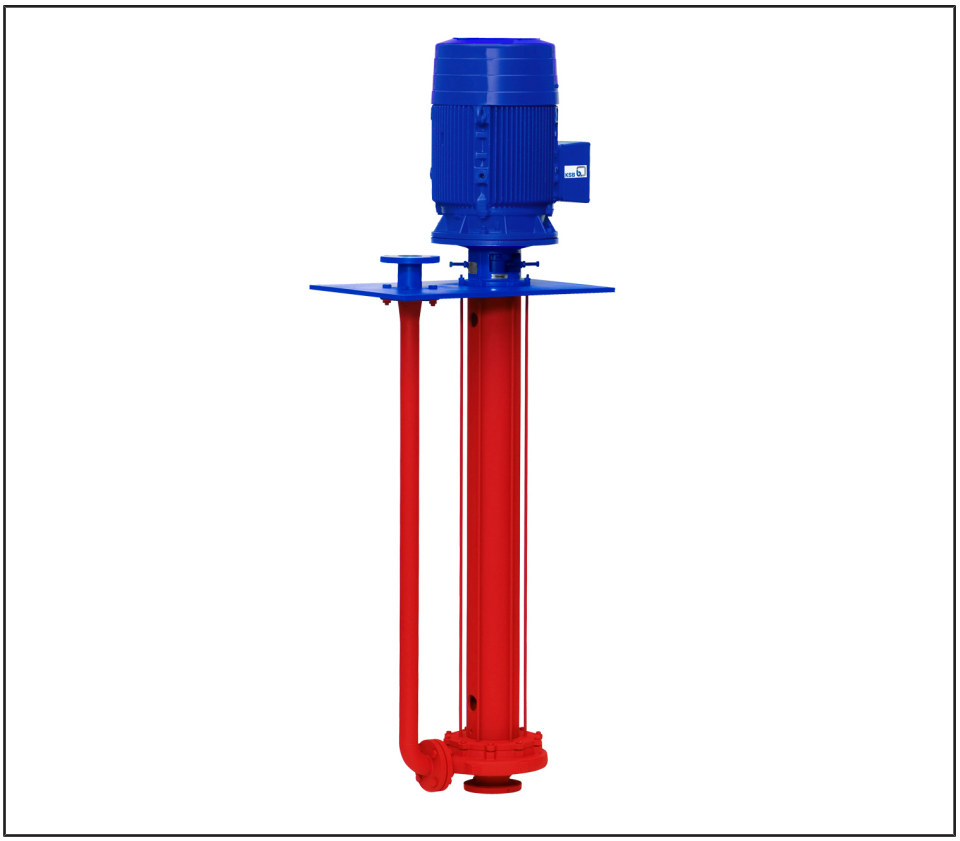
Vertical Low-pressure Pump

Etanorm V

Design W

Operating Manual



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Operating Manual Etanorm V

Original operating manual

Contents

Glossary

Certificate of decontamination

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

Discharge line

The 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

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

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

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

Noise characteristics see (⇨ Section 4.6, Page 18)

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 2.4, Page 9)

1.4 Other applicable documents

Table 1: Overview of other applicable documents

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

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

1.5 Symbols

Table 2: Symbols used in this manual

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

1) If agreed upon in scope of supply

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

2 Safety

DANGER

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

2.1 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
DANGER	**DANGER** This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
WARNING	**WARNING** This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
CAUTION	**CAUTION** This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	**General hazard** In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	**Electrical hazard** In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	**Machine damage** In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

2.2 General

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

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

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

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

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

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

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

2.3 Intended use

- The product must not be used in potentially explosive atmospheres.
- The pump (set) must only be operated within the operating limits described in the other applicable documents. (⇨ Section 1.4, Page 6)
- Only operate pumps/pump sets which are in perfect technical condition.
- Do not operate the pump (set) in partially assembled condition.
- Only use the pump to handle the fluids described in the data sheet or product literature of the pump model or variant.
- Never operate the pump without the fluid to be handled.
- Observe the minimum flow rates indicated in the data sheet or product literature (to prevent overheating, bearing damage, etc).
- Observe the maximum flow rates indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage, etc).
- Do not throttle the flow rate on the suction side of the pump (to prevent cavitation damage).
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.

Prevention of foreseeable misuse

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

2.4 Personnel qualification and training

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

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

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

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

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

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

2.6 Safety awareness

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

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

2.7 Safety information for the operator/user

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

2.8 Safety information for maintenance, inspection and installation

- Modifications or alterations of the pump are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts authorised by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- The pump casing must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the pump set out of service always adhere to the procedure described in the manual. (⇨ Section 6.3, Page 32)
- Decontaminate pumps which handle fluids posing a health hazard.
- As soon as the work has been completed, re-install and/or re-activate any safety-relevant and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇨ Section 6.1, Page 29)

2.9 Unauthorised modes of operation

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

The warranty relating to the operating reliability and safety of the supplied pump (set) is only valid if the equipment is used in accordance with its intended use.
(⇨ Section 2.3, Page 9)

3 Transport/Temporary Storage/Disposal

3.1 Checking the condition upon delivery

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

3.2 Transport

DANGER

The pump (set) could slip out of the suspension arrangement

Danger to life from falling parts!

- Always transport the pump (set) in the specified position.
- Never attach the suspension arrangement to the free shaft end or the motor eyebolt.
- Give due attention to the weight data and the centre of gravity.
- Observe the applicable local health and safety regulations.
- Use suitable, permitted lifting accessories, e.g. self-tightening lifting tongs.

CAUTION

Improper pump transport

Damage to the bearings!

- Use a suitable transport lock to prevent axial movement of the pump shaft during transport.

CAUTION

Incorrect transport of the pump set

Damage to the tie bolts.

- Do not attach any ropes in the area of the tie bolts 905.
- Do not place or support the pump set on tie bolts 905.

When transporting the pump without motor, shaft 210 must be locked with hexagon head bolt 901.57 and nut 920.75.

To transport the pump/pump set suspend it from the lifting tackle as shown.

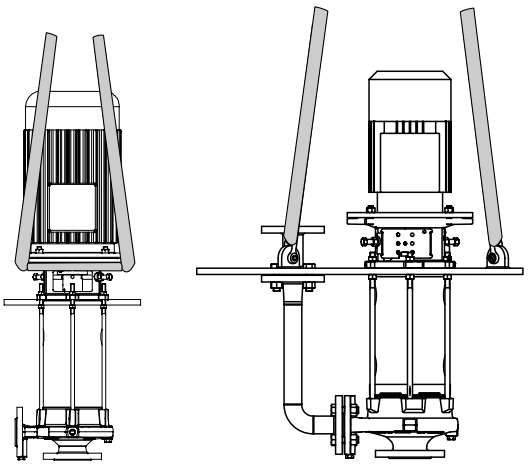


Fig. 1: Transporting the pump set without/with cover plate up to motor size 160

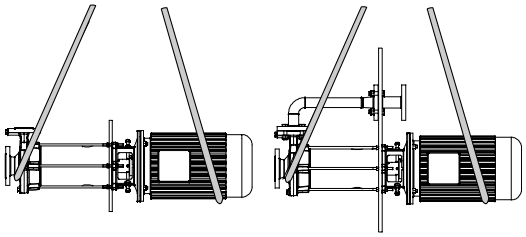


Fig. 2: Transporting the pump set without/with cover plate up to motor size 160 for larger installation depths

NOTE

For pump sets with motors of size 180 or larger the pump and motor are supplied separately as the motor weighs more than the pump. The motor is mounted on site. If required, screw eyebolts for attaching the lifting gear into the threaded holes of the lantern.

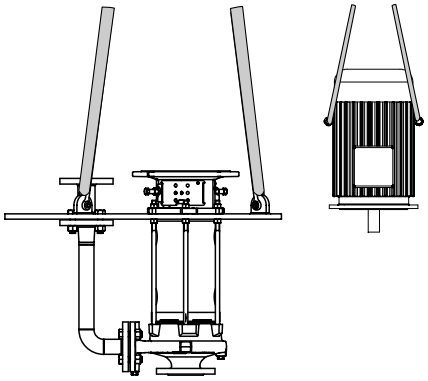


Fig. 3: For motor size 180 and above, pump and motor are transported separately

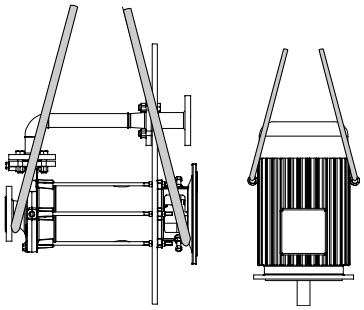


Fig. 4: For motor size 180 and above for larger installation depths, pump and motor are transported separately

3.3 Storage/preservation

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

CAUTION

Damage during storage due to humidity, dirt, or vermin

Corrosion/contamination of the pump (set)!

- ▷ For outdoor storage cover the packed or unpacked 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.

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

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

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

For storing a pump (set) which has already been operated, the shutdown measures must be adhered to. (⇨ Section 6.3.1, Page 32)

3.4 Return to supplier

1. Drain the pump as per operating instructions. (⇨ Section 7.3, Page 35)
2. Always flush and clean the pump, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pump set has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pump set must also be neutralised, and anhydrous inert gas must be blown through the pump to ensure drying.
4. Always complete and enclose a certificate of decontamination when returning the pump (set).
   Always indicate any safety and decontamination measures taken.
   (⇨ Section 11, Page 56)

NOTE

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

3.5 Disposal

⚠ WARNING

Fluids, consumables and supplies which are hot and/or pose a health hazard

Hazard to persons and the environment!

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

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

4 Description of the Pump (Set)

4.1 General description

- Vertical low-pressure centrifugal pump

Pump for handling clean or aggressive fluids which are neither chemically nor mechanically aggressive to the pump materials.

4.2 Designation

Example: Etanorm V 050-032-125.1 GG X DDB0422

Table 4: Designation key

Code	Description	
Etanorm V	Type series	
050	Nominal suction nozzle diameter [mm]	
032	Nominal discharge nozzle diameter [mm]	
125.1	Nominal impeller diameter [mm]	
G	Casing material	
	G	Cast iron
G	Impeller material	
	G	Cast iron
X	Special design	
	X	Non-standard
D	Design	
	D	Dry
	W	Wet
D	Scope of supply	
	D	Pump set
B	Cover plate	
	B	With cover plate
042	Immersion depth	
	042	425 mm
2	Shaft unit	
	2	Shaft unit WS 25

4.3 Name plate

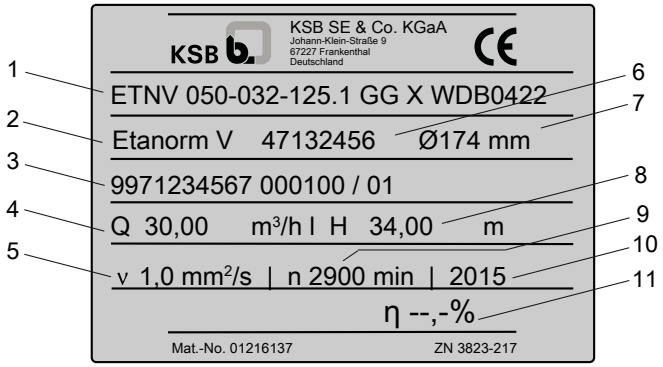


Fig. 5: Name plate (example) Etanorm V - design W

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)		

4.4 Design details

Design

- Volute casing pump
  - For vertical installation in closed tanks under atmospheric pressure
- Single-stage
- Ratings to EN 733
- Rigid connection between pump and motor

Pump casing

- Radially split volute casing
- Volute casing with integrally cast pump feet for:
  - Stainless steel variant
  - Grey cast iron variant with shaft unit WS 55
- Replaceable casing wear rings

Impeller type

- Closed radial impeller with multiply curved vanes

Shaft seal

- Controlled gap

Drive

- KSB surface-cooled IEC frame three-phase current squirrel-cage motor

Winding

- 50 Hz: ≤ 2.20 kW at 220-240 V / 380-420 V
- 50 Hz: ≥ 3.00 kW at 380-420 V / 660-725 V
- 60 Hz: ≤ 2.60 kW at 440-480 V
- 60 Hz: ≤ 3.60 kW at 440-480 V
- Type of construction IM V1
- IP55 enclosure
- Thermal class F with temperature sensor, 3 PTC thermistors
- Duty cycle: continuous duty S1

Contact guard

- Cover plates at bearing lantern[2)] and drive lantern[3)] to EN 294

Bearings

Design D

- Deep groove ball bearing greased for life in a bearing bracket lantern above the cover plate.
  Pump shaft cantilevered below the cover plate.

2) Design D
3) Design W

Design W

- Product-lubricated SiC/SiC plain bearing at the pump end
  Rigid coupling between pump shaft and motor shaft

Bearings used

Table 5: Overview

Shaft unit	Deep groove ball bearing	
	Pump end	Drive end
WS_25	6311 2Z C3	6310 2Z C3
WS_35	6311 2Z C3	6310 2Z C3
WS_55	6413 C3[4)]	6311 2Z C3

Table 6: Overview of shaft units

Nominal diameter		Nominal impeller diameter					
[mm]		[mm]					
DN_1	DN_2	125	160	200	250	315	400
50	32	WS_25	WS_25	WS_25	WS_25	WS_35	-
65	40	WS_25	WS_25	WS_25	WS_25	WS_35	-
65	50	WS_25	WS_25	WS_25	WS_25	WS_35	-
80	65	WS_25	WS_25	WS_25	WS_35	WS_35	WS_55
100	80	-	WS_25	WS_35	WS_35	WS_35	WS_55
125	100	-	WS_35	WS_35	WS_35	WS_35	WS_55
150	125	-	-	WS_35	-	WS_55	WS_55
200	150	-	-	WS_35	-	WS_55	WS_55

4) With Nilos ring AV 6413

4.5 Design and function

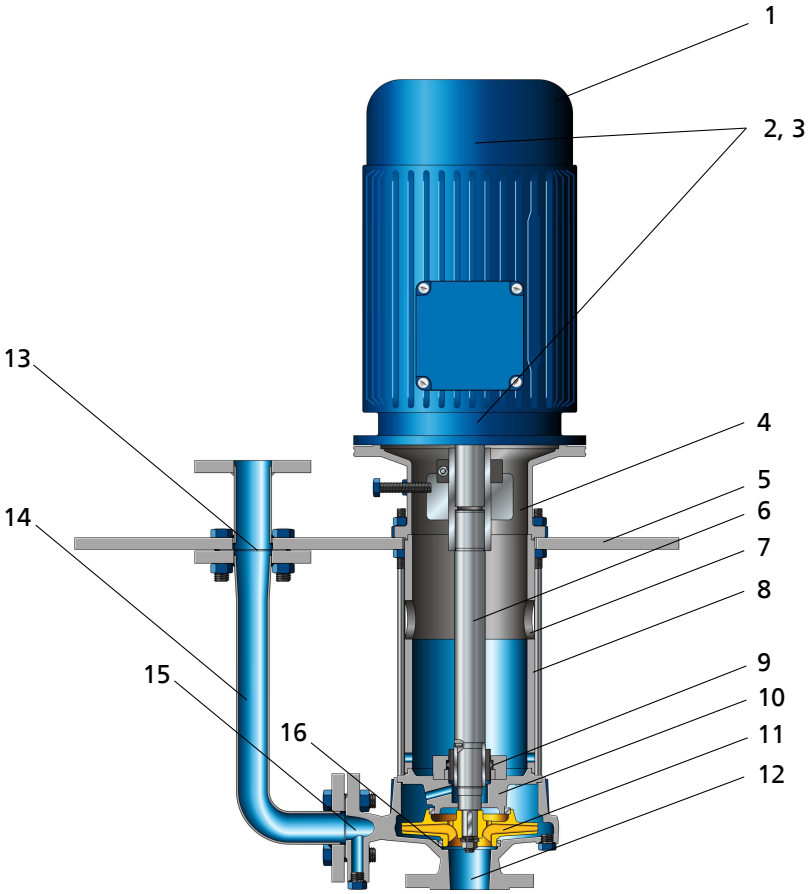


Fig. 6: Sectional drawing

1	Motor housing	2, 3	Rolling element bearings
4	Drive lantern	5	Cover plate
6	Shaft	7	Overflow opening
8	Support column	9	Shaft passage
10	Casing cover	11	Impeller
12	Suction nozzle	13	Discharge nozzle
14	Riser	15	Volute casing
16	Clearance gap		

Design The pump is designed with an axial fluid inlet and a radial outlet. The hydraulic system is rigidly connected to the motor via a stub shaft and runs in a product-lubricated SIC/SIC plain bearing on the impeller side, which compensates any lateral movement or deflection of the shaft. Thanks to the graded lengths of support column (8) and shaft (6) the pump set can be matched to various immersion depths. The pump set is mounted on a cover plate (5). The discharge nozzle of the volute casing (15) is connected with the discharge nozzle (13) of the cover plate via a riser (14). If on request the pump set is supplied without cover plate and riser, it is supplied with a bracket.

Function The fluid enters the pump via the suction nozzle (12) and is accelerated outward by the rotating impeller (11). 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 (15), where it leaves the pump. The clearance gap (16) prevents any fluid from flowing back from the casing to the suction nozzle. At the rear side of the impeller, the shaft (6) enters the hydraulic system through the casing cover (10). The shaft runs in rolling element bearings (2 and 3), which are supported by a motor housing (1) linked with the pump casing and/or casing cover (10) via the support column (8) and the drive lantern (4).

Sealing The pump is seal-less with little leakage flowing into the support column (8) at the shaft passage (9) and then through the overflow opening (7) back to the tank.

4.6 Noise characteristics

Table 7: Surface sound pressure level L_{pA} [5)]

Rated power input P_N [kW]	Pump set	
	1450 rpm [dB]	2900 rpm [dB]
2.2	59	67
3.0	60	68
4.0	61	68
5.5	62	70
7.5	64	71
11.0	65	73
15.0	67	74
18.5	68	75
22.0	69	76
30.0	70	77
37.0	71	78
45.0	73	78
55.0	74	79
75.0	75	80
90.0	76	81

In wet installation, the pump itself does not contribute to sound emission levels.

4.7 Scope of supply

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

- Pump
- Drive
- Cover plate
- Discharge pipe

4.8 Pump size / shaft unit combinations

Table 8: Sizes with shaft unit WS 25

Size	Casing cover design	
	Clamped	Bolted
050-032-125.1	✘	-
050-032-160.1	✘	-
050-032-200.1	-	✘
050-032-250.1	-	✘
050-032-125	✘	-
050-032-160	✘	-
050-032-200	-	✘
050-032-250	-	✘
065-040-125	✘	-
065-040-160	✘	-
065-040-200	-	✘
065-040-250	-	✘
065-050-125	✘	-
065-050-160	✘	-

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

Size	Casing cover design	
	Clamped	Bolted
065-050-200	-	✗
065-050-250	-	✗
080-065-125	✗	-
080-065-160	✗	-
080-065-200	-	✗
100-080-160	✗	-

Table 9: Sizes with shaft unit WS 35

Size	Casing cover design	
	Clamped	Bolted
065-040-315	-	✗
065-050-315	-	✗
080-065-250	-	✗
080-065-315	-	✗
100-080-200	✗	-
100-080-250	-	✗
100-080-315	-	✗
125-100-160	✗	-
125-100-200	✗	-
125-100-250	-	✗
125-100-315	-	✗
150-125-200	✗	-
150-125-250	-	✗
200-150-200	✗	-
200-150-250	-	✗

Table 10: Sizes with shaft unit WS 55

Size	Casing cover design	
	Clamped	Bolted
100-080-400	-	✗
125-100-400	-	✗
150-125-315	✗	-
150-125-400	-	✗
200-150-315	✗	-
200-150-400	-	✗

4.9 Dimensions and weights

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

5 Installation at Site

5.1 Safety regulations

DANGER

Installing electric equipment (motors) in potentially explosive atmospheres

Risk of explosion!

- Comply with the applicable local explosion protection regulations.
- Verify the test certificate of the motor.
- Keep the test certificate close to the location of operation (e.g. in the foreman's office).

5.2 Checks to be carried out prior to installation

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

5.3 Installing the pump set

Foundation

The sturdy cover plate 68-3.01 serves as a foundation on which the pump set is fastened. This cover plate covers the tank opening completely. If the pump set is supplied with cover plate and riser, the cover plate is supported by a sectional steel frame provided on the tank.

If ordered without cover plate and riser, the pump set is supplied with a bolted-on bracket 732. This bracket serves to mount the pump set on the tank.

If pump and motor are delivered separately, transport and installation can be facilitated by screwing eyebolts into the threaded holes in the lantern for attaching support ropes.

Installing the pump

1. Carefully align the support frame.
2. Align the base of the bracket.
3. Align the upper flange of the drive lantern with a spirit level.
4. Make adjustments between cover plate and tank edge, if required.
   If the pump is installed without suction strainer, observe a minimum distance B to the tank floor.

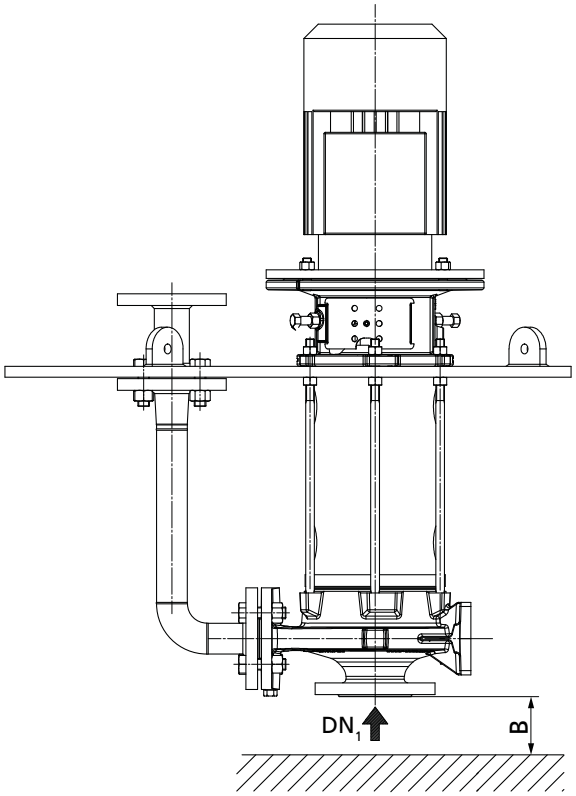


Fig. 7: Distance from the floor

Table 11: Distance from the floor in [mm]

DN_1	B
50	≥80
65	≥80
80	≥100
100	≥100
125	≥100
150	≥150
200	≥150

Mounting the motor

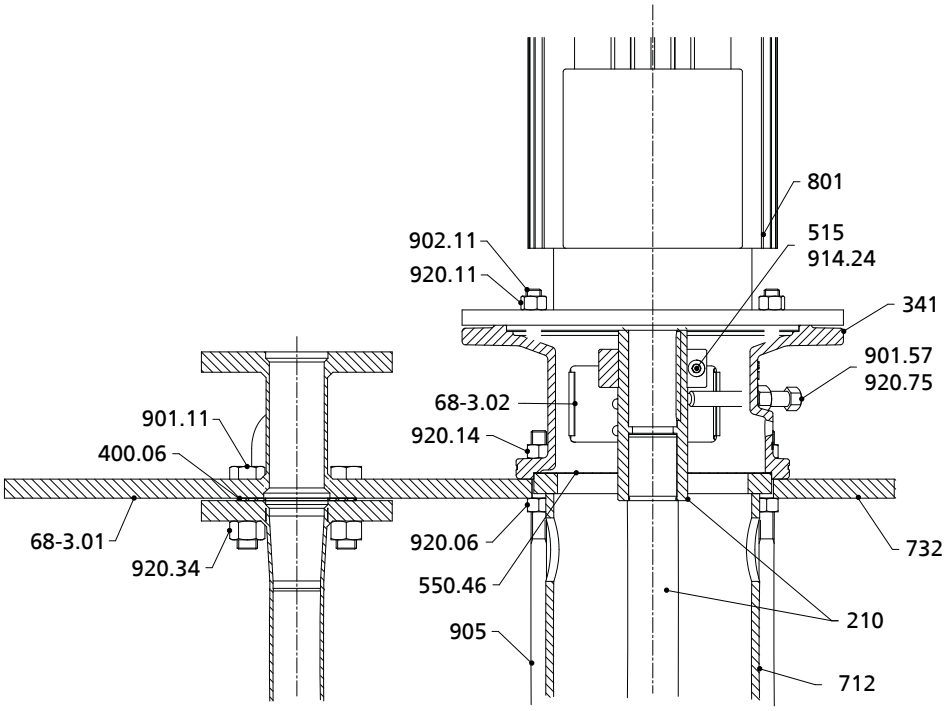


Fig. 8: Fastening the pump with motor

- ✓ Shaft 210 is locked in drive lantern 341 with two bolts 901.57.
- ✓ Locking ring 515 has been loosened and can easily be moved on the coupling shaft.
- ✓ Screw 914.24 has been loosened if necessary.
- ✓ The shaft of electric motor 801 and the coupling bore of shaft 210 have been checked for rust and deposits or deformations caused during transport; remedial action has been taken as required.

1. Insert the motor shaft into the coupling bore of shaft 210.
2. Fit the motor flange in drive lantern 341 and fasten it with studs 902.11 and hexagon nuts 920.11.
   The axial position is correct when shaft 210 and the motor shaft have been assembled in the position they are closest to each other. This is the case when the motor shaft end abuts the coupling inside the coupling sleeve.

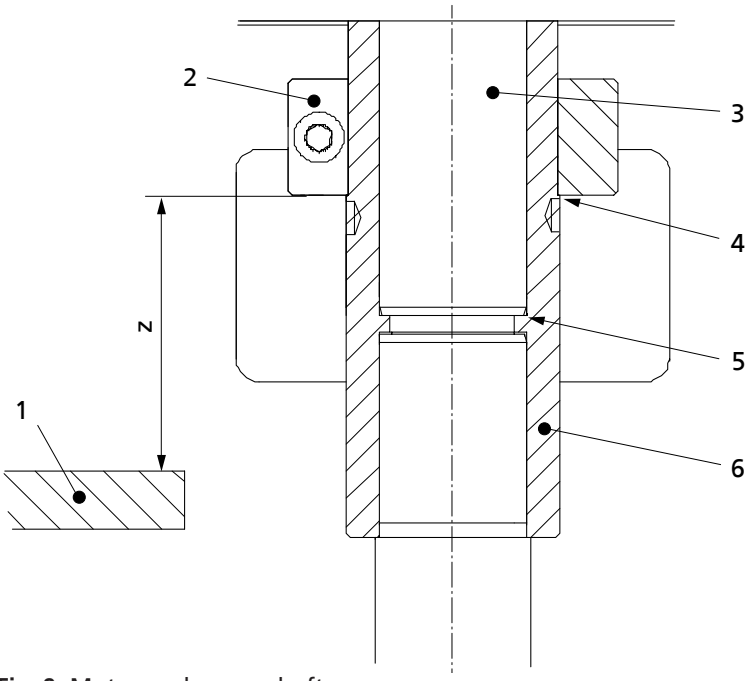


Fig. 9: Motor and pump shafts

1	Cover plate 68-3.01 / bracket 732	2	Locking ring 515
3	Motor shaft end	4	Stop / end position locking ring with coupling
5	Stop / end position motor shaft with coupling	6	Shaft 210 with coupling sleeve
z	Reference dimension		

3. Verify the axial position of the motor shaft end and pump coupling by measuring the reference dimension z (see Fig. "Motor and pump shafts") and comparing it against the value given in the table "Reference dimension z". This is based on the condition that locking ring 515 abuts the externally visible stop/ end position of the locking ring with coupling.

Table 12: Reference dimension z [mm]

Shaft unit	IEC size									
	100/112	132	160/180	200	225		250		280	
					2 poles	4 poles	2 poles	4 poles	2 poles	4 poles
WS_25	64	72	83	83	-	-	-	-	-	-
WS_35	61	69	80	80	111	103	115	115	115	-
WS_55	-	-	80	80	-	103	-	115	-	115

4. If the reference dimension z does not match the value indicated, shaft 210 must be re-aligned. To do so, position and support the pump set with its shaft in a horizontal position and move the shaft end through the suction nozzle in the direction of motor 801. If required, repeat step 3 (verifying the axial position of the motor shaft end and pump coupling).

CAUTION

Incorrect assembly

Damage to the motor!

- ▷ Never move the shaft by using lever and spindle type tools (universal pullers).

5. Check the position of the slot of locking ring 515.
Make sure that the slot of locking ring 515 is above and aligned with the shaft/ coupling slot (see Fig. "Position of the locking ring").

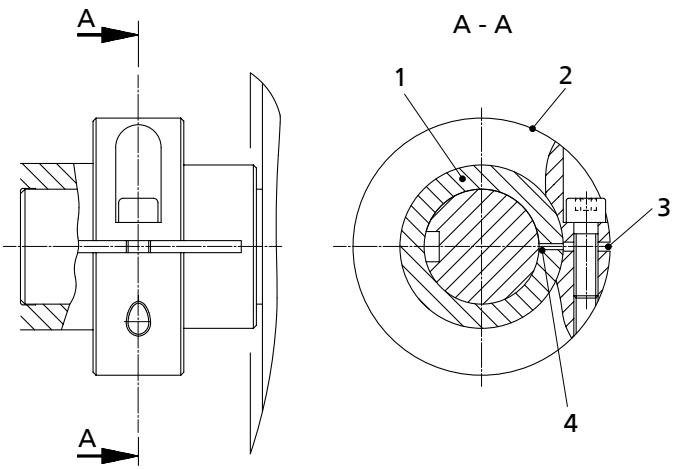


Fig. 10: Position of the locking ring

1	Coupling sleeve	2	Locking ring 515
3	Slot of the locking ring	4	Slot of the coupling sleeve

6. Tighten screw 914.24 of locking ring 515. (⇨ Section 7.6.1, Page 41)
7. Loosen nuts 920.75 of bolts 901.57. Unscrew the bolts until they protrude approximately 15 mm from the lantern, allowing the coupling of shaft 210 to rotate freely.
8. Secure bolts 901.57 with nuts 920.75.
9. Check that shaft 210 functions properly.
   Check that shaft 210 can easily be rotated by hand.

5.4 Piping

5.4.1 Connecting the piping

DANGER

Excessive 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 without transmitting any stresses or strains.
- ▹ Take appropriate measures to compensate thermal expansion of the piping.

CAUTION

Incorrect earthing during welding work at the piping

Destruction of rolling element bearings (pitting effect)!

- ▹ Never earth the electric welding equipment on the pump or baseplate.
- ▹ Prevent current flowing through the rolling element bearings.

NOTE

Installing check and shut-off elements in the system is recommended, depending on the type of plant and pump. However, such elements must not obstruct proper drainage or hinder disassembly of the pump.

- ✓ The nominal diameters of the pipelines are equal to or greater than the nominal diameters of the pump nozzles.
- ✓ To prevent excessive pressure losses, adapters to larger diameters have a diffuser angle of approx. 8°.
- ✓ The pipeline is anchored in close proximity to the discharge flange and connected without transmitting any stresses or strains. Its weight must not be carried by the pump discharge flange.

1. Thoroughly clean, flush and blow through all vessels, pipelines and connections (especially of new installations).

5.4.2 Permissible forces and moments at the pump nozzles

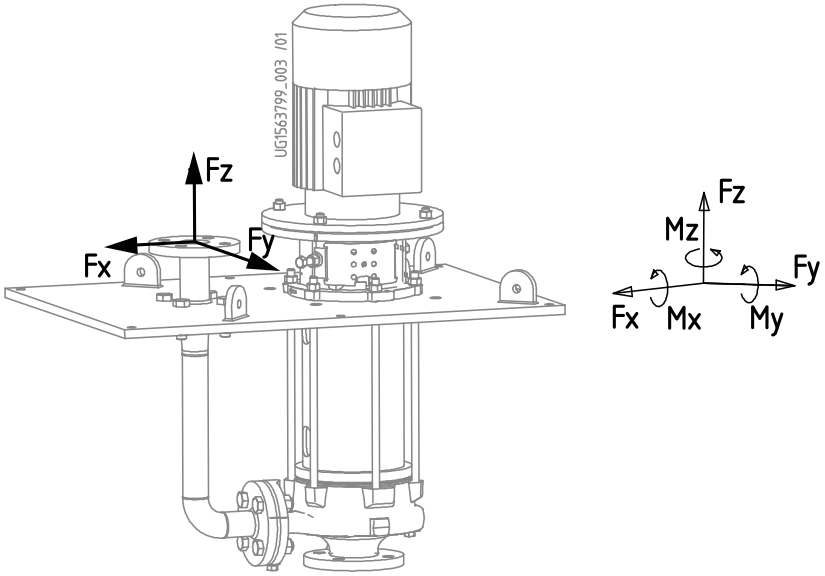


Fig. 11: Forces and moments at the pump nozzles

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 foundation.

Table 13: Forces and moments at the pump nozzles

Size	Suction nozzle / discharge nozzle							
	DN_3	F_x	F_y	F_z	ΣF	M_x	M_y	M_z
		[N]	[N]	[N]	[N]	[Nm]	[Nm]	[Nm]
050-032-125.1	40	780	640	1000	1421	500	280	415
050-032-160.1	40	780	640	1000	1421	500	280	415
050-032-200.1	40	780	640	1000	1421	500	280	415
050-032-250.1	40	780	640	1000	1421	500	280	415
050-032-125	40	780	640	1000	1421	500	280	415
050-032-160	40	780	640	1000	1421	500	280	415
050-032-200	40	780	640	1000	1421	500	280	415
050-032-250	40	780	640	1000	1421	500	280	415
065-040-125	50	1000	830	1250	1803	650	320	500
065-040-160	50	1000	830	1250	1803	650	320	500
065-040-200	50	1000	830	1250	1803	650	320	500

Size	Suction nozzle / discharge nozzle							
	DN_3	F_x	F_y	F_z	ΣF	M_x	M_y	M_z
		[N]	[N]	[N]	[N]	[Nm]	[Nm]	[Nm]
065-040-250	50	1000	830	1250	1803	650	320	500
065-040-315	50	1000	830	1250	1803	650	320	500
065-050-125	65	1300	1050	1600	2314	1050	550	790
065-050-160	65	1300	1050	1600	2314	1050	550	790
065-050-200	65	1300	1050	1600	2314	1050	550	790
065-050-250	65	1300	1050	1600	2314	1050	550	790
065-050-315	65	1300	1050	1600	2314	1050	550	790
080-065-125	80	1550	1300	1950	2810	1350	690	1000
080-065-160	80	1550	1300	1950	2810	1350	690	1000
080-065-200	80	1550	1300	1950	2810	1350	690	1000
080-065-250	80	1550	1300	1950	2810	1350	690	1000
080-065-315	80	1550	1300	1950	2810	1350	690	1000
100-080-160	100	2000	1600	2500	3579	1850	900	1400
100-080-200	100	2000	1600	2500	3579	1850	900	1400
100-080-250	100	2000	1600	2500	3579	1850	900	1400
100-080-315	100	2000	1600	2500	3579	1850	900	1400
100-080-400	100	2000	1600	2500	3579	1850	900	1400
125-100-160	125	2700	2200	3400	4867	2550	1300	1900
125-100-200	125	2700	2200	3400	4867	2550	1300	1900
125-100-250	125	2700	2200	3400	4867	2550	1300	1900
125-100-315	125	2700	2200	3400	4867	2550	1300	1900
125-100-400	125	2700	2200	3400	4867	2550	1300	1900
150-125-200	150	3450	2850	4300	6206	3150	1600	2450
150-125-250	150	3450	2850	4300	6206	3150	1600	2450
150-125-315	150	3450	2850	4300	6206	3150	1600	2450
150-125-400	150	3450	2850	4300	6206	3150	1600	2450
200-150-200	200	5250	4300	6750	9572	4850	2450	3550
200-150-250	200	5250	4300	6750	9572	4850	2450	3550
200-150-315	200	5250	4300	6750	9572	4850	2450	3550
200-150-400	200	5250	4300	6750	9572	4850	2450	3550

5.5 Electrical connection

DANGER

Electrical connection work by unqualified personnel

Risk of fatal injury due to electric shock!

- ▷ Always have the electrical connections installed by a trained and qualified electrician.
- ▷ Observe regulations IEC 60364 and, for explosion-proof models, EN 60079.

WARNING

Incorrect connection to the mains

Damage to the mains network, short circuit!

- ▷ Observe the technical specifications of the local energy supply companies.

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

NOTE

A motor protection device is recommended.

5.5.1 Setting the time relay

CAUTION

Switchover between star and delta on three-phase motors with star-delta starting takes too long.

Damage to the pump (set)!

- ▷ Keep switch-over intervals between star and delta as short as possible.

Table 14: Time relay settings for star-delta starting:

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

5.5.2 Connecting the motor

CAUTION

Operation at resonant frequencies of the pump set at immersion depths > 1000 mm

Damage to the pump (set)!

- ▷ Never retrofit with a variable speed system pump sets which were originally selected for a specific rated speed.
- ▷ If you would like to retrofit pumps with a variable speed system, contact KSB.

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.

5.6 Checking the direction of rotation

⚠ WARNING

Hands inside the pump casing

Risk of injuries, damage to the pump!

- ▷ Always disconnect the pump set from the power supply and secure it against unintentional start-up before inserting your hands or other objects into the pump.

⚠ WARNING

Reaching into the drive lantern opening

Risk of injury!

- ▷ When the cover plate is removed, never reach into the uncovered opening.

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 motor 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 drive lantern/bearing lantern.
3. If the motor is running in the wrong direction of rotation, check 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

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

- The pump set has been properly connected to the power supply and is equipped with all protection devices.
- The pump has been primed with the fluid to be handled. The pump has been vented. (⇨ Section 6.1.2, Page 29)
- The direction of rotation has been checked. (⇨ Section 5.6, Page 27)
- All auxiliary connections required are connected and operational.
- The lubricants have been checked.
- After prolonged shutdown of the pump (set), the activities required for returning the pump (set) to service have been carried out. (⇨ Section 6.4, Page 32)

CAUTION

Operation at resonant frequencies

Damage to the pump!

▹ For immersion depths > 1000 mm observe the combination of pump size, rated speed, motor size and immersion depth. (⇨ Section 7.7.4, Page 43)

6.1.2 Priming and venting the pump

CAUTION

Increased wear due to dry running

Damage to the pump/plain bearing!

▹ Never operate the pump set without liquid fill.

▹ Never supply the pump with cold fluid after dry running.

During pump start-up and operation, the fluid level must be within 130 mm above the volute casing centreline and 50 mm below the cover plate.

6.1.3 Start-up

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.

✓ Pump, suction line and inlet tank, if any, have been vented and primed with the fluid to be handled.

✓ The fluid level has been checked.

1. Close or slightly open the shut-off element in the discharge line.
2. Start up the motor.
3. 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.

6.1.4 Shutdown

1. Close the shut-off valve in the discharge line.
2. Switch off the motor and make sure the pump set runs down smoothly to a standstill.

NOTE

If the discharge line is equipped with a check valve, the shut-off element in the discharge line may remain open, provided the site's requirements and regulations are taken into account and observed.

For prolonged shutdown periods:

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

CAUTION

Risk of freezing during prolonged pump shutdown periods

Damage to the pump!

- ▷ Drain the pump and the cooling/heating chambers (if any) or otherwise protect them against freezing.

6.2 Operating limits

DANGER

Non-compliance with operating limits for pressure, temperature and speed

Explosion hazard!

Leakage of hot or toxic fluid handled!

- ▷ Comply with the operating data indicated in the data sheet.
- ▷ Never use the pump to handle fluids it is not designed for.
- ▷ Avoid prolonged operation against a closed shut-off element.
- ▷ Never operate the pump at temperatures exceeding those specified in the data sheet or on the name plate unless the written consent of the manufacturer has been obtained.

6.2.1 Ambient temperature

CAUTION

Operation outside the permissible ambient temperature

Damage to the pump (set)!

- ▷ Observe the specified limits for permissible ambient temperatures.

Observe the following parameters and values during operation:

Table 15: Permissible ambient temperatures

Permissible ambient temperature	Value
Maximum	40 °C
Minimum	See data sheet.

6.2.2 Frequency of starts

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

To prevent high temperature increases in the motor and excessive loads on the pump, coupling, motor, seals and bearings, do not exceed 10 start-ups per hour [h].

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 Minimum permissible speed

CAUTION

Plain bearing is overloaded

Damage to the bearings!

- ▷ Never use a speed of less than 800 rpm.

6.2.4 Fluid handled

6.2.4.1 Flow rate

Table 16: Flow rate

	Minimum flow rate	Maximum flow rate
For a short period (approximately 2 minutes)	15 % of $Q_{opt.}$ [6)]	See hydraulic characteristic curves
Continuous operation	$Q_{low\ flow} \geq 50$ % of Q_{Opt} [6)]	

6.2.4.2 Density of the fluid handled

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

CAUTION

Impermissibly high density of the fluid handled

Motor overload!

- ▷ Observe the information on fluid density in the data sheet.
- ▷ Make sure the motor has sufficient power reserves.

6.2.4.3 Temperature of the fluid handled

CAUTION

Evaporated fluid washes lubricant out of the bearing

Damage to the bearings!

- ▷ Never exceed the fluid temperature of 95 °C.
- ▷ The fluid temperature must remain at least 5 °C below the boiling point.

6.2.4.4 Abrasive fluids

The fluid handled may contain abrasive particles up to a maximum content of 5 g/dm³ and a maximum particle size of 0.5 mm. When the pump handles fluids containing abrasive substances, increased wear of the hydraulic system and the shaft seal are to be expected. In this case, reduce the commonly recommended inspection intervals.

6) Best efficiency point

6.3 Shutdown/storage/preservation

6.3.1 Measures to be taken for shutdown

The pump (set) remains installed

✓ Sufficient fluid is supplied for the operation check run of the pump.

1. Start up the pump (set) regularly between once a month and once every three months for approximately five minutes during prolonged shutdown periods. This will prevent the formation of deposits within the pump and the pump intake area.

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

✓ The pump has been properly drained (⇨ Section 7.3, Page 35) and the safety instructions for dismantling the pump have been observed. (⇨ Section 7.4.1, Page 35)

1. Spray-coat the inside wall of the pump casing and, in particular, the impeller clearance areas with a preservative.
2. Spray the preservative through the suction and discharge nozzles. It is advisable to then close the pump nozzles (e.g. with plastic caps or similar).
3. Oil or grease all exposed machined parts and surfaces of the pump (with silicone-free oil and grease, food-approved if required) to protect them against corrosion. Observe the additional instructions (⇨ Section 3.3, Page 12) .

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

Observe any additional instructions and information provided. (⇨ Section 3, Page 11)

6.4 Returning to service

For returning the equipment to service, observe the sections on commissioning/start-up (⇨ Section 6.1, Page 29) and the operating limits.

In addition, carry out all servicing/maintenance operations before returning the pump (set) to service. (⇨ Section 7, Page 33)

⚠ WARNING

Failure to re-install or re-activate protective devices

Risk of personal injury from moving parts or escaping fluid!

- ▹ As soon as the work is complete, re-install and/or re-activate any safety-relevant and protective devices.

NOTE

If the pump has been out of service for more than one year, replace all elastomer seals.

6.5 Cleaning the pump set

NOTE

The pump is splash-proof as it is designed without bearings above the cover plate.

NOTE

For the electric motor observe the manufacturer´s product literature.

7 Servicing/Maintenance

7.1 Safety regulations

The operator ensures that maintenance, inspection and installation is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

⚠ WARNING

Unintentional starting of pump set

Risk of injury by moving parts!

- ▷ Ensure 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 and supplies posing a health hazard and/or hot fluids handled and supplies

Risk of 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 to prevent tilting or tipping over.

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

NOTE

All maintenance, service and installation work can be carried out by KSB Service or authorised workshops. For contact details please refer to the enclosed "Addresses" booklet or visit "www.ksb.com/contact" on the Internet.

Never use force when dismantling and reassembling the pump set.

7.2 Servicing/inspection

7.2.1 Supervision of operation

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.

While the pump 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 seals for leakages.
- Check the rolling element bearings for running noises.
  Vibrations, noise and an increase in current input occurring during unchanged operating conditions indicate wear.
- Monitor the stand-by pump.
  To make sure that the stand-by pumps are ready for operation, start them up once a week.
- Monitor the bearing temperature.
  The bearing temperature must not exceed 90 °C (measured on the outside of the motor housing).

CAUTION

Operation outside the permissible bearing temperature

Damage to the pump!

- ▷ The bearing temperature of the pump (set) must never exceed 90 °C (measured on the outside of the motor housing).

NOTE

After commissioning, increased temperatures may occur at grease-lubricated rolling element bearings due to the running-in process. The final bearing temperature is only reached after a certain period of operation (up to 48 hours depending on the conditions).

7.2.2 Inspection work

7.2.2.1 Checking the clearances

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 17: Clearances between impeller and casing

	Casing wear rings 502.01/.02		Bearing cartridge 381.01/ bearing sleeve 529.16	
	Material variant			
	GG	CC	GG, CC	
			SU 25/35[7)]	SU 55[7)]
As-new	0.3 mm	0.5 mm	0.12 mm	0.14 mm
Maximum permissible enlargement	0.9 mm	1.5 mm	0.25 mm	0.3 mm

7.3 Drainage/cleaning

⚠ WARNING

Fluids, consumables and supplies which are hot and/or pose a health hazard

Hazard to persons and the environment!

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

1. 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 cleaning record for the pump.

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.
- ▷ Close the shut-off elements in suction and discharge line.
- ▷ Drain the pump and release the pump pressure.
- ▷ Close any auxiliary connections.
- ▷ Allow the pump set to cool down to ambient temperature.

⚠ WARNING

Unqualified personnel performing work on the pump (set)

Risk of injury!

- ▷ Always have repair and maintenance work performed by specially trained, qualified personnel.

⚠ WARNING

Hot surface

Risk of injury!

- ▷ Allow the pump set to cool down to ambient temperature.

7) Shaft unit see data sheet.

⚠ 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 33)

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 our service department.

NOTE

All maintenance, service and installation work can be carried out by KSB Service or authorised workshops. For contact details please refer to the enclosed "Addresses" booklet or visit "www.ksb.com/contact" on the Internet.

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 penetrating agent and/or - if possible - an appropriate puller.

7.4.2 Preparing the pump set

1. De-energise the pump set and secure it against unintentional start-up.
2. Reduce pressure in the piping by opening a consumer installation.
3. Disconnect and remove all auxiliary pipework.

7.4.3 Removing the complete pump set from the piping

✓ The notes and steps stated in (⇨ Section 7.4.1, Page 35) to (⇨ Section 7.4.2, Page 36) have been observed/carried out.

1. Unbolt the discharge nozzle from the pipeline.
2. Undo the bolts fastening the cover plate.
3. Remove the complete pump set with the cover plate from the tank opening.

7.4.4 Removing the motor

⚠ WARNING

Motor tilting

Risk of crushing hands and feet!

- ▹ Suspend or support the motor to prevent it from tilting.

✓ The notes and steps stated in (⇨ Section 7.4.1, Page 35) to (⇨ Section 7.4.3, Page 36) have been observed/carried out.

✓ The removed pump with cover plate 68-3.01 is placed horizontally on a suitable base in a clean and level assembly area.

1. Remove cover plates 68-3.02 from the openings of drive lantern 341.
2. Undo nuts 920.75 of bolts 901.57.
3. Turn shaft 210 to align bolts 901.57 with the locking holes of the pump shaft coupling.

4. Lock shaft 210 with bolts 901.57. Lock bolts 901.57 with nuts 920.75.
5. Undo hexagon socket head cap screw 914.24 of locking ring 515 and remove nuts 920.11 at the motor flange.
6. Remove the motor.

7.4.5 Removing the riser

✓ The notes and steps stated in (⇨ Section 7.4.1, Page 35) to (⇨ Section 7.4.4, Page 36) have been observed/carried out.

1. Remove nuts 920.34/920.19 and bolts 901.11/901.39.
2. Remove riser 711.
3. Remove gaskets 400.06/400.16.

7.4.6 Removing the volute casing and support column

Clamped casing cover 161 - combination see (⇨ Section 4.8, Page 18)

✓ The notes and steps stated in (⇨ Section 7.4.1, Page 35) to (⇨ Section 7.4.5, Page 37) have been observed/carried out.

1. Undo and remove nuts 920.14/920.06.
2. Undo and remove volute casing 102 with tie bolts 905.
3. Remove impeller nut 920.95 with disc 550.95 (shaft unit 25 only), safety device 930.95 and impeller 230.
   Support column 712 has to remain in the locating fits of drive lantern 341 and casing cover 161.
4. Undo bolts 901.57 to unlock the shaft coupling.

CAUTION

Improper dismantling/installation

Damage to the plain bearing parts!

- ▹ Take appropriate care when removing/installing shock-sensitive SiC plain bearing parts (bearing sleeve, bearing bush in the bearing cartridge).

5. Remove the shaft with SiC bearing sleeve 529.16.
6. Separate casing cover 161, support column 712, cover plate 68-3.01 and drive lantern 341.

Bolted casing cover 161 - combination see (⇨ Section 4.8, Page 18)

✓ The notes and steps stated in (⇨ Section 7.4.1, Page 35) to (⇨ Section 7.4.5, Page 37) have been observed/carried out.

1. Undo and remove nuts 920.01.
2. Remove volute casing 102.
3. Remove impeller nut 920.95 with disc 550.95 (shaft unit 25 only), safety device 930.95 and impeller 230.
4. Undo bolts 901.57 to unlock the shaft coupling.

CAUTION

Improper dismantling/installation

Damage to the plain bearing parts!

- ▹ Take appropriate care when removing/installing shock-sensitive SiC plain bearing parts (bearing sleeve, bearing bush in the bearing cartridge).

5. Remove shaft 210 with SiC bearing sleeve 529.16.
6. Undo and remove nuts 920.14/920.06.
7. Undo and remove casing cover 161 with tie bolts 905.
8. Separate support column 712, cover plate 68-3.01 and drive lantern 341.

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.

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.

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 adhesives
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 Epple 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.

Tightening torques
For reassembly, tighten all screws and bolts as specified in this manual.
(⇨ Section 7.6, Page 41)

7.5.2 Installing the plain bearing in the casing cover

- ✓ The casing cover and the individual parts of the plain bearing are kept in a clean and level assembly area.
- ✓ All dismantled parts have been cleaned and checked for wear.
- ✓ Any damaged or worn parts have been replaced by original spare parts.

1. Evenly press bearing bush 545 into casing cover 161.
2. Fit O-rings 412.24 on bearing cartridge 381.01.
3. Wet the O-rings at the bearing cartridge with water or a suitable lubricant and press them into the fitted bearing bush 545.
4. Place bearing housing 350 on bearing cartridge 381.01 and fasten it with bolts 901.33 at casing cover 161. Take care not to damage O-ring 412.24 when fitting bearing housing 350.
5. Fasten the plain bearing assembly to casing cover 161 with bolts 901.33.

NOTE

Assembling the pump in a vertical position starting from the bottom is recommended.

Horizontal assembly is permissible as long as the components are supported and secured appropriately.

Motor size up to 160, immersion depth up to 750 mm

Up to motor size 160 and/or immersion depths up to 750 mm, start the pump assembly with the motor.

From motor size 180, immersion depth 1000 mm and greater

From motor size 180 and/or immersion depths of 1000 mm or greater, start the pump assembly with drive lantern 341.

⚠ WARNING

Pump (set) tipping over

Risk of crushing injuries!

- ▹ When assembling the pump in a vertical position, secure the motor and/or drive lantern against tipping over and/or bolt them to the assembly base.

7.5.3 Installing the volute casing and support column

Motor size up to 160, immersion depth up to 750 mm

- ✓ The notes and steps stated in (⇨ Section 7.5.1, Page 38) to (⇨ Section 7.5.2, Page 38) have been observed/carried out.
- ✓ The pre-assembled casing cover as well as the individual parts have been placed in a clean and level assembly area.
- ✓ All dismantled parts have been cleaned and checked for wear.
- ✓ Any damaged or worn parts have been replaced by original spare parts.

1. Place drive lantern 341 on motor 801 and fasten it with joining elements 902.11 and 920.11.
2. Fit cover plate 68-3.01 (bracket 732 for pumps without cover plate) on drive lantern 341 and support it to make sure it lies flush.
3. Fasten bearing sleeve 529.16 with disc 550.80 and circlips 932.41/932.42 on shaft 210 as per the general assembly drawing. Depending on the shaft unit and material variant, the design may differ. Please refer to the general assembly drawing.
   Make sure that pin 561.29 in shaft 210 is engaged in the groove of the bearing sleeve.
4. Slide shaft 210 with locking ring 515 onto the motor shaft end until it will not go any further.
   Make sure that locking ring 515 is positioned on the coupling of shaft 210 in such a way that screw 914.24 can be tightened through the opening in the bearing bracket lantern.
   Make sure that the slot of locking ring 515 is above and aligned with the shaft/coupling slot.
5. Tighten screw 914.24 of locking ring 515. (⇨ Section 7.6, Page 41)
6. Rotate shaft 210 until bolts 901.57 are aligned with the locking holes of the shaft coupling.
7. Lock shaft 210 with bolts 901.57. Lock bolts 901.57 with nuts 920.75.
8. Slide disc 550.46 onto shaft 210 and into the locating fit of drive lantern 341.
9. Fit support column 712 on drive lantern 341.
10. Slide spacer sleeve 525, if any, onto shaft 210.
11. Fit key 940.01 in shaft 210.

12. Screw tie bolts 905 with the shorter thread end to volute casing 102 / casing cover 161. Screw nuts 920.06 to tie bolts 905, then guide the tie bolts through support column 712 into the drilled holes of cover plate 68-3.01 and drive lantern 341.
    If screwing the tie bolts to pump casing 102, complete steps 15 and 16 first. See below on how to fit casing cover 161.
13. Tighten nuts 920.14. (⇨ Section 7.6, Page 41)
    Nuts 920.06 must remain accessible.
14. Then, use nuts 920.06 to clamp cover plate 68-3.01 to drive lantern 341.
15. Slide the impeller onto shaft 210.
16. Fit disc 550.95 on the impeller hub and tighten impeller 230 with nut 920.95.

From motor size 180, immersion depth 1000 mm and greater

- ✓ The notes and steps stated in (⇨ Section 7.5.1, Page 38) to (⇨ Section 7.5.2, Page 38) have been observed/carried out.
- ✓ The pre-assembled casing cover as well as the individual parts have been placed in a clean and level assembly area.
- ✓ All dismantled parts have been cleaned and checked for wear.
- ✓ Any damaged or worn parts have been replaced by original spare parts.

1. Place drive lantern 341 in a clean and level assembly area and protect it against tipping over.
2. Fit cover plate 68-3.01 (bracket 732.12 for pumps without cover plate) on the drive lantern and support it to make sure it lies flush.
3. Fasten bearing sleeve 529.16 with disc 550.80 and circlips 932.41/932.42 on shaft 210 as per the general assembly drawing. Depending on the shaft unit and material variant, the design may differ. Please refer to the general assembly drawing.
   Make sure that pin 561.29 in shaft 210 is engaged in the groove of the bearing sleeve.
4. Support shaft 210 at its coupling until bolts 901.57 can engage in the locking holes of the shaft coupling.
   Centre shaft 210 in relation to the recesses of the drive lantern.
5. Lock shaft 210 with the bolts. Lock the bolts with nuts 920.75.
   Secure shaft 210 against tipping over.
6. Insert disc 550.46 into the locating fit between drive lantern 341 and support column 712.12. To do so, slide disc 550.46 onto shaft 210 and into the locating fit of drive lantern 341.
7. Fit support column 712 on drive lantern 341.
8. Slide spacer sleeve 525, if any, onto shaft 210.
9. Fit key 940.01 in shaft 210.
10. Carefully slide casing cover 161 on bearing sleeve 529.16 fitted on shaft 210 and place it down on support column 712.
11. Fit gasket 400.10 on casing cover 161. (⇨ Section 7.5.1, Page 38)
12. For fitting tie bolts 905, first screw nuts 920.06 to the longer thread ends. Then insert the longer thread ends into the drilled holes of cover plate 68-3.01 and drive lantern 341.
13. Screw the tie bolts into casing cover 161 or pump casing 102 as applicable for the shaft unit and material variant. If screwing the tie bolts to pump casing 102, complete steps 14 and 15 first.
14. Slide the impeller onto shaft 210.
15. Fit disc 550.95 on the impeller hub and tighten impeller 230 with nut 920.95.
16. Place volute casing 102 on casing cover 161 and fasten it with nuts 920.01.

7.5.4 Installing the riser

✓ The notes and steps stated in (⇨ Section 7.5.1, Page 38) to (⇨ Section 7.5.3, Page 39) have been observed/carried out.

1. Fit new gaskets 400.06/400.16 at the flanges connecting it to the pump and to the cover plate. (⇨ Section 7.5.1, Page 38)
2. Fasten riser 711 with nuts 920.19/920.34 and bolts 901.11/901.39. (⇨ Section 7.6, Page 41)

7.5.5 Mounting the motor

(⇨ Section 5.3, Page 20)

7.6 Tightening torques

7.6.1 Tightening torques for the pump

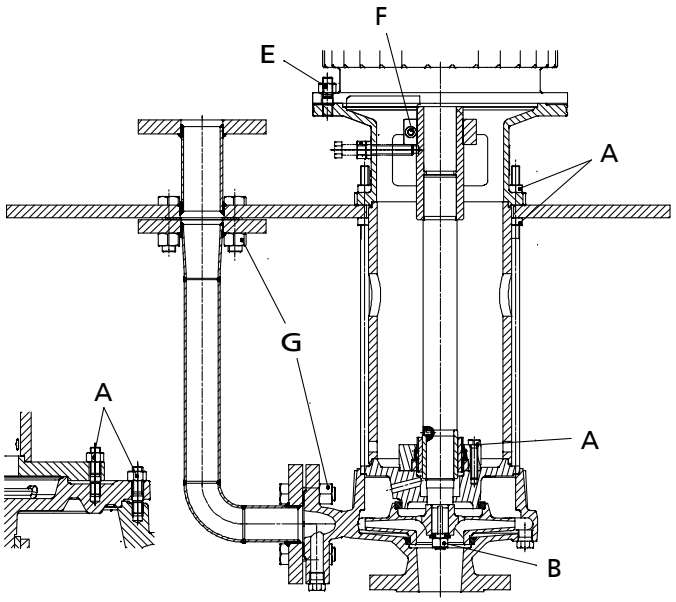


Fig. 12: Tightening points

Table 18: Tightening torques for bolted/screwed connections at the pump

Position	Thread	Tightening torque
		[Nm]
A	M12	55
B	M12 × 1.5	55
	M16 × 1.5	55
	M24 × 1.5	130
	M30 × 1.5	170
E	M12	55
	M16	130
F	M6	15
	M8	38
	M10	49
	M12	86
G	M12	40
	M16	100
	M20	180

7.7 Spare parts stock

7.7.1 Ordering spare parts

Always quote the following data when ordering replacement 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. (⇨ Section 4.3, Page 14)

Also specify the following data:

- Part number and description (⇨ Section 9.1, Page 52)
- 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

Table 19: Quantity of spare parts for recommended spare parts stock

Part No.	Description	Number of pumps (including stand-by pumps)						
		2	3	4	5	6 - 7	8 - 9	10 and more
		Number of spare parts						
210/211[8)]	Shaft	1	1	2	2	2	3	30 %
230	Impeller	1	1	2	2	2	3	30 %
381	Bearing cartridge	1	1	2	2	3	4	50 %
400.10	Gasket	4	6	8	8	9	12	150 %
502.01/502.02	Casing wear ring	2	2	2	3	3	4	50 %

7.7.3 Sets of spare parts

Table 20: Overview of spare parts sets

Spare assembly	Comprises the following parts	
210 - shaft	210	Shaft
	515	Locking ring
	550.95[9)]	Disc
	840	Coupling
	914.24	Hexagon socket head cap screw
	920.95	Nut
	930.95	Safety device
	940.01	Key
211 - pump shaft	211	Pump shaft
	515	Locking ring
	550.95[9)]	Disc
	561.29	Grooved pin

8) 211 only for pumps with motor 110/112
9) For shaft unit 25 only

Spare assembly	Comprises the following parts	
211 - pump shaft	914.24	Hexagon socket head cap screw
	920.95	Nut
	930.95	Safety device
	940.01	Key
102 - volute casing	102	Volute casing
	502.01	Casing wear ring
	902.01[10)]	Stud
	903.01	Screw plug
	903.03	Screw plug
	920.01[10)]	Nut
161 - casing cover	161	Casing cover
	502.02	Casing wear ring
515 - locking ring	515	Locking ring
	914.24	Hexagon socket head cap screw
381 - bearing cartridge	381.01	Bearing cartridge
	412.24	O-ring
	504[11)]	Spacer ring
	529.16	Bearing sleeve
	550.80[12)]	Disc
	561.29	Grooved pin
	932.41[12)]	Circlip
	932.42[13)]	Circlip
341 - drive lantern	68-3.02	Cover plate
	341	Drive lantern
	902.11	Stud
	920.11	Nut

7.7.4 Immersion depths

Pump sets, 50 Hz / 60 Hz, 2-pole

✓	Permissible immersion depth at rated speed
✓ (max. speed)	Permissible immersion depth with PumpDrive (maximum permissible speed for operation on a frequency inverter)
-	Combination impermissible

Table 21: Overview of immersion depths for 2-pole pump sets

Size	Shaft unit	Motor size	50 Hz, 2-pole							60 Hz, 2-pole						
			P_N	Immersion depth [mm]						P_N	Immersion depth [mm]					
			[kW]	< 1000	1000	1250	1500	1750	2000	[kW]	< 1000	1000	1250	1500	1750	2000
050-032-125	25	100L	3,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	3,45	✓ (3600)	✓	-	✓	✓	✓
	25	112M	4,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	4,6	✓ (3600)	✓	-	✓	✓	✓
	25	132S	5,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	6,3	✓ (3600)	✓	-	✓	✓	✓
	25	132S	7,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3600)	✓	-	✓	✓	✓
050-032-125.1	25	100L	3,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	3,45	✓ (3600)	✓	-	✓	✓	✓
	25	112M	4,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	4,6	✓ (3600)	✓	-	✓	✓	✓
	25	132S	5,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	6,3	✓ (3600)	✓	-	✓	✓	✓
	25	132S	7,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3600)	✓	-	✓	✓	✓
050-032-160	25	100L	3,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	3,45	✓ (3600)	✓	-	✓	✓	✓
	25	112M	4,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	4,6	✓ (3600)	✓	-	✓	✓	✓

10) For bolted casing cover only
11) Only for Etanorm V, in stainless steel, design W, shaft unit 55
12) Only for Etanorm V, in cast iron, design W, shaft unit 55
13) Only for Etanorm V, in cast iron, design W, shaft units 25, 35 and 55

Size	Shaft unit	Motor size	50 Hz, 2-pole							60 Hz, 2-pole						
			P_N	Immersion depth [mm]						P_N	Immersion depth [mm]					
			[kW]	< 1000	1000	1250	1500	1750	2000	[kW]	< 1000	1000	1250	1500	1750	2000
050-032-160	25	132S	5,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	6,3	✓ (3600)	✓	-	✓	✓	✓
	25	132S	7,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	11	✓ (3600)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3600)	✓	-	✓	✓	✓
050-032-160.1	25	100L	3,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	3,45	✓ (3600)	✓	-	✓	✓	✓
	25	112M	4,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	4,6	✓ (3600)	✓	-	✓	✓	✓
	25	132S	5,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	6,3	✓ (3600)	✓	-	✓	✓	✓
	25	132S	7,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	11	✓ (3600)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3600)	✓	-	✓	✓	✓
050-032-200	25	100L	3,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	-	-	-	-	-	-	-
	25	112M	4,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	4,6	✓ (3600)	✓	-	✓	✓	✓
	25	132S	5,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	6,3	✓ (3600)	✓	-	✓	✓	✓
	25	132S	7,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	11	✓ (3600)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	15	✓ (3600)	✓ (3000)	✓	-	✓	✓	17,3	✓ (3600)	✓	-	✓	✓	✓
050-032-200.1	25	100L	3,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	3,45	✓ (3600)	✓	-	✓	✓	✓
	25	112M	4,0	✓ (3600)	✓ (3000)	✓	✓	✓	✓	4,6	✓ (3600)	✓	-	✓	✓	✓
	25	132S	5,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	6,3	✓ (3600)	✓	-	✓	✓	✓
	25	132S	7,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	11	✓ (3600)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	15	✓ (3600)	✓ (3000)	✓	-	✓	✓	17,3	✓ (3600)	✓	-	✓	✓	✓
050-032-250	25	132S	7,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160M	11	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160M	15	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160L	18,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
050-032-250.1	25	112M	4,0	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	132S	5,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	132S	7,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160M	11	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160M	15	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
065-040-125	25	100L	3,0	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	112M	4,0	✓ (3500)	✓ (3000)	✓	-	✓	✓	4,6	✓ (3500)	✓	-	✓	✓	✓
	25	132S	5,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	6,3	✓ (3500)	✓	-	✓	✓	✓
	25	132S	7,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3500)	✓	-	✓	✓	✓
	25	160M	11	✓ (3500)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3500)	✓	-	✓	✓	✓
065-040-160	25	100L	3,0	✓ (3600)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	112M	4,0	✓ (3600)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	132S	5,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	6,3	✓ (3600)	✓	-	✓	✓	✓
	25	132S	7,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	11	✓ (3600)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	15	✓ (3600)	✓ (3000)	✓	-	✓	✓	17,3	✓ (3600)	✓	-	✓	✓	✓
	25	160L	18,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	21,3	✓ (3600)	✓	-	✓	✓	✓
	25	180M	22	✓ (3600)	✓ (3000)	✓	-	✓	✓	24,5	✓ (3600)	✓	-	✓	✓	✓
065-040-200	25	132S	5,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	132S	7,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160M	11	✓ (3600)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	15	✓ (3600)	✓ (3000)	✓	-	✓	✓	17,3	✓ (3600)	✓	-	✓	✓	✓
	25	160L	18,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	21,3	✓ (3600)	✓	-	✓	✓	✓
	25	180M	22	✓ (3600)	✓ (3000)	✓	-	✓	✓	24,5	✓ (3600)	✓	-	✓	✓	✓
	25	200L	30	✓ (3600)	✓ (3000)	✓	-	✓	✓	33,5	✓ (3600)	✓	-	✓	✓	✓
065-040-250	25	160M	11	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160M	15	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160L	18,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	180M	22	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	200L	30	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
065-050-125	25	100L	3,0	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	112M	4,0	✓ (3500)	✓ (3000)	✓	-	✓	✓	4,6	✓ (3500)	✓	-	✓	✓	✓
	25	132S	5,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	6,3	✓ (3500)	✓	-	✓	✓	✓
	25	132S	7,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3500)	✓	-	✓	✓	✓
	25	160M	11	✓ (3500)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3500)	✓	-	✓	✓	✓

Size	Shaft unit	Motor size	50 Hz, 2-pole							60 Hz, 2-pole						
			P_N	Immersion depth [mm]						P_N	Immersion depth [mm]					
			[kW]	< 1000	1000	1250	1500	1750	2000	[kW]	< 1000	1000	1250	1500	1750	2000
065-050-160	25	132S	5,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	132S	7,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	11	✓ (3600)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	15	✓ (3600)	✓ (3000)	✓	-	✓	✓	17,3	✓ (3600)	✓	-	✓	✓	✓
	25	160L	18,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	21,3	✓ (3600)	✓	-	✓	✓	✓
	25	180M	22	✓ (3600)	✓ (3000)	✓	-	✓	✓	24,5	✓ (3600)	✓	-	✓	✓	✓
	25	200L	30	✓ (3600)	✓ (3000)	✓	✓	-	✓	33,5	✓ (3600)	✓	✓	-	✓	✓
	25	200L	37	✓ (3600)	✓ (3000)	✓	✓	-	✓	41,5	✓ (3600)	✓	✓	-	✓	✓
065-050-200	25	160M	11	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160M	15	✓ (3500)	✓ (3000)	✓	-	✓	✓	17,3	✓ (3500)	✓	-	✓	✓	✓
	25	160L	18,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	21,3	✓ (3500)	✓	-	✓	✓	✓
	25	180M	22	✓ (3500)	✓ (3000)	✓	-	✓	✓	24,5	✓ (3500)	✓	-	✓	✓	✓
	25	200L	30	✓ (3500)	✓ (3000)	✓	✓	-	✓	33,5	✓ (3500)	✓	✓	-	✓	✓
	25	200L	37	✓ (3500)	✓ (3000)	✓	✓	-	✓	41,5	✓ (3500)	✓	✓	-	✓	✓
065-050-250	25	160M	15	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160L	18,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	180M	22	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	200L	30	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	200L	37	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
080-065-125	25	112M	4,0	✓ (3500)	✓ (3000)	✓	✓	✓	✓	-	-	-	-	-	-	-
	25	132S	5,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	6,3	✓ (3500)	✓	-	✓	✓	✓
	25	132S	7,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	8,6	✓ (3500)	✓	-	✓	✓	✓
	25	160M	11	✓ (3500)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3500)	✓	-	✓	✓	✓
	25	160M	15	✓ (3500)	✓ (3000)	✓	-	✓	✓	17,3	✓ (3500)	✓	-	✓	✓	✓
080-065-160	25	132S	5,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	132S	7,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160M	11	✓ (3600)	✓ (3000)	✓	-	✓	✓	12,6	✓ (3600)	✓	-	✓	✓	✓
	25	160M	15	✓ (3600)	✓ (3000)	✓	-	✓	✓	17,3	✓ (3600)	✓	-	✓	✓	✓
	25	160L	18,5	✓ (3600)	✓ (3000)	✓	-	✓	✓	21,3	✓ (3600)	✓	-	✓	✓	✓
	25	180M	22	✓ (3600)	✓ (3000)	✓	-	✓	✓	24,5	✓ (3600)	✓	-	✓	✓	✓
	25	200L	30	✓ (3600)	✓ (3000)	✓	✓	-	✓	33,5	✓ (3600)	✓	✓	-	✓	✓
	25	200L	37	✓ (3600)	✓ (3000)	✓	✓	-	✓	41,5	✓ (3600)	✓	✓	-	✓	✓
080-065-200	25	160M	11	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160M	15	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160L	18,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	21,3	✓ (3500)	✓	-	✓	✓	✓
	25	180M	22	✓ (3500)	✓ (3000)	✓	-	✓	✓	24,5	✓ (3500)	✓	-	✓	✓	✓
	25	200L	30	✓ (3500)	✓ (3000)	✓	✓	-	✓	33,5	✓ (3500)	✓	✓	-	✓	✓
080-065-250	35	180M	22	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	200L	30	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	200L	37	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	225M	45	✓ (3500)	✓ (3000)	✓	✓	-	✓	-	-	-	-	-	-	-
100-080-160	25	160M	11	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160M	15	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	25	160L	18,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	21,3	✓ (3500)	✓	-	✓	✓	✓
	25	180M	22	✓ (3500)	✓ (3000)	✓	-	✓	✓	24,5	✓ (3500)	✓	-	✓	✓	✓
	25	200L	30	✓ (3500)	✓ (3000)	✓	✓	-	✓	33,5	✓ (3500)	✓	✓	-	✓	✓
	25	200L	37	✓ (3500)	✓ (3000)	✓	✓	-	✓	41,5	✓ (3500)	✓	✓	-	✓	✓
100-080-200	35	160L	18,5	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	180M	22	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	200L	30	✓ (3500)	✓ (3000)	✓	-	✓	✓	33,5	✓ (3500)	✓ (3000)	✓	-	✓	✓
	35	200L	37	✓ (3500)	✓ (3000)	✓	-	✓	✓	41,5	✓ (3500)	✓ (3000)	✓	-	✓	✓
	35	225M	45	✓ (3500)	✓ (3000)	✓	✓	-	✓	51	✓ (3500)	✓ (3000)	✓	-	✓	✓
	35	250M	55	✓ (3500)	✓ (3000)	✓	✓	-	✓	63	✓ (3500)	✓ (3000)	✓	-	✓	✓
	35	280S	75	✓ (3500)	✓ (3000)	✓	✓	-	✓	84	✓ (3500)	✓ (3000)	✓	-	✓	✓
100-080-250	35	200L	30	✓ (3500)	✓ (2900)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	200L	37	✓ (3500)	✓ (2900)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	225M	45	✓ (3500)	✓ (2900)	✓	✓	-	✓	-	-	-	-	-	-	-
	35	250M	55	✓ (3500)	✓ (2900)	✓	✓	-	✓	-	-	-	-	-	-	-
	35	280S	75	✓ (3500)	✓ (2900)	✓	✓	-	✓	-	-	-	-	-	-	-

Size	Shaft unit	Motor size	50 Hz, 2-pole							60 Hz, 2-pole						
			P_N	Immersion depth [mm]						P_N	Immersion depth [mm]					
			[kW]	< 1000	1000	1250	1500	1750	2000	[kW]	< 1000	1000	1250	1500	1750	2000
125-100-160	35	180M	22	✓ (3600)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	200L	30	✓ (3600)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	200L	37	✓ (3600)	✓ (3000)	✓	-	✓	✓	41,5	✓ (3600)	✓ (3000)	✓	-	✓	✓
	35	225M	45	✓ (3600)	✓ (3000)	✓	✓	-	✓	51	✓ (3600)	✓ (3000)	✓	-	✓	✓
	35	250M	55	✓ (3600)	✓ (3000)	✓	✓	-	✓	63	✓ (3600)	✓ (3000)	✓	-	✓	✓
	35	280S	75	✓ (3600)	✓ (3000)	✓	✓	-	✓	84	✓ (3600)	✓ (3000)	✓	-	✓	✓
125-100-200	35	200L	30	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	200L	37	✓ (3500)	✓ (3000)	✓	-	✓	✓	-	-	-	-	-	-	-
	35	225M	45	✓ (3500)	✓ (3000)	✓	✓	-	✓	51	✓ (3500)	✓ (3000)	✓	-	✓	✓
	35	250M	55	✓ (3500)	✓ (3000)	✓	✓	-	✓	63	✓ (3500)	✓ (3000)	✓	-	✓	✓
	35	280S	75	✓ (3500)	✓ (3000)	✓	✓	-	✓	84	✓ (3500)	✓ (3000)	✓	-	✓	✓
	35	280M	90	✓ (3500)	✓ (3000)	✓	✓	-	✓	101	✓ (3500)	✓ (3000)	✓	-	✓	✓
125-100-250	35	225M	45	✓ (3500)	✓ (3000)	✓ (3000)	✓	-	✓	-	-	-	-	-	-	-
	35	250M	55	✓ (3500)	✓ (3000)	✓ (3000)	✓	-	✓	-	-	-	-	-	-	-
	35	280S	75	✓ (3500)	✓ (3000)	✓ (3000)	✓	-	✓	-	-	-	-	-	-	-
	35	280M	90	✓ (3500)	✓ (3000)	✓ (3000)	✓	-	✓	-	-	-	-	-	-	-
150-125-200	35	225M	45	✓ (3500)	✓ (3500)	✓ (3000)	✓	-	✓	-	-	-	-	-	-	-
	35	250M	55	✓ (3500)	✓ (3500)	✓ (3000)	✓	-	✓	-	-	-	-	-	-	-
	35	280S	75	✓ (3500)	✓ (3500)	✓ (3000)	✓	-	✓	84	✓ (3500)	✓ (3500)	✓	-	✓	✓
	35	280M	90	✓ (3500)	✓ (3500)	✓ (3000)	✓	-	✓	101	✓ (3500)	✓ (3500)	✓	-	✓	✓

Pump sets, 50 Hz / 60 Hz, 4-pole

✓	Permissible immersion depth at rated speed
✓ (max. speed)	Permissible immersion depth with PumpDrive (maximum permissible speed for operation on a frequency inverter)
-	Combination impermissible

Table 22: Overview of immersion depths for 4-pole pump sets

Size	Shaft unit	Motor size	50 Hz, 4-pole							60 Hz, 4-pole						
			P_N	Immersion depth [mm]						P_N	Immersion depth [mm]					
			[kW]	< 1000	1000	1250	1500	1750	2000	[kW]	< 1000	1000	1250	1500	1750	2000
050-032-125	25	100M	2,2	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
050-032-125.1	25	100M	2,2	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
050-032-160	25	100M	2,2	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
050-032-160.1	25	100M	2,2	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
050-032-200	25	100M	2,2	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	112M	4,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
050-032-200.1	25	100M	2,2	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
050-032-250	25	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	132S	5,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	6,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	132M	7,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	8,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
050-032-250.1	25	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	132S	5,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	6,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
065-040-125	25	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
065-040-160	25	100M	2,2	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓

Size	Shaft unit	Motor size	50 Hz, 4-pole							60 Hz, 4-pole						
			P_N	Immersion depth [mm]						P_N	Immersion depth [mm]					
			[kW]	< 1000	1000	1250	1500	1750	2000	[kW]	< 1000	1000	1250	1500	1750	2000
065-040-200	25	100M	2,2	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	112M	4,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	132S	5,5	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	6,3	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
065-040-250	25	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	132S	5,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	6,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	132M	7,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	8,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	160M	11	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	12,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
065-040-315	35	100L	3,0	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	-	-	-	-	-	-	-	-
	35	112M	4,0	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (2900)	✓ (2900)	✓ (1800)	✓	-	-
	35	132S	5,5	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	6,3	✓ (2900)	✓ (2900)	✓ (1800)	✓	✓	-
	35	132M	7,5	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	8,6	✓ (2900)	✓ (2900)	✓ (1800)	✓	✓	-
	35	160M	11	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	12,6	✓ (2900)	✓ (2900)	✓ (1800)	✓	✓	-
	35	180M	18,5	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	21,3	✓ (2900)	✓ (2900)	✓ (1800)	✓	✓	-
065-050-125	25	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
065-050-160	25	100M	2,2	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	112M	4,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	132S	5,5	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	6,3	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
065-050-200	25	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	-
	25	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	-
	25	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	-
	25	132S	5,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	6,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	132M	7,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	8,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	160M	11	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	12,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
065-050-250	25	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	-	-	-	-	-	-	-
	25	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	-
	25	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	-
	25	132S	5,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	6,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	132M	7,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	8,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	160M	11	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	12,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
065-050-315	35	112M	4,0	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	-	-	-	-	-	-	-	-
	35	132S	5,5	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	-	-	-	-	-	-	-
	35	132M	7,5	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	8,6	✓ (2900)	✓ (2900)	✓ (1800)	✓	✓	-
	35	160M	11	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	12,6	✓ (2900)	✓ (2900)	✓ (1800)	✓	✓	-
	35	160L	15	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	17,3	✓ (2900)	✓ (2900)	✓ (1800)	✓	✓	-
	35	180M	18,5	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	21,3	✓ (2900)	✓ (2900)	✓ (1800)	✓	✓	-
	35	180L	22	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	25,3	✓ (2900)	✓ (2900)	✓ (1800)	✓	✓	-
080-065-125	25	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
080-065-160	25	100M	2,2	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	112M	4,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	25	132S	5,5	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	6,3	✓ (3600)	✓ (3000)	✓ (1800)	✓	✓	-
080-065-200	25	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	132S	5,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	6,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	132M	7,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	8,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	160M	11	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	12,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
080-065-250	35	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	-	-	-	-	-	-	-
	35	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	-	-	-	-	-	-	-
	35	132S	5,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	6,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	35	132M	7,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	8,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	35	160M	11	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	12,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-

Size	Shaft unit	Motor size	50 Hz, 4-pole							60 Hz, 4-pole						
			P_N	Immersion depth [mm]						P_N	Immersion depth [mm]					
			[kW]	< 1000	1000	1250	1500	1750	2000	[kW]	< 1000	1000	1250	1500	1750	2000
080-065-250	35	180M	18,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	21,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
080-065-315	35	132S	5,5	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	-	-	-	-	-	-	-
	35	132M	7,5	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	8,6	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓	-
	35	160M	11	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	12,6	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓	-
	35	160L	15	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	17,3	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓	-
	35	180M	18,5	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	21,3	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓	-
	35	180L	22	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	25,3	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓	-
	35	200L	30	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	34,5	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓	-
	35	225M	45	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	52	✓ (2900)	✓ (2900)	✓ (1800)	✓ (1800)	✓	-
100-080-160	25	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	2,55	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	3,45	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	25	132S	5,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	6,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	132M	7,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	8,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	25	160M	11	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	12,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
100-080-200	35	100M	2,2	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	-	-	-	-	-	-	-
	35	100L	3,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	-	-	-	-	-	-	-
	35	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	-	✓
	35	132S	5,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	6,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	35	132M	7,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	8,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	35	160M	11	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	12,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	35	160L	15	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	17,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
100-080-250	35	112M	4,0	✓ (3500)	✓ (2900)	✓ (1800)	✓ (1500)	✓	-	-	-	-	-	-	-	-
	35	132S	5,5	✓ (3500)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	-	-	-	-	-	-	-
	35	132M	7,5	✓ (3500)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	8,6	✓ (3500)	✓ (2900)	✓ (1800)	✓	✓	-
	35	160M	11	✓ (3500)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	12,6	✓ (3500)	✓ (2900)	✓ (1800)	✓	✓	-
	35	160L	15	✓ (3500)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	17,3	✓ (3500)	✓ (2900)	✓ (1800)	✓	✓	-
	35	180M	18,5	✓ (3500)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	21,3	✓ (3500)	✓ (2900)	✓ (1800)	✓	✓	-
	35	200L	30	✓ (3500)	✓ (2900)	✓ (1800)	✓ (1500)	✓	✓	34,5	✓ (3500)	✓ (2900)	✓ (1800)	✓	✓	-
100-080-315	35	132M	7,5	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	-	-	-	-	-	-	-
	35	160M	11	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	-	-	-	-	-	-	-
	35	160L	15	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	17,3	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓	-
	35	180M	18,5	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	21,3	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓	-
	35	180L	22	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	25,3	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓	-
	35	200L	30	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	34,5	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓	-
	35	225S	37	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	42,5	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓	-
	35	225M	45	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	52	✓ (2900)	✓ (2900)	✓ (2000)	✓ (1800)	✓	-
100-080-400	55	160L	15	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	180M	18,5	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	180L	22	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	25,3	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	200L	30	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	34,5	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	225S	37	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	42,5	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	225M	45	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	52	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	250M	55	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	63	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
125-100-160	35	100L	3,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	-	-	-	-	-	-	-
	35	112M	4,0	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	4,6	✓ (3600)	✓ (3000)	✓ (1800)	✓	-	✓
	35	132S	5,5	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	6,3	✓ (3600)	✓ (3000)	✓ (1800)	✓	✓	-
	35	132M	7,5	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	8,6	✓ (3600)	✓ (3000)	✓ (1800)	✓	✓	-
	35	160M	11	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	12,6	✓ (3600)	✓ (3000)	✓ (1800)	✓	✓	-
	35	160L	15	✓ (3600)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	17,3	✓ (3600)	✓ (3000)	✓ (1800)	✓	✓	-
125-100-200	35	112M	4,0	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	-	-	-	-	-	-	-	-
	35	132S	5,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	6,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	35	132M	7,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	8,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	35	160M	11	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	12,6	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	35	160L	15	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	17,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	35	180M	18,5	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	21,3	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
	35	200L	30	✓ (3500)	✓ (3000)	✓ (1800)	✓ (1500)	✓	✓	34,5	✓ (3500)	✓ (3000)	✓ (1800)	✓	✓	-
125-100-250	35	132S	5,5	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	35	132M	7,5	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-

Size	Shaft unit	Motor size	50 Hz, 4-pole							60 Hz, 4-pole						
			P_N	Immersion depth [mm]						P_N	Immersion depth [mm]					
			[kW]	< 1000	1000	1250	1500	1750	2000	[kW]	< 1000	1000	1250	1500	1750	2000
125-100-250	35	160M	11	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	12,6	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	160L	15	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	17,3	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	180M	18,5	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	21,3	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	180L	22	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	25,3	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	200L	30	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	34,5	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	225M	45	✓ (3500)	✓ (3000)	✓ (3000)	✓ (1800)	✓ (1800)	✓ (1800)	52	✓ (3500)	✓ (3000)	✓ (3000)	✓ (1800)	✓	-
125-100-315	35	160M	11	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	35	160L	15	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	35	180M	18,5	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	21,3	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	180L	22	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	25,3	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	200L	30	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	34,5	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	225S	37	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	42,5	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	225M	45	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	✓ (1800)	52	✓ (2900)	✓ (2100)	✓ (2100)	✓ (1800)	✓	
125-100-400	55	180L	22	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	200L	30	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	225S	37	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	42,5	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	225M	45	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	52	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	250M	55	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	63	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	280S	75	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	86	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
150-125-200	35	132M	7,5	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1500)	✓ (1500)	-	-	-	-	-	-	-
	35	160M	11	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1500)	✓ (1500)	12,6	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	160	15	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1500)	✓ (1500)	17,3	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	180M	18,5	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1500)	✓ (1500)	21,3	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	180L	22	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1500)	✓ (1500)	25,3	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
	35	200L	30	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1500)	✓ (1500)	34,5	✓ (3500)	✓ (2100)	✓ (2100)	✓ (1800)	✓	-
150-125-250	35	160M	11	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	-	-	-	-	-	-	-
	35	160L	15	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	17,3	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓	-
	35	180M	18,5	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	21,3	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓	-
	35	180L	22	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	25,3	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓	-
	35	200L	30	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	34,5	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓	-
	35	225S	37	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	42,5	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓	-
	35	225M	45	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓ (1500)	✓ (1500)	52	✓ (2000)	✓ (2000)	✓ (2000)	✓ (1800)	✓	-
150-125-315	55	180M	18,5	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	180L	22	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	200L	30	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	34,5	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)
	55	225S	37	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	42,5	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)
	55	225M	45	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	52	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)
	55	250M	55	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	63	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)
	55	280S	75	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	86	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)
	55	280M	90	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)	104	✓ (2300)	✓ (2100)	✓ (2100)	✓ (2100)	✓ (1800)	✓ (1800)
150-125-400	55	200L	30	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	225S	37	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	225M	45	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	52	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	250M	55	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	63	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	280S	75	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	86	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	280M	90	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	104	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
200-150-200	35	160M	11	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	-	-	-	-	-	-	-
	35	160L	15	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	17,3	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓	-
	35	180M	18,5	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	21,3	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓	-
	35	180L	22	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	25,3	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓	-
	35	200L	30	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	34,5	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓	-
200-150-250	35	160L	15	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	-	-	-	-	-	-	-
	35	180M	18,5	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	21,3	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓	-
	35	180L	22	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	25,3	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓	-
	35	200L	30	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	34,5	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓	-
	35	225S	37	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	42,5	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓	-
	35	225M	45	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1500)	✓ (1500)	52	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓	-
200-150-315	55	180L	22	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	200L	30	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-

Size	Shaft unit	Motor size	50 Hz, 4-pole							60 Hz, 4-pole						
			P_N	Immersion depth [mm]						P_N	Immersion depth [mm]					
			[kW]	< 1000	1000	1250	1500	1750	2000	[kW]	< 1000	1000	1250	1500	1750	2000
200-150-315	55	225S	37	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	42,5	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	225M	45	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	52	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	250M	55	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	63	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	280S	75	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	86	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	280M	90	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	104	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
200-150-400	55	225M	45	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	250M	55	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	-	-	-	-	-	-	-
	55	280S	75	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	86	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)
	55	280M	90	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	104	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)	✓ (1800)

8 Trouble-shooting

⚠ WARNING

Improper work to remedy faults

Risk of injury!

- ▷ For any work to remedy faults observe the relevant information in this manual or in the relevant accessory manufacturer's product literature.

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

A Pump delivers insufficient flow rate

B Motor is overloaded

C Increased bearing temperature

D Vibrations during pump operation

Table 23: Trouble-shooting

A	B	C	D	Possible cause	Remedy[14)]
✗	-	-	-	Pump delivers against an excessively high pressure.	Re-adjust to duty point. Fit a larger impeller.
✗	-	-	-	Supply line or impeller clogged	Remove deposits in the pump and/or piping.
✗	-	-	✗	Suction lift is too high/$NPSH_{available}$ (positive suction head) is too low.	Check/alter liquid level. Check any strainers installed/suction opening.
✗	-	-	-	Wrong direction of rotation	Interchange two of the phases of the power cable.
✗	-	-	-	Speed is too low.[15)]	Increase speed.
✗	-	-	✗	Wear of internal components	Replace worn components by new ones.
-	✗	-	✗	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.[15)]
-	✗	-	-	Density or viscosity of fluid handled higher than stated in purchase order	Contact KSB.
-	-	✗	-	Increased axial thrust[15)]	Clean balancing holes in the impeller. Replace the casing wear rings.
-	-	✗	✗	Defective motor deep groove ball bearing	Replace.
✗	✗	-	-	Motor is running on two phases only.	Replace the defective fuse. Check the electric cable connections.
-	-	-	✗	Rotor out of balance	Clean the impeller. Re-balance the impeller.
-	-	-	✗	Defective plain bearing	Replace.
-	-	-	✗	Flow rate is too low.	Increase the minimum flow rate.

14) Pump pressure must be released before attempting to remedy faults on parts which are subjected to pressure.
15) Contact KSB.

9 Related Documents

9.1 General assembly drawings with list of components

9.1.1 Etanorm V, design W

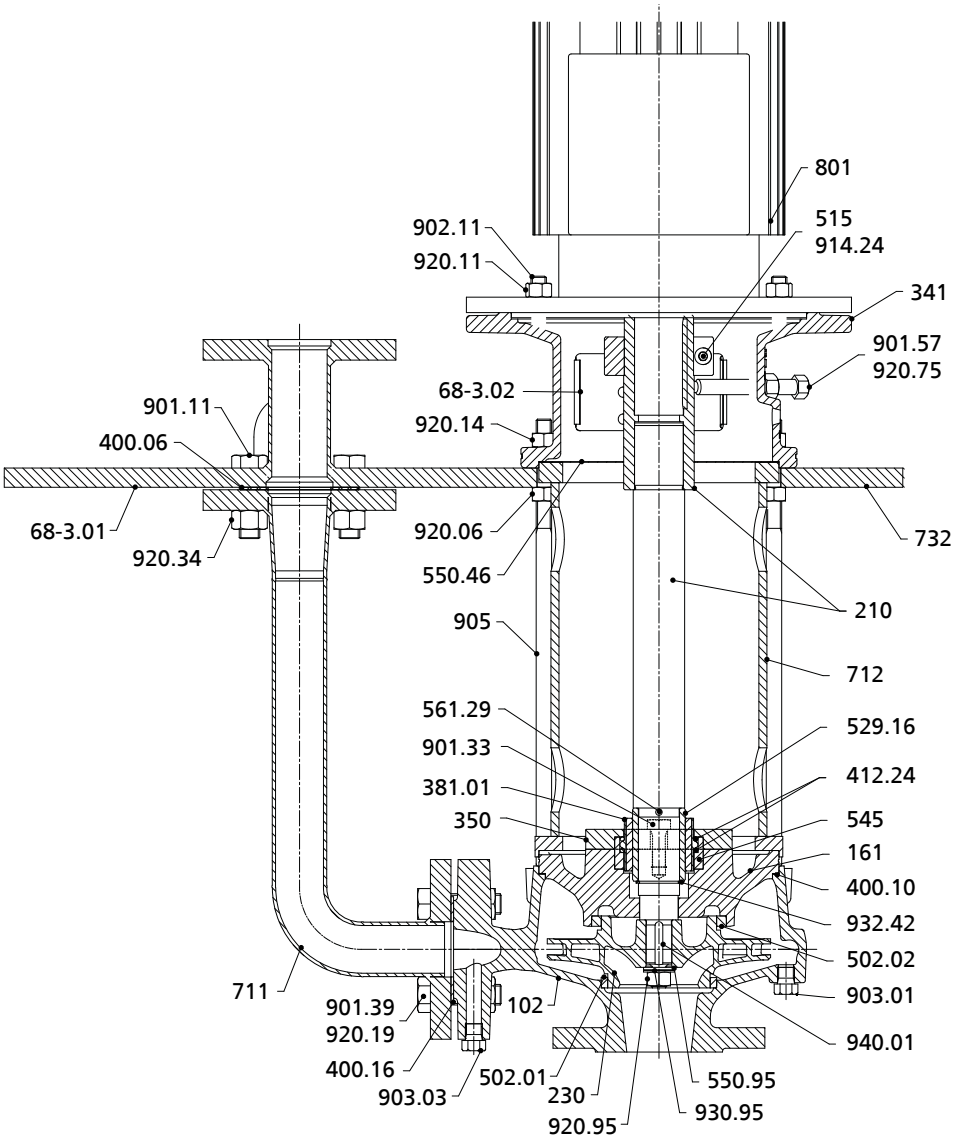
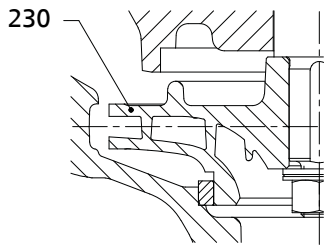
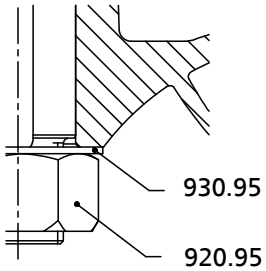
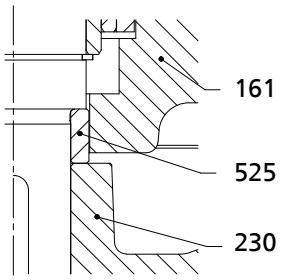


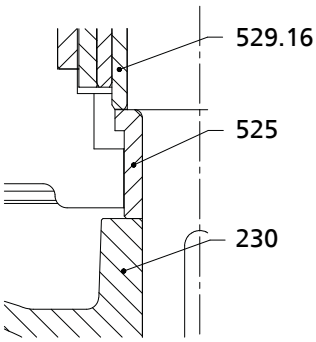
Fig. 13: General assembly drawing Etanorm V, design W

Table 24: Detail drawings Etanorm V, design W

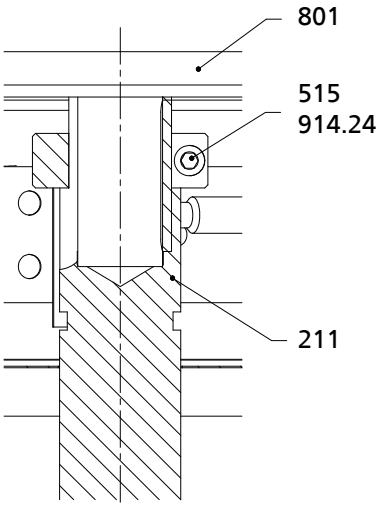
	
Impeller, unbalanced 50-32-125.1 50-32-160.1 50-32-125 65-40-125	Impeller fastening Material variants GG / CC; shaft units WS 35 / 55



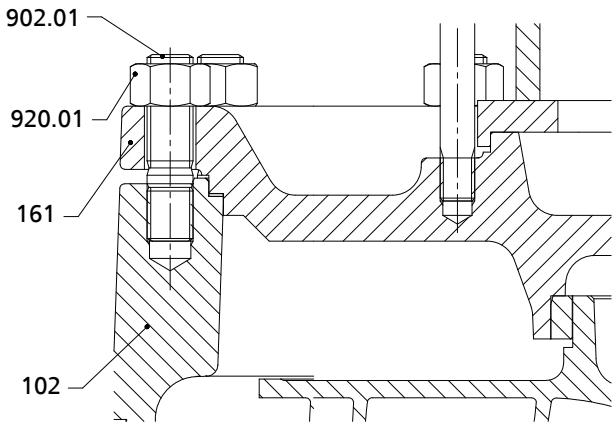
Spacer sleeve
Material variant GG; shaft units WS 35 / 55



Spacer sleeve and bearing sleeve
Material variant CC; shaft units WS 25 / 35 / 55



Motor connection
Material variants GG / CC; shaft units WS 25 / 35; motors 100 / 112



Bolted casing cover
Material variants GG / CC; shaft units WS 25 / 35 / 55

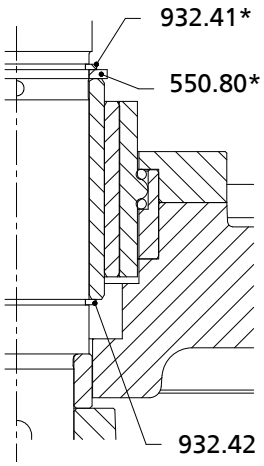


Fig.1_ WS55
Material variant GG;
* For shaft unit WS 55 only

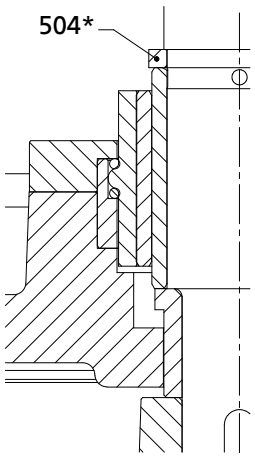
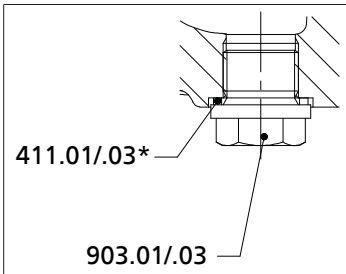
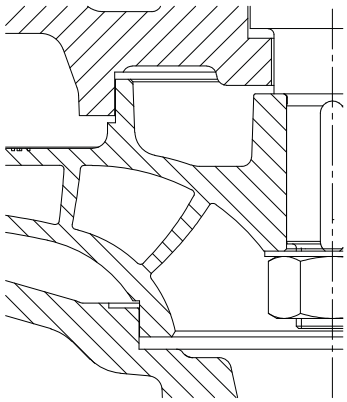


Fig.2_WS55
Material variant CC; shaft unit WS 55



Drain plug
* For material variant CC only



Drawing without casing wear ring
Material variant CC

Table 25: List of components

Part No.	Description	Part No.	Description
68-3.01/.02	Cover plate	545	Bearing bush
102	Volute casing	550.46/.80[16]/.95[17]	Disc
161	Casing cover	561.29	Grooved pin
210	Shaft	711	Discharge pipe
211	Pump shaft	712	Support column
230	Impeller	732[18]	Holder
341	Drive lantern	801	Flanged motor
350	Bearing housing	901.11/.33/.39/.57[19]	Hexagon head bolt
381.01	Bearing cartridge	902.01/.11	Stud
400.06/.10/.16	Gasket	903.01/.03	Screw plug
411.01/.03	Joint ring	905	Tie bolt
412.24	O-ring	914.24	Hexagon socket head cap screw
502.01/.02	Casing wear ring	920.01/.06/.11/.14/.19/.34/.75[19]/.95	Nut
504[16]	Spacer ring	930.95	Safety device
515	Locking ring	932.41[16]/.42	Circlip
525	Spacer sleeve	940.01[20]	Key
529.16	Bearing sleeve		

16) For WS_55 only
17) For WS_25 only
18) On pumps without cover plate only
19) Assembly aid or transport lock
20) 2x for WS_55

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, Vitachrom

KSB order number: .....

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

The manufacturer also declares that

- the following harmonised international standards have been applied:
  - ISO 12100
  - EN 809

Person authorised to compile the technical file:

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

.....[21)].....

Name

Function

Company
Address

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

11 Certificate of Decontamination

Type: .....
Order number/
Order item number[22]: .....
Delivery date: .....
Field of application: .....
Fluid handled[22]: .....

Please tick where applicable[22]:

☐ Radioactive

☐ Explosive

☐ Corrosive

☐ Toxic

☐ Harmful

☐ Bio-hazardous

☐ Highly flammable

☐ Safe

Reason for return[22]: .....
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 containment shroud leakage, the outer rotor, bearing bracket lantern, leakage barrier and bearing bracket or intermediate piece have also been cleaned.

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 dispatch is effected in accordance with the relevant legal provisions.

.....	.....	.....
Place, date and signature	Address	Company stamp

22) Required fields

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1228.8/03-EN (01647732)

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