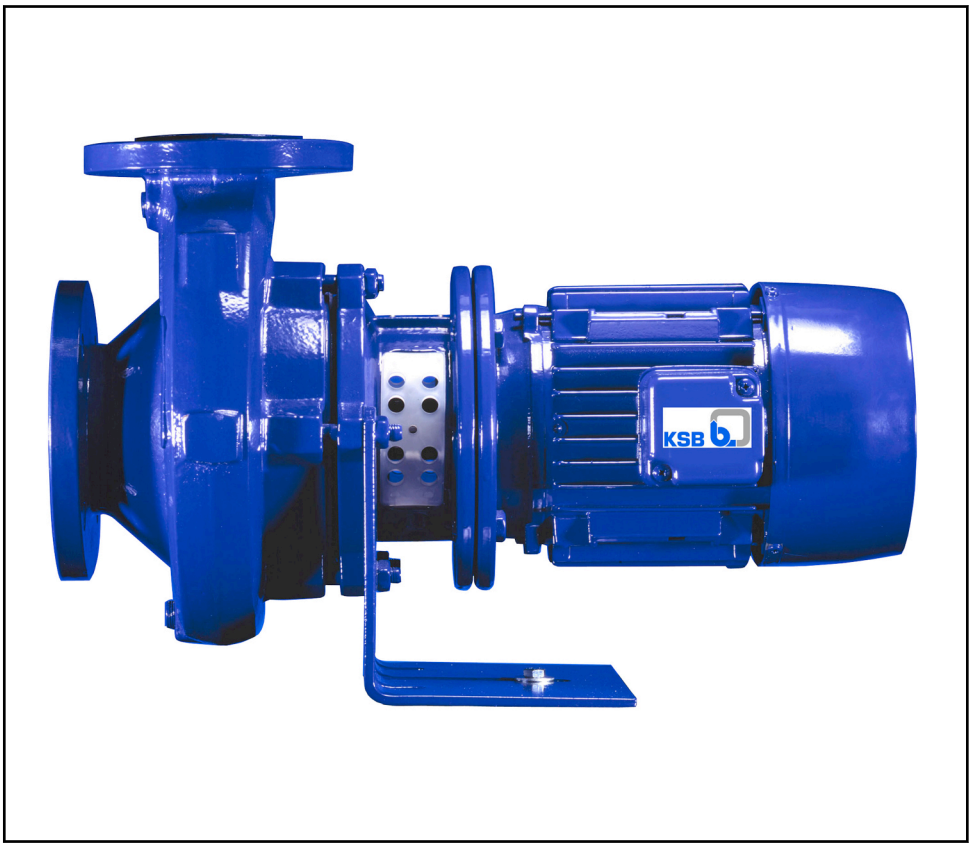
Closed-coupled Pump

Etabloc

Installation/Operating Manual



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Installation/Operating Manual Etabloc

Original operating manual

Subject to technical modification without prior notice.

Contents

Glossary

Back pull-out design

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

Back pull-out unit

Pump without pump casing; partly completed machinery

Certificate of decontamination

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

Close-coupled design

Motor directly fitted to the pump via a flange or a drive lantern

Discharge line

The line which is connected to the discharge nozzle

Hydraulic system

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

Pool of pumps

Pumps which are purchased and stored independently of their later use

Pump

Machine without drive, additional components or accessories

Pump set

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

Suction lift line/suction head line

The line which is connected to the suction nozzle

1 General

1.1 Principles

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

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

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

Noise characteristics (⇨ Section 4.7 Page 19)

1.2 Installation of partly completed machinery

To install partly completed machinery supplied by KSB, refer to the sub-sections under Servicing/Maintenance.(⇨ Section 7.5.4 Page 41)

1.3 Target group

This 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 documentation for accessories and integrated machine parts
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

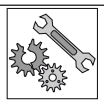
2 Safety

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.
	**Explosion protection** This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EC Directive 94/9/EC (ATEX).
	**General hazard** In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	**Electrical hazard** In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	**Machine damage** In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

2.2 General

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

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

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

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

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

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

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

2.3 Intended use

The pump (set) must only be operated within the operating limits described in the other applicable documents.

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

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

Prevention of foreseeable misuse

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

2.4 Personnel qualification and training

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

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

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

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

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

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

2.6 Safety awareness

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

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

2.7 Safety information for the operator/user

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

2.8 Safety information for maintenance, inspection and installation work

- Modifications or alterations of the pump are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts authorised by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that all maintenance, inspection and installation work is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- The pump casing must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the pump set out of service always adhere to the procedure described in the manual.(⇨ Section 6.1.5 Page 29)(⇨ Section 6.3 Page 31)
- Decontaminate pumps which handle fluids posing a health hazard.(⇨ Section 7.3 Page 36)
- As soon as the work is 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 27)

2.9 Unauthorised modes of operation

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

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

2.10 Explosion protection

DANGER

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

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

Special conditions apply to the operation of explosion-proof pump sets to EC Directive 94/9/EC (ATEX).
Especially adhere to the sections in this manual marked with the Ex symbol and the following sections(⇨ Section 2.10.1 Page 11) to(⇨ Section 2.10.4 Page 12) (⇨ Section 2.10.3 Page 11).
The explosion-proof status of the pump set is only assured if the pump set is used in accordance with its intended use.

Never operate the pump set outside the limits stated in the data sheet and on the name plate.
Prevent impermissible modes of operation at all times.

2.10.1 Marking

Pump

The marking on the pump refers to the pump part only.
Example of such marking: II 2 G c TX
Refer to the Temperature Limits table for the temperatures permitted for the individual pump variants. (⇨ Section 2.10.2 Page 11)

Shaft coupling

An EC manufacturer's declaration is required for the shaft coupling; the shaft coupling must be marked accordingly.

Motor

The motor has its own marking. The marking is maintained on the condition that the temperatures the pump causes to develop at the motor flange and motor shaft are permitted by the motor manufacturer.
The motors used by KSB on pumps with ATEX certification meet this condition.

2.10.2 Temperature limits

In normal pump operation, the highest temperatures are to be expected on the surface of the pump casing and at the shaft seal.
The surface temperature at the pump casing corresponds to the temperature of the fluid handled. If the pump is heated, the operator of the system is responsible for observing the specified temperature classes and fluid temperature (operating temperature).
The table below lists the temperature classes and the resulting theoretical temperature limits of the fluid handled. (A possible temperature rise in the shaft seal area has already been taken into account).

The temperature class specifies the maximum permissible temperature at the surface of the pump set during operation. For the permissible operating temperature of the pump in question refer to the data sheet.

Table 4: Temperature limits

Temperature class as per EN 13463-1	Max. permissible fluid temperature
T1	Temperature limit of the pump
T2	280 °C
T3	185 °C
T4	120 °C
T5	85 °C
T6	Only after consultation with the manufacturer

If the pump is to be operated at a higher temperature, the data sheet is missing or if the pump is part of a pool of pumps, contact KSB for the maximum permissible operating temperature.

Motor supplied by the operator

If a pump is supplied without motor (as part of a pool of pumps), the motor specified in the pump data sheet must meet the following conditions:

- The permissible temperature limits at the motor flange and motor shaft must be higher than the temperatures generated by the pump.
- Contact the manufacturer for the actual pump temperatures.

2.10.3 Monitoring equipment

The pump (set) must only be operated within the limits specified in the data sheet and on the name plate.
If the system operator cannot warrant compliance with these operating limits, appropriate monitoring devices must be used.
Check whether monitoring equipment is required to ensure that the pump set functions properly.

Contact KSB for further information on monitoring equipment.

2.10.4 Operating limits

The minimum flows indicated in (⇨ Section 6.2.3.1 Page 30) refer to water and water-like fluids. Longer operating periods with these fluids and at the flow rates indicated will not cause an additional increase in the temperatures at the pump surface. However, if the physical properties of the fluids handled are different from water, it is essential to check whether an additional heat build-up may occur and if the minimum flow rate must therefore be increased. The calculation formula in(⇨ Section 6.2.3.1 Page 30) can be used to check whether an additional heat build-up may lead to a hazardous temperature increase at the pump surface.

3 Transport/Temporary Storage/Disposal

3.1 Checking the condition upon delivery

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

3.2 Transport

⚠ 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

Incorrect transport of the pump
Damage to the shaft seal!

- ▷ For transport, lock the pump shaft with a suitable transport lock to prevent any movement of the shaft.

Make sure shaft 210 of the pump without motor is locked for transport.

1. Undo bolts 900.
2. Remove cover plates 68-3 from drive lantern 341.
3. Insert washer plates 931 into the shaft groove.
4. Tighten screws 901.3.

To transport the pump/pump set suspend it from the lifting tackles as follows.

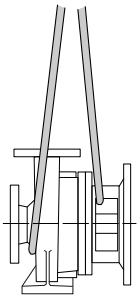


Fig. 1: Transporting the pump

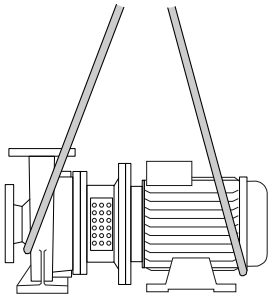


Fig. 2: Transporting the pump set

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 by 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 set!

- ▹ Only remove caps/covers from the openings of the pump set at the time of installation.

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

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

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

For storing a pump (set) which has already been operated, observe the instructions in. (⇨ Section 6.3.1 Page 31)

3.4 Return to supplier

1. Drain the pump as per operating instructions.(⇨ Section 7.3 Page 36)
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 fluids handled by the pump set leave residues which might lead to corrosion damage when coming into contact with atmospheric humidity, or which might ignite when coming into contact with oxygen, the pump set must also be neutralised, and anhydrous inert gas must be blown through the pump for drying purposes.
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 63)

NOTE

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

3.5 Disposal

⚠ WARNING

Fluids, consumables and supplies which are hot 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

- Close-coupled pump with shaft seal

Pump for handling clean or aggressive fluids not chemically and mechanically aggressive to the pump materials.

4.2 Product Information as per Regulation No. 547/2012 (for Water Pumps with a Maximum Shaft Power of 150 kW) Implementing "Ecodesign" Directive 2009/125/EC

- Minimum efficiency index: see name plate, key to name plate (⇨ Section 4.4 Page 17)
- The benchmark for most efficient water pumps is MEI ≥ 0.70.
- Year of construction: see name plate, key to name plate (⇨ Section 4.4 Page 17)
- Manufacturer's name or trade mark, commercial registration number and place of manufacture: see data sheet or order documentation
- Product's type and size identificator: see name plate, key to name plate (⇨ Section 4.4 Page 17)
- Hydraulic pump efficiency (%) with trimmed impeller: see data sheet
- Pump performance curves, including efficiency characteristics: see documented characteristic curve
- The efficiency of a pump with a trimmed impeller is usually lower than that of a pump with full impeller diameter. Trimming of the impeller will adapt the pump to a fixed duty point, leading to reduced energy consumption. The minimum efficiency index (MEI) is based on the full impeller diameter.
- Operation of this water pump with variable duty points may be more efficient and economic when controlled, for example, by the use of a variable speed drive that matches the pump duty to the system.
- Information on dismantling, recycling and disposal after decommissioning: (⇨ Section 3.5 Page 15)
- Information on benchmark efficiency or benchmark efficiency graph for MEI = 0.7 (0.4) for the pump based on the model shown in the Figure are available at: http://www.europump.org/efficiencycharts

4.3 Designation

Example: Etabloc G N 125-250/1504 G10

Table 5: Key to the designation

Code	Description	
Etabloc	Type series	
G	Casing material	
	G	Grey cast iron
	M	Pressure-retaining parts made of cast iron, impeller made of bronze
N	Stub shaft version with standardised motor	
125	Nominal discharge nozzle diameter [mm]	
250	Nominal impeller diameter [mm]	
150	Motor rating [kW x 10]	
	150	15 kW
4	Number of motor pole pairs	
G10	Seal code of the mechanical seal	
	G10	Q1Q1X4GG
	G11	BQ1EGG

4.4 Name plate

Fig. 3: Etabloc name plate (example)

1	Type series, size and version (⇨ Section 4.3 Page 16)	2	Material number (optional)
3	KSB order No., order item No. and consecutive No.	4	Flow rate
5	Kinematic viscosity of the fluid handled	6	Minimum efficiency index
7	Impeller diameter	8	Head
9	Speed	10	Year of construction
11	Efficiency (see data sheet)		

4.5 Design details

Design

- Volute casing pump
- Close-coupled design
- Single-stage[2)]
- Horizontal/vertical installation
- Back pull-out design
- Ratings to EN 733

Etabloc GN, MN, SN, BN, CN

- Rigid connection between pump and motor

Pump casing

- Radially split volute casing
- Replaceable casing wear rings[3)]

Impeller type

- Closed radial impeller

Shaft seal

- Standardised mechanical seal to EN 12756
- Shaft equipped with a replaceable shaft sleeve in the shaft seal area

Bearings

- Radial ball bearings in the motor housing
- Grease lubrication

2) Etabloc 32-23: two stages

3) Except for Etabloc 25-20 and 32-23

Drive

- KSB IEC frame standardised IE2 motor (from 0.75 kW)
- Type of construction: V1 up to 4 kW / V15 above 4 kW
- 220-240 V / 380-420 V up to 2.2 kW; 380-420 V / 660-725 V above 2.2 kW
- IP 55 enclosure
- Thermal class F
- 3 PTC thermistors

4.6 Design and function

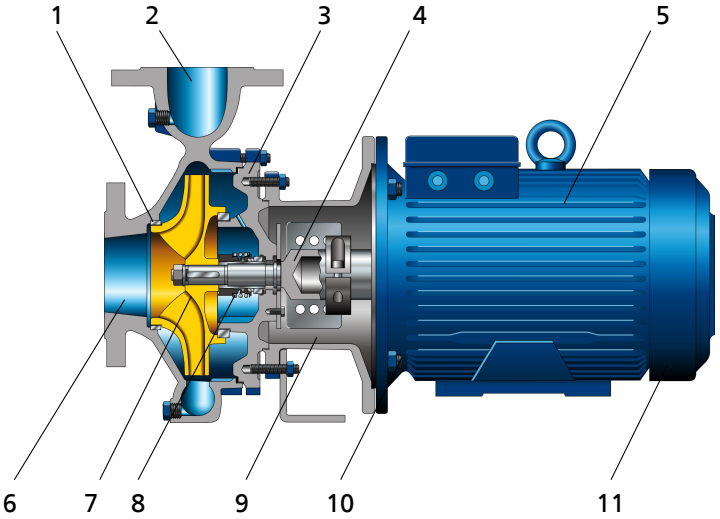


Fig. 4: Sectional drawing

1	Clearance gap	2	Discharge nozzle
3	Casing cover	4	Shaft
5	Motor housing	6	Suction nozzle
7	Impeller	8	Shaft seal
9	Drive lantern	10	Rolling element bearing
11	Rolling element bearing		

Design The pump is designed with an axial fluid inlet and a radial outlet. The hydraulic system is rigidly connected with the motor via a stub shaft coupling or has a common shaft with the motor.

Function The fluid enters the pump via the suction nozzle (6) and is accelerated outward by the rotating impeller (7). In the flow passage of the pump casing the kinetic energy of the fluid is converted into pressure energy. The fluid is pumped to the discharge nozzle (2), where it leaves the pump. The clearance gap (1) prevents any fluid from flowing back from the casing to the suction nozzle. At the rear side of the impeller, the shaft (4) enters the casing via the casing cover (3). The shaft passage through the cover is sealed to the atmosphere with a dynamic shaft seal (8). The shaft runs in rolling element bearings (10 and 11), which are supported by a motor housing (5) linked with the pump casing and/or casing cover (3) via the drive lantern (9).

Sealing The pump is sealed by a standardised mechanical seal.

4.7 Noise characteristics

Table 6: Sound pressure level measured at the surfaces L_{pA} [4)]

Rated power input P_N[kW]	Pump set			
	1450 rpm [dB]	1750 rpm [dB]	2900 rpm [dB]	3500 rpm [dB]
0.25	53	54	-	-
0.37	54	55	-	-
0.55	55	56	-	-
0.75	56	57	66	-
1.1	57	58	66	69
1.5	58	59	67	70
2.2	59	60	67	70
3	60	61	68	71
4	61	62	68	71
5.5	62	63	70	73
7.5	64	65	71	74
11	65	66	73	76
15	67	68	74	77
18.5	68	69	75	78
22	69	70	76	79
30	70	71	77	80
37	71	72	78	81
45	73	74	78	81

4.8 Scope of supply

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

- Pump

Drive

- Surface-cooled IEC frame three-phase squirrel-cage motor

Contact guard

- Cover plates on drive lantern to EN 294 (Etabloc .N)

4.9 Dimensions and weights

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

4) Spatial average to ISO 3744 and EN 12639. Applies to non-cavitating pump operation in the range Q/Qopt = 0.8 - 1.1. If noise levels are to be guaranteed: Add +3 dB for measuring and constructional tolerance.

5 Installation at Site

5.1 Safety regulations

⚠ DANGER

Improper installation in potentially explosive atmospheres
Explosion hazard!
Damage to the pump set!

- ▹ Comply with the applicable local explosion protection regulations.
- ▹ Observe the information in the data sheet and on the name plates of pump and motor.

5.2 Checking the site before installation

Place of installation

⚠ WARNING

Installation on mounting surfaces which are unsecured and cannot support the load
Personal injury and damage to property!

- ▹ Use a concrete of compressive strength class C12/15 which meets the requirements of exposure class X0 to EN 206-1.
- ▹ The mounting surface must have set and must be completely horizontal and even.
- ▹ Observe the weights indicated.

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

5.3 Installing the pump set

CAUTION

Ingress of leakage into the motor
Damage to the pump!

- ▹ Never install the pump set with the "motor below".

Fastening

Typical installation positions(⇨ Section 9.1 Page 49)

Table 7: Fastening

Motor rating	Type of fastening
Up to 4 kW (explosion-proof models up to 3.3 kW)	Fastening via support foot or by fastening the pump to the piping (with the support foot removed)
From 5.5 kW (explosion-proof models from 4.6 kW)	Fastening via motor foot
Four poles, from 30 kW	Fastening via pump foot and motor support

NOTE

On Etabloc GN, MN with motor sizes 132 or 160, the motor foot must be shimmed (20 mm shim height) for installation on a foundation.
On some pump/motor combinations of Etabloc G, M, GN and MN, the angle foot / the motor feet need to be shimmed for installation on a foundation (see outline drawing).

1. Position the pump set on the foundation and fasten it (see table on Fastening).

2. Use a spirit level to align the pump set with the discharge nozzle.
3. If the volute casing is turned, drill a drain hole in the volute casing, if required (see table "Drain hole size").
4. Change the position of the plugs for the condensation water holes on Etabloc G or M depending on the installation position.(⇨ Section 9.1 Page 49)

Table 8: Drain hole size

Sizes	Drilled hole diameter
25-20 and 32-125.1 to 80-315	G $^{3}/_{8}$ [5]
32-23 and 100-160 to 150-250	G $^{1}/_{2}$ [6]

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

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

✓ The suction lift line has been laid with a rising slope, the suction head line with a downward slope towards the pump.
✓ A flow stabilisation section having a length equivalent to at least twice the inside diameter of the suction flange has been provided upstream of the suction flange.
✓ The nominal diameters of the pipelines are equal to or greater than the nominal diameters of the pump nozzles.
✓ Adapters to larger nominal diameters are designed with a diffuser angle of approx. 8° to avoid excessive pressure losses.
✓ The pipelines have been anchored in close proximity to the pump and connected without transmitting any stresses or strains.

1. Thoroughly clean, flush and blow through all vessels, pipelines and connections (especially of new installations).
2. Before installing the pump in the piping, remove the flange covers on the suction and discharge nozzles of the pump.

5) G = ISO 228/1
6) G = ISO 228/1

CAUTION

Welding beads, scale and other impurities in the piping
Damage to the pump!

- ▷ Free the piping from any impurities.
- ▷ If necessary, install a filter.
- ▷ Comply with the instructions set out in (⇨ Section 7.2.2.2 Page 36).

3. Check that the inside of the pump is free from any foreign objects. Remove any foreign objects.
4. If required, install a filter in the piping (see drawing: Filter in the piping).

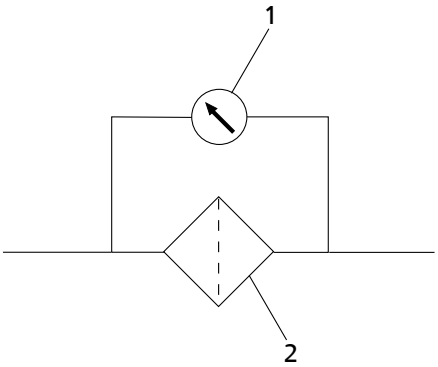


Fig. 5: Filter in the piping

1	Differential pressure gauge	2	Filter

NOTE

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

5. Connect the pump nozzles to the piping.

CAUTION

Aggressive flushing and pickling agents
Damage to the pump!

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

5.4.2 Permissible forces and moments at the pump nozzles

No piping-induced forces and moments (from warped pipelines or thermal expansion, for example) must act on the pump.

5.4.3 Vacuum balance line

NOTE

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

The following rules apply to vacuum balance lines:

- Minimum nominal line diameter 25 mm.
- The line extends above the highest permissible fluid level in the vessel.

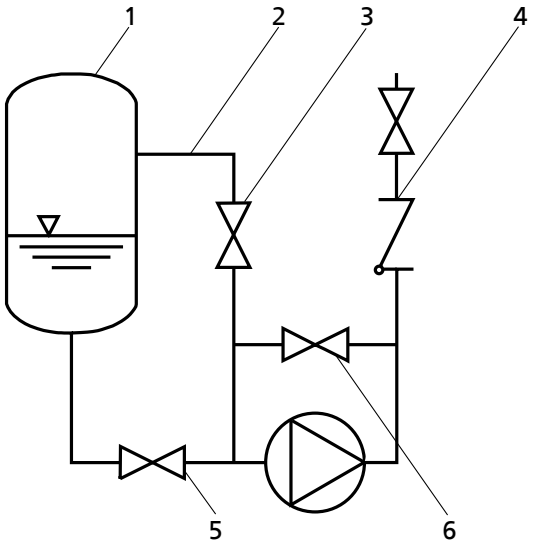


Fig. 6: Vacuum balance system

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

NOTE

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

5.4.4 Auxiliary connections

⚠ DANGER

Risk of potentially explosive atmosphere by mixing of incompatible fluids in the auxiliary piping
Risk of burns!
Explosion hazard!

- ▹ Make sure that the barrier fluid and quench liquid are compatible with the fluid pumped.

⚠ WARNING

Failure to use or incorrect use of auxiliary connections (e.g. barrier fluid, flushing liquid, etc.)
Risk of injury from escaping fluid!
Risk of burns!
Malfunction of the pump!

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

5.5 Enclosure/insulation

⚠ DANGER

Explosive atmosphere forming due to insufficient venting
Explosion hazard!

- ▹ Make sure the space between the casing cover/discharge cover and the motor flange is sufficiently vented.
- ▹ Do not cover the perforated holes of the contact guards at the drive lantern (e.g. by insulation).

⚠ WARNING

The volute casing and casing/discharge cover take on the same temperature as the fluid handled
Risk of burns!

- ▹ Insulate the volute casing.
- ▹ Fit protective equipment.

CAUTION

Heat build-up inside the drive lantern
Damage to the bearing!

- ▹ Never insulate the casing cover and the drive lantern.

5.6 Electrical connection

⚠ DANGER

Incorrect electrical installation
Explosion hazard!

- ▹ For electrical installation, also observe the requirements of IEC 60079-14.
- ▹ Always connect explosion-proof motors via a motor protection switch.

⚠ DANGER

Work on the pump set by unqualified personnel
Danger of death from 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 motor name plate.
2. Select an appropriate start-up method.

NOTE

A motor protection device is recommended.

5.6.1 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 9: Time relay settings for star-delta starting:

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

5.6.2 Earthing

⚠ DANGER

Electrostatic charging
Explosion hazard!
Fire hazard!
Damage to the pump set!

- ▷ Connect the PE conductor to the earthing terminal provided.

5.6.3 Connecting the motor

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.

5.7 Checking the direction of rotation

⚠ DANGER

Temperature increases resulting from contact between rotating and stationary components
Explosion hazard!
Damage to the pump set!

- ▷ Never check the direction of rotation by starting up the unfilled pump.

⚠ 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.

CAUTION

Drive and pump running in the wrong direction of rotation
Damage to the pump!

- ▷ Refer to the arrow indicating the direction of rotation on the pump.
- ▷ Check the direction of rotation. If required, check the electrical connection and correct the direction of rotation.

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

1. Start the motor and stop it again immediately to determine the motor's direction of rotation.
2. Check the direction of rotation.
   The motor's direction of rotation must match the arrow indicating the direction of rotation on the pump.
3. If the motor runs 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 electric power supply and is equipped with all protection devices.
- The pump has been primed with the fluid to be handled.(⇨ Section 6.1.2 Page 27)
- The direction of rotation has been checked.(⇨ Section 5.7 Page 25)
- All auxiliary connections required are connected and operational.
- The lubricants have been checked.
- After prolonged shutdown of the pump (set), the activities described in (⇨ Section 6.4 Page 31) have been carried out.
- The lockwashers have been pulled out of the shaft groove.

6.1.2 Priming and venting the pump

⚠ DANGER

Risk of potentially explosive atmosphere inside the pump
Explosion hazard!

▷ Before starting up the pump, vent the suction line and the pump and prime them with the fluid to be handled.

CAUTION

Increased wear due to dry running
Damage to the pump set!

▷ Never operate the pump set without liquid fill.

▷ Never close the shut-off element in the suction line and/or supply line during pump operation.

1. Vent the pump and suction line and fill them with the fluid to be handled. Connection 6D can be used for venting (see drawing of auxiliary connections). For vertical installation with the motor on top, use connection 5B (if any) for venting (see drawing of auxiliary connections and (⇨ Section 9.1 Page 49).
2. Fully open the shut-off valve in the suction line.
3. Fully open all auxiliary feed lines (barrier fluid, flushing liquid, etc.), if applicable.
4. Open the shut-off valve (3), if any, in the vacuum balance line (2) and close the vacuum-tight shut-off valve (6), if any. (⇨ Section 5.4.3 Page 22)

NOTE

For design-inherent reasons some unfilled volume in the hydraulic system cannot be excluded after the pump has been primed for commissioning/start-up. However, once the motor is started up the pumping effect will immediately fill this volume with the fluid handled.

6.1.3 Start-up

⚠ DANGER

Non-compliance with the permissible pressure and temperature limits if the pump is operated with the suction and/or discharge line closed.
Explosion hazard!
Leakage of hot or toxic fluids!

- ▹ Never operate the pump with the shut-off elements in the suction line and/or discharge line closed.
- ▹ Only start up the pump set with the discharge-side shut-off element slightly or fully open.

⚠ DANGER

Excessive temperatures due to dry running or excessive gas content in the fluid handled
Explosion hazard!
Damage to the pump set!

- ▹ Never operate the pump set without liquid fill.
- ▹ Prime the pump as specified.
- ▹ Always operate the pump within the permissible operating range.

CAUTION

Abnormal noises, vibrations, temperatures or leakage
Damage to the pump!

- ▹ Switch off the pump (set) immediately.
- ▹ Eliminate the causes before returning the pump set to service.

✓ The system piping has been cleaned.
✓ The pump, suction line and inlet tank, if any, have been vented and primed with the fluid to be pumped.
✓ The lines for priming and venting have been closed.

CAUTION

Start-up against open discharge line
Motor overload!

- ▹ Make sure the motor has sufficient power reserves.
- ▹ Use a soft starter.
- ▹ Use speed control.

1. Fully open the shut-off element in the suction head/suction lift line.
2. Close or slightly open the shut-off element in the discharge line.
3. Start up the motor.
4. Immediately after the pump has reached full rotational speed, slowly open the shut-off element in the discharge line and adjust it to comply with the duty point.

6.1.4 Checking the shaft seal

Mechanical seal

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

6.1.5 Shutdown

CAUTION

Heat build-up inside the pump
Damage to the shaft seal!

- ▹ Depending on the type of installation, the pump set requires sufficient after-run time – with the heat source switched off – until the fluid handled has cooled down.

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

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

NOTE

If the discharge line is equipped with a non-return or 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.
2. Close the auxiliary connections.
   If the fluid handled is fed in under vacuum, also supply the shaft seal with barrier fluid during standstill.

CAUTION

Risk of freezing during prolonged pump shutdown periods
Damage to the pump!

- ▹ Drain the pump and 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, fluid handled and speed
Explosion hazard!
Hot or toxic fluid could escape!

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

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 10: Permissible ambient temperatures

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

6.2.2 Switching frequency

DANGER

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

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

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

Table 11: Switching frequency

Material variant	Maximum switching frequency [start-ups/hour]
Etabloc G, M	15
Etabloc GN, MN, SN	15
Etabloc BN, CN	6

CAUTION

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

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

6.2.3 Fluid handled

6.2.3.1 Flow rate

Table 12: Flow rate

Temperature range (t)	Minimum flow rate	Maximum flow rate
-30 to +70 °C	≈ 15 % of Q_{Opt} [7)]	See hydraulic characteristic curves
> 70 to +140 °C	≈ 25 % of Q_{Opt} [7)]	

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

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

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

Table 13: Key

Symbol	Description	Unit
c	Specific heat capacity	J/kg K
g	Gravitational constant	m/s²

7) Best efficiency point

Symbol	Description	Unit
H	Pump head	m
T_f	Temperature of the fluid handled	°C
T_o	Temperature at the casing surface	°C
η	Pump efficiency at duty point	-
$\Delta\vartheta$	Temperature difference	K

6.2.3.2 Density of the fluid handled

The power input of the pump increases 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 indicated in the data sheet.
- ▹ Make sure the motor has sufficient power reserves.

6.2.3.3 Abrasive fluids

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

6.3 Shutdown/storage/preservation

6.3.1 Measures to be taken for shutdown

The pump (set) remains installed

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

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

The pump (set) is removed and stored

✓ The pump has been properly drained (⇨ Section 7.3 Page 36) and the safety instructions for dismantling the pump have been observed.(⇨ Section 7.4.1 Page 36)

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 or grease, food-approved, if required) to protect them against corrosion.
   Observe the additional instructions.(⇨ Section 3.3 Page 14)

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

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

6.4 Returning to service

For returning the pump to service observe the sections on commissioning/start-up (⇨ Section 6.1 Page 27) and the operating limits.(⇨ Section 6.2 Page 29)

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.

7 Servicing/Maintenance

7.1 Safety regulations

⚠ DANGER

Improperly serviced pump set
Risk of explosion!
Damage to the pump set!

- ▷ Service the pump set regularly.
- ▷ Prepare a maintenance schedule with special emphasis on the shaft seal.

The operator ensures that all maintenance, inspection and installation work 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!

- ▷ Make sure that the pump set cannot be started up unintentionally.
- ▷ Always make sure the electrical connections are disconnected before carrying out work on the pump set.

⚠ WARNING

Fluids and supplies posing a health hazard and/or hot fluids or 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 tipping or falling over.

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

NOTE

All maintenance, service and installation work can be carried out by KSB Service or authorised workshops. Find your contact in the attached "Addresses" booklet or on the Internet at "www.ksb.com/contact".

Never use force when dismantling and reassembling the pump set.

7.2 Maintenance/inspection

7.2.1 Supervision of operation

⚠ DANGER

Risk of potentially explosive atmosphere inside the pump
Explosion hazard!

- The pump internals in contact with the fluid to be handled, including the seal chamber and auxiliary systems must be filled with the fluid to be handled at all times.
- Provide sufficient inlet pressure.
- Provide an appropriate monitoring system.

⚠ DANGER

Incorrectly serviced shaft seal
Explosion hazard!
Leakage of hot, toxic fluids!
Damage to the pump set!
Risk of burns!
Fire hazard!

- Regularly service the shaft seal.

⚠ DANGER

Excessive temperatures as a result of bearings running hot or defective bearing seals
Explosion hazard!
Fire hazard!
Damage to the pump set!

- Regularly check the rolling element bearings for running noises.

⚠ DANGER

Incorrectly serviced barrier fluid system
Explosion hazard!
Fire hazard!
Damage to the pump set!
Hot and/or toxic fluids could escape!

- Service the barrier fluid system regularly.
- Monitor the barrier fluid pressure.

CAUTION

Increased wear due to dry running
Damage to the pump set!

- Never operate the pump set without liquid fill.
- Never close the shut-off element in the suction line and/or supply line during pump operation.

CAUTION

Impermissibly high temperature of fluid handled
Damage to the pump!

- Prolonged operation against a closed shut-off element is not permitted (heating up of the fluid).
- Observe the temperature limits in the data sheet and in the section on operating limits.(⇨ Section 6.2 Page 29)

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. (⇨ Section 6.1.4 Page 28)
- Check the static seals for leakage.
- Check the rolling element bearings for running noises.
  Vibrations, noise and an increase in current input occurring during unchanged operating conditions indicate wear.
- Monitor the correct functioning of any auxiliary connections.
- 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 at 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

⚠ DANGER

Excessive temperatures caused by friction, impact or frictional sparks
Explosion hazard!
Fire hazard!
Damage to the pump set!

▷ Regularly check the cover plates, plastic components and other guards of rotating parts for deformation and sufficient distance from rotating parts.

7.2.2.1 Checking the clearance gaps

For checking the clearance gaps remove the impeller, if required.
If the clearance gap is larger than permitted (see the following table), replace casing wear ring 502.1 and/or 502.2 with a new one.
The clearances given refer to the diameter.

Table 14: Clearance gaps between impeller and casing / between impeller and casing cover

	Etabloc G, M, GN, MN, SN, BN	Etabloc CN
New	0.3 mm	0.5 mm
Maximum permissible expansion	0.9 mm	1.5 mm

7.2.2.2 Cleaning filters

CAUTION

Insufficient inlet pressure due to clogged filter in the suction line
Damage to the pump!

- ▹ Monitor contamination of filter with suitable means (e.g. differential pressure gauge).
- ▹ Clean filter at appropriate intervals.

7.3 Drainage/cleaning

⚠ WARNING

Fluids, consumables and supplies which are hot 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. Use connection 6B to drain the fluid handled (see drawing of auxiliary connections).
2. Always flush the pump if it has been used for handling noxious, explosive, hot or other hazardous fluids.
   Always flush and clean the pump before transporting it to the workshop.
   Provide a cleaning record for the pump.

7.4 Dismantling the pump set

7.4.1 General information/Safety regulations

⚠ 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.

⚠ 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 safety 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.(⇨ Section 9.2 Page 52)

NOTE

All maintenance, service and installation work can be carried out by KSB Service or authorised workshops. Find your contact in the attached "Addresses" booklet or on the Internet at "www.ksb.com/contact".

⚠ DANGER

Insufficient preparation of work on the pump (set)
Risk of injury!

- ▹ Properly shut down the pump set.(⇨ Section 6.1.5 Page 29)
- ▹ Close the shut-off elements in suction and discharge line.
- ▹ Drain the pump and release the pump pressure. (⇨ Section 7.3 Page 36)
- ▹ Close any auxiliary connections.
- ▹ Allow the pump set to cool down to ambient temperature.

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 Dismantling the complete pump set

NOTE

The pump casing can remain installed in the piping for further dismantling.

✓ The notes and steps stated in(⇨ Section 7.4.1 Page 36) to(⇨ Section 7.4.2 Page 37) have been observed/carried out.

1. Disconnect the discharge and suction nozzle from the piping.
2. Depending on the pump/motor size, unscrew the bolts that fix the support foot and/or motor foot to the foundation.
3. Remove the complete pump set from the piping.

7.4.4 Dismantling the motor

⚠ WARNING

Motor tipping over
Risk of crushing hands and feet!

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

✓ The notes and steps stated in(⇨ Section 7.4.1 Page 36) to(⇨ Section 7.4.2 Page 37) have been observed/carried out.

1. Depending on the pump/motor size, unscrew the bolts that fix the motor foot to the foundation.
2. Undo screws 900.
3. Remove cover plates 68-3 from drive lantern 341.
4. Undo hexagon head bolts 901.3.

5. Insert both lockwashers 931 into the groove in shaft 210(⇨ Section 7.5.5 Page 41).
6. Tighten hexagon head bolts 901.3.
7. Remove the motor.

7.4.5 Removing the back pull-out unit

⚠ WARNING

Back pull-out unit tipping over
Risk of squashing hands and feet!

▹ Suspend or support the back pull-out unit at the pump end.

✓ The notes and steps stated in(⇨ Section 7.4.1 Page 36) to(⇨ Section 7.4.4 Page 37) have been observed/carried out.

1. If required, suspend or support the back pull-out unit to prevent it from tipping over.
2. Undo nut 920.2 (with bolted discharge cover) or 920.4 (with clamped discharge cover) at the volute casing.
3. Pull the back pull-out unit out of the volute casing.
4. Remove and dispose of gasket 400.1.
5. Place the back pull-out unit on a clean and level surface.

7.4.6 Removing the impeller

✓ The notes and steps stated in(⇨ Section 7.4.1 Page 36) to(⇨ Section 7.4.5 Page 38) have been observed/carried out.

✓ The back pull-out unit has been placed in a clean and level assembly area.

1. Undo impeller nut 920.1 (right-hand thread).
2. Remove impeller 230 with an impeller removal tool.
3. Place impeller 230 on a clean and level surface.
4. Remove keys 940.2 from shaft 210.

7.4.7 Removing the mechanical seal

✓ The notes and steps stated in(⇨ Section 7.4.1 Page 36) to(⇨ Section 7.4.6 Page 38) have been observed/carried out.

✓ The back pull-out unit is kept in a clean and level assembly area.

1. Remove shaft sleeve 523 with the rotating part of the mechanical seal (primary ring) from shaft 210.
2. Remove the rotating part of the mechanical seal (primary ring) from shaft sleeve 523.
3. Unscrew hexagon nuts 920.3 and 920.4, if any, at drive lantern 341 or at the motor flange of Etabloc G, M.
4. Remove discharge cover 163 from drive lantern 341 or, on Etabloc G, M, from the motor flange.
5. Remove the stationary part of the mechanical seal (mating ring) from discharge cover 163.
6. Remove and dispose of gasket 400.2.

7.5 Reassembling the pump set

7.5.1 General information/Safety regulations

⚠ DANGER

Wrong selection of motor
Explosion hazard!

- ▷ Use an original motor or a motor of identical design from the same manufacturer.
- ▷ The permissible temperature limits at the motor flange and motor shaft must be higher than the temperatures generated by the pump. (Contact KSB for temperatures.)

⚠ 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 42)

7.5.2 Installing the mechanical seal

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

- Work cleanly and accurately.
- Only remove the protective wrapping of the contact faces immediately before installation takes place.
- Prevent any damage to the sealing surfaces or O-rings.

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

✓ The bearing assembly 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.

✓ The sealing surfaces have been cleaned.

1. Clean shaft sleeve 523, and touch up any score marks or scratches with a polishing cloth, if necessary.
   If score marks or scratches are still visible, fit new shaft sleeve 523.
2. Push shaft sleeve 523 with new gasket 400.2 onto shaft 210.
3. Clean the mating ring location in discharge cover 163 and mating ring carrier 476.

CAUTION

Elastomers in contact with oil/grease
Shaft seal failure!

- ▹ Use water as assembly lubricant.
- ▹ Never use oil or grease as assembly lubricant.

4. Carefully insert mating ring and mating ring carrier 476.
   Make sure to apply pressure evenly.
5. Fit discharge cover 163 into the locating surface of drive lantern 341 or, on Etabloc G, M, into the locating surface of the motor flange.
6. Fit and tighten hexagon nuts 920.3 and 920.4, if applicable.

NOTE

To reduce friction forces when assembling the seal, wet the shaft sleeve and the location of the stationary ring with water.

7. Remove the rotating assembly of the mechanical seal (primary ring) from shaft sleeve 523.

Observe the following installation dimension b for mechanical seals with installation dimension L_{1k} to EN 12756 (design KU):

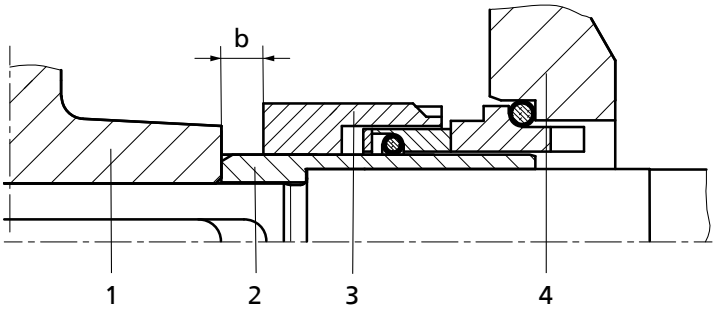


Fig. 7: Installation dimension b of mechanical seal

1	Impeller	2	Shaft sleeve
3	Mechanical seal	4	Discharge cover

Table 15: Installation dimensions of the mechanical seal

Shaft unit[8)]	Installation dimension b
25	7.5 mm
35	10 mm
55	15 mm

8) Shaft unit see data sheet.

7.5.3 Fitting the impeller

✓ The notes and steps stated in (⇨ Section 7.5.1 Page 39) to (⇨ Section 7.5.2 Page 39) have been observed/carried out.

✓ The preassembly (motor, shaft, drive lantern, discharge 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.

✓ The sealing surfaces have been cleaned.

1. Insert key 940 and slide impeller 230 onto shaft 210.
2. Fasten impeller nut 920.1, safety device 930 and, if applicable, disc 550.1 (see table: Tightening torques for screwed connections on the pump) (⇨ Section 7.6 Page 42).

7.5.4 Installing the back pull-out unit

⚠ WARNING

Back pull-out unit tipping over
Risk of squashing hands and feet!

▹ Suspend or support the back pull-out unit at the pump end.

✓ The notes and steps stated in(⇨ Section 7.5.1 Page 39) to (⇨ Section 7.5.3 Page 41) have been observed/carried out.

✓ Any damaged or worn parts have been replaced by original spare parts.

✓ The sealing surfaces have been cleaned.

1. If required, suspend or support the back pull-out unit to prevent it from tipping over.
2. Fit new gasket 400.1 into the recess of volute casing 102.
3. Push the back pull-out unit into volute casing 102.
4. Depending on the pump size and motor size, fit support foot 183.
5. Tighten hexagon nut 920.2 (with bolted discharge cover) or 920.4 (with clamped discharge cover) at the volute casing.

7.5.5 Mounting the motor

⚠ DANGER

Incorrect shaft connection
Explosion hazard!

▹ Connect the shafts between pump and motor as described in this manual.

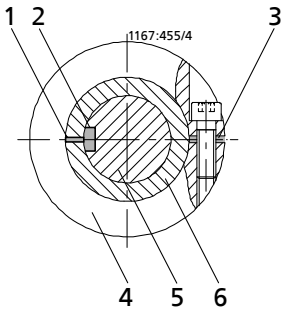


Fig. 8: Fitting the motor shaft stub on the shaft

1	Shaft slot	2	Keyway of the motor shaft end
3	Slot of the taper lock ring	4	Taper lock ring
5	Motor shaft	6	Shaft

✓ The notes and steps stated in(⇨ Section 7.5.1 Page 39) to (⇨ Section 7.5.4 Page 41) have been observed/carried out.

1. Fit the motor shaft stub on shaft 210 and make sure that the keyway of the motor shaft end aligns with the slot in shaft 210 and that both are located opposite the slot of taper lock ring 515 (see illustration: Fitting the motor shaft stub on the shaft).
2. Tighten hexagon socket head cap screws 914.1. (⇨ Section 7.6.1 Page 42)
3. Undo hexagon head bolts 901.5.

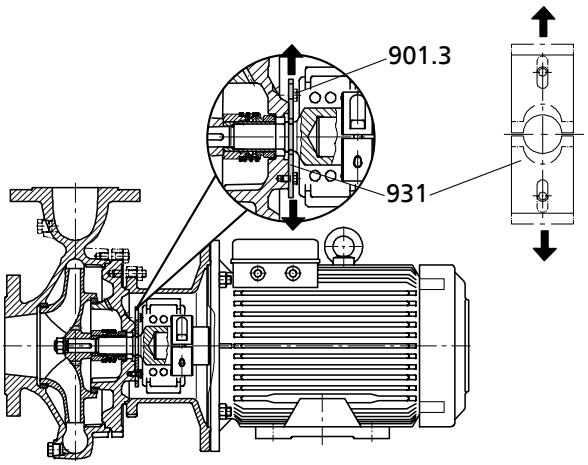


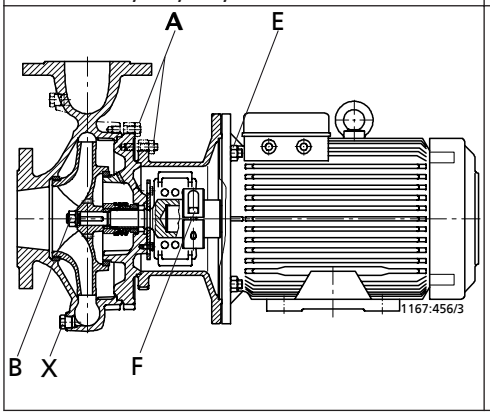
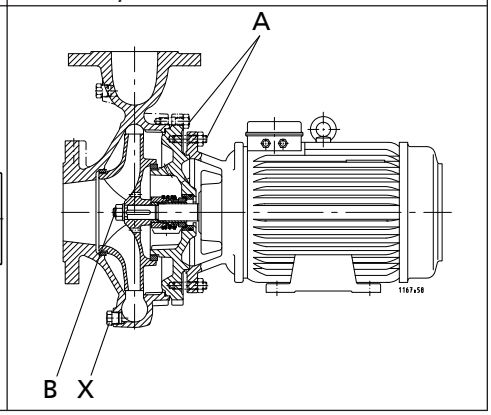
Fig. 9: Removing the lockwashers

901.3	Hexagon head bolts	931	Lockwasher

4. Pull both lockwashers 931 out of the groove in shaft 210.
5. Tighten hexagon head bolts 901.3.
6. Fit and tighten hexagon nuts 920.2.

7.6 Tightening torques

7.6.1 Tightening torques for the pump

Etabloc GN, BN, CN, SN	Etabloc G, M
	

Bolts to be tightened

Table 16: Tightening torques for screwed connections at the pump

Position	Thread	Rated torque [Nm]
A	M10	38
	M12	55
B	M12 x 1.5	55
	M24 x 1.5	130
	M30 x 1.5	170
C	M8	20
	M10	38
D	M12	125
E	M8	20
	M10	38
	M12	55
	M16	130
F	M6	15
	M8	38
	M10	38
	M12	55
X	1/8	25
	1/4	55
	3/8	80
	1/2	130
	3/4	220

7.7 Spare parts stock

7.7.1 Ordering spare parts

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

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

Refer to the name plate for all data. (⇨ Section 4.4 Page 17)

Also specify the following data:

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

Refer to the exploded view or general assembly drawing for part numbers and descriptions. (⇨ Section 9.2 Page 52)

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

Table 17: Quantity of spare parts for recommended spare parts stock

Part No.	Description	Number of pumps (including stand-by pumps)						
		2	3	4	5	6 and 7	8 and 9	10 and more
210	Shaft[9)]	1	1	1	2	2	2	20 %
230	Impeller (including casing wear ring 502.2) [10)]	1	1	1	2	2	2	20 %
230.1/.2	Impeller (set) [11)]	1	1	1	2	2	2	20 %
400.1/.2	Gasket[12)]	4	6	8	8	9	12	150 %
412.3	O-ring [11)]	2	3	4	4	4	5	100 %
433	Mechanical seal	1	1	2	2	2	3	25 %
502.1	Casing wear ring [10)]	2	2	2	3	3	4	50 %
523	Shaft sleeve [10)]	2	2	2	3	3	4	50 %

9) Not applicable for Etabloc G, M
10) Not applicable for Etabloc 25-20/... and 32-23/...
11) Etabloc 32-23/... only
12) Not applicable for Etabloc 32-23/...

7.7.3 Interchangeability of Etabloc/Etanorm pump components

Components featuring the same number in a column are interchangeable.

Table 18: Interchangeability of pump components

Etabloc	Shaft unit	Description																
		Volute casing	Discharge cover	Shaft [13]										Impeller	Mechanical seal	Casing wear ring suction side	Casing wear ring discharge side	Shaft sleeve
		Part No.																
		102	163	210										230	433	502.1	502.2	523
		M		71	80	90	100/112	132	160	180	200	225 2 poles	225 4 poles					
25-20/...	25	○	○											○	○	✗	✗	✗
32-23/...		○	✗											○	○	✗	✗	✗
32-125.1/...		○	1*	1	2	3	□	□	□	□	□	/	/	○*	1*	1*	✗	1*
32-160.1/...		○	1*	1	□	3	4	□	□	□	□	/	/	1	1*	1*	3*	1*
32-200.1/...		○	2*	□	2	□	4	5	□	□	□	/	/	2	1*	1*	3*	1*
32-250.1/...		○	3*	□	□	3	□	5	6	□	□	/	/	3	1*	1*	4	1*
32-125/...		○	1*	1	2	3	4	□	□	□	□	/	/	○*	1*	1*	✗	1*
32-160/...		○	1*	□	2	□	4	□	□	□	□	/	/	1	1*	1*	3*	1*
32-200/...		○	2*	□	2	3	□	5	6	□	□	/	/	2	1*	1*	3*	1*
32-250/...		○	3*	□	□	3	4	□	6	□	□	/	/	3	1*	1*	4	1*
40-125/...		○	1*	1	2	3	4	□	□	□	□	/	/	○*	1*	2*	✗	1*
40-160/...		○	1*	□	2	□	4	5	6	□	□	/	/	○*	1*	2*	3*	1*
40-200/...		○	2*	□	□	3	□	5	6	□	□	/	/	○*	1*	○*	3*	1*
40-250/...		○	3*	□	□	□	4	□	6	7	□	/	/	○*	1*	2*	4*	1*
40-315/...	35	○	○*	□	□	□	8	9	□	□	□	□	□	○*	2*	2*	12*	2*
50-125/...	25	○	1*	□	2	□	4	5	□	□	□	/	/	○*	1*	3*	3*	1*
50-160/...		○	1*	□	□	3	□	5	6	□	□	/	/	○*	1*	3*	3*	1*
50-200/...		○	2*	□	□	□	4	□	6	7	12	/	/	○*	1*	3*	3*	2*
50-250/...		○	3*	□	□	□	4	□	□	□	12	/	/	○*	1*	3*	4*	1*
50-315/...	35	○	4*	□	□	□	8	9	□	□	/	□	□	○*	2*	5*	10*	2*
65-125/...	25	○	1*	□	2	3	4	5	6	□	□	/	/	○*	1*	5*	3*	1*
65-160/...		○	5*	□	□	3	4	□	6	□	□	/	/	○*	1*	5*	9*	1*
65-200/...		○	○*	□	□	□	4	□	6	7	12	/	/	○*	1*	5*	9*	1*
65-250/...	35	○	○*	□	□	□	□	9	□	□	13	□	14	○*	2*	9*	12*	2*
65-315/...		○	4*	□	□	□	□	9	10	□	□	□	□	○*	2*	9*	10*	2*
80-160/...	25	○	5*	□	□	□	4	□	6	7	12	/	/	○*	1*	6*	9*	1*
80-200/...	35	○	6*	□	□	□	8	9	□	□	13	15	□	○*	2*	6*	10*	2*
80-250/...		○	7*	□	□	□	□	9	10	□	13	15	□	○*	2*	6*	10*	2*
80-315/...		○	4*	□	□	□	□	□	10	11	13	□	□	○*	2*	6*	10*	2*
80-400/...	55	○	10*	/	/	/	/	/	/	/	16	/	17	○*	3*	○*	○*	3*
100-160/...	35	○	6*	□	□	□	8	□	□	□	13	□	□	○*	2*	7*	10*	2*
100-200/...		○	6*	□	□	□	□	9	□	□	13	15	□	○*	2*	7*	10*	2*
100-250/...		○	7*	□	□	□	□	□	10	□	□	□	□	○*	2*	7*	10*	2*
100-315/...		○	4*	□	□	□	□	□	□	11	13	□	□	○*	2*	7*	10*	2*
100-400/...	55	○	10*	/	/	/	/	/	/	/	16	/	17	○*	3*	7*	8*	3*
125-200/...	35	○	8*	□	□	□	□	9	10	□	□	□	□	○*	2*	8*	11*	2*
125-250/...		○	9*	□	□	□	□	□	10	11	13	□	□	○*	2*	8*	11*	2*
125-315/...	55	○	11*	/	/	/	/	/	/	/	16	/	17	○*	3*	8*	8*	3*
125-400/...		○	10*	/	/	/	/	/	/	/	16	/	17	○*	3*	8*	8*	3*
150-200/...	35	○	8*	□	□	□	□	□	10	□	□	□	□	○*	2*	○*	11*	2*

13) For Etabloc with standardised motor only

Etabloc		Description																
		Volute casing	Discharge cover	Shaft [13]									Impeller	Mechanical seal	Casing wear ring suction side	Casing wear ring discharge side	Shaft sleeve
		Part No.															
	Shaft unit	102	163	210									230	433	502.1	502.2	523
		M		71	80	90	100/ 112	132	160	180	200	225 2 poles	225 4 poles					
150-250/...		○	9*	□	□	□	□	□	10	11	13	□	□	○*	2*	14*	13*	2*
150-315/...	55	○	11*	/	/	/	/	/	/	/	16	/	17	○*	3*	14*	8*	3*

Table 19: Key to the symbols

Symbol	Description
*	Component interchangeable with Etanorm
○	Components differ
✗	Component not fitted
□	This pump/motor combination is available on request.
/	This pump/motor combination is not possible.

Table 20: Interchangeability of the drive lantern (motor rating)

M	Drive lantern 341			Motor rating
	Shaft unit			
	25	35	55	
71	○	/	/	.../024, .../034
80	1	/	/	.../054, .../074, .../072, .../112
90	1	/	/	.../114, .../154, .../152, .../222
100	2	4	/	.../224, .../304, .../302
112	2	4	/	.../404, .../402
132	○	○	/	.../554, .../754, .../552, .../752
160	3	6	/	.../1104, .../1504, .../1102, .../1502, .../1852
180	3	6	/	.../1854, .../2204, .../2202
200	7	8	10	.../3004, .../3704, .../3002, .../3702
225	/	9	11	.../4504, .../4502

13) For Etabloc with standardised motor only

8 Trouble-shooting

⚠ WARNING

Improper remedial work on the pump (set)
Risk of injury!

- ▷ For any work performed in order to remedy faults on the pump (set) observe the relevant information given in this operating manual or the product literature provided by the accessories manufacturers.

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

A Pump delivers insufficient flow rate
B Motor is overloaded
C Motor protection switch trips the pump
D Increased bearing temperature
E Leakage at the pump
F Excessive leakage at the shaft seal
G Vibrations during pump operation
H Impermissible rise of temperature inside the pump

Table 21: Trouble-shooting

A	B	C	D	E	F	G	H	Possible cause	Remedy[14]
✗								Pump delivers against an excessively high pressure.	Re-adjust to duty point. Check system for impurities. Fit a larger impeller.[15] Increase the speed (turbine, I.C. engine)
✗						✗	✗	Pump and/or piping are not completely vented and/or primed.	Vent and/or prime.
✗								Supply line or impeller clogged	Remove deposits in the pump and/or piping.
✗								Formation of air pockets in the piping	Alter piping layout. Fit vent valve.
✗						✗	✗	Suction lift is too high/$NPSH_{available}$ (positive suction head) is too low.	Check/alter fluid level. Fully open the shut-off element in the suction line. Change suction line, if the friction losses in the suction line are too high. Check any strainers installed/suction opening.
✗								Wrong direction of rotation	Check the electrical connection of the motor and the control system, if any.
✗						✗		Wear of internal components	Replace worn parts by new ones.
	✗	✗				✗		Pump back pressure is lower than specified in the purchase order.	Re-adjust to duty point.
	✗							Density or viscosity of fluid handled higher than stated in purchase order	Contact KSB.
				✗				Defective gasket	Fit new gasket between volute casing and discharge cover.
					✗			Worn shaft seal	Fit new shaft seal.
✗					✗			Score marks or roughness on shaft sleeve	Fit new shaft sleeve. Fit new shaft seal.
					✗			Vibrations during pump operation	Correct the suction conditions. Increase the pressure at the pump suction nozzle.

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

A	B	C	D	E	F	G	H	Possible cause	Remedy[14)]
			✗		✗	✗		Pump is warped or sympathetic vibrations in the piping.	Check the piping connections and secure fixing of pump; if required, reduce distances between the pipe clamps. Fix the pipelines using anti-vibration material.
			✗					Increased axial thrust[15)]	Clean balancing holes in the impeller. Replace the casing wear rings.
			✗			✗		Insufficient or excessive quantity of lubricant or unsuitable lubricant	Top up, reduce or change lubricant.
✗	✗							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 bearing(s)	Fit new bearing(s).
						✗	✗	Flow rate is too low.	Increase the minimum flow rate.
		✗						Incorrect setting of motor protection switch	Check setting. Fit new motor protection switch.
	✗	✗						Transport lock has not been removed from the shaft groove.	Remove.

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

9 Related Documents

9.1 Installation examples

Table 22: Installation examples for Etabloc G, M

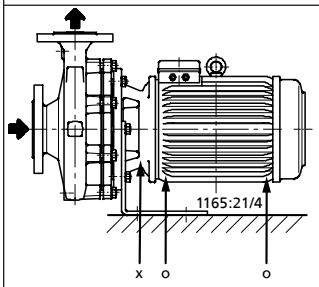
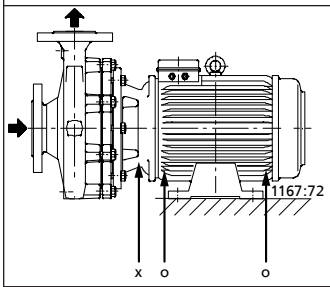
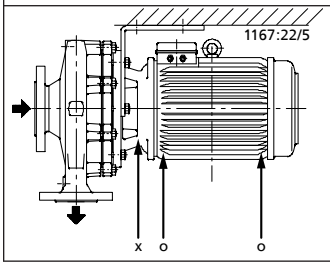
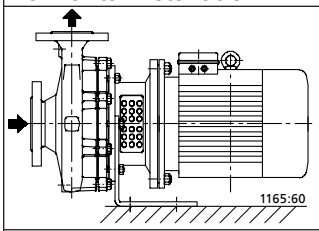
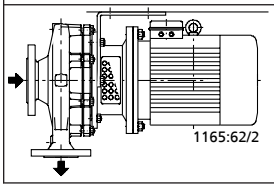
Examples	Special features
Horizontal installation	
	**Pump foot fastened at the bottom** ▪ Up to motor size 112 = 4 kW Check condensation water holes o = open x = closed
	**Motor foot fastened at the bottom** ▪ Motor size 132 = 5.5 kW to 180 = 22 kW Check condensation water holes o = open x = closed
	**Pump foot fastened at the top** ▪ Motor must be turned through 180°. Check condensation water holes o = open x = closed

Table 23: Installation examples for Etabloc GN, MN, BN[16], SN[16], CN[16]

Examples	Special features
Horizontal installation	
	**Pump foot fastened at the bottom** ▪ Up to motor size 112 = 4 kW
	**Pump foot fastened at the top** ▪ Up to motor size 112 = 4 kW ▪ Motor must be turned through 180°.

16) Volute casing with foot

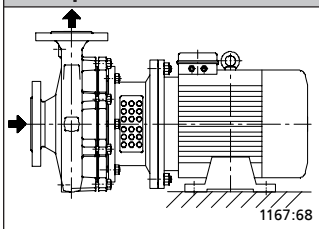
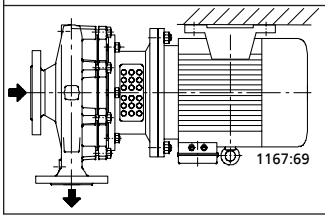
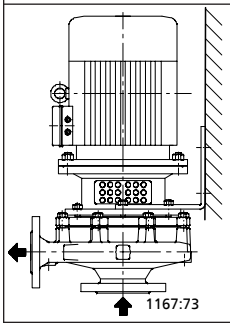
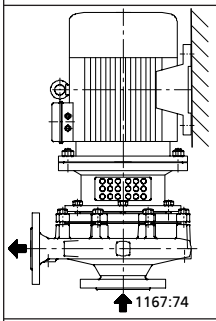
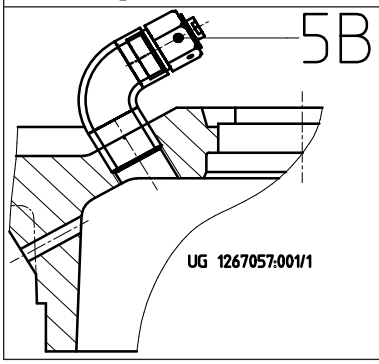
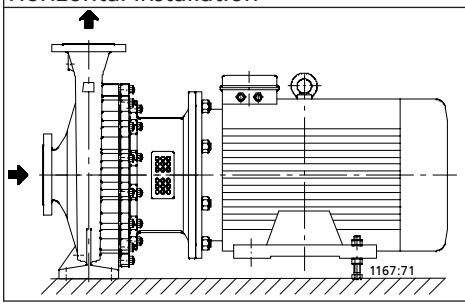
Examples	Special features
	**Motor foot fastened at the bottom** ▪ Motor size 132 = 5.5 kW to 180 = 22 KW
	**Motor foot fastened at the top** ▪ Motor size 132 = 5.5 kW to 180 = 22 KW ▪ Motor must be turned through 180°.

Table 24: Installation examples for Etabloc GN, MN, BN[17], SN[17], CN

Examples	Special features
Vertical installation	
	**Pump foot fastened at the side** ▪ Up to motor size 112 = 4 kW ▪ For vertical installation provide a vent valve to avoid dry running of the mechanical seal
	**Motor foot fastened at the side** ▪ Motor size 132 = 5.5 kW to 180 = 22 KW ▪ For vertical installation with the motor on top use connection 5B (if applicable) for ventilation
	**Vent valve** Design with vent valve for vertical installation

17) Volute casing with foot

Table 25: Installation examples for Etabloc GN, MN, SN, CN

Examples	Special features
Horizontal installation	
	**Motor foot fastened at the bottom, additional support** ▪ Motor size 200 = 30 kW to 225 = 45 KW

9.2 Exploded view / List of components

9.2.1 Etabloc G, M 32-200.1/... to 150-250/...

This view applies to the following sizes:

32-200.1/...	40-200/...	50-200/...	65-200/...	80-250/...	125-250/...
32-250.1/...	40-250/...	50-250/...	65-250/...	80-315/...	150-250/...
32-200/...	40-315/...	50-315/...	65-315/...	100-250/...	
32-250/...				100-315/...	

[Supplied in packaging units only

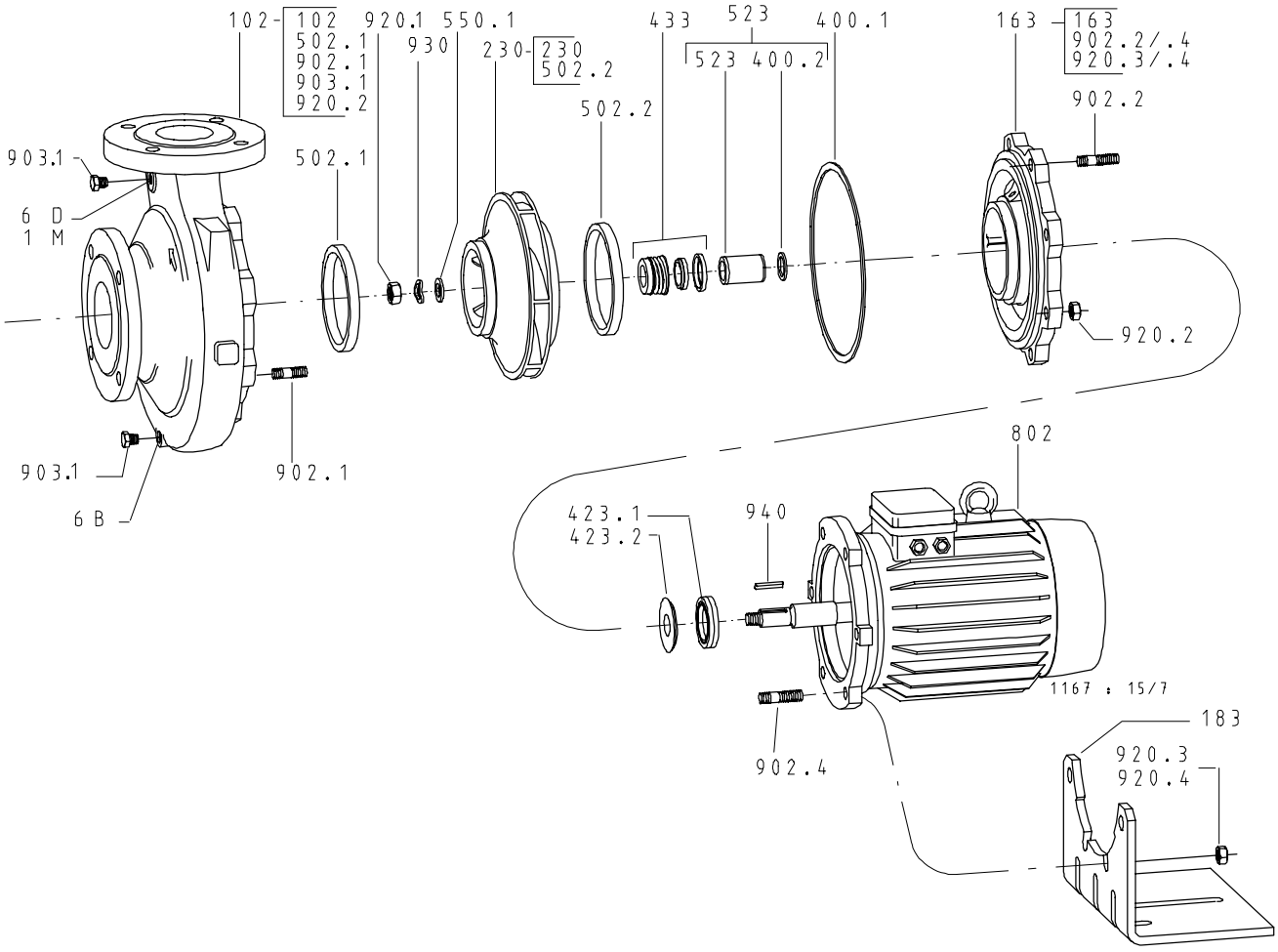


Fig. 10: Standardised mechanical seal and bolted discharge cover

Table 26: List of components

Part No.	Description	Part No.	Description	Part No.	Description
102	Volute casing	502.1/.2	Casing wear ring	920.4[18)]	Hexagon nut
163	Discharge cover	523	Shaft sleeve	930	Safety device
183[18)]	Support foot	550.1[19)]	Disc	940	Key
230	Impeller	802	Motor for close coupling		
400.1/.2	Gasket	902.1/.2/.4[18)]	Stud	1M	Connection for pressure gauge

18) Up to motor size 112 = 4 kW only, (from motor size 132 = 5.5 kW with motor foot, not shown in exploded view)

19) For Etabloc pumps with shaft unit 25 only (shaft unit see data sheet).

Part No.	Description	Part No.	Description	Part No.	Description
423.1/.2	Labyrinth seal	903.1	Screw plug	6B	Fluid drain
433	Mechanical seal	920.1/.2/.3	Hexagon nut	6D	Fluid filling and venting

9.2.2 Etabloc G, M 32-125.1 - 150-200...

This view applies to the following sizes:

32-125.1/...	40-125/...	65-125/...	100-160/...
32-160.1/...	40-160/...	65-160/...	100-200/...
32-125/...	50-125/...	80-160/...	125-200/...
32-160/...	50-160/...	80-200/...	150-200/...

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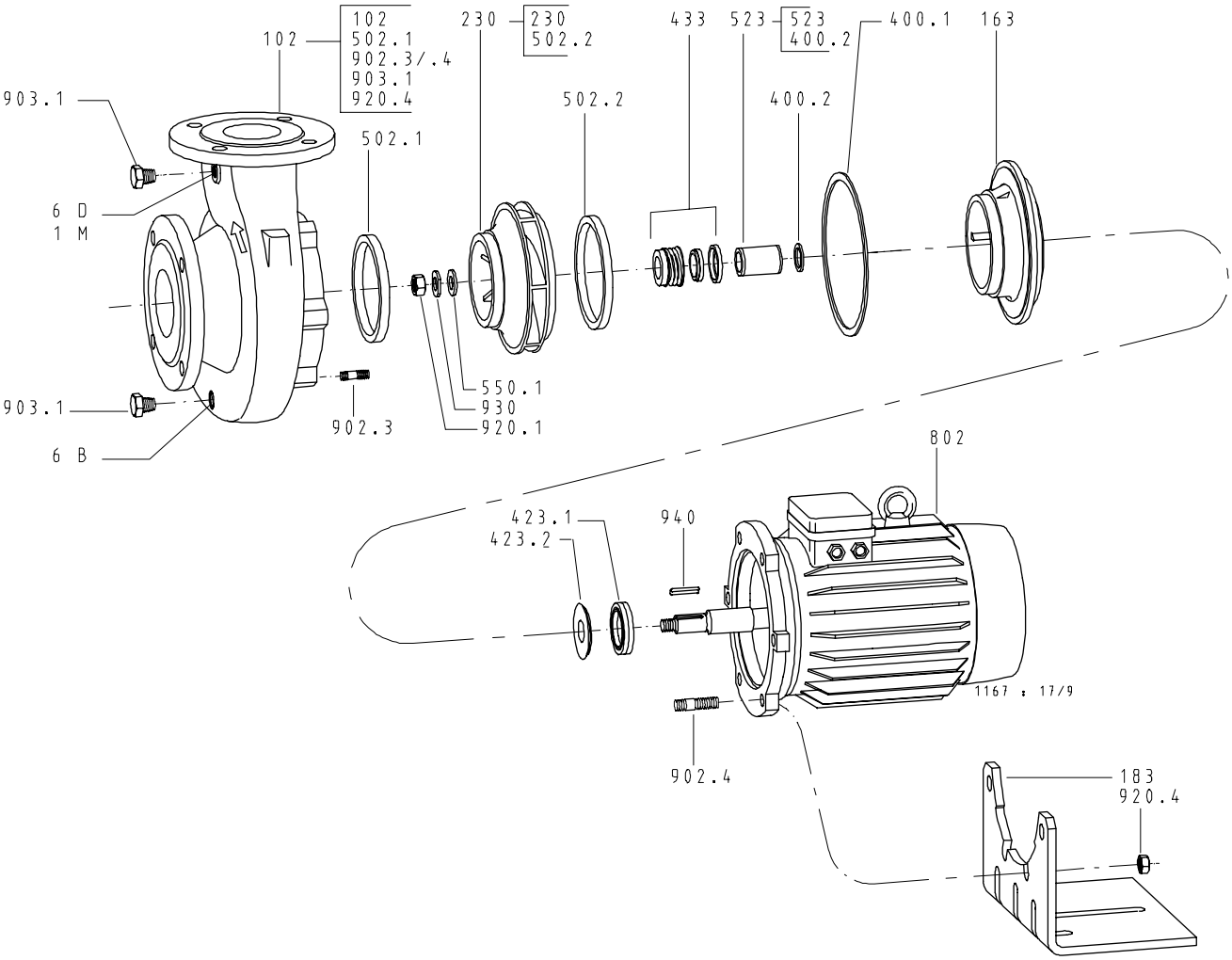

Fig. 11: Standardised mechanical seal and clamped discharge cover

Table 27: List of components

Part No.	Description	Part No.	Description	Part No.	Description
102	Volute casing	502.1/.2	Casing wear ring	930	Safety device
163	Discharge cover	523	Shaft sleeve	940	Key
183[20)]	Support foot	550.1[21)]	Disc		
230	Impeller	802	Motor for close coupling	1M	Connection for pressure gauge
400.1/.2	Gasket	902.3/.4[20)]	Stud	6B	Fluid drain
423.1/.2	Labyrinth seal	903.1	Screw plug	6D	Fluid filling and venting
433	Mechanical seal	920.1/.4	Hexagon nut		

20) Up to motor size 112 = 4 kW only, (from motor size 132 = 5.5 kW with motor foot, not shown in exploded view)

21) For Etabloc pumps with shaft unit 25 only (shaft unit see data sheet).

9.2.3 Standardised mechanical seal Etabloc G, M 25-20/...

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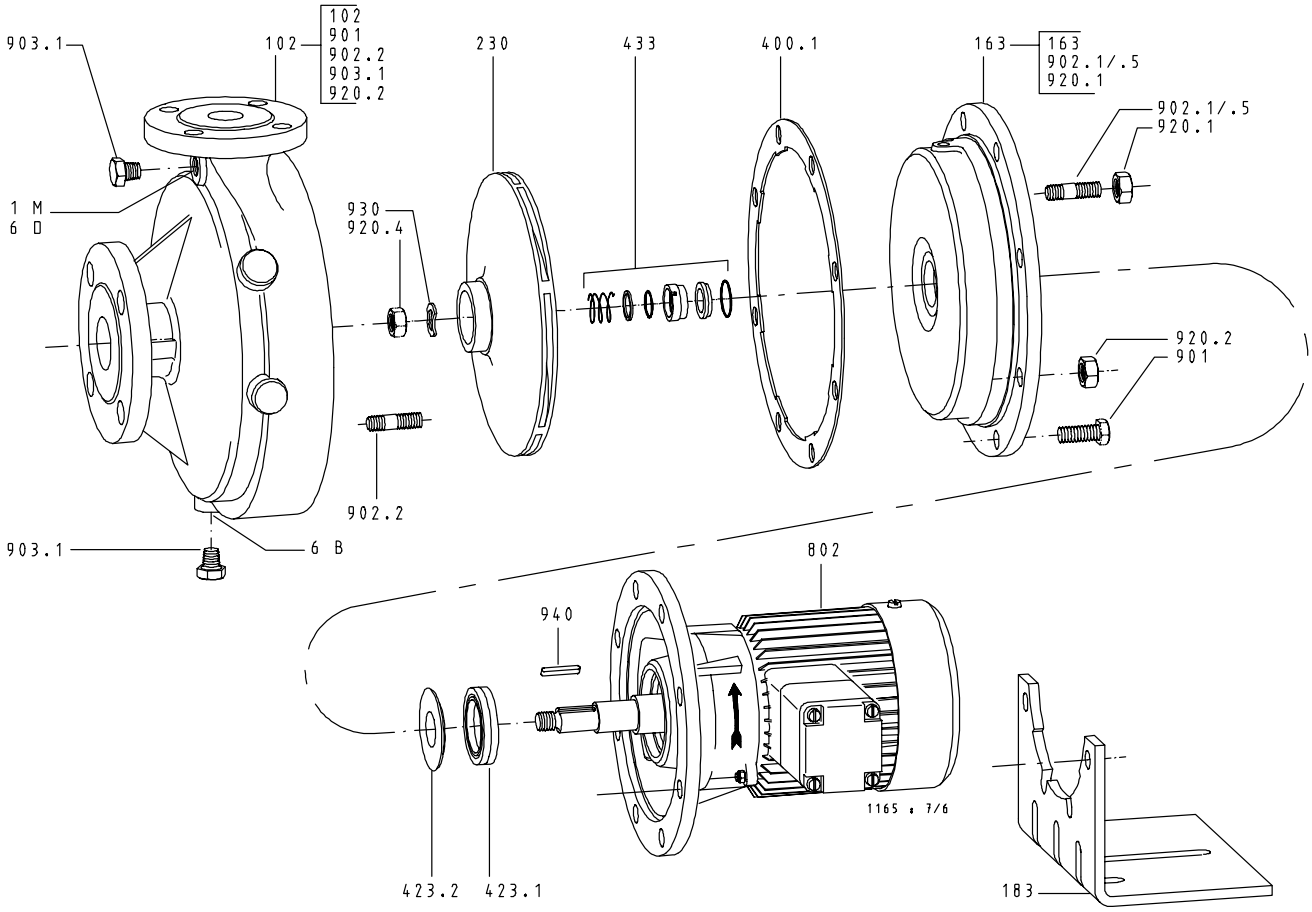

Fig. 12: Etabloc G, M 25-20/...

Table 28: List of components

Part No.	Description	Part No.	Description	Part No.	Description
102	Volute casing	802	Motor for close coupling	1M	Connection for pressure gauge
163	Discharge cover	901	Hexagon head bolt	6B	Fluid drain
183	Support foot	902.1/.2/.5	Stud	6D	Fluid filling and venting
230	Impeller	903.1	Screw plug		
400.1	Gasket	920.1/.2/.4	Hexagon nut		
423.1/.2	Labyrinth seal	930	Safety device		
433	Mechanical seal	940	Key		

9.2.4 Standardised mechanical seal Etabloc G, M 32-23/...

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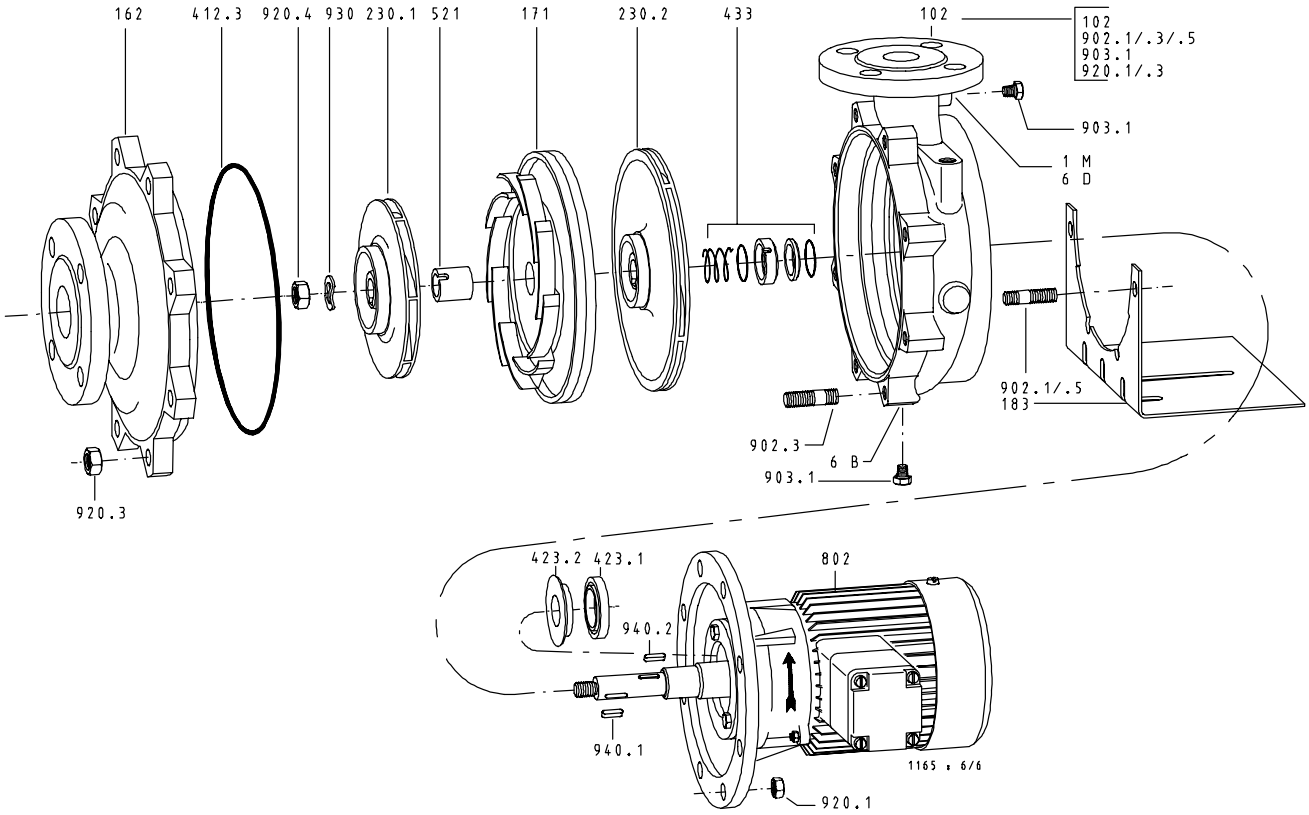

Fig. 13: Etabloc G,M 32-23/...

Table 29: List of components

Part No.	Description	Part No.	Description	Part No.	Description
102	Volute casing	433	Mechanical seal	1M	Connection for pressure gauge
162	Suction cover	521	Stage sleeve	6B	Fluid drain
171	Diffuser	802	Motor for close coupling	6D	Fluid filling and venting
183	Support foot	902.1/.3/.5	Stud		
230.1	Impeller 1st stage	903.1	Screw plug		
230.2	Impeller 2nd stage	920.1/.3/.4	Hexagon nut		
412.3	O-ring	930	Safety device		
423.1/.2	Labyrinth seal	940.1/.2	Key		

9.2.5 Etabloc GN, MN, SN, BN, CN

This view applies to the following sizes:

32-200.1/...	40-200/...	50-200/...	65-200/...	80-250/...	125-250/...
32-250.1/...	40-250/...	50-250/...	65-250/...	80-315/...	150-250/...
32-200/...	40-315/...	50-315/...	65-315/...	100-250/...	
32-250/...				100-315/...	

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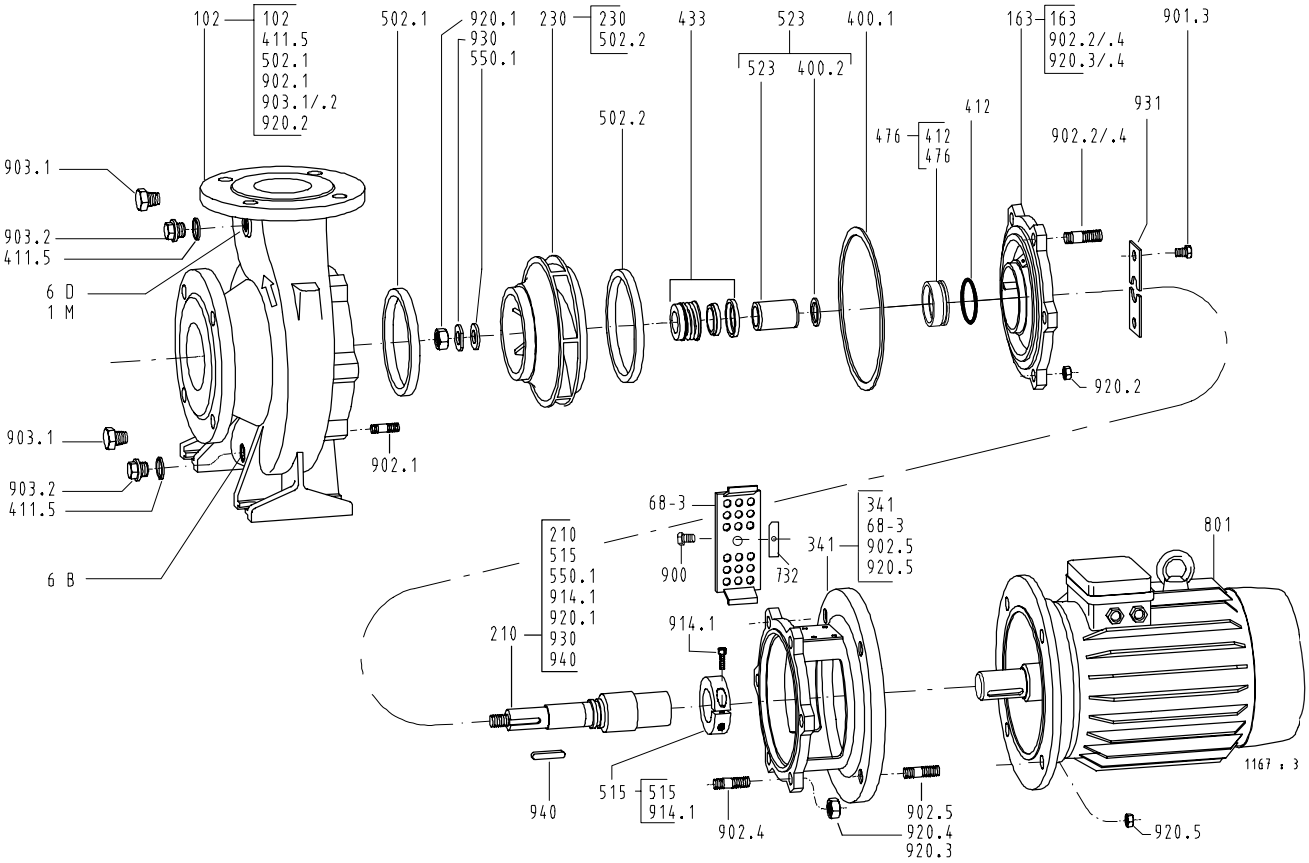

Fig. 14: Standardised mechanical seal and bolted discharge cover

Table 30: List of components

Part No.	Description	Part No.	Description	Part No.	Description
102[22)]	Volute casing	476[26)]	Mating ring carrier	902.1/.2/.4[23)]/.5	Stud
163	Discharge cover	502.1/.2	Casing wear ring	903.1/.2[25)]	Screw plug
183[23)]	Support foot	515	Taper lock ring	914.1	Hexagon socket head cap screw
210	Shaft	523	Shaft sleeve	920.1-.5	Hexagon nut
230	Impeller	550.1[24)]	Disc	930	Safety device
341	Drive lantern	68-3	Cover plate	931	Lockwasher
400.1/.2	Gasket	732	Bracket	940	Key
411.5[25)]	Joint ring	801	Flanged motor	1M	Connection for pressure gauge

22) Foot-mounted volute casing for Etabloc SN, BN, CN only

23) For Etabloc GN, MN up to motor size 112 = 4 kW only, (from motor size 132 = 5.5 kW with motor foot, not shown in exploded view)

24) For sizes with shaft unit 25 only (shaft unit / pump size combinations see data sheet).

25) Etabloc SN, CN only

Part No.	Description	Part No.	Description	Part No.	Description
412[26)]	O-ring	900	Screw	6B	Fluid drain
433	Mechanical seal	901.3	Hexagon head bolt	6D	Fluid filling and venting

26) Etabloc BN, SN only

9.2.6 Etabloc GN, MN, SN, BN, CN

This view applies to the following sizes:

32-125.1/...	40-125/...	65-125/...	100-160/...
32-160.1/...	40-160/...	65-160/...	100-200/...
32-125/...	50-125/...	80-160/...	125-200/...
32-160/...	50-160/...	80-200/...	150-200/...

[Supplied in packaging units only

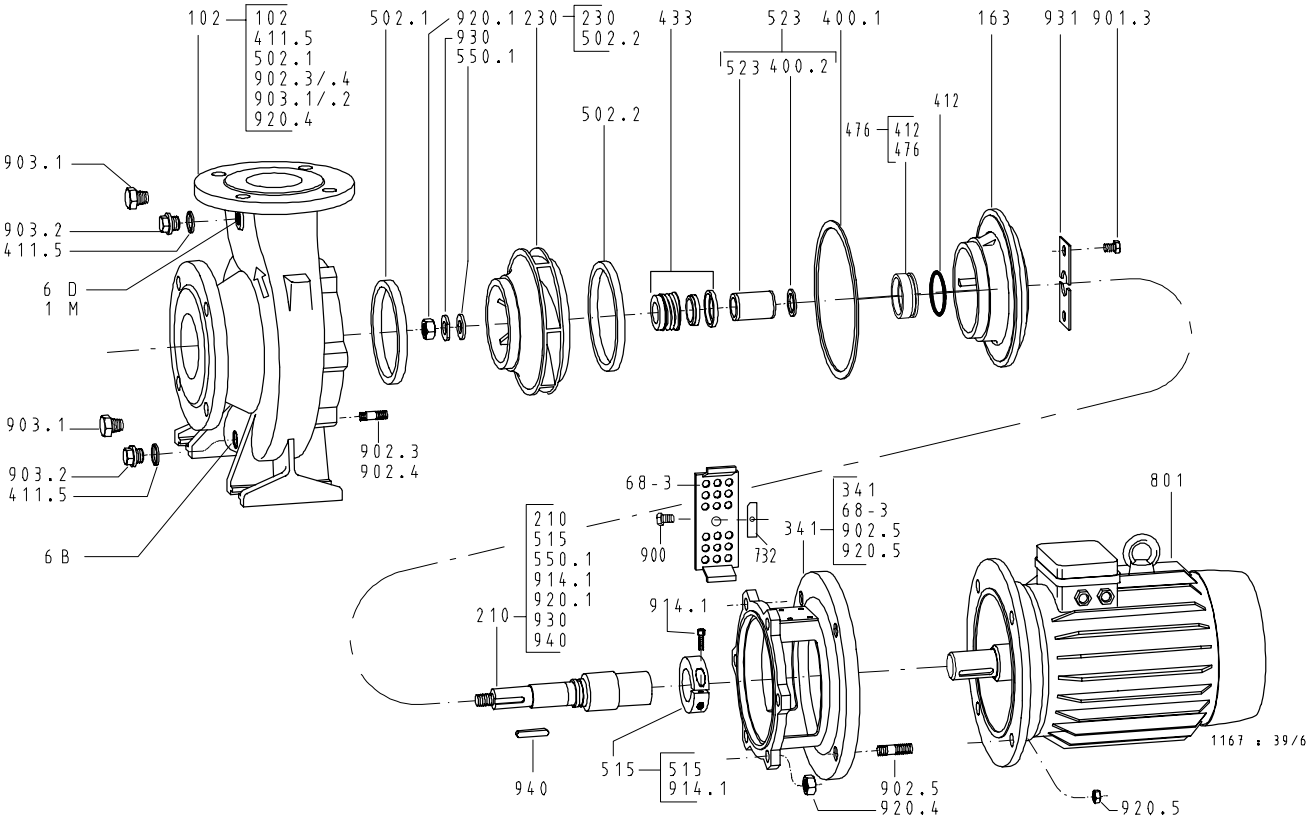

Fig. 15: Standardised mechanical seal and clamped discharge cover

Table 31: List of components

Part No.	Description	Part No.	Description	Part No.	Description
102[27)]	Volute casing	476[31)]	Mating ring carrier	902.3/.4[28)]/.5	Stud
163	Discharge cover	502.1/.2	Casing wear ring	903.1/.2[30)]	Screw plug
183[28)]	Support foot	515	Taper lock ring	914.1	Hexagon socket head cap screw
210	Shaft	523	Shaft sleeve	920.1/.4/.5	Hexagon nut
230	Impeller	550.1[29)]	Disc	930	Safety device
341	Drive lantern	68-3	Cover plate	931	Lockwasher
400.1/.2	Gasket	732	Bracket	940	Key
411.5[30)]	Joint ring	801	Flanged motor	1M	Connection for pressure gauge
412[31)]	O-ring	900	Bolt	6B	Fluid drain
433	Mechanical seal	901.3	Hexagon head bolt	6D	Fluid filling and venting

27) Foot-mounted volute casing for Etabloc SN, BN, CN only

28) For Etabloc GN, MN up to motor size 112 = 4 kW only, (from motor size 132 = 5.5 kW with motor foot, not shown in exploded view)

29) For sizes with shaft unit 25 only (shaft unit / pump size combinations see data sheet).

30) For Etabloc SN, CN only

31) For Etabloc BN, SN only

9.2.7 Etabloc GN, MN, SN, CN, BN

Motor size 200 = 30 kW to 225 = 45 kW

This view applies to the following sizes:

50-200/...	80-250/...	100-315/...	150-250/...
50-250/...	80-315/...	100-400/...	
65-200/...	80-400/...	125-250/...	
65-250/...		125-400/...	

[Supplied in packaging units only

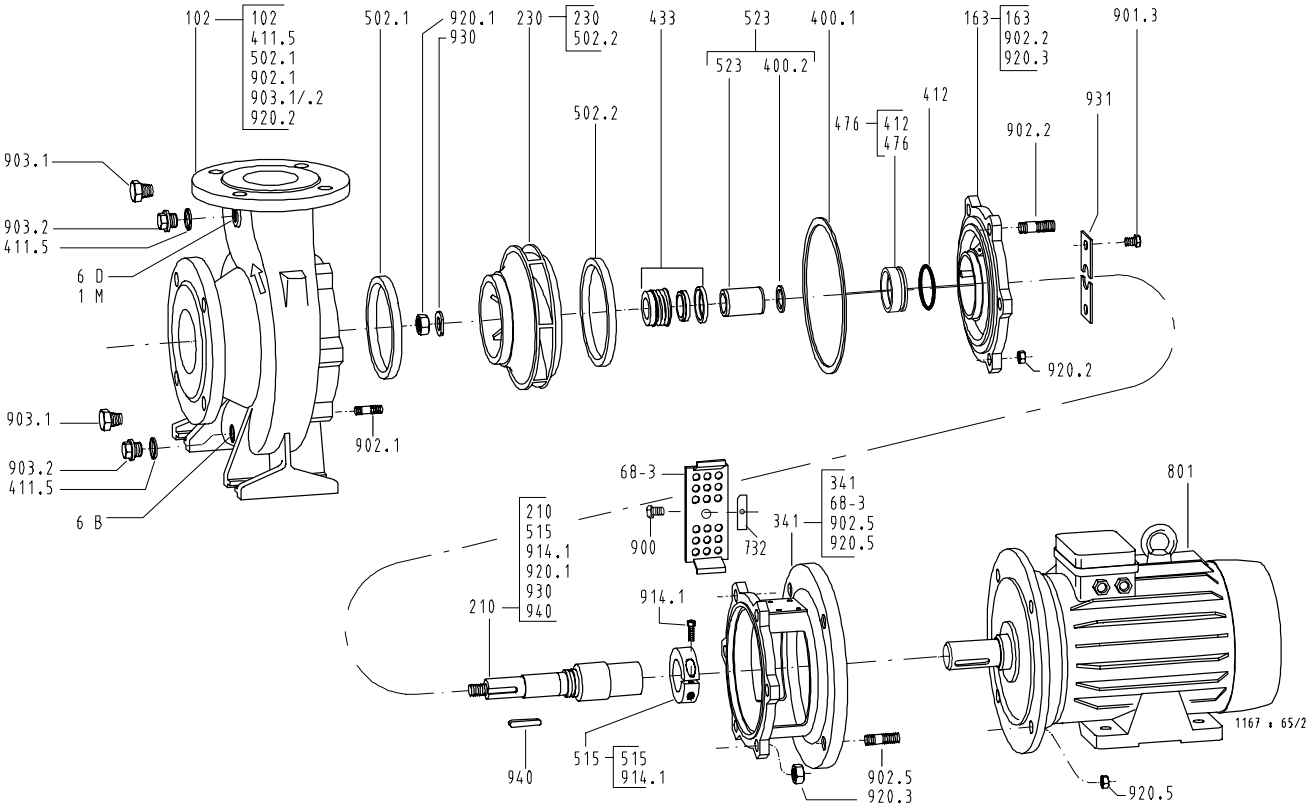

Fig. 16: Standardised mechanical seal and bolted discharge cover

Table 32: List of components

Part No.	Description	Part No.	Description	Part No.	Description
102	Volute casing	502.1/.2	Casing wear ring	914.1	Hexagon socket head cap screw
163	Discharge cover	515	Taper lock ring	920.1/.2/.3/.5	Hexagon nut
210	Shaft	523	Shaft sleeve	930	Safety device
230	Impeller	68-3	Cover plate	931	Lockwasher
341	Drive lantern	732	Bracket	940	Key
400.1/.2	Gasket	801	Flanged motor		
411.5[32)]	Joint ring	900	Bolt/Screw		
412[33)]	O-ring	901.3	Hexagon head bolt	1M	Connection for pressure gauge
433	Mechanical seal	902.1/.2/.5	Stud	6B	Fluid drain
476[33)]	Mating ring carrier	903.1/.2[32)]	Screw plug	6D	Fluid filling and venting

32) For Etabloc SN, CN only

33) For Etabloc BN, SN only

9.2.8 Etabloc GN, MN, SN, CN, BN

Motor size 200 = 30 kW to 225 = 45 kW

This view applies to the following sizes:

80-160/...	100-160/...	125-315/...
80-200/...	100-200/...	150-315/...

[Supplied in packaging units only

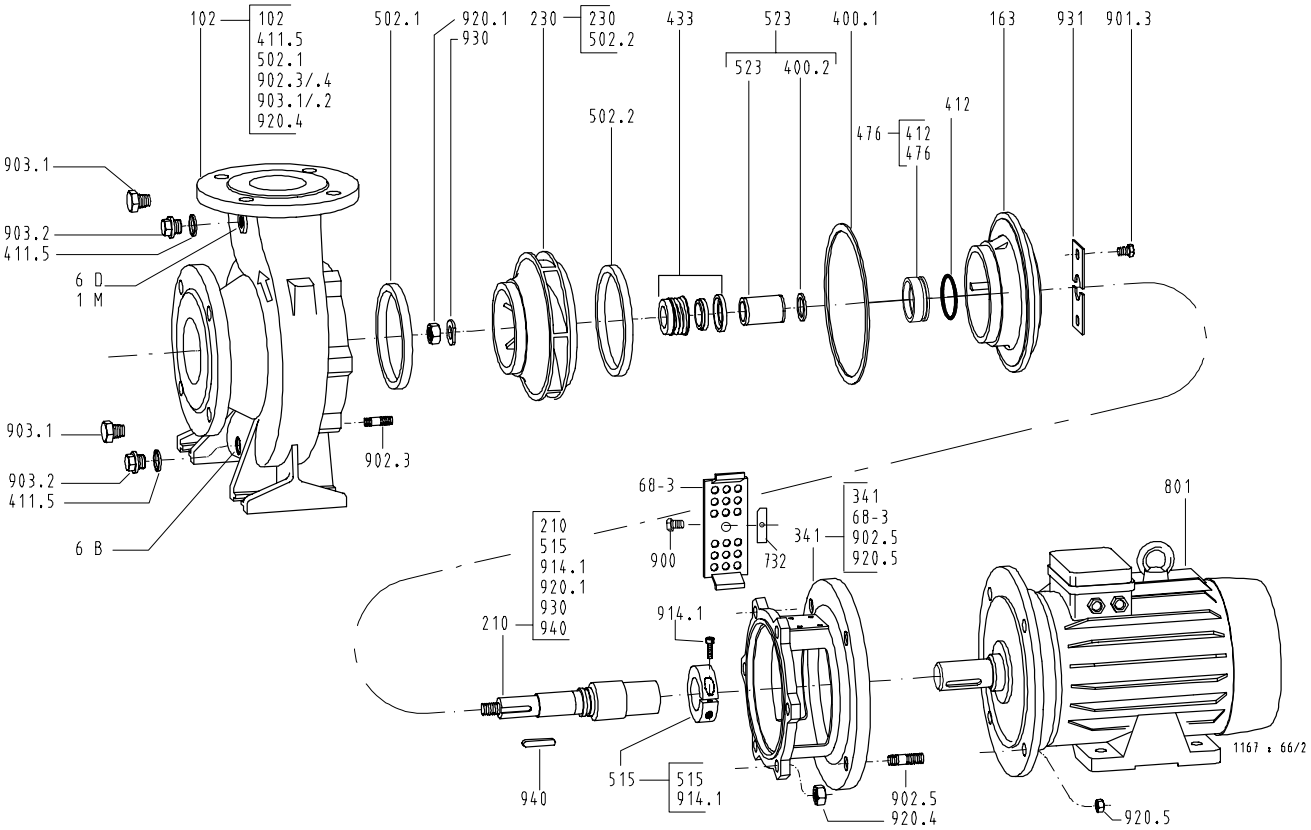

Fig. 17: Standardised mechanical seal and clamped discharge cover

Table 33: List of components

Part No.	Description	Part No.	Description	Part No.	Description
102	Volute casing	502.1/.2	Casing wear ring	914.1	Hexagon socket head cap screw
163	Discharge cover	515	Taper lock ring	920.1/.4/.5	Hexagon nut
210	Shaft	523	Shaft sleeve	930	Safety device
230	Impeller	68-3	Cover plate	931	Lockwasher
341	Drive lantern	732	Bracket	940	Key
400.1/.2	Gasket	801	Flanged motor		
411.5[34)]	Joint ring	900	Bolt/Screw	1M	Connection for pressure gauge
412[35)]	O-ring	901.3	Hexagon head bolt	6B	Fluid drain
433	Mechanical seal	902.3/.5	Stud	6D	Fluid filling and venting
476[35)]	Mating ring carrier	903.1/.2[34)]	Screw plug		

34) Etabloc SN, CN only

35) Etabloc BN, SN only

10 EC Declaration of Conformity

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

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

Etabloc, Etabloc SYT, Etaline, Etaline SYT, Etaline Z, Etachrom NC, Etachrom BC, Etanorm, Etanorm SYT, Etanorm GPV/CPV, Etaprime L, Etaprime B/BN, 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/A1

Person authorised to compile the technical file:
Name
Function
Address (company)
Address (Street, No.)
Address (post or ZIP code, city) (country)

The EC Declaration of Conformity was issued in/on:

Place, date

.....[36)].....

Name

Function
Company
Address

Address

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

11 Certificate of Decontamination

Type .....
Order number/
Order item number[37)] .....

Delivery date .....

Field of application: .....

Fluid pumped[37)]: .....

Please tick where applicable[37)]:


☐ Radioactive


☐ Explosive


☐ Corrosive


☐ Toxic


☐ Harmful


☐ Bio-hazardous


☐ Highly flammable

☐ Safe

Reason for return[37)]: .....

Comments: .....

.....

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

We hereby declare that this product is free from hazardous chemicals, biological or radioactive substances.

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

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

.....

.....

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

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

37) Required fields

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