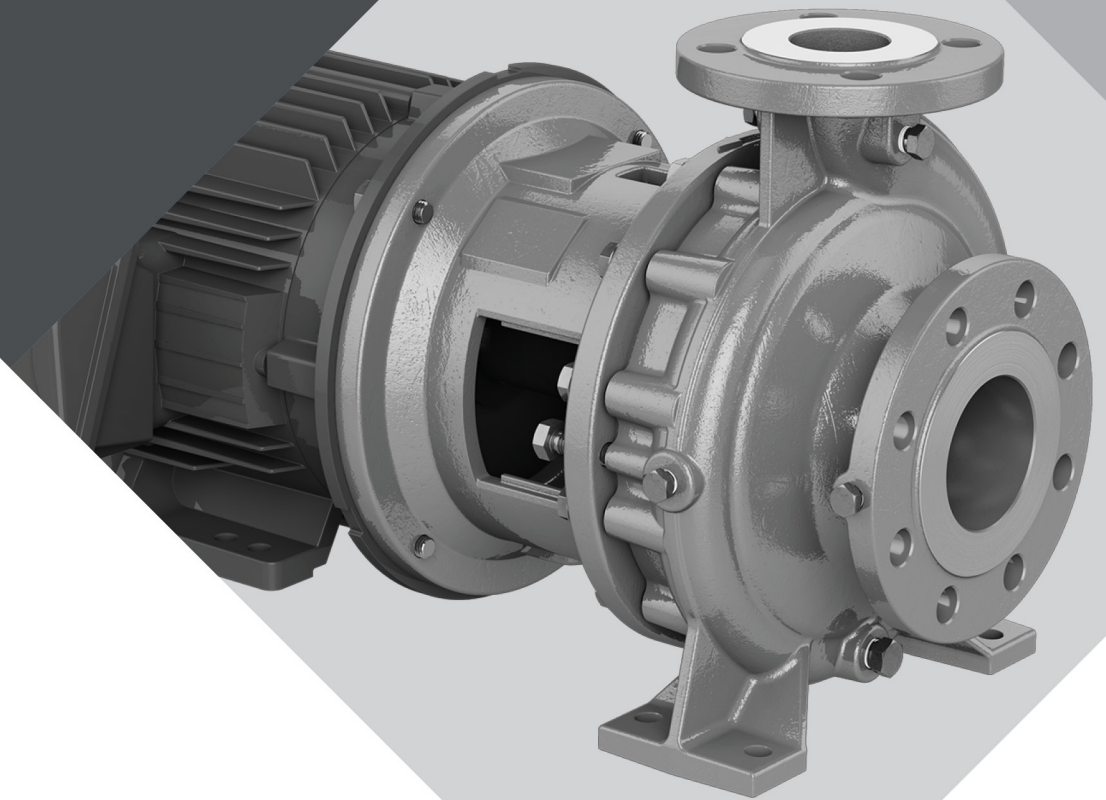




Installation, Operation and Maintenance Instruction

ICB



ITT

ENGINEERED FOR LIFE

IMPORTANT SAFETY NOTICE

To: Our Valued Customers

User safety is a major focus in the design of our products. Following the precautions outlined in this manual will minimize your risk of injury.

ITT Goulds pumps will provide safe, trouble-free service when properly installed, maintained, and operated.

Safe installation, operation, and maintenance of ITT Goulds Pumps equipment are an essential end user responsibility. This *Pump Safety Manual* identifies specific safety risks that must be considered at all times during product life. Understanding and adhering to these safety warnings is mandatory to ensure personnel, property, and/or the environment will not be harmed. Adherence to these warnings alone, however, is not sufficient — it is anticipated that the end user will also comply with industry and corporate safety standards. Identifying and eliminating unsafe installation, operating and maintenance practices is the responsibility of all individuals involved in the installation, operation, and maintenance of industrial equipment.

Please take the time to review and understand the safe installation, operation, and maintenance guidelines outlined in this Pump Safety Manual and the Instruction, Operation, and Maintenance (IOM) manual. Current manuals are available at www.gouldspumps.com/literature_ioms.html or by contacting your nearest Goulds Pumps sales representative.

These manuals must be read and understood before installation and start-up.

For additional information, contact your nearest Goulds Pumps sales representative or visit our Web site at www.gouldspumps.com.

SAFETY WARNINGS

Specific to pumping equipment, significant risks bear reinforcement above and beyond normal safety precautions.

 **WARNING**

A pump is a pressure vessel with rotating parts that can be hazardous. Any pressure vessel can explode, rupture, or discharge its contents if sufficiently over pressurized causing death, personal injury, property damage, and/or damage to the environment. All necessary measures must be taken to ensure over pressurization does not occur.

 **WARNING**

Operation of any pumping system with a blocked suction and discharge must be avoided in all cases. Operation, even for a brief period under these conditions, can cause superheating of enclosed pumpage and result in a violent explosion. All necessary measures must be taken by the end user to ensure this condition is avoided.

 **WARNING**

The pump may handle hazardous and/or toxic fluids. Care must be taken to identify the contents of the pump and eliminate the possibility of exposure, particularly if hazardous and/or toxic. Potential hazards include, but are not limited to, high temperature, flammable, acidic, caustic, explosive, and other risks.

 **WARNING**

Pumping equipment Instruction, Operation, and Maintenance manuals clearly identify accepted methods for disassembling pumping units. These methods must be adhered to. Specifically, applying heat to impellers and/or impeller retaining devices to aid in their removal is strictly forbidden. Trapped liquid can rapidly expand and result in a violent explosion and injury.

ITT Goulds Pumps will not accept responsibility for physical injury, damage, or delays caused by a failure to observe the instructions for installation, operation, and maintenance contained in this Pump Safety Manual or the current IOM available at www.gouldspumps.com/literature.

SAFETY

DEFINITIONS

Throughout this manual the words **WARNING**, **CAUTION**, **ELECTRICAL**, and **ATEX** are used to indicate where special operator attention is required.

Observe all Cautions and Warnings highlighted in this Pump Safety Manual and the IOM provided with your equipment.



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Example: Pump shall never be operated without coupling guard installed correctly.



CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Example: Throttling flow from the suction side may cause cavitation and pump damage.




ELECTRICAL HAZARD

Indicates the possibility of electrical risks if directions are not followed.

Example: Lock out driver power to prevent electric shock, accidental start-up, and physical injury.









When installed in potentially explosive atmospheres, the instructions that follow the Ex symbol must be followed. Personal injury and/or equipment damage may occur if these instructions are not followed. If there is any question regarding these requirements or if the equipment is to be modified, please contact an ITT Goulds Pumps representative before proceeding.














Example:  Improper impeller adjustment could cause contact between the rotating and stationary parts, resulting in a spark and heat generation.



GENERAL PRECAUTIONS

WARNING

A pump is a pressure vessel with rotating parts that can be hazardous. Hazardous fluids may be contained by the pump including high temperature, flammable, acidic, caustic, explosive, and other risks. Operators and maintenance personnel must realize this and follow safety measures. Personal injuries will result if procedures outlined in this manual are not followed. ITT Goulds Pumps will not accept responsibility for physical injury, damage or delays caused by a failure to observe the instructions in this manual and the IOM provided with your equipment.

General Precautions		
WARNING		NEVER APPLY HEAT TO REMOVE IMPELLER. It may explode due to trapped liquid.
WARNING		NEVER use heat to disassemble pump due to risk of explosion from tapped liquid.
WARNING		NEVER operate pump without coupling guard correctly installed.
WARNING		NEVER run pump below recommended minimum flow when dry, or without prime.
WARNING		ALWAYS lock out power to the driver before performing pump maintenance.
WARNING		NEVER operate pump without safety devices installed.
WARNING		NEVER operate pump with discharge valve closed.
WARNING		NEVER operate pump with suction valve closed.
WARNING		DO NOT change service application without approval of an authorized ITT Goulds Pumps representative.
WARNING		<p>Safety Apparel:</p> <ul style="list-style-type: none"> ♦ Insulated work gloves when handling hot bearings or using bearing heater ♦ Heavy work gloves when handling parts with sharp edges, especially impellers ♦ Safety glasses (with side shields) for eye protection ♦ Steel-toed shoes for foot protection when handling parts, heavy tools, etc. ♦ Other personal protective equipment to protect against hazardous/toxic fluids
WARNING		<p>Receiving:</p> <p>Assembled pumping units and their components are heavy. Failure to properly lift and support equipment can result in serious physical injury and/or equipment damage. Lift equipment only at specifically identified lifting points or as instructed in the current IOM. Current manuals are available at www.gouldspumps.com/literature_ioms.html or from your local ITT Goulds Pumps sales representative. Note: Lifting devices (eyebolts, slings, spreaders, etc.) must be rated, selected, and used for the entire load being lifted.</p>
WARNING		<p>Alignment:</p> <p>Shaft alignment procedures must be followed to prevent catastrophic failure of drive components or unintended contact of rotating parts. Follow coupling manufacturer's coupling installation and operation procedures.</p>

General Precautions		
WARNING		Before beginning any alignment procedure, make sure driver power is locked out. Failure to lock out driver power will result in serious physical injury.
CAUTION		Piping: Never draw piping into place by forcing at the flanged connections of the pump. This may impose dangerous strains on the unit and cause misalignment between pump and driver. Pipe strain will adversely effect the operation of the pump resulting in physical injury and damage to the equipment.
WARNING		Flanged Connections: Use only fasteners of the proper size and material.
WARNING		Replace all corroded fasteners.
WARNING		Ensure all fasteners are properly tightened and there are no missing fasteners.
WARNING		Startup and Operation: When installing in a potentially explosive environment, please ensure that the motor is properly certified.
WARNING		Operating pump in reverse rotation may result in contact of metal parts, heat generation, and breach of containment.
WARNING		Lock out driver power to prevent accidental start-up and physical injury.
WARNING		The impeller clearance setting procedure must be followed. Improperly setting the clearance or not following any of the proper procedures can result in sparks, unexpected heat generation and equipment damage.
WARNING		If using a cartridge mechanical seal, the centering clips must be installed and set screws loosened prior to setting impeller clearance. Failure to do so could result in sparks, heat generation, and mechanical seal damage.
WARNING		The coupling used in an ATEX classified environment must be properly certified and must be constructed from a non-sparking material.
WARNING		Never operate a pump without coupling guard properly installed. Personal injury will occur if pump is run without coupling guard.
WARNING		Make sure to properly lubricate the bearings. Failure to do so may result in excess heat generation, sparks, and / or premature failure.
CAUTION		The mechanical seal used in an ATEX classified environment must be properly certified. Prior to start up, ensure all points of potential leakage of process fluid to the work environment are closed.
CAUTION		Never operate the pump without liquid supplied to mechanical seal. Running a mechanical seal dry, even for a few seconds, can cause seal damage and must be avoided. Physical injury can occur if mechanical seal fails.
WARNING		Never attempt to replace packing until the driver is properly locked out and the coupling spacer is removed.
WARNING		Dynamic seals are not allowed in an ATEX classified environment.
WARNING		DO NOT operate pump below minimum rated flows or with suction and/or discharge valve closed. These conditions may create an explosive hazard due to vaporization of pumpage and can quickly lead to pump failure and physical injury.

General Precautions		
WARNING		Ensure pump is isolated from system and pressure is relieved before disassembling pump, removing plugs, opening vent or drain valves, or disconnecting piping.
WARNING		Shutdown, Disassembly, and Reassembly: Pump components can be heavy. Proper methods of lifting must be employed to avoid physical injury and/or equipment damage. Steel toed shoes must be worn at all times.
WARNING		The pump may handle hazardous and/or toxic fluids. Observe proper decontamination procedures. Proper personal protective equipment should be worn. Precautions must be taken to prevent physical injury. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.
WARNING		Operator must be aware of pumpage and safety precautions to prevent physical injury.
WARNING		Lock out driver power to prevent accidental startup and physical injury.
CAUTION		Allow all system and pump components to cool before handling them to prevent physical injury.
CAUTION		If pump is a Model NM3171, NM3196, 3198, 3298, V3298, SP3298, 4150, 4550, or 3107, there may be a risk of static electric discharge from plastic parts that are not properly grounded. If pumped fluid is non-conductive, pump should be drained and flushed with a conductive fluid under conditions that will not allow for a spark to be released to the atmosphere.
WARNING		Never apply heat to remove an impeller. The use of heat may cause an explosion due to trapped fluid, resulting in severe physical injury and property damage.
CAUTION		Wear heavy work gloves when handling impellers as sharp edges may cause physical injury.
CAUTION		Wear insulated gloves when using a bearing heater. Bearings will get hot and can cause physical injury.

ATEX CONSIDERATIONS and INTENDED USE

Special care must be taken in potentially explosive environments to ensure that the equipment is properly maintained. This includes but is not limited to:

1. Monitoring the pump frame and liquid end temperature.
2. Maintaining proper bearing lubrication.
3. Ensuring that the pump is operated in the intended hydraulic range.

The ATEX conformance is only applicable when the pump unit is operated within its intended use. Operating, installing or maintaining the pump unit in any way that is not covered in the Instruction, Operation, and Maintenance manual (IOM) can cause serious personal injury or damage to the equipment. This includes any modification to the equipment or use of parts not provided by ITT Goulds Pumps. If there is any question regarding the intended use of the equipment, please contact an ITT Goulds representative before proceeding. Current IOMs are available at www.gouldspumps.com/literature_ioms.html or from your local ITT Goulds Pumps Sales representative.

All pumping unit (pump, seal, coupling, motor and pump accessories) certified for use in an ATEX classified environment, are identified by an ATEX tag secured to the pump or the baseplate on which it is mounted. A typical tag would look like this:



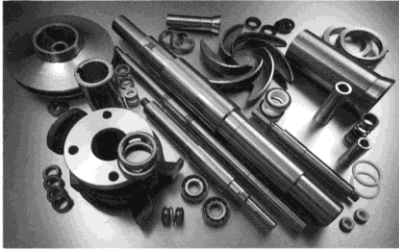
The CE and the Ex designate the ATEX compliance. The code directly below these symbols reads as follows:

- II = Group 2
- 2 = Category 2
- G/D = Gas and Dust present
- T4 = Temperature class, can be T1 to T6 (see Table 1)

Code	Max permissible surface temperature °F (°C)	Max permissible liquid temperature °F (°C)
T1	842 (450)	700 (372)
T2	572 (300)	530 (277)
T3	392 (200)	350 (177)
T4	275 (135)	235 (113)
T5	212 (100)	Option not available
T6	185 (85)	Option not available

The code classification marked on the equipment must be in accordance with the specified area where the equipment will be installed. If it is not, do not operate the equipment and contact your ITT Goulds Pumps sales representative before proceeding.

PARTS



The use of genuine Goulds parts will provide the safest and most reliable operation of your pump. ITT Goulds Pumps ISO certification and quality control procedures ensure the parts are manufactured to the highest quality and safety levels.


Please contact your local Goulds representative for details on genuine Goulds parts.

Table of Contents

Pump Name Plate	3
ATEX-Label (only for pumps in compliance with EC directive 94/9/EC)	4
General	5
General	5
Guarantee	5
Safety Regulations	6
Safety Regulations	6
Marking of References in the Operating Instructions	6
Dangers of non-observance of the Safety Instructions	6
Safety Instructions for the Operator / Worker	6
Safety Instructions for Maintenance, Inspections and Mounting Work	7
Unauthorized Alteration and Spare Parts Production	7
Undue Operation	7
Explosion Protection	7
Use acc. to Regulations	9
Description	11
Description	11
Design	11
Shaft Sealing	11
Bearing	12
Approximate Value for Sound Pressure Level	12
Permitted Nozzle Loads and Torques at the Pump Nozzles	12
Permitted pressures and temperatures	14
Condensate	15
Transport, Handling, Storage	16
Transport, Handling, Storage	16
Transport, Handling	16
Storage / Conservation	17
Mounting / Installation	18
Mounting / Installation	18
Mounting of Pump / Unit	18
Connection of Pipings to the Pump	18
Suction and discharge pipe	18
Additional connections	19
Drive	19
Electric Connection	20
Final Control	20
Start-up, Operation, Shut down	21
Start-up, Operation, Shut down	21
Initial start-up	21
Switch on drive	21
Restarting	21
Limits of Operation	22
Flow min. / max.	22
Abrasive Media	22
Permitted number of starts	22
Lubrication	22

Monitoring	23
Shutting Down	23
Storage / longer periods of non- operation	23
Servicing, Maintenance	25
Servicing, Maintenance	25
General remarks	25
Mechanical seals	25
Motor bearings	25
Cleaning of pump	25
Dismantling and repair of pump	26
Dismantling and repair of pump	26
General remarks	26
General	26
Removal and Installation of screen in the motor lantern	26
Removal of the Back Pull Out Assembly	27
Removal of Impeller	28
Removal of Shaft Sealing	28
Removal of Stub Shaft	28
Reconditioning	28
Mounting	29
Mounting of Stub Shaft	30
Spare parts, Spare pumps	32
Spare parts, Spare pumps	32
Spare parts	32
Stand-by pumps	32
Faults - Causes and Solutions	33
Appendix	36
Single mech. seal without shaft sleeve (Design code S1..2)	36
Safety Instructions	36
Design Description	36
Removal of mechanical seal	37
Installation of a mechanical seal	37
Single mechanical seal with quench without shaft sleeve (Design code S4..2)	38
Safety Instructions	38
Description	38
Removal of mechanical seal	40
Installation of mechanical seal	40
Design: S1...2 Single mech. seal, unbalanced (DIN 24960, I _{1k} / EN 12756, design K, form U), Impeller with back vanes	41
Design: S1...2 Single-mech. seal, unbalanced (DIN 24960, I _{1k} / EN 12756, design K, form U), Impeller with balancing holes	43
Design: S4...2 Single mech. seal, unbalanced (DIN 24960, I _{1k} / EN 12756, design K, form U), with quench, Impeller with back vanes	45
Design: S4...2 Single mech. seal, unbalanced (DIN 24960, I _{1k} / EN 12756, design K, form U), with quench, Impeller with balancing holes	47

Pump Name Plate

GOULDS PUMPS  ITT

TYPE

S/N YEAR

Q m³/h P kW

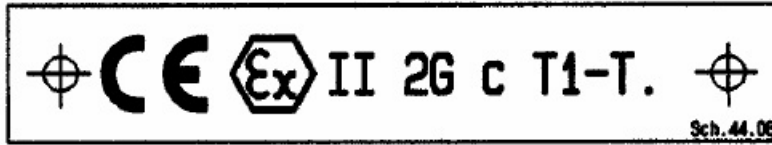
H m N min⁻¹

Pallwc bar @TEMP °C

ITEM NO MATL

TYPE *)	Type and size of pump
S/N *)	Serial number
YEAR	Year of construction
Q	Rated capacity at the operating point
P	Rated power at the operating point
H	Head (Energy head) at the operating point
N	Speed
P _{all w C}	Max. permitted casing-operation-pressure (=highest discharge pressure at the rated operating temperature to which the pump casing can be used)
TEMP	Rated operating temperature of pumped liquid
ITEM NO.	Customer equipment number
MATL	Material of construction
*)	All details of design and materials are defined with this information. They must be stated on all inquiries to the manufacturer resp. orders of spare

ATEX-Label (only for pumps in compliance with EC directive 94/9/EC)



CE	Marking of compliance with the EC directive 94/9/EC
Ex	specific marking for explosion protection
II	Symbol for the appliance group
2G	Symbol for the category (2), explosive atmosphere due to gases, vapors or mist (G)
c	Symbol for used ignition protection (constructual safety "c")
T1-T.	Symbol for classification of the theoretically available range of the temperature classes - data for temperature class refer to Explosion Protection (page 7), <i>Temperature Limits</i> ; Data for maximum permitted temperature of pumped liquid refer to pump name plate, data sheet and / or order confirmation.

The conformity with the EC directive 94/9/EC " Equipment and Protective Systems for Use in Potentially Explosive Atmospheres " is declared by the issue of the EC-Declaration of Conformity and the attachment of the ATEX-label at the pump (adapter). The ATEX-label is attached additionally to the pump name plate.

General

General



This product corresponds with the requirements of the Machine directive 98/37/EG (former 89/392/EWG).

WARNING: The staff employed on installation, operation, inspection and maintenance must be able to prove that they know about the relevant accident prevention regulations and that they are suitably qualified for this work. If the staff does not have the relevant knowledge, they should be provided with suitable instruction.

The operation safety of the delivered pump resp. unit (= pump with motor) can only be guaranteed on designated use according to the attached data sheet and / or order confirmation resp. *Start-up, Operation, Shut down* (page 21).

The operator is responsible for following the instructions and complying with the safety requirements given in these Operating Instructions. Smooth operation of the pump or pump unit can only be achieved if installation and maintenance are carried out carefully in accordance with the rules generally applied in the field of engineering and electrical engineering.

If not all the information can be found in these Operating Instructions, please contact us.

The manufacturer takes no responsibility for the pump or pump unit if the Operating Instructions are not followed.

These Operating Instructions should be kept in a safe place for future use.

If this pump or pump unit is handed on to any third party, it is essential that these Operating Instructions and the operating conditions and working limits given in the Confirmation of Order are also passed on in full. These Operating Instructions do not take into account all design details and variants nor all the possible chance occurrences and events which might happen during installation, operation and maintenance.

We retain all copyright in these Operating Instructions; they are intended only for personal use by the owner of the pump or the pump unit. The Operating Instructions contain technical instructions and drawings which may not, as a whole or in part, be reproduced, distributed or used in any unauthorised way for competitive purposes or passed on to others.

Guarantee

The guarantee is given in accordance with our Conditions of Delivery and / or the confirmation of order.

Repair work during the guarantee period may only be carried out by us, or subject to our written approval. Otherwise the guarantee ceases to apply.

Longer-term guarantees basically only cover correct handling and use of the specified material. The guarantee shall not cover natural wear and tear and all parts subject to wear, such as impellers, shaft sealings, shafts, shaft sleeves, bearings, wear rings etc. or damage caused by transport or improper handling.

In order for the guarantee to apply, it is essential that the pump or pump unit is used in accordance with the operating conditions given on the name plate, confirmation of order and in the data sheet. This applies particularly for the endurance of the materials and smooth running of the pump and shaft sealing.

If one or more aspects of the actual operating conditions are different, we should be asked to confirm in writing that the pump is suitable.

Safety Regulations

Safety Regulations

These Operating Instructions contain important instructions which must be followed when the pump is assembled and commissioned and during operating and maintenance. For this reason, these Operating Instructions must be read by the skilled staff responsible and / or by the operator of the plant before it is installed and commissioned, and they must be left permanently available at the place where the pump or pump unit is in use.

These Operating Instructions do not refer to the General Regulations on Accident Prevention or local safety and / or operating regulations. The operator is responsible for complying with these (if necessary by calling in additional installation staff).

Equally, instructions and safety devices regarding handling and disposal of the pumped media and/or auxiliary media for flushing, lubrication a.s.o., especially if they are explosive, toxic, hot a.s.o., are not part of this operating instruction.

For the competent and prescribed handling only the operator is responsible.

Marking of References in the Operating Instructions

The safety regulations contained in these Operating Instructions are specially marked with safety signs acc. to nach DIN 4844:

Safety reference!

Non-observance can impair the pump and its function.

EC-Ex Marking

Products intended for use in explosive atmospheres must be marked.

General Symbol for Danger!

Persons can be endangered.

Warning of electric voltage!


Safety instructions attached directly to the pump resp. unit must be followed under any circumstances. Further they must be kept in good readable condition. In the same way, as these Operating Instructions of the pump, all possibly attached Operating Instructions of accessories (e.g. motor) must be noticed and kept available.

Dangers of non-observance of the Safety Instructions

Non-observance of the Safety Instructions can lead to loss of any claim for damages.

Further, non-observance can lead to following risks:

- Failure of important functions of the machine or facility.
- Failure of electronic appliances and measuring instruments by magnetic fields.
- Endangering of persons and their personal property by magnetic fields.
- Endangering of persons by electric, mechanic and chemical influences.
- Endangering of environment through leakage of dangerous substances.

 On application of the unit in areas endangered to explosion special attention must be paid to sections marked with Ex.

Safety Instructions for the Operator / Worker

- Depending on the operating conditions, wear and tear, corrosion or age will limit the working life of the pump/pump unit, and its specified characteristics. The operator must ensure that regular inspection and maintenance are carried out so that all parts are replaced in good time, which would otherwise endanger the safe operation of the system. If abnormal operation or any damage are observed, the pump must cease operation immediately.

- If the breakdown or failure of any system or unit could lead to people being hurt or property being damaged, such system or unit must be provided with alarm devices and/or spare modules, and they should be tested regularly to ensure that they function properly.
- If there is any risk of injury from hot or cold machine parts, these parts must be protected against contact by the user, or suitable warning signs must be affixed.
- Contact protection on moving parts (e.g. coupling guards) must not be removed from systems that are in operation.
- If the sound level of a pump or pump unit is above 85 dB(A) an ear protection has to be used when staying near the pump for some time.
- If dangerous media (e.g. explosive, toxic, hot) leak out (e.g. from shaft seals), these must be directed away so that there is no danger to people or the environment. The provisions of the law must be observed.
- Measures should be taken to exclude any danger from electricity (e.g. by complying with the local regulations on electrical equipment). If work is carried out on live electrical components, they should be unplugged from the mains or the main switch turned off and fuse unscrewed. A motor protection switch is to be provided.

Safety Instructions for Maintenance, Inspections and Mounting Work

- The operator is responsible that any maintenance, inspections and mounting work is made by authorized competent personnel, which must be informed by having read the Operating Instructions.
- Basically, all work on the pump or pump unit should only be carried out when the pump is stationary and not under pressure. All parts must be allowed to return to ambient temperature. Make sure that no-one can start the motor during such work. It is essential that the procedure for stopping the system described in the Operating Instructions is observed. Pumps or pump systems that carry media that are dangerous to health must be decontaminated before being taken apart. Safety Data Sheets for the various liquids handled. Immediately after finishing work, all safety and protective devices must be replaced or restarted.

Unauthorized Alteration and Spare Parts Production

Alteration or changes of the machine are permitted after agreement with the manufacturer. Original spare parts and accessory authorized by the manufacturer are serving the safety. The use of other parts can lead to loss of liability for therefrom resulting consequences.

Undue Operation


The operating safety of the delivered machine can only be guaranteed by designated use acc. to the following chapters of the Operating Instructions.

The limits stated in the data sheet and / or order confirmation must not be exceeded under any circumstances.


Explosion Protection

On application of units in areas endangered to explosion measures and references in the *Filling of Unit* and *Maintenance* sections, must be observed, so that explosion protection is guaranteed.

Filling of unit

 During operation of the pump the system of the suction and pressure pipe and the pump itself must permanently be filled with the pumped liquid.

Thus, no explosive atmosphere can develop and the danger of dry-run is avoided.

 If the operator can't guarantee that, according monitoring measures must be provided.

NOTICE: Equally all seal casings, auxiliary systems of the shaft sealing, as well as heating and cooling systems must be filled carefully.

Marking

⚠ The marking of the pump refers to the pump itself. For the motor resp. further additions a separate Declaration of Conformity, as well as a corresponding marking must be available. Example of marking at pump: CE Ex II 2 G c T1-T.

The marking shows the theoretically applicable range of temperature classes. The different temperatures, permitted acc. to pump design, result as shown in *Temperature Limits*. The same is valid for the drive.

For a whole unit (pump, motor) with different temperature classes the lowest is valid.

Rotation Control

⚠ If danger of explosion is also existing during installation, the rotation control must not be carried out by short start-up of the empty pump, to avoid undue temperature increase in case of contact of rotating and stationary parts.

Operation of pump

The pump must only be started up with fully opened suction side and slightly opened pressure side valve. The start-up against closed non-return valve, however, is possible. Immediately after the start-up the discharge side valve must be adjusted to the operating point.

Refer to [Switch on drive](#) (page 21), as well.

Operation with closed valve in suction and / or discharge pipe is not permitted!

⚠ There's a danger, that high surface temperatures are developing at the pump casing after relatively short time, through fast heating of the liquid inside the pump.



WARNING: Fast pressure increase inside the pump can lead to overload and, thus, the pump can burst.

In [Limits of Operation](#) (page 22), *Flow min. / max.*, the minimum flow is stated. Longer operating phases with these flows and the named liquids don't cause additional increase of surface temperature at the pump.

Furthermore the references in [Start-up, Operation, Shut down](#) (page 21) of these operating Instructions must be taken into consideration.

⚠ On pumps with mech. seals the permitted temperature limits can be exceeded due to dry-run. Dry run not only can occur on insufficiently filled seal casing, but also because of too much gas in the medium.

Operation of the pump out of the permitted operating range can lead to dry-run, as well.

Temperature limits

⚠ Under normal operating conditions the highest temperatures must be expected at the surface of the pump casing and in the area of the bearings.

The surface temperature occurring at pump casing corresponds with the temperature of the pumped liquid.

In the area of lantern and motor free contact of surface to environment must be given for proper cooling.

⚠ During operation of the pump it must be secured that an overabundant sedimentation of dust is avoided (regular cleaning), to prevent heating of pump surface over the permitted temperature.

The operator of the plant must secure that the defined operating temperature is observed. The max. allowed temperature of the pumped liquid at suction depends on the particular temperature class.

The following table shows the theoretical temperature limits of the pumped liquid in consideration of the temperature classes acc. to EN 13463-1.

Temperature class acc. EN 13463-1	Temperature class acc. EN 13463-1
T4 (135°C)	135°C
T3 (200°C)	140°C
T2 (300°C)	140°C
T1 (450°C)	140°C

⚠ The particular allowed operating temperature of the pump is shown in the data sheet and / or the order confirmation resp. the type plate at the pump.

Maintenance

⚠ For a secure and reliable operation it must be secured by regular inspections, that the unit is maintained competently and is kept in good technical condition.

Example: Function of bearings. Operation and application conditions are essentially responsible for their achievable life cycle.

By regular control of the lubricant and the running sound the danger of occurring over temperatures by bearings running hot or defect bearing seals is avoided. Refer to [Monitoring](#) (page 23) and [Cleaning of pump](#) (page 25).

The function of the shaft sealing must be secured by regular control.

If auxiliary systems (e.g. external flushing, cooling, heating) are installed, it must be checked, if monitoring devices are necessary to secure the function.

Electrical switches and control device, instrumentation and accessories

Electric switches and control device, Instrumentation and accessories

⚠ Electric switches and control devices, instrumentation and accessories must correspond with the valid safety requirements and regulations for explosion protection.

Use acc. to Regulations

Speed, Pressure, Temperature

⚠ Suitable safety measures must be taken at the plant to ensure that the speed, pressure and temperature of the pump and the shaft sealing do not exceed the limit values given in the data sheet and / or order confirmation. The given admission pressures (system pressures) must also be sufficiently high.

Further, pressure shocks, as can occur on too fast shut down of the facility, must be kept away from the pump (e.g. by non-return valve at pressure side, airtanks). Quick temperature changes must be avoided. They could cause a temperature shock and lead to damage or impair the function of single components.

Permitted Nozzle Loads and Torques

⚠ Basically the suction and discharge piping must be designed in such way, that as little forces as possible are effective to the pump. If that is not possible, the values shown in chapter 3.5 must not be exceeded under any circumstances. This is valid for the operation as well as for the standstill of the pump and therefore for all possible pressures and temperatures of the unit.

NPSH

⚠ The pumped liquid must have a min. pressure NPSH at the impeller inlet, so that cavitation free work is secured resp. a "break off" of the pump flow is prevented. This condition is fulfilled,

when NPSH-value of the system (NPSHA) lies above NPSH-value of the pump (NPSHR) under all operating conditions.

Attention must especially be paid to the NPSH- value on pumping liquids near the vapour pressure. If the NPSH-value of the pump remains under, this can lead from damage of the material due to cavitation to destruction by overheating.

The NPSH-value of the pump (NPSHR) is shown in the curves of every pump type.

Sealing, Flushing, Cooling

Suitable provisions for the regulation and monitoring of sealing, flushing or cooling are to be provided.

When handling dangerous liquids or if temperatures are high, care should be taken to ensure that the pump ceases operating if the sealing, flushing or cooling system fails.

Sealing, flushing and cooling systems must always be operational before the pump is started up. They should not be taken out of operation until the pump has stopped, provided that the nature of the operation allows this at all.

Back Flow

In systems where pumps are operating in closed circuits under pressure (gas cushions, steam pressure), the pressure of the gas cushion must not be reduced via the pump, since the back flow speed may be much higher than the operating speed, which would destroy the unit.

Description

Description

Design

ICB-pumps are single-stage volute casing pumps in block design. Hydraulic design and dimensions comply with ISO 2858/ EN 22858, the technical design complies with ISO 5199/EN 25199.

The motors comply with DIN 42677-IM B5. Motor and pump shaft are coupled rigidly.

The permitted application conditions and design details of the delivered pump are shown in the attached data sheet and / or the order confirmation (see *Design Coding System* below).

Installation position: ICB-pump are intended for use with horizontal shaft, discharge up.

Installation positions deviating therefrom must be approved by the manufacturer.

Design Coding System

Due to the coding on data sheet and / or order confirmation all information regarding delivered pump can be found in this Installation, Operation and Maintenance Instruction, e.g.:

ICB	100	- 65	- 250	S1	V	L	2	- 132
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

Position (0) - Name of Model

ICB - ISO block pump

Position (1) - Suction Nozzle in mm

Position (2) - Discharge Nozzle in mm

Position (3) - Nominal diameter of impeller in mm

Position (4) - Shaft sealing

S1 - Single-mechanical seal acc. DIN 24960 I1k / EN 12756 form U

S4 - Single-mechanical seal acc. DIN 24960 I1k / EN 12756 form U with Quench (throttle bush)

Position (5) - Material Impeller

N = Cast Iron (0.6025)

L = Ductile Iron (0.7043)

V = Carbon Steel (1.4408) W = Duplex (1.4517)

Position (6) - Material pump casing (same coding as impeller, cast iron not available)

Position (7) - Stub shaft

2 - without shaft sleeve (Duplex 1.4462 std)

Position (8) - IEC Motor size

Shaft Sealing

Pumps of design ICB are exclusively sealed with single mech. seals with installation dimensions acc. to EN 12756 (DIN 24960), design "K", form "U".

Two shaft sealing variants are available. On the data sheet and / or the order confirmation the kind of shaft sealing is given. An instruction for the mounting and operation of mech. seals is contained in the particular "Mounting Instruction of Shaft Sealing".

For nominal size (d1) of the mech. seal refer to following chart.

Type	nom. size d1 of mech. seal	Type	nom. size d1 of mech. seal
40-25-160	33	100-65-160	43
40-25-200	33	100-65-200	43
40-25-250	43	100-65-250	43
50-32-160	33	100-65-315	53
50-32-200	33	125-80-160	43

50-32-250	43	125-80-200	43
50-32-315	43	125-80-250	43
65-40-160	33	125-80-315	53
65-40-200	33	125-100-200	43
65-40-250	43	125-100-250	53
65-40-315	43	125-100-315	53
80-50-160	33	150-125-250	53
80-50-200	33	150-125-315	53
80-50-250	43	200-150-250	53
80-50-315	43		

NOTICE: The mech. seal used in the standard design is not resistant to mineral oils.

NOTICE: For further details about mech. seals, as well as the dangers of accidents, connected to them refer to [Monitoring](#) (page 23) and [Mechanical seals](#) (page 25).

Bearing

The shaft is guided by the ball bearings of the motor. The bearings are grease lubricated for life and, therefore maintenance-free.

Approximate Value for Sound Pressure Level

Nom- inal power $P_{N,in}$ kW	Sound pressure level L_{pA} in dB(A)					
	Pump alone			Pump + Motor		
	2950 min ⁻¹	1450 min ⁻¹	975 min ⁻¹	2950 min ⁻¹	1450 min ⁻¹	975 min ⁻¹
0,55	50,5	49,5	49,0	58,0	52,0	51,5
0,75	52,0	51,0	50,5	59,0	54,0	53,0
1,1	54,0	53,0	52,5	60,0	55,5	54,5
1,5	55,5	55,0	54,5	63,5	57,0	56,0
2,2	58,0	57,0	56,5	64,5	59,0	58,5
3,0	59,5	58,5	58,0	68,5	61,0	62,0
4,0	61,0	60,0	59,5	69,0	63,0	63,0
5,5	63,0	62,0	61,5	70,0	65,0	65,0
7,5	64,5	63,5	63,0	70,5	67,0	67,0
11,0	66,5	65,5	65,0	72,0	69,0	68,5
15,0	68,0	67,0	66,5	72,5	70,0	70,5
18,5	69,0	68,5	68,0	73,0	70,5	74,0
22,0	70,5	69,5	69,0	74,5	71,0	74,0
30,0	72,0	71,0	-	75,0	72,0	-
37,0	73,0	-	-	76,0	-	-

Sound pressure level L_{pA} measured in 1 m distance from pump surface acc. to DIN 45635, part 1 and 24. Room and foundation influences are not considered. The tolerance for these values is ± 3 dB(A).

Addition with 60 Hz-operation:

Pump alone: -

Pump with motor: +4 dB(A)

Permitted Nozzle Loads and Torques at the Pump Nozzles ...

... following the Europump-Recommendation for pump acc. to ISO 5199.

The data for forces and torques are only valid for static piping loads.

All values for forces and torques refer to standard materials EN-GJS400-18LT and 1.4408.

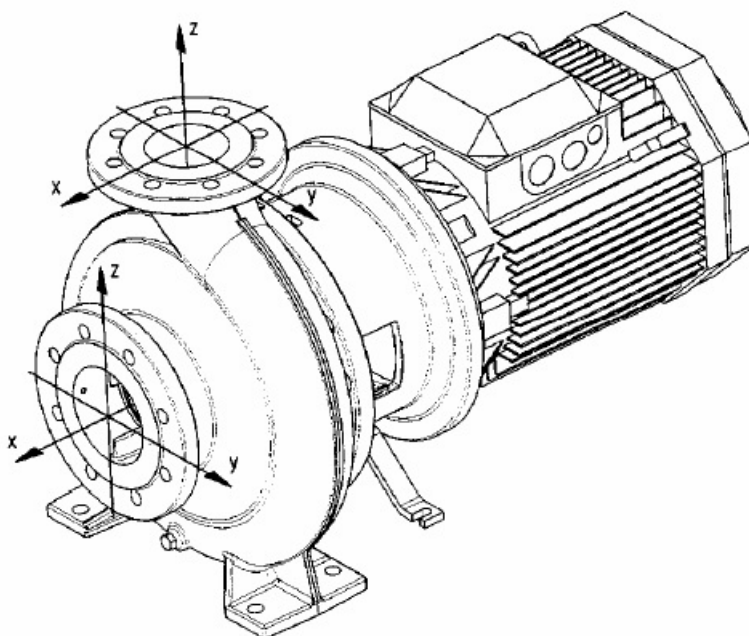


Figure 1: Permitted Nozzle loads and torques at pump Nozzle

Sizes	Suction nozzle									Discharge nozzle								
	ØD N	Forces in N				Torques in Nm				ØD N	Forces in N				Torques in Nm			
		F _x	F _y	F _z	ΣF	M _x	M _y	M _z	ΣM		F _x	F _y	F _z	ΣF	M _x	M _y	M _z	ΣM
40-25-160	40	700	620	560	1100	730	500	590	1070	25	420	400	480	730	500	340	400	730
40-25-200	40	700	620	560	1100	730	500	590	1070	25	420	400	480	730	500	340	400	730
40-25-250	40	700	620	560	1100	730	500	590	1070	25	420	400	480	730	500	340	400	730
50-32-160	50	920	840	760	1450	780	560	650	1150	32	500	480	590	930	620	420	480	900
50-32-200	50	920	840	760	1450	780	560	650	1150	32	500	480	590	930	620	420	480	900
50-32-250	50	920	840	760	1450	780	560	650	1150	32	500	480	590	930	620	420	480	900
50-32-315	50	920	840	760	1450	780	560	650	1150	32	500	480	590	930	620	420	480	900
65-40-160	65	1180	1040	950	1850	840	620	670	1230	40	620	560	700	1100	730	500	590	1060
65-40-200	65	1180	1040	950	1850	840	620	670	1230	40	620	560	700	1100	730	500	590	1060
65-40-250	65	1180	1040	950	1850	840	620	670	1230	40	620	560	700	1100	730	500	590	1060
65-40-315	65	1180	1040	950	1850	840	620	670	1230	40	620	560	700	1100	730	500	590	1060
80-50-160	80	1400	1260	1150	2200	900	650	730	1320	50	840	760	920	1450	780	560	650	1150
80-50-200	80	1400	1260	1150	2200	900	650	730	1320	50	840	760	920	1450	780	560	650	1150
80-50-250	80	1400	1260	1150	2200	900	650	730	1320	50	840	760	920	1450	780	560	650	1150
80-50-315	80	1400	1260	1150	2200	900	650	730	1320	50	840	760	920	1450	780	560	650	1150
100-65-160	100	1880	1680	1520	2950	980	700	810	1450	65	1040	950	1180	1850	840	620	670	1230
100-65-200	100	1880	1680	1520	2950	980	700	810	1450	65	1040	950	1180	1850	840	620	670	1230

100-65-250	100	188 0	168 0	152 0	295 0	980	700	810	145 0	65	104 0	950	118 0	185 0	840	620	670	123 0
100-65-315	100	188 0	168 0	152 0	295 0	980	700	810	145 0	65	104 0	950	118 0	185 0	840	620	670	123 0
125-80-160	125	221 0	200 0	180 0	348 0	118 0	840	107 0	171 0	80	126 0	115 0	140 0	220 0	900	650	730	132 0
125-80-200	125	221 0	200 0	180 0	348 0	118 0	840	107 0	171 0	80	126 0	115 0	140 0	220 0	900	650	730	132 0
125-80-250	125	221 0	200 0	180 0	348 0	118 0	840	107 0	171 0	80	126 0	115 0	140 0	220 0	900	650	730	132 0
125-80-315	125	221 0	200 0	180 0	348 0	118 0	840	107 0	171 0	80	126 0	115 0	140 0	220 0	900	650	730	132 0
125-100-200	125	221 0	200 0	180 0	348 0	118 0	840	107 0	171 0	100	168 0	152 0	188 0	295 0	980	700	810	145 0
125-100-250	125	221 0	200 0	180 0	348 0	118 0	840	107 0	171 0	100	168 0	152 0	188 0	295 0	980	700	810	145 0
125-100-315	125	221 0	200 0	180 0	348 0	118 0	840	107 0	171 0	100	168 0	152 0	188 0	295 0	980	700	810	145 0
150-125-250	150	280 0	252 0	227 0	440 0	140 0	980	115 0	205 0	125	200 0	180 0	221 0	348 0	118 0	840	107 0	171 0
150-125-315	150	280 0	252 0	227 0	440 0	140 0	980	115 0	205 0	125	200 0	180 0	221 0	348 0	118 0	840	107 0	171 0
200-150-250	200	375 0	336 0	303 0	585 0	182 0	129 0	149 0	270 0	150	252 0	227 0	280 0	440 0	140 0	980	115 0	205 0

Permitted pressures and temperatures

Basically the values, regarding pressures and temperatures, given in the data sheet and / or the order confirmation, as well as on the name plate. Exceeding or remaining under of these values are undue. If there are no pressures and / or temperatures mentioned in data sheet and / or order confirmation, the following limits are valid for suction pressure and room temperature.

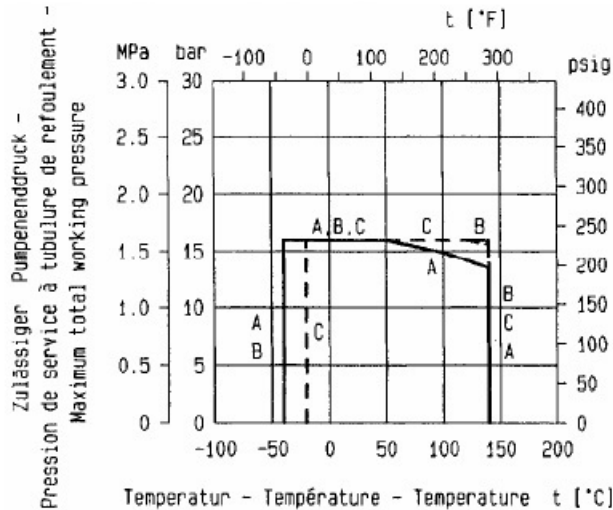


Figure 2: For all pump types, except: 50-32-315, 65-40-315, 80-50-315, 100-65-315, 125-80-315, 125-100-315

Table 1:

Curve	Casing material	Description
A	1.4408	Austenitic Steel
B	1.4517	Duplex Steel
C	EN-GJS-400-18-LT (0.7043)	Ductile Iron

Suction pressure (System pressure) = Pressure at pump suction: max. 5 bar

Ambient temperature max. 40°C.

On Application of pumps local laws and regulations must be noticed, as well (e.g. DIN 4747 or DIN 4752, section 4.5).

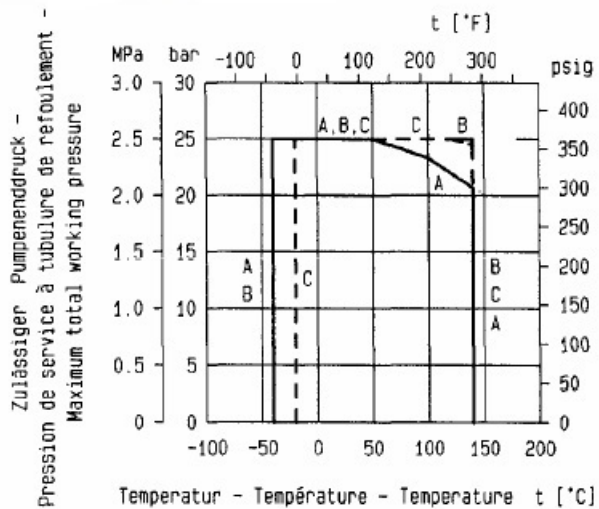


Figure 3: Only for: 50-32-315 - 65-40-315 - 80-50-315 - 100-65-315 - 125-80-315 - 125-100-315

The given pressure and temperature limits are valid for standard mechanical seals.
Application limits for other materials on request.

Condensate

On motors which are subject to strong temperature deviations or extreme climatic conditions, we recommend the use of a motor with stand-by heating to avoid formation of condensate inside the motor. The stand-by heating must not be switched on during the operation of the motor.

Transport, Handling, Storage

Transport, Handling, Storage

Transport, Handling

- Check the pump / pump unit immediately upon delivery / receipt of despatch for damage or missing parts.
- The pump / pump unit must be transported carefully and by competent personnel. Avoid serious impacts.
- Keep the pump / pump unit in the same position in which it was supplied from the factory. Take note of the instructions on the packaging.
- The suction and discharge side of the pump must be closed with plugs during transport and storage.

NOTICE: Dispose of all packing materials in accordance with local regulations.

- Lifting devices (e.g. fork-lift truck, crane, crane device, pulleys, sling ropes, etc.) must be sufficiently strong and must only be used by authorized persons.
- The pump / pump unit may only be lifted by solid points such as the casing, flanges or frame. Figure *Pump Lifting*, shows the correct method of carrying by crane.



WARNING: Do not stand underneath suspended loads. Take note of the general regulations on prevention of accidents. The pump / pump unit must be secured against tipping over and slipping until it has been fixed in its final location.

NOTICE: Sling ropes must not be fixed to ends of shafts or the ring loops of the motor.



WARNING: Slipping out of the pump / unit of the transport lifting device can cause damages to persons and things.



Figure 4: Pump Lifting

Storage / Conservation

Pumps or units, which are stored over a longer period before start-up (max. 6 months), must be protected from moisture, vibrations and dirt (e.g. by wrapping in oil paper or plastic). Pumps must basically be stored in a place where they are protected from the weather, e.g. under dry cover. During this time, all suction and discharge branches and all other intakes and outlets must be closed with dummy flanges or plugs.

For longer periods of storage conservation measurements at machined surfaces and packing with moisture protection can be necessary!

Mounting / Installation

Mounting / Installation

Mounting of Pump / Unit

The pumps must be bolted to a solid base (e.g. concrete foundation, steel plate, steel bracket, etc.). This base must withstand all loads occurring during operation. The place, where the pump is mounted must be prepared acc. to the dimensions of the dimensional drawings. The concrete foundations should have sufficient firmness acc. to DIN 1045 or equal standard (min. BN 15), to ensure a secure, functional mounting.

The concrete foundation must have set, before the unit is erected. Ist surface must be horizontal and even. For the position and size of the pump feet and the foudation screws refer to the dimensional drawing.

Concrete expansion bolts, epoxy capsle anchor bolts or anchor bolts grouted with the foundation (stone screws), can be used for.

NOTICE: Sufficient space must be provided for maintenance and repair work, especially for replacing the drive motor or the complete pump unit. The motor fan must be able to take in enough cool air, and the intake grille must therefore be at least 10 cm away from any wall, etc.

- When mounting the pump on the foundation it must be adjusted at the discharge nozzle by means of a spirit-level (at discharge nozzle). The permitted deviation is 0,2 mm/m. Levelling shims must be inserted next to the foundation anchors and must lie plainly.
- If vibrations are transmitted to the foundation from adjoining components, it must be guarded through adequate vibration damping paddings (vibrations from outside can impair the bearing).
- To prevent vibrations being transmitted to adjoining components, the foundation should be laid on a suitable insulating base.

NOTICE: The size of these insulating pads will vary, depending on circumstances, and should therefore be determined by an experienced specialist.

Connection of Pipings to the Pump



WARNING: The pump must not be used as fixed point for the piping. The permitted piping loads must not be exceeded, refer to *Permitted Nozzle loads and torques at the pump nozzles*.

Suction and discharge pipe

- The pipes must be of a size and design that liquid can flow freely into the pump and that the pump functions without problems. Particular attention is to be paid to ensuring that suction pipes are airtight and that the NPSH values are observed. Under suction lift condition lay the suction pipe in the horizontal section towards the pump so that it is slightly inclined upwards so that no air traps occur. Do not install fittings or elbows right before the suction nozzle.
- If the suction supply is under vacuum and entrained gas may be present in the liquid, it is recommended that a vent line (min. diameter 25 mm) be considered upstream of the pump suction with return to the suction supply, above the max liquid level.
- An additional flushed piping - discharge branch-vent line - makes it easier to de-aerate the pump before start-up.

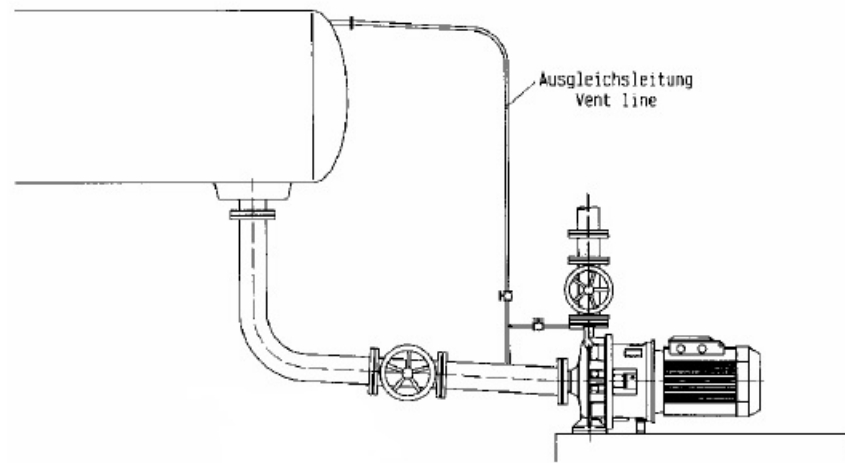


Figure 5: Suction and discharge pipe

- When laying the pipes, make sure that the pump is accessible for maintenance, installation and disassembly.
- Notice "Permitted Forces on Flanges" ([Condensate](#) (page 15)).
- If expansion joints are used in the pipes, they have to be supported in such a way that the pump is not loaded unduly high because of the pressure in the pipes.
- Before connecting up to pump: remove protective coverings from suction and discharge branches.
- Before starting up, the pipe system, fittings and equipment must be cleaned to remove weld spatter, scale etc. Any pollutants are to be completely removed from pump units that are directly or indirectly connected to drinking water systems before being installed and taken into use.
- To protect the shaft sealing (especially mechanical seals) against foreign impurities, it is recommended that a sieve, 800 micron, is installed in the suction / intake pipe when the motor is being started up.
- If the pipe system is tested with the pump installed, do not exceed the maximum permitted casing pressure of the pump and/or shaft sealing (see data sheet).
- When emptying the pipe after the pressure test, make sure that the pump is treated properly (danger of rust and problems when starting up).

Additional connections

Any required sealing, flushing or cooling pipe connections must be installed. Please consult the data sheet to see which pipes, pressures and amounts are necessary. The position and size of connections to the pump are given in the appendix, "Connections".

NOTICE: These connections are essential for the function!

It is recommended that a pipeline is installed to take off any leakage from the shaft seal. For connection, see appendix, "Connections".

Drive

Note the Operating Instructions of the motor manufacturer.

⊕ On application in zone 1 and 2 a motor with valid Atex-certification must be used.

If in the process of the repair a new motor is used, the following has to be noticed:


- The motor must comply with the requirements stated in sheet 1220.1A608 (order from manufacturer, on demand).
- Clean motor end and motor flange of new motor carefully (remove varnish).

Electric Connection



Electrical connection work may only be carried out by an authorised professional. The rules and regulations valid for electrical technology, especially those concerned with safety measures, must be observed. The regulations of the national power supply companies operating in that area must also be observed.

Before starting work, check that the information on the motor name plate is the same as the local mains network. The power supply cable of the coupled drive motor must be connected up in accordance with the wiring diagram produced by the motor manufacturer. A protective motor switch must be provided.

 In areas endangered to explosion IEC 60079-14 must additionally be noticed for the electric installation.

NOTICE: The direction of rotation must only be checked when the pump is full. Dry running will cause damage to the pump.

Final Control

It must be possible to turn the unit easily by hand at the stub shaft.

Start-up, Operation, Shut down

Start-up, Operation, Shut down



WARNING: The plant may only be started up by people who are familiar with the local safety regulations and with these Operating Instructions (especially with the safety regulations and safety instructions given here).

Initial start-up


Before starting up the pump, check, if the following points were controlled and carried out:

- There's no need to lubricate the pump before starting it up.
- Pump and suction pipe must be filled completely with liquid when starting up.
- Turn pump unit once again by hand and check that it moves smoothly and evenly.
- Check that lantern guard sheets are mounted and that all safety devices are operational.
- Switch on any existing sealing or flushing pipings. For quantities and pressures refer to data sheet and / or order confirmation.
- Open valve in suction /intake pipe.
- Set discharge side valve to approx. 25% of rated flow quantity. With pumps with a discharge branch rated width less than 200, the valve can remain closed when starting up.
- Secure, that unit is electrically connected acc. To all regulations and with all safety devices.
- Check direction of rotation by switching on and off briefly. It must be the same as the directional arrow on the drive lantern.

Switch on drive

- Immediately (max. 10 seconds on 50 Hz resp. max. 7 seconds on 60 Hz currency feed) after reaching normal operating speed open discharge valve adjust the required operating point. The pumping data shown at the type plate resp. in the data sheet and / or the order confirmation must be met. Every change is only permitted after talking with the manufacturer!



WARNING:  Operation with closed valve in the suction and / or discharge piping is not permitted.



WARNING: On starting-up without back-pressure, the back- pressure must be produced through throttling at the discharge side. After reaching full back- pressure open valve.



WARNING: If pump does not reach attended head or if atypical sounds or vibrations do occur:

Switch off pump (see *Shutting down*) and seek for causes (see *Faults - Causes and Solutions* (page 32)).

Restarting

Basically, the same procedure should be followed as for starting up for the first time. However, there is no need to check the direction of rotation and the accessibility of the pump unit.

The pump should only be automatically restarted if it has been made sure that the pump has remained filled whilst stand by.



WARNING: Be particularly careful not to touch hot machine parts and when working in the unprotected shaft seal area. Remember that automatically controlled systems may switch themselves on suddenly at any time. Suitable warning signs should be affixed.

Limits of Operation

⚠ The operating limits of the pump / unit regarding pressure, temperature, performance and speed are shown in the data sheet and / or order confirmation and must be observed under any circumstances!

- Do not exceed the output given on the motor name plate.
- Avoid sudden changes in temperature (temperature shocks).
- The pump and motor should run evenly and without vibrations; check at least once a week.

Flow min. / max.

If no other data are given in the curves or data sheets, the following is valid:

$Q_{\min} = 0,1 \times Q_{\text{BEP}}$ for short time operation

$Q_{\min} = 0,3 \times Q_{\text{BEP}}$ for continuous operation

$Q_{\max} = 1,2 \times Q_{\text{BEP}}$ for continuous operation *)

Q_{BEP} = Flow in efficiency optimum

*) on condition that $\text{NPSH}_{\text{facility}} > (\text{NPSH}_{\text{pump}} + 0,5 \text{ m})$

Abrasive Media

⚠ On pumping liquids with abrasive components an increased wear at hydraulic and shaft sealing must be expected. The intervals of inspection should be reduced compared to the usual times.

Permitted number of starts

The permitted number of starts of the pump must not be exceeded, see diagram below.

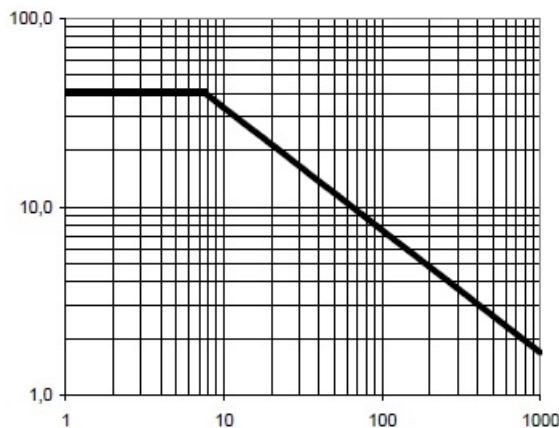


Figure 6: Permitted number of starts - diagram

With electric motors, the permitted number of starts is given in the attached motor operating instructions.


If two different figures are given, the lower figure is valid.

Lubrication

The pump has no bearings and, therefore there's no need for lubrication.

For possibly required lubrication of the motor bearings refer to the Operation and Maintenance Instructions of the motor supplier.

Monitoring

 In areas endangered to explosion it is recommended to monitor the temperature of the bearings and the vibrations of the pump.

NOTICE: Regular monitoring and maintenance will extend the life of your pump or pump system.

- Check pump for leaks at least once a week.
- Check the regulating and monitoring devices of any sealing or flushing systems once a week to ensure that they function properly. Outgoing cooling water should be handwarm.
- Pumps which are exposed to corrosive chemicals or to wear through abrasion must be inspected periodically for corrosion or wear and tear. The first inspection should be carried out after six months. All further inspection intervals should be determined on the basis of the state of the pump.

Shutting Down

- Close the valve in discharge pipe right before (max. 10 seconds) switching off the motor. This is not necessary if there is a spring-loaded check valve.
- Switch off motor (make sure it runs down quietly).
- Close the valve on suction side.
- Close auxiliary circuit.
- On danger of freezing empty pump and pipes completely.
- If pump remains under pressure and temperature when stationary: leave existing sealing and flushing systems switched on.
- The shaft sealing must remain sealed if there is a risk of air being sucked in (in the event of supply from vacuum systems or parallel operation with shared suction pipe).

Storage / longer periods of non- operation

Storage of new pumps

If the putting into operation shall happen a longer period after the delivery, we recommend the following

measures for the storage of the pump:

- Store pump at a dry place.
- Rotate pump by hand at least once a month.

Measures for longer putting out of operation

Pump remains installed and in ready for operation:

- Test runs of 5 min. duration must be made in regular intervals. The span between the test runs is depending on the plant. However, it should be made once a week, at least.

Longer periods of non-operation

Start-up must be handled like initial start-up (see [Start-up, Operation, Shut down](#) (page 21)).

a) Filled pumps

- Switch stand-by pumps on and immediately off again once a week. Possibly use as main pump.
- If the stand-by pump is under pressure and temperature: leave all existing sealing and flushing systems switched on.
- Replace motor bearings after 5 years.

b) Drained pumps

- Turn shaft at least 1x week (do not switch on because of dry running).
- Replace motor bearings after 5 years.


Servicing, Maintenance

Servicing, Maintenance

General remarks



WARNING: Work should only be carried out on the pump or pump unit when it is not in operation. You must observe [Safety Regulations](#) (page 6).

NOTICE:  Maintenance and servicing work must only be carried out by trained, experienced staff who are familiar with the contents of these Operating Instructions, or by the Manufacturer's own service staff.

Mechanical seals



WARNING: Before opening the pump, it is essential that you note [Safety Regulations](#) (page 6) and [Dismantling and repair of pump](#) (page 2526).


If the liquid being handled leaks out at the mechanical seal, it is damaged and must be replaced. Replacement of the mechanical seal according to accompanying "Mounting Instructions for Shaft sealing".

Motor bearings

After approx. 5 years the grease in the motor bearings is so aged, that a replacement of the bearings is recommended. However, the bearings must be replaced after 25000 operating hours, at least, resp. acc. to the Maintenance Instruction of the motor supplier, if that recommends a shorter maintenance period.

Cleaning of pump

- Dirt on the outside of the pump has an adverse effect on transmission of heat. The pump should therefore be cleaned with water at regular intervals (depending on the degree of dirt).

NOTICE:  The pump must not be cleaned with pressurised water - water will get into the bearings.

Dismantling and repair of pump

Dismantling and repair of pump

General remarks



WARNING: Repair to the pump or pump system may only be carried out by authorised skilled personnel or by the manufacturer's specialist staff.



WARNING: When disassembling the pump pay attention to [Safety Regulations](#) (page 6) and [Transport, Handling](#) (page 16).

For mounting and repair you can order specialized personnel if you want.



WARNING: If dangerous liquids are pumped the appropriate disposal of the handled liquid is necessary before the disassembly of the pump. Pay attention to the fact, that even in drained pumps there are remainders of the handled liquid. If necessary the pump must be flushed or decontaminated. Laws must be observed, otherwise danger to health is existing!

- Before the disassembly the pump has to be secured in such a way, that it can't be started.
- The pump casing must be drained and without pressure.
- All locking devices in the suction- and discharge-pipe must be closed.
- All parts must have taken on the temperature of the environment.



WARNING: Secure disassembled pumps, units or single parts against tipping over or rolling off.



WARNING: While disassembling the pump use of an open flame (blowlamp, etc.) only, when there is no danger of setting fire, cause an explosion or cause injurious vapours.

NOTICE: Use original spare parts only. Pay attention to the right materials and the matching design.

General

Works, which require shocks (hammer), must only be performed outside the explosive atmosphere or only non-sparking tools must be used.

Carry out disassembly and mounting according to the appropriate sectional drawing.

You will only need common tools.

Before disassembly check if required parts are ready.

Disassemble the pump only so far, as required for the replacement of the repair part.

Removal and Installation of screen in the motor lantern

The guard plates (680) are fixed in the windows of the motor lantern (681).

For removing insert a screwdriver about 4 cm into the last row with punches of the guard plate. Then pull up the screwdriver until the lower edge of the guard plate lifts off the window. Now you can remove the screwdriver together with the guard plate from the window (see Figure 8).

On installation insert the screwdriver about 4 cm into the last row with punches of the guard plate. Then put the upper part of the guard plate into the upper edge of the window. Now pull up

the screw driver until the guard plate is bent through so much, that it can be inserted into the lower edge of the window of the motor lantern.



Figure 7: Motor lantern screen removal

NOTICE: Pull up screw driver only so far as is absolutely necessary to insert the guard plate into the window. If the guard plate does not stick fast in the window after installation:

Dismantle guard plate once again, flatten it and install again.

Removal of the Back Pull Out Assembly

The back pull out assembly consists of all pump parts except the volute casing (102V). As the pumps are constructed in block design, the volute casing (102V) can remain on the foundation and in the piping, if it's not the volute casing itself, which must be repaired.

- Drain volute casing (102V) via drain plug (912.11).
- Loosen screws of existing sealing or flushing piping.
- Loosen screws of support foot (183) from the foundation (not existing on all sizes).
- Hang the Back Pull Out Assembly onto a lifting device, so that it won't sink down or press into the volute casing during the dismantling. Example see Figure 9 for lifting recommendations.

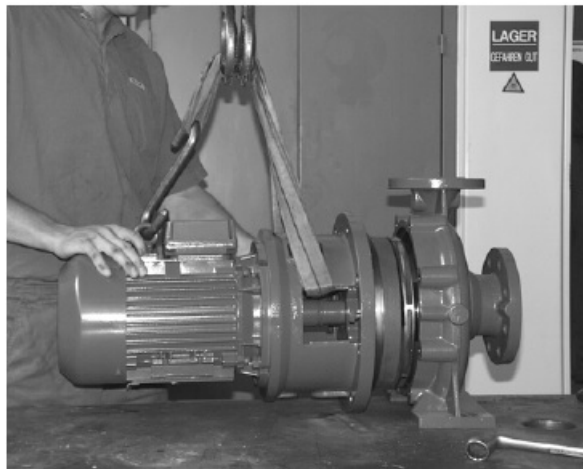


Figure 8: Back pull-out removal

- Loosen hex head bolt (901.11) from the casing.
- Using the jack screws provided (901.42), separate the Back Pull Out Assembly from the casing.

Removal of Impeller

NOTICE: Notice attached "Mounting Instruction for Shaft Sealing".

- If the impeller has back vanes check the axial clearance "a" between the impeller (230) and casing cover (161) before you continue the dismantling. Refer to sect. 8.7.1.
- Loosen impeller nut with a sensitive hit on the wrench (right-hand thread). If necessary back up with a pry bar in the cross boring of the stud shaft (in clamp area).
- Draw off the impeller (230) with two screw drivers or pry bars (Figure 10). Remove key (940.31).

NOTICE: Be sure to locate pry bars under impeller vanes to prevent damage to the impeller.

- For further dismantling, and for installation, the Back Pull Out Assembly should be placed in a vertical position. Prevent assembly from tipping!



Figure 9: Place in vertical position to prevent tipping

Removal of Shaft Sealing

- Before you remove casing cover notice "Mounting Instructions for Shaft Sealing".
- Unfasten hexagonal nut (902.32) (not available on all pump sizes) and take casing cover (161) out of bearing bracket (344).

Removal of Stub Shaft

- Loosen screws (920.41) and pull motor with stub shaft (210) out of the motor lantern (341).
- Loosen radial stub shaft screwing (904.41 and 904.42) (stud bolts) and deduct stub shaft (210) from motor shaft. For support (break loose) you can insert a solid screw driver into the cross boring, press it against the front face of the motor and move both shafts against each other.

Reconditioning

After disassembly all parts must be cleaned and checked for wear carefully. Worn or damaged parts must be replaced by new parts (spare parts).

It is recommended in most cases to replace mech. seal, ball bearings and seals (flat seal, O-rings).

NOTICE: All PTFE-sealing elements and graphite sealings are intended for being used only once.

In most cases it make sense, if damaged absolutely necessary, to renew the mech. seal and the bearings Deposits on the impeller (230), in the volute casing (102V) or on the casing cover must be removed.

Clearance at impeller

Suction side of impeller shown below left, back vanes of impeller shown below right

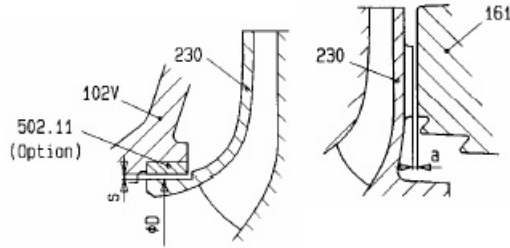


Figure 10: Suction side of impeller (shown on left), Back vanes of impeller (shown on right)

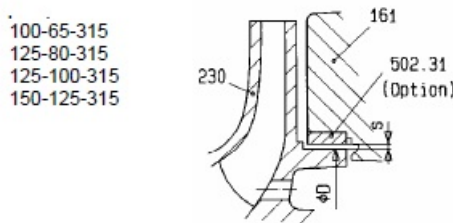


Figure 11: Drive side of impeller (only with pump size shown below)

Nominal diameter D (mm)		60	85	100	155	220	
		68		120	175		
				135			
Radial clearance s (mm)	new	min.	0,15	0,17	0,20	0,22	0,25
		max.	0,19	0,22	0,24	0,27	0,30
	worn		0,78	0,85	0,90	1,05	1,15
Axial clearance a (mm)	new	0,8 - 1,2					
	worn	max. 1,7					

⊠ When the wear limits has been reached or exceeded, the worn parts must be replaced. For volute casings (102V) with a wear ring (502.11) and cover casings (161) with a wear ring (502.31) there are the following possibilities to restore the correct clearance:

- a) Renew impeller (230) and wear ring. Then the original measures are restored.
- b) A customized wear ring (bored to fit) can be supplied to avoid replacement of the impeller. Please contact factory for details.

When volute casing (102V) or casing cover (161) without wear ring must be repaired, a wear ring can be installed to renew pump performance. Remachining of the volute casing and / or casing cover is required. Please contact the factory for details and assistance.

Mounting

General

Re-assemble the pumps using the reverse order of steps as completed for pump disassembly. However the following observations should be considered:

- Pay attention to the utmost cleanliness when reassembling the pump.
- For tight tolerances e.g. between stub shaft (210) and motor shaft or impeller (230) and shaft (210), as well as thread, use suitable anti-galling compound (e.g. Molykote / Never-Seeze), so that the next mounting and dismantling will be easier.



WARNING: Anti-galling compound must be compatible with the pumpage.

- Screws should be tightened, with the following torque:

Location	Screw Size	Screw torque in Nm	
		Lubricated threads	Dry threads
Casing Screws	M12	35	50
	M16	105	150
	M20	210	305
All other screws	M10	35	50
	M12	60	90
	M16	150	220

- Do not use excessive force.
- For mounting of stub shaft refer to *Mounting of Stub Shaft*.
- For mounting of mechanical seal refer to separate "Mounting Instruction of Shaft Sealing" and *Removal of Impeller* (page 28).
- For impellers with back vanes the axial clearance between the back vanes and the casing cover (161) should be checked after mounting the impeller (230) and tightening the impeller nut (922) (see *General remarks* (page 26)).
- After the mounting of the back pull out assembly, and its assembly into the volute casing, turn the shaft and control the free moving of the pump in this way. The shaft sealing will cause slightly resistance when turning, but there must not be any contact between metal parts.



WARNING: Before starting the pump do not forget to install and connect all security devices.

Mounting of Stub Shaft

- Insert key in the motor stump.
- Put anti-galling compound onto the motor stump (see *Mounting* (page 29), *General*).
- Push stub shaft up the motor shaft to measure A (see *Stub shaft mounting* image and chart).
- Drill countersink into motor shaft, approximately 2-3 mm depth, through the radial bore in the motor shaft (see *Stub shaft mounting* image), by using a twist-drill with 90° tip.
- Remove cuttings out of the stud hole (e.g. with compressed-air), screw in and make safe thread pins (904.41 and 904.42) (e.g. with Omnifit 100 M or Loctite).
- Check smooth running of stub shaft opposite to motor flange with a dial gauge. The pointer deflection of the dial gauge must not exceed 0,1 mm.

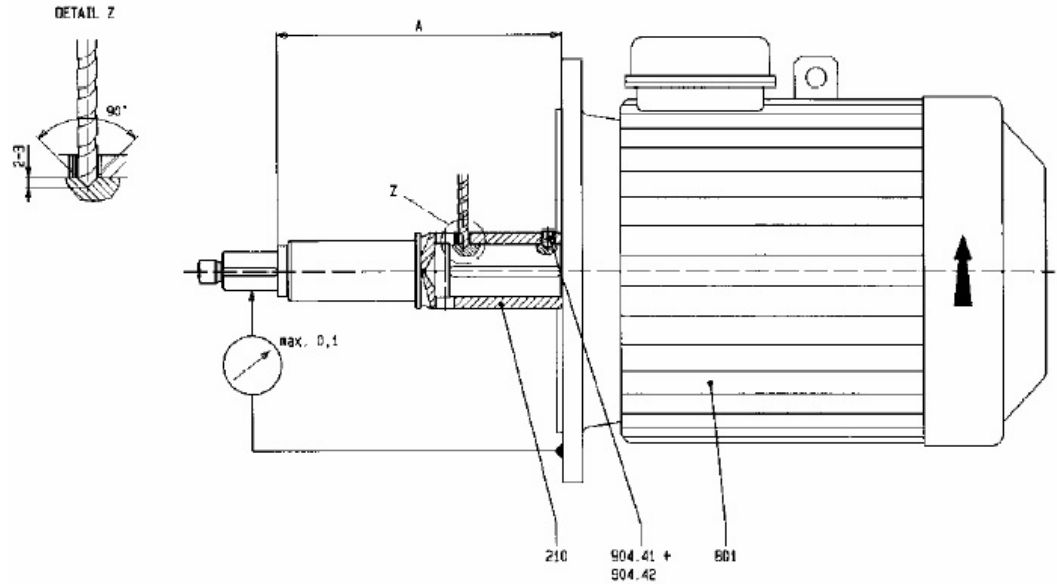


Figure 12: Stub shaft mounting

Type	Measure A by motor size							
	80	90	100	112	132	160	180	200
40-25-160	157	157	197	197	197	232	-	-
40-25-200	157	157	197	197	197	232	-	-
40-25-250	162	162	202	202	202	237	237	237
50-32-160	157	157	197	197	197	232	-	-
50-32-200	157	157	197	197	197	232	-	-
50-32-250	162	162	202	202	202	237	237	237
50-32-315	-	-	202	202	197	237	237	237
65-40-160	157	157	197	197	197	232	-	-
65-40-200	157	157	197	197	197	232	232	-
65-40-250	162	162	202	202	202	237	237	237
65-40-315	-	-	202	202	197	237	237	237
80-50-160	157	157	197	197	197	232	232	-
80-50-200	157	157	197	197	202	232	232	232
80-50-250	-	162	202	202	202	237	237	237
80-50-315	-	-	202	202	202	237	237	237
100-65-160	162	162	202	202	202	237	237	237
100-65-200	-	162	202	202	202	237	237	237
100-65-250	-	162	202	202	206	237	237	237
100-65-315	-	-	206	206	202	241	241	241
125-80-160	-	162	202	202	202	237	237	237
125-80-200	-	162	202	202	202	237	237	237
125-80-250	-	-	202	202	202	237	237	237
125-80-315	-	-	-	206	206	241	241	241
125-100-200	-	-	202	202	202	237	237	237
125-100-250	-	-	216	216	216	251	251	251
125-100-315	-	-	-	-	206	241	241	241
150-125-250	-	-	-	-	216	251	251	251
150-125-315	-	-	-	-	-	241	241	241
200-150-250	-	-	-	-	-	251	251	251

Spare parts, Spare pumps

Spare parts, Spare pumps

Spare parts

Spare parts should be selected to last for two-years continuous operation. If no other guidelines are applicable, we recommend that you stock the number of parts listed below (in accordance with VDMA 24296).

NOTICE: To ensure optimum availability, we recommend that suitable quantities of spare parts are held in stock, especially if these are made from special materials and in the case of mechanical seals, because of the longer delivery times.

Spare Parts	Number of pumps (incl. stand-by pumps)							20%
	2	3	4	5	6/7	8/9	10/+	
Impeller	1	1	1	2	2	2	20%	
Wear ring	2	2	2	3	3	4	50%	
Shaft with keys and nuts	1	1	1	2	2	2	20%	
Joints for pump casing sets	4	6	8	8	9	12	150%	
other joints sets	4	6	8	8	9	10	100%	
Mech. seal sets	1	1	2	2	2	3	25%	

Ordering spare parts

When ordering spare parts, please supply the following information:

- Type: _____
- S/N (Order No.) _____
- Part name _____
- Sectional drawing _____

All the information is given in the data sheet and the relevant sectional drawing.

NOTICE: Store spare parts in dry and clean rooms.

Stand-by pumps



WARNING: It is essential that a sufficient number of stand-by pumps are kept ready for use in plants where failure of a pump could endanger human life or cause damage to property or high costs. Regular checks should be carried out to ensure that such pumps are always ready for use (see [Storage / longer periods of non-operation](#) (page 23)).

NOTICE: Store stand-by pumps according to [Storage / longer periods of non-operation](#) (page 23).

Faults - Causes and Solutions

The following notes on causes of faults and how to repair them are intended as an aid to recognising the problem. The manufacturer's Customer Service Department is available to help repair faults that the operator cannot or does not want to repair. If the operator repairs or changes the pump, the design data on the data sheet and [Description](#) (page 11) of these Operating Instructions should be particularly taken into account. If necessary, the written agreement of the manufacturer must be obtained.

Table 2: Troubleshooting procedure

Symptom	Cause	Remedy
Discharge too low	Back-pressure too high	<ul style="list-style-type: none"> • check facility for pollution, open discharge valve • reduce resistance in discharge pipe (e.g. clean filter if necessary) • use larger impeller (note available motor power)
	Speed too low	<ul style="list-style-type: none"> • increase speed (check available motor power) • compare speed of motor with specified pump speed (rating plate) • when adjusting speed (frequency transformer) check reference value settings
	Impeller diameter too small	<ul style="list-style-type: none"> • use larger impeller (check available motor power)
	Pump and/or pipes not completely filled with liquid	<ul style="list-style-type: none"> • fill • vent
	Pump or suction/intake pipe blocked	<ul style="list-style-type: none"> • clean
	Air pocket in pipeline	<ul style="list-style-type: none"> • vent • improve course of pipe
	Suction height too big / NPSH of system too small	<ul style="list-style-type: none"> • increase liquid level and admission pressure • reduce resistance in the intake/suction pipe (change course and rated width, open shut-off valves, clean filters)
	Air being sucked in	<ul style="list-style-type: none"> • increase liquid level • check if suction pipe is vacuum-tight
	Air being sucked in through shaft sealing	<ul style="list-style-type: none"> • clean sealing pipe • increase sealing pressure • replace shaft sealing
	Direction of rotation is wrong	<ul style="list-style-type: none"> • swap over two phases of power supply (to be done by an electrician)
	Inner components suffering from wear	<ul style="list-style-type: none"> • replace worn parts
	Density and/or viscosity of liquid handled is too high	<ul style="list-style-type: none"> • seek assistance
Discharge stops after a time	Flow too little	<ul style="list-style-type: none"> • increase min. flow (open discharge valve, bypass)
	Pump or suction/intake pipe blocked	<ul style="list-style-type: none"> • clean
	Suction height too big / NPSH of system too small	<ul style="list-style-type: none"> • increase liquid level and admission pressure • reduce resistance in the intake/suction pipe (change course and rated width, open shut-off valves, clean filters)
	Air being sucked in	<ul style="list-style-type: none"> • increase liquid level • check if suction pipe is vacuum-tight
	Air being sucked in through shaft sealing	<ul style="list-style-type: none"> • clean sealing pipe • increase sealing pressure • replace shaft sealing

Symptom	Cause	Remedy
Head too low	Back-pressure too low, discharge too low	• throttle discharge valve
	Speed too low	• increase speed (check available motor power) • compare speed of motor with specified pump speed (rating plate) • when adjusting speed (frequency transformer) check reference value settings
	Flow too little	• increase min. flow (open discharge valve, bypass)
	Impeller diameter too small	• use larger impeller (check available motor power)
	Pump and/or pipes not completely filled with liquid	• fill • vent
	Pump or suction/intake pipe blocked	• clean
	Air pocket in pipeline	• vent • improve course of pipe
	Suction height too big / NPSH of system too small	• increase liquid level and admission pressure • reduce resistance in the intake/suction pipe (change course and rated width, open shut-off valves, clean filters)
	Air being sucked in	• increase liquid level • check if suction pipe is vacuum-tight
	Air being sucked in through shaft sealing	• clean sealing pipe • increase sealing pressure • replace shaft sealing
	Direction of rotation is wrong	• swap over two phases of power supply (to be done by an electrician)
	Inner components suffering from wear	• replace worn parts
	Density and/or viscosity of liquid handled is too high	• seek assistance
Head too high	Speed too high	• reduce speed • compare speed of motor with specified pump speed (rating plate) • when adjusting speed (frequency transformer) check reference value setting
	Impeller diameter too big	• use smaller impeller
Drive mechanism overloaded	Back-pressure too low, discharge too low	• throttle discharge valve
	Speed too high	• reduce speed • compare speed of motor with specified pump speed (rating plate) • when adjusting speed (frequency transformer) check reference value setting
	Impeller diameter too big	• use smaller impeller
	Density and/or viscosity of liquid handled is too high	• seek assistance
	Forces in pipeline too high (pump unit under strain)	• change (support pipes, use compensators, etc.) • is foundation plate/frame properly cast in place?
	Electricity supply not right (2-phase running)	• check voltage of all phases • check cable connections and fuses

Symptom	Cause	Remedy
Pump not running quietly	Flow too little	<ul style="list-style-type: none"> • increase min. flow (open discharge valve, bypass)
	Pump and/or pipes not completely filled with liquid	<ul style="list-style-type: none"> • fill • vent
	Suction height too big / NPSH of system too small	<ul style="list-style-type: none"> • increase liquid level and admission pressure • reduce resistance in the intake/suction pipe (change course and rated width, open shut-off valves, clean filters)
	Inner components suffering from wear	<ul style="list-style-type: none"> • replace worn parts
	Impeller out of balance	<ul style="list-style-type: none"> • remove blocks/deposits • replace impeller if broken or unevenly worn • check shafts to ensure that they are running true
	Forces in pipeline too high (pump unit under strain)	<ul style="list-style-type: none"> • change (support pipes, use compensators, etc.) • is foundation plate/frame properly cast in place?
	Bearing damaged	<ul style="list-style-type: none"> • replace
Temperature in pump too high	System-related vibrations (resonance)	<ul style="list-style-type: none"> • seek assistance
	Flow too little	<ul style="list-style-type: none"> • increase min. flow (open discharge valve, bypass)
	Pump and/or pipes not completely filled with liquid	<ul style="list-style-type: none"> • fill • vent
	Suction height too big / NPSH of system too small	<ul style="list-style-type: none"> • increase liquid level and admission pressure • reduce resistance in the intake/suction pipe (change course and rated width, open shut-off valves, clean filters)
	Lines and roughness at shaft	<ul style="list-style-type: none"> • replace parts
	Deposits on mechanical seal	<ul style="list-style-type: none"> • clean • replace mechanical seal if necessary • if necessary provide additional rinsing or quench
	Temperature at the bearing too high	Back-pressure too low, discharge too low
Flow too big		<ul style="list-style-type: none"> • reduce flow (throttle discharge valve)
Inner components suffering from wear		<ul style="list-style-type: none"> • replace worn parts
Forces in pipeline too high (pump unit under strain)		<ul style="list-style-type: none"> • change (support pipes, use compensators, etc.) • is foundation plate/frame properly cast in place?
Bearing damaged		<ul style="list-style-type: none"> • replace
Relief fittings insufficient		<ul style="list-style-type: none"> • clean relief openings in impeller • replace worn parts (impeller, split rings) • adjust in line with the system pressure/intake pressure given on ordering
Pump leaking		Forces in pipeline too high (pump unit under strain)
	Sealing insufficient	<ul style="list-style-type: none"> • tighten screws • replace sealing
Leakage rate at shaft sealing too high	Lines and roughness at shaft	<ul style="list-style-type: none"> • replace parts
	Deposits on mechanical seal	<ul style="list-style-type: none"> • if necessary provide additional rinsing or quench
	Impeller out of balance	<ul style="list-style-type: none"> • remove blocks/deposits • replace impeller if broken or unevenly worn • check shafts to ensure that they are running true
	Forces in pipeline too high (pump unit under strain)	<ul style="list-style-type: none"> • change (support pipes, use compensators, etc.) • is foundation plate/frame properly cast in place?


Appendix

Single mech. seal without shaft sleeve (Design code S1..2)

Safety Instructions



WARNING: Every person, who is responsible for the installation, removal, operation, start-up and maintenance of the shaft seal, must also have read and understood the Installation, Operation and Maintenance Instruction of the particular pump and especially *General remarks* and *General*, and follow the instructions under any circumstances!

 For pumps which are designed in conformity with the Directive 94/9/EC (Atex95) for environment endangered to explosion, the additional Operating Instruction for explosion protection of the mechanical seal must be noticed.

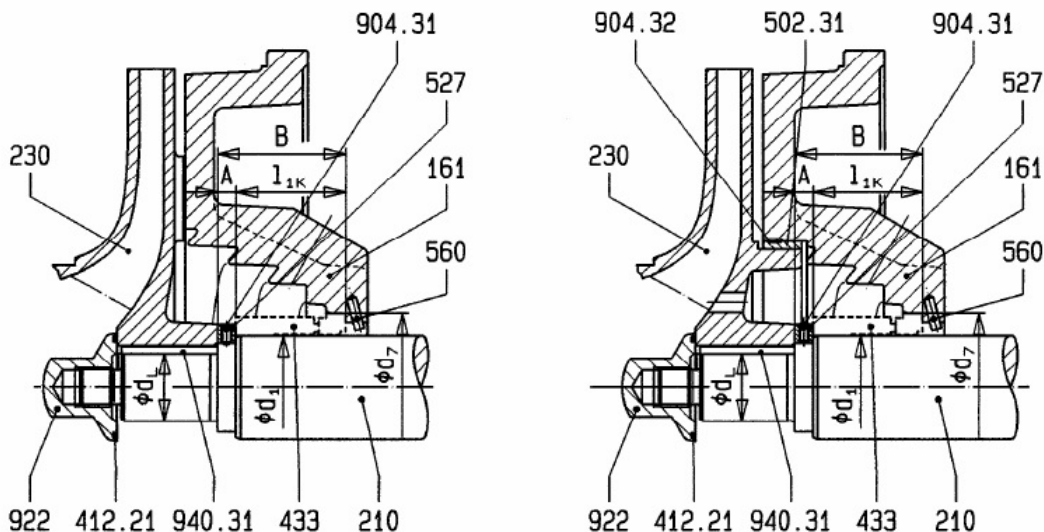
The following descriptions are only valid commonly, as far as they refer to the inner design of the mechanical seal. For possible particularities refer to the data sheet of the mechanical seal or instruction of the mechanical seal-manufacturer.

Design Description

This shaft seal is a single mech. seal with installation dimensions acc. to EN 12756 (DIN 24960) design "K". API plan 02 / ISO plan 00.

Due to the patented Cyclon Seal Chamber no additional flushing of the mech. seal chamber is required.

For data of materials and application range of used mech. seals refer to the data sheet in the operation instruction resp. the order confirmation.



Index of parts:

161 Casing cover
210 Shaft
230 Impeller
412.21 O-ring
433 Mech. seal
502.31*) Wear ring

527 a) Fixing ring
560 b) Pin
904.31 a) Set screw
904.32*) Set screw
922 Impeller nut
940.31 Key

*) optional

a) not for all designs

b) only for mech. seals with PTFE-O-rings

Nominal size of mech. seal	$\varnothing d_1$	$\varnothing d_7$	l_{1K}	A	B	$\varnothing d_L$
33	33	48	42,5	7,5	50	19
43	43	61	45	7,5	52,5	28
53	53	73	47,5	10	57,5	38

This leaflet is subject to alteration!

Removal of mechanical seal


For that purpose use the appropriate sectional drawing and the enclosed data sheet of the mechanical seal.

- Remove and disassemble the pump acc. to the Installation, Operation and Maintenance Instructions including *Removal of Shaft Sealing* (page 28).
- Remove fixing ring (527) (if existing) and rotating part of the mechanical seal (433) from shaft (210). Refer to the enclosed data sheet of the mechanical seal, if set screws are to be loosened at the mechanical seal at first.
- Remove stationary part of the mechanical seal (433) out of the casing cover (161).
M Clean drilling for stationary seal ring ($\varnothing d_7$) in the casing cover (161) and surface of shaft (210).

NOTICE: The reuse of mechanical seals, which have already been used for a longer time, can lead to leaking at the seal faces after re-installation. Therefore the replacement of the mechanical seal through a new one is recommended. The dismantled mechanical seal can be reconditioned by the manufacturer and serve as a replacement mechanical seal.

Installation of a mechanical seal

For that purpose use the sectional drawing and data sheet of the mechanical seal.

 It is only allowed to install mechanical seals, which have a certificate of Conformity acc. the Directive 94/9/EC.

On changing the mechanical seal type resp. the mechanical seal manufacturer the data regarding max. operating temperature of the pumped medium and temperature class must be checked again.

NOTICE: Pay attention to the utmost cleanness! Especially the seal faces must be clean, dry and undamaged. Don't apply lubrication on the seal faces of the mechanical seal.

- If a lubricant is provided with the replacement mechanical seal, you should use this.

NOTICE: Use mineral grease or oil only, if you are completely sure that the elastomers of the mechanical seal are oil resistant. Use no silicone.



WARNING: Use only lubricants when you are sure that there can't occur any dangerous reactions between the pumpage and the lubricant.

NOTICE: Make all required parts available, so that assembly can be completed quickly. The lubricants are only effective for a short time. After that the axial movability and, thus, the automatic adjustment of the elastomeres is lost.

NOTICE: Don't push elastomers over sharp edges. If necessary use mounting devices.

- Press the stationary part of the mechanical seal in the casing cover (161). For this you can eventually use a stamp with a soft surface. Unequal load can lead to cracking of the seal face.
- Don't damage seal face!
- Pay attention that the stationary ring is in solid contact with the casing cover. The seal face must be installed perpendicular to the shaft.
- If a pin (560) is existing, be careful that it fits into the slot of the mechanical sealing, without touching the mechanical seal.
- Push the rotating unit of the mechanical seal on the shaft (210).
- Complete the face on the impeller side of the mechanical seal exactly with the shaft (measure l_{1K}). For mech. seals without own set screws the fixing ring (527) serves as a stop.

NOTICE: Push mechanical seals with bellows in such a way, that the bellow is compressed and not stretched (danger of tearing apart!).


- Further mounting and installation of the pump referring to the repair instructions.

Single mechanical seal with quench without shaft sleeve (Design code S4..2)

Safety Instructions



WARNING: Every person, who is responsible for the installation, removal, operation, start-up and maintenance of the shaft seal, must also have read and understood the Installation, Operation and Maintenance Instruction of the particular pump and especially *General remarks* and *General*, and follow the instructions under any circumstances!

 For pumps which are designed in conformity with the Directive 94/9/EC (Atex95) for environment endangered to explosion, the additional Operating Instruction for explosion protection of the mechanical seal must be noticed.

The following descriptions are only valid commonly, as far as they refer to the inner design of the mechanical seal. For possible particularities refer to the data sheet of the mechanical seal or instruction of the mechanical seal-manufacturer.

Description

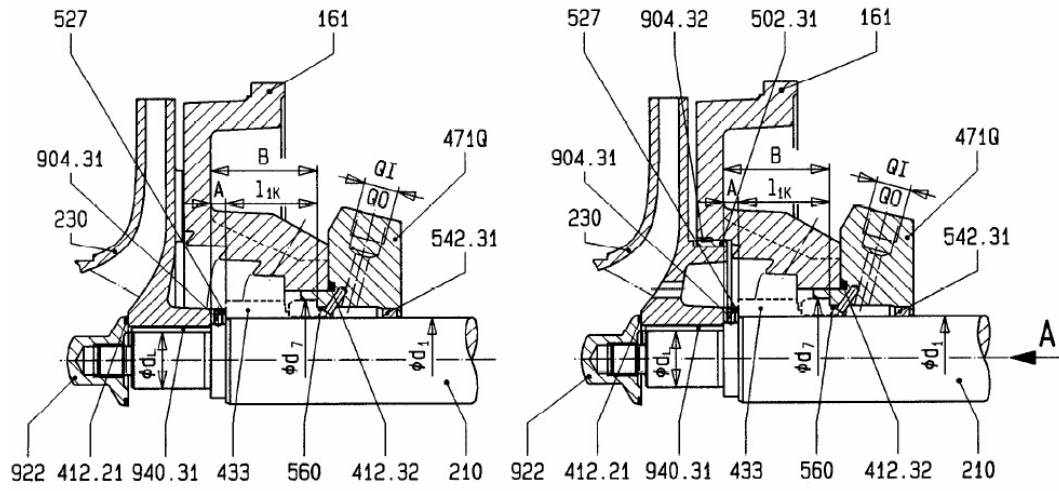
This shaft seal is a single mechanical seal with installation dimensions acc. EN 12756 (DIN 24960) design "K", form "U". API plan 62 / ISO plan 09. The resistance of the materials in the mechanical seal chamber (especially of elastomeres) against the quench liquid has to be noticed.

The quench chamber must be flown through by the quench liquid without pressure. For connection refer to the following sectional drawing.

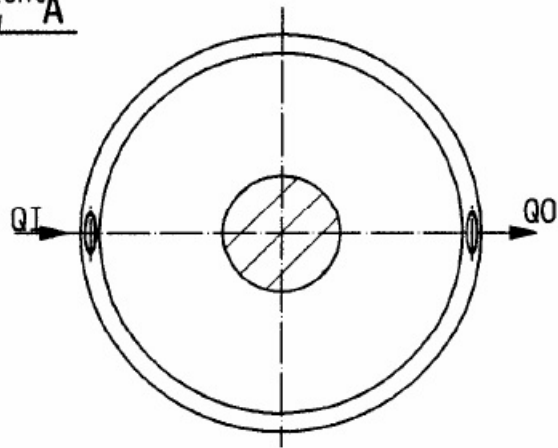


WARNING: The liquid of the quench must be selected in such way that there can not occur any dangerous reactions with the handled fluid. The liquid of the quench can be contaminated due to the handled fluid, therefore the operator must care for an adequate disposal.

Because of the patented Cyclone Seal Chamber no additional flushing of the seal chamber is necessary. For description of materials and operational range of the mechanical seals supplied please refer to the data sheet in the Operation Instruction resp. order confirmation.



Ansicht A
View



Index of parts:

- | | |
|---------------------|----------------------|
| 161 Casing cover | 502.31*) Wear ring |
| 210 Shaft | 527 a) Fixing ring |
| 230 Impeller | 542.31 Throttle bush |
| 412.21 O-ring | 560 b) Pin |
| 412.32 O-ring | 904.31 a) Grub screw |
| 433 Mechanical seal | 904.32*) Grub screw |
| 471Q Quench cover | 923 Impeller nut |

*) optional

a) not for all designs

b) only for mechanical seals with PTFE-O-rings

Nominal size of mech. seal	$\varnothing d_1$	$\varnothing d_7$	l_{1K}	A	B	$\varnothing d_L$	QI, QO
33	33	48	42,5	7,5	50	19	1/4-18 NPT
43	43	61	45	7,5	52,5	28	3/8-18 NPT
53	53	73	47,5	10	57,5	38	3/8-18 NPT

Subject to technical alterations!

Removal of mechanical seal


For that purpose use the appropriate sectional drawing and the enclosed data sheet of the mechanical seal.

- Remove and disassemble the pump acc. to the Installation, Operation and Maintenance Instructions including *Removal of Shaft Sealing* (page 28).
- Remove fixing ring (527) (if existing) and rotating part of the mechanical seal (433) from shaft (210).
- Refer to the enclosed data sheet of the mechanical seal, if set screws are to be loosened at the mechanical seal at first.
- Remove casing cover (161) together with quench cover (471Q). Use hexagonal screws (901.42) as jack screws.
- Pull stationary part of the mechanical seal (433) and throttle bush (542.31) out of quench cover (471Q).
- Clean drilling for stationary seal ring ($\varnothing d_7$) in the quench cover (471Q) and surface of the shaft (210).

NOTICE: The reuse of mechanical seals, which have already been used for a longer time, can lead to leaking at the seal faces after re-installation. Therefore the replacement of the mechanical seal through a new one is recommended. The dismantled mechanical seal can be reconditioned by the manufacturer and serve as a replacement mechanical seal.

Installation of mechanical seal

For that purpose use the appropriate sectional drawing and the enclosed data sheet of the mechanical seal.

 It is only allowed to install mechanical seals, which have a certificate of Conformity acc. the Directive 94/9/EC.

On changing the mechanical seal type resp. the mechanical seal manufacturer the data regarding max. operating temperature of the pumped medium and temperature class must be checked again.

NOTICE: Pay attention to the utmost cleanness! Especially the seal faces must be clean, dry and undamaged. Don't apply lubrication on the seal faces of the mechanical seal.

- If a lubricant is provided with the replacement mechanical seal, you should use this.

NOTICE: Use mineral grease or oil only, if you are completely sure that the elastomers of the mechanical seal are oil resistant. Use no silicone.



WARNING: Use only lubricants when you are sure that there can't occur any dangerous reactions between the pumpage and the lubricant.

NOTICE: Make all required parts available, so that assembly can be completed quickly. The lubricants are only effective for a short time. After that the axial movability and, thus, the automatic adjustment of the elastomeres is lost.

NOTICE: Don't push elastomers over sharp edges. If necessary use mounting devices.

- Put throttle bush (542.31) into quench cover (471Q) carefully.

- Press the stationary part of the mechanical seal in the quench cover (471Q). For this you can eventually use a stamp with a soft surface. Unequal load can lead to cracking of the seal face.
- Don't damage seal face!
- Pay attention that the stationary ring is in solid contact with the quench cover. The seal face must be installed perpendicular to the shaft.
- If a pin (560) is existing, be careful that it fits into the slot of the mechanical sealing, without touching the mechanical seal.
- Insert casing cover (161) carefully, until it fits axially in the bearing frame lantern (344).
- Push the rotating unit of the mechanical seal on the shaft (210).
- Adjust the face on the impeller side of the mechanical seal exactly on measure A. For mechanical seals without own set screws the fixing ring (527) serves as a stop.

NOTICE: Push mechanical seals with bellows in such a way, that the bellow is compressed and not stretched (danger of tearing apart!).



WARNING: Use anti-friction device (Molykote, etc.) between shaft sleeve and shaft only, if you are sure that no dangerous reactions between pumped liquid and anti-friction device can occur.

- Further assembly and installation of pump acc. [Dismantling and repair of pump](#) (page 2526) of Installation, Operation and Maintenance Instruction.



WARNING: Before starting the pump connect flushing system for quench and put it into operation.

Design: S1...2 Single mech. seal, unbalanced (DIN 24960, I_{1k} / EN 12756, design K, form U), Impeller with back vanes

You find the shaft sealing of your pump on the data sheet / the order confirmation. Refer to *Design coding system*, as well.

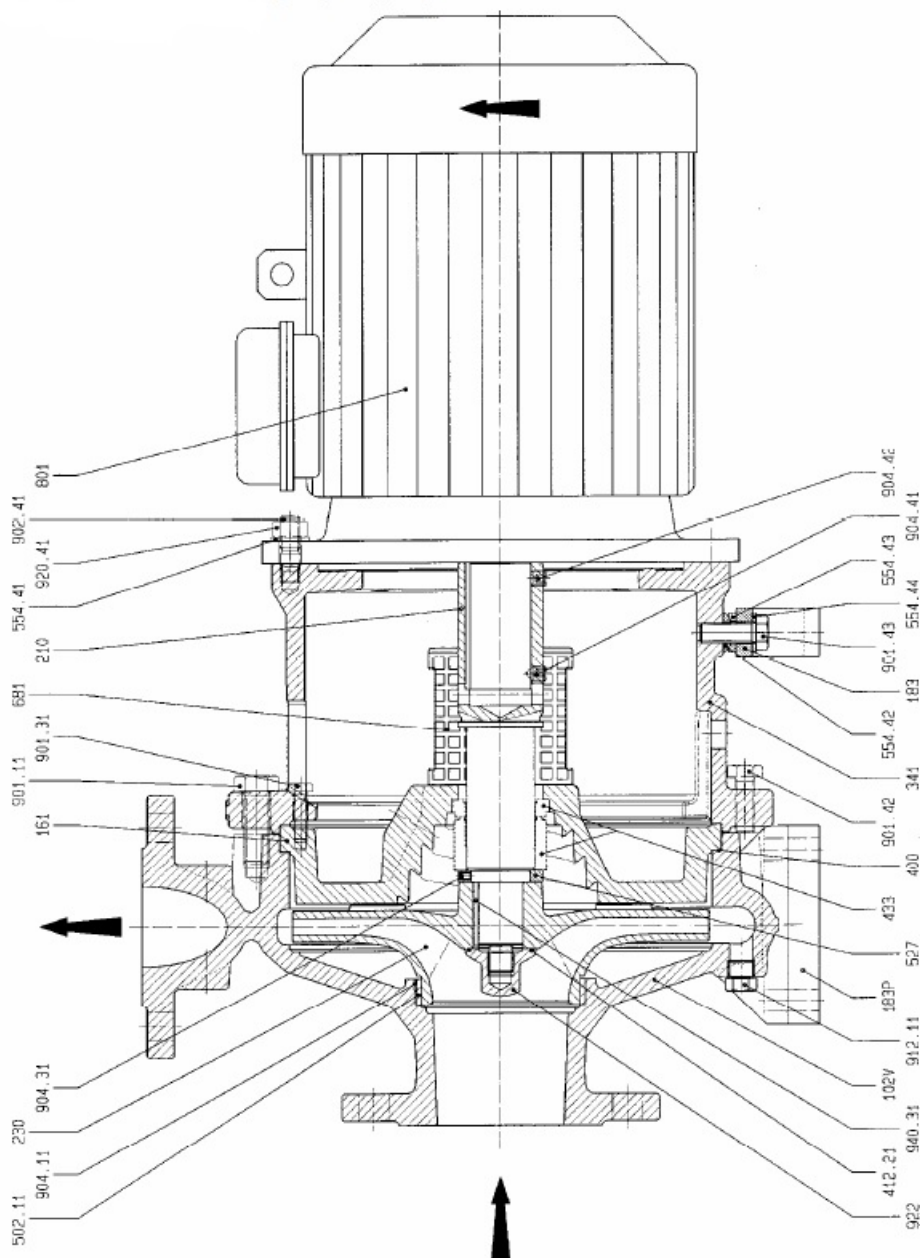


Table 3: Valid for

40-25-160	65-40-160	80-50-315	125-100-200
40-25-200	65-40-200	100-65-160	125-100-250
40-25-250	65-40-250	100-65-200	150-125-250
50-32-160	65-40-315	100-65-250	200-150-250
50-32-200	80-50-160	125-80-160	
50-32-250	80-50-200	125-80-200	
50-32-315	80-50-250	125-80-250	

No.	Part name:
102V	Volute casing
161	Casing cover
183 ***)	Support foot
183P **)	Pump alignment
210	Stub shaft
230	Impeller

No.	Part name:
341	Motor lantern
400	Gasket
412.21	O-ring
433	Mechanical seal
502.11 *)	Wear ring
527 **	Fixing ring
554.41	Washer
554.42 ***)	Bevelwasher
554.43 ***)	Bevelcup
554.44 ***)	Washer
681	Guard plate
801	Flange motor
901.11	Hex screw
901.31 **)	Hex screw
901.42	Hex screw
901.43 ***)	Hex screw
902.41	Stud
904.11 *)	Grub screw
904.31 **)	Grub screw
904.41	Grub screw
904.42	Grub screw
912.11	Drain plug
920.41	Hex nut
922	Impeller nut
940.31	Key

*) ... optional

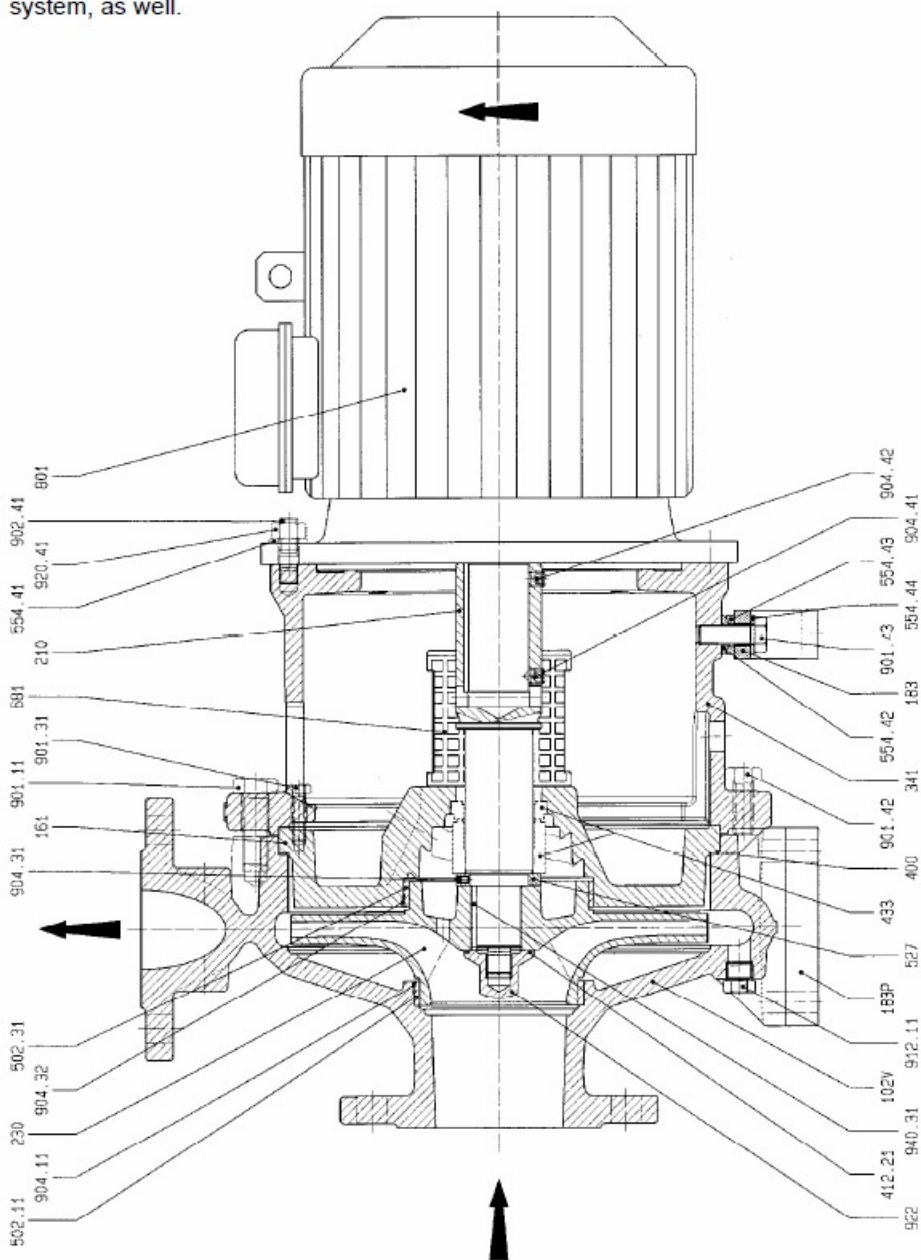
**) ... not for all designs

***) ... with IEC-Motor sizes: 160MA, 160M, 160L, 180M, 180L, 200L, 200LA, only

Design: S1...2 Single-mech. seal, unbalanced (DIN 24960, I_{1k} / EN 12756, design K, form U), Impeller with balancing holes

For the shaft sealing of your pump refer to data sheet / order confirmation. See [Design](#) (page 11) *Design Coding System*, as well.

system, as well.



Valid for type

Table 4:

100-65-315 125-80-315 125-100-315 125-125-315

No.	Part name:
102V	Volute casing
161	Casing cover
183 ***)	Support foot
183P **)	Pump alignment
210	Stub shaft
230	Impeller
341	Motor lantern
400	Gasket
412.21	O-ring
433	Mechanical seal

No.	Part name:
502.11 *)	Wear ring
502.31 *)	Wear ring
527 **	Fixing ring
554.41	Washer
554.42 ***)	Bevelwasher
554.43 ***)	Bevelcup
554.44 ***)	Washer
681	Guard plate
801	Flange motor
901.11	Hex screw
901.31 **)	Hex screw
901.42	Hex screw
901.43 ***)	Hex screw
902.41	Stud
904.11 *)	Grub screw
904.32 *)	Grub screw
904.31**)	Grub screw
904.41	Grub screw
904.42	Grub screw
912.11	Drain plug
920.41	Hex nut
922	Impeller nut
940.31	Key

*) ... optional

**) ... not for all designs

***) ... with IEC-Motor sizes: 160MA, 160M, 160L, 180M, 180L, 200L, 200LA, only

Design: S4...2 Single mech. seal, unbalanced (DIN 24960, I_{1k} / EN 12756, design K, form U), with quench, Impeller with back vanes

For shaft sealing of your pump refer to data sheet / order confirmation. See *Design coding system*, as well.

as well.

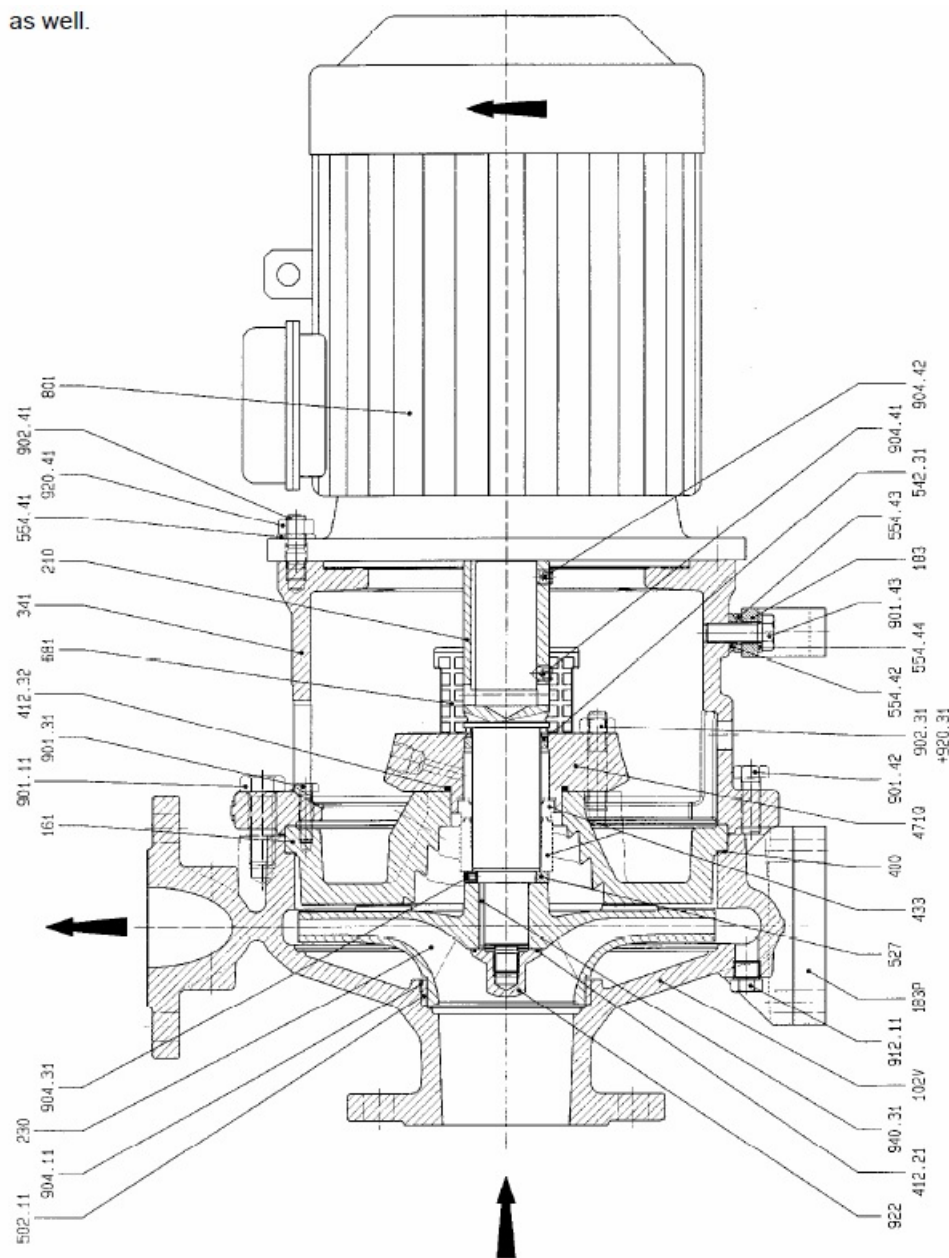


Table 5:

40-25-160	65-40-160	80-50-315	125-100-200
40-25-200	65-40-200	100-65-160	125-100-250
40-25-250	65-40-250	100-65-200	150-125-250
50-32-160	65-40-315	100-65-250	200-150-250
50-32-200	80-50-160	125-80-160	
50-32-250	80-50-200	125-80-200	
50-32-315	80-50-250	125-80-250	

No.	Part name:
102V	Volute casing
161	Casing cover
183 ***)	Support foot
183P **)	Pump alignment
210	Stub shaft
230	Impeller

No.	Part name:
341	Motor lantern
400	Gasket
412.21	O-ring
412.32	O-ring
433	Mechanical seal
471Q	Quench cover
502.11 *)	Wear ring
527 **	Fixing ring
542..31	Throttle bush
554.41	Washer
554.42 ***)	Bevelwasher
554.43 ***)	Bevelcup
554.44 ***)	Washer
681	Guard plate
801	Flange motor
901.11	Hex screw
901.31 **)	Hex screw
901.42	Hex screw
901.43 ***)	Hex screw
902.31	Stud
902.41	Stud
904.11 *)	Grub screw
904.11 **)	Grub screw
904.41	Grub screw
904.42	Grub screw
912.11	Drain plug
920.41	Hex nut
922	Impeller nut
940.31	Key

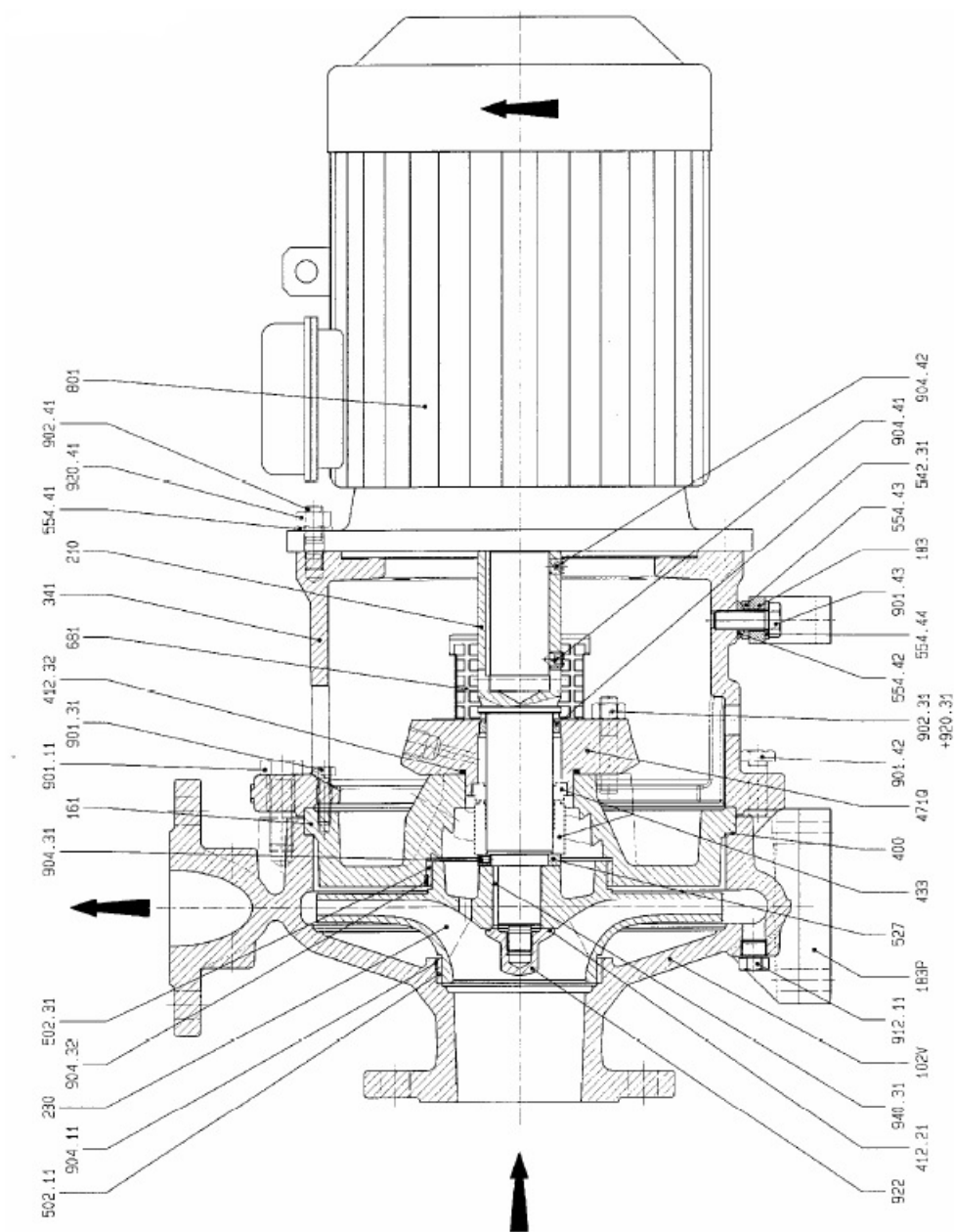
*) ... optional

**) ... not for all designs

***) ... only with IEC-Motor sizes: 160MA, 160M, 160L, 180M, 180L, 200L, 200LA, only

Design: S4...2 Single mech. seal, unbalanced (DIN 24960, I_{1k} / EN 12756, design K, form U), with quench, Impeller with balancing holes

For shaft sealing of your pump refer to data sheet / order confirmation. See *Design coding system*, as well.



Valid for type

Table 6:

100-65-315 125-80-315 125-100-315 125-125-315

No.	Part name:
102V	Volute casing
161	Casing cover
183 ***)	Support foot
183P **)	Pump alignment
210	Stub shaft
230	Impeller
341	Motor lantern
400	Gasket
412.21	O-ring
433	Mechanical seal
471Q	Quench cover

No.	Part name:
502.11 *)	Wear ring
502.31*)	Wear ring
527 **	Fixing ring
542.31	Throttle bush
554.41	Washer
554.42 ***)	Bevelwasher
554.43 ***)	Bevelcup
554.44 ***)	Washer
681	Guard plate
801	Flange motor
901.11	Hex screw
901.31 **)	Hex screw
901.42	Hex screw
901.43 ***)	Hex screw
902.31	Stud
902.41	Stud
904.11 *)	Grub screw
904.31 **)	Grub screw
904.32 **)	Grub screw
904.41	Grub screw
904.42	Grub screw
912.11	Drain plug
920.31	Hex nut
920.41	Hex nut
922	Impeller nut
940.31	Key

*) ... optional

**) ... not for all designs

***) ... only with IEC-Motor sizes: 160MA, 160M, 160L, 180M, 180L, 200L, 200LA, only

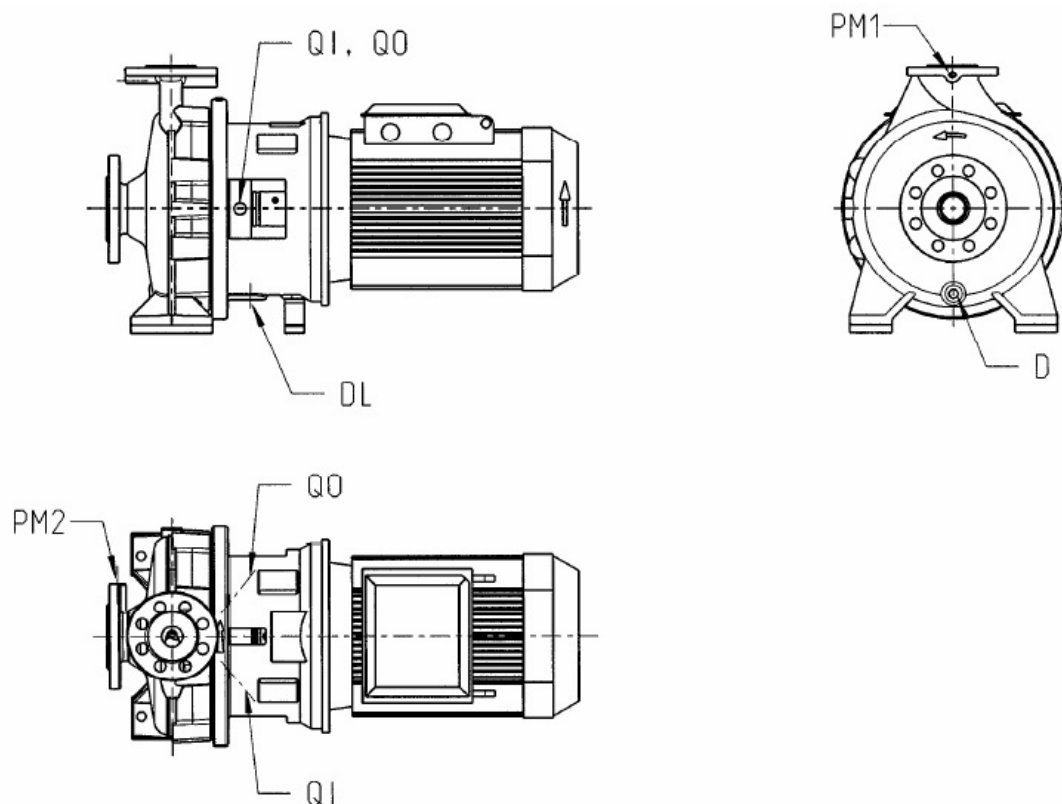


Figure 13: Connections:

Code	Number	Connection	Bearing bracket	
			24	32, 42, 48
PM1 *)	1	pressure gaging	1/4-18 NPT	
PM2 *)	1	pressure gaging	1/4-18 NPT	
D	1	draining (casing)	3/8-18 NPT	
DL	1	draining (lantern)	G 1/2	
QI **)	1	Quench-suction	1/4-18 NPT	3/8-18 NPT
QO **)	1	Quench-discharge	1/4-18 NPT	3/8-18 NPT

*) ... optional, possible with designs S2..1 and S4..2

**) ... only with design S4..2

For the type of your pump refer to data sheet / order confirmation. See *Design coding system*.

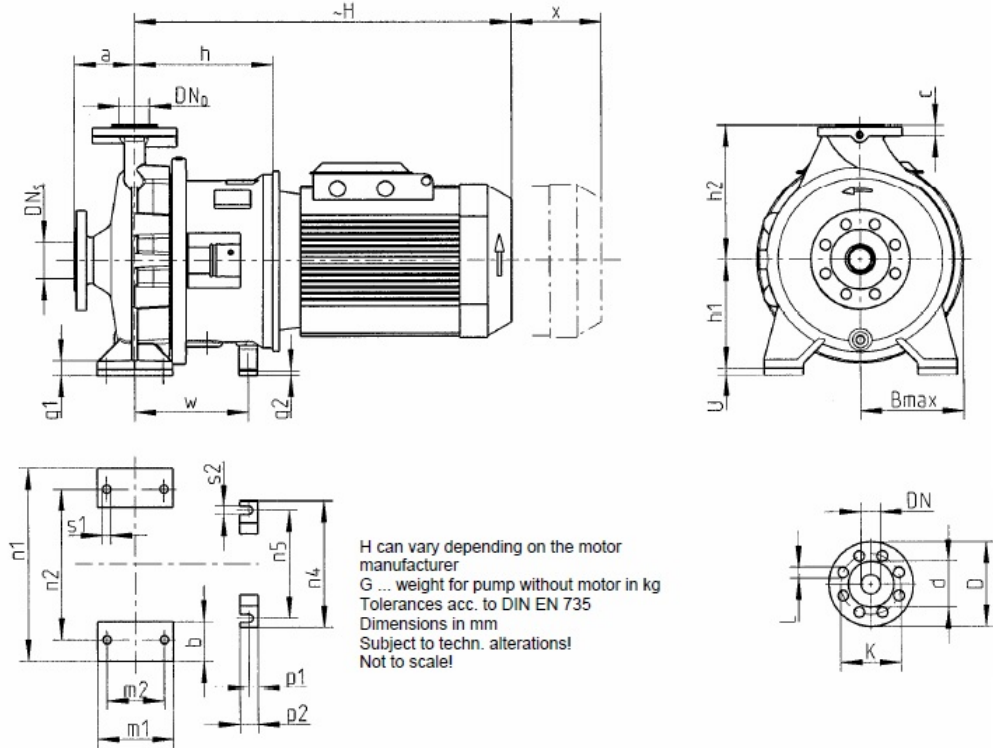


Figure 14: Dimensional drawing

Pump	DN _s	DN _b	a	b	g2	h1	h2	m1	m2	n1	n2	p1	p2	s1	s2	x
ICB 40-25-160 - ...	40	25	80	50	10	132	160	100	70	240	190	15	30	14	13,5	100
ICB 40-25-200 - ...	40	25	80	50	10	160	180	100	70	240	190	15	30	14	13,5	100
ICB 40-25-250 - ...	40	25	100	65	10	180	225	125	95	320	250	15	30	14	13,5	100
ICB 50-32-160 - ...	50	32	80	50	10	132	160	100	70	240	190	15	30	14	13,5	100
ICB 50-32-200 - ...	50	32	80	50	10	160	180	100	70	240	190	15	30	14	13,5	100
ICB 50-32-250 - ...	50	32	100	65	10	180	225	125	95	320	250	15	30	14	13,5	100
ICB 50-32-315 - ...	50	32	125	65	10	200	250	125	95	345	280	15	30	14	13,5	100
ICB 65-40-160 - ...	65	40	80	50	10	132	160	100	70	240	190	15	30	14	13,5	100
ICB 65-40-200 - ...	65	40	100	50	10	160	180	100	70	265	212	15	30	14	13,5	100
ICB 65-40-250 - ...	65	40	100	65	10	180	225	125	95	320	250	15	30	14	13,5	100
ICB 65-40-315 - ...	65	40	125	65	10	200	250	125	95	345	280	15	30	14	13,5	100
ICB 80-50-160 - ...	80	50	100	50	10	160	180	100	70	265	212	15	30	14	13,5	100
ICB 80-50-200 - ...	80	50	100	50	10	160	200	100	70	265	212	15	30	14	13,5	100
ICB 80-50-250 - ...	80	50	125	65	10	180	225	125	95	320	250	15	30	14	13,5	100
ICB 80-50-315 - ...	80	50	125	65	10	225	280	125	95	345	280	15	30	14	13,5	100
ICB 100-65-160 - ...	100	65	100	65	10	160	200	125	95	280	212	15	30	14	13,5	100

ICB 100-65-200 - ...	100	65	100	65	10	180	225	125	95	320	250	15	30	14	13,5	140
ICB 100-65-250 - ...	100	65	125	80	10	200	250	160	120	360	280	15	30	18	13,5	140
ICB 100-65-315 - ...	100	65	128	80	10	225	280	160	120	400	315	15	30	18	13,5	140
ICB 125-80-160 - ...	125	80	125	65	10	180	225	125	95	320	250	15	30	14	13,5	140
ICB 125-80-200 - ...	125	80	125	65	10	180	250	125	95	345	280	15	30	14	13,5	140
ICB 125-80-250 - ...	125	80	125	80	10	225	280	160	120	400	315	15	30	18	13,5	140
ICB 125-80-315 - ...	125	80	125	80	10	250	315	160	120	400	315	15	30	18	13,5	140
ICB 125-100-200 - ...	125	100	125	80	10	200	280	160	120	360	280	15	30	18	13,5	140
ICB 125-100-250 - ...	125	100	140	80	10	225	280	160	120	400	315	15	30	18	13,5	140
ICB 125-100-315 - ...	125	100	140	80	10	250	315	160	120	400	315	15	30	18	13,5	140
ICB 150-125-250 - ...	150	125	140	80	10	250	355	160	120	400	315	15	30	18	13,5	140
ICB 150-125-315 - ...	150	125	140	100	10	280	355	200	150	500	400	15	30	22	13,5	140
ICB 200-150-250 - ...	200	150	160	100	10	280	375	200	150	500	400	15	30	22	13,5	180

Pump	Bmax	g1	~H	h	U	n4	n5	w	~G
ICB 40-25-160 - 80	119	15	408	176	-	-	-	-	31
ICB 40-25-160 - 90	119	15	457	176	-	-	-	-	31
ICB 40-25-160 - 100	144	15	530	216	-	-	-	-	37
ICB 40-25-160 - 112	144	15	539	216	-	-	-	-	37
ICB 40-25-160 - 132	150	35	666	216	20	-	-	-	37
ICB 40-25-160 - 160	175	60	771	251	45	210	180	206	43
ICB 40-25-200 - 80	119	15	408	176	-	-	-	-	39
ICB 40-25-200 - 90	119	15	457	176	-	-	-	-	39
ICB 40-25-200 - 100	144	15	530	216	-	-	-	-	45
ICB 40-25-200 - 112	144	15	539	216	-	-	-	-	45
ICB 40-25-200 - 132	150	15	666	216	-	-	-	-	45
ICB 40-25-200 - 160	175	60	815	251	45	210	180	206	54
ICB 40-25-250 - 80	171	15	421	189	-	-	-	-	60
ICB 40-25-250 - 90	171	15	470	189	-	-	-	-	60
ICB 40-25-250 - 100	171	15	543	229	-	-	-	-	65
ICB 40-25-250 - 112	171	15	552	229	-	-	-	-	65
ICB 40-25-250 - 132	171	15	679	229	-	-	-	-	65
ICB 40-25-250 - 160	175	15	828	264	-	210	180	219	75
ICB 40-25-250 - 180	180	20	859	264	5	210	180	219	75
ICB 40-25-250 - 200	225	65	964	264	50	280	250	219	75
ICB 50-32-160 - 80	119	15	408	176	-	-	-	-	31

ICB 50-32-160 - 90	119	15	457	176	-	-	-	-	31
ICB 50-32-160 - 100	144	15	530	216	-	-	-	-	37
ICB 50-32-160 - 112	144	15	539	216	-	-	-	-	37
ICB 50-32-160 - 132	150	35	666	216	20	-	-	-	37
ICB 50-32-160 - 160	175	60	771	251	45	210	180	206	43
ICB 50-32-200 - 80	119	15	408	176	-	-	-	-	39
ICB 50-32-200 - 90	119	15	457	176	-	-	-	-	39
ICB 50-32-200 - 100	144	15	530	216	-	-	-	-	45
ICB 50-32-200 - 112	144	15	539	216	-	-	-	-	45
ICB 50-32-200 - 132	150	15	666	216	-	-	-	-	45
ICB 50-32-200 - 160	175	60	815	251	45	210	180	206	54
ICB 50-32-250 - 80	171	15	421	189	-	-	-	-	60
ICB 50-32-250 - 90	171	15	470	189	-	-	-	-	60
ICB 50-32-250 - 100	171	15	543	229	-	-	-	-	65
ICB 50-32-250 - 112	171	15	552	229	-	-	-	-	65
ICB 50-32-250 - 132	171	15	679	229	-	-	-	-	65
ICB 50-32-250 - 160	175	15	828	264	-	210	180	219	75
ICB 50-32-250 - 180	180	20	859	264	5	210	180	219	75
ICB 50-32-250 - 200	225	65	964	264	50	280	250	219	75
ICB 50-32-315 - 100	201	15	543	229	-	-	-	-	102
ICB 50-32-315 - 112	201	15	552	229	-	-	-	-	102
ICB 50-32-315 - 132	201	15	679	229	-	-	-	-	102
ICB 50-32-315 - 160	201	15	828	264	-	210	180	219	112
ICB 50-32-315 - 180	201	15	859	264	-	210	180	219	112
ICB 50-32-315 - 200	225	65	964	264	50	280	250	219	112
ICB 65-40-160 - 80	124	15	408	176	-	-	-	-	32
ICB 65-40-160 - 90	124	15	457	176	-	-	-	-	32
ICB 65-40-160 - 100	144	15	530	216	-	-	-	-	39
ICB 65-40-160 - 112	144	15	539	216	-	-	-	-	39
ICB 65-40-160 - 132	150	35	666	216	20	-	-	-	39
ICB 65-40-160 - 160	175	60	815	251	45	210	180	206	44
ICB 65-40-200 - 80	139	15	408	176	-	-	-	-	44
ICB 65-40-200 - 90	139	15	457	176	-	-	-	-	44
ICB 65-40-200 - 100	144	15	530	216	-	-	-	-	50
ICB 65-40-200 - 112	144	15	539	216	-	-	-	-	50

ICB 65-40-200 - 132	150	15	666	216	-	-	-	-	50
ICB 65-40-200 - 160	175	35	815	251	20	210	180	206	60
ICB 65-40-200 - 180	180	60	846	251	45	210	180	206	60
ICB 65-40-250 - 80	171	15	421	189	-	-	-	-	62
ICB 65-40-250 - 90	171	15	470	189	-	-	-	-	62
ICB 65-40-250 - 100	171	15	543	229	-	-	-	-	68
ICB 65-40-250 - 112	171	15	552	229	-	-	-	-	68
ICB 65-40-250 - 132	171	15	679	229	-	-	-	-	68
ICB 65-40-250 - 160	175	15	828	264	-	210	180	219	77
ICB 65-40-250 - 180	180	20	859	264	5	210	180	219	77
ICB 65-40-250 - 200	225	65	964	264	50	280	250	219	77
Pump	Bmax	g1	~H	h	U	n4	n5	w	~G
ICB 65-40-315 - 100	201	15	543	229	-	-	-	-	102
ICB 65-40-315 - 112	201	15	552	229	-	-	-	-	102
ICB 65-40-315 - 132	201	15	679	229	-	-	-	-	102
ICB 65-40-315 - 160	201	15	828	264	-	210	180	219	112
ICB 65-40-315 - 180	201	15	859	264	-	210	180	219	112
ICB 65-40-315 - 200	225	65	964	264	50	280	250	219	112
ICB 80-50-160 - 80	141	15	408	176	-	-	-	-	36
ICB 80-50-160 - 90	141	15	457	176	-	-	-	-	36
ICB 80-50-160 - 100	144	15	530	216	-	-	-	-	43
ICB 80-50-160 - 112	144	15	539	216	-	-	-	-	43
ICB 80-50-160 - 132	150	15	666	216	-	-	-	-	43
ICB 80-50-160 - 160	175	35	815	251	20	210	180	206	49
ICB 80-50-160 - 180	180	60	846	251	45	210	180	206	49
ICB 80-50-200 - 80	157	15	408	176	-	-	-	-	45
ICB 80-50-200 - 90	157	15	457	176	-	-	-	-	45
ICB 80-50-200 - 100	157	15	530	216	-	-	-	-	51
ICB 80-50-200 - 112	157	15	539	216	-	-	-	-	51
ICB 80-50-200 - 132	157	15	666	216	-	-	-	-	51
ICB 80-50-200 - 160	175	35	815	251	20	210	180	206	60
ICB 80-50-200 - 180	180	60	846	251	45	210	180	206	60
ICB 80-50-200 - 200	225	85	951	251	70	280	250	206	60
ICB 80-50-250 - 90	181	15	470	189	-	-	-	-	69
ICB 80-50-250 - 100	181	15	543	229	-	-	-	-	75

ICB 80-50-250 - 112	181	15	552	229	-	-	-	-	75
ICB 80-50-250 - 132	181	15	679	229	-	-	-	-	75
ICB 80-50-250 - 160	181	15	828	264	-	210	180	219	84
ICB 80-50-250 - 180	181	20	859	264	5	210	180	219	84
ICB 80-50-250 - 200	225	65	964	264	50	280	250	219	84
ICB 80-50-315 - 100	212	15	543	229	-	-	-	-	108
ICB 80-50-315 - 112	212	15	552	229	-	-	-	-	108
ICB 80-50-315 - 132	212	15	679	229	-	-	-	-	108
ICB 80-50-315 - 160	212	15	828	264	-	210	180	219	118
ICB 80-50-315 - 180	212	15	859	264	-	210	180	219	118
ICB 80-50-315 - 200	225	40	964	264	25	280	250	219	118
ICB 100-65-160 - 80	164	15	421	189	-	-	-	-	49
ICB 100-65-160 - 90	164	15	470	189	-	-	-	-	49
ICB 100-65-160 - 100	164	15	543	229	-	-	-	-	55
ICB 100-65-160 - 112	164	15	552	229	-	-	-	-	55
ICB 100-65-160 - 132	164	15	679	229	-	-	-	-	55
ICB 100-65-160 - 160	175	40	828	264	25	210	180	219	64
ICB 100-65-160 - 180	180	40	859	264	25	210	180	219	64
ICB 100-65-160 - 200	225	85	964	264	70	280	250	219	64
ICB 100-65-200 - 90	173	15	470	189	-	-	-	-	53
ICB 100-65-200 - 100	173	15	543	229	-	-	-	-	58
ICB 100-65-200 - 112	173	15	552	229	-	-	-	-	58
ICB 100-65-200 - 132	173	15	679	229	-	-	-	-	58
ICB 100-65-200 - 160	175	15	828	264	-	210	180	219	68
ICB 100-65-200 - 180	180	20	859	264	5	210	180	219	68
ICB 100-65-200 - 200	225	65	964	264	50	280	250	219	68
ICB 100-65-250 - 90	193	18	470	189	-	-	-	-	74
ICB 100-65-250 - 100	193	18	543	229	-	-	-	-	80
ICB 100-65-250 - 112	193	18	552	229	-	-	-	-	80
ICB 100-65-250 - 132	193	18	679	229	-	-	-	-	80
ICB 100-65-250 - 160	193	18	828	264	-	210	180	219	89
ICB 100-65-250 - 180	193	18	859	264	-	210	180	219	89

ICB 100-65-250 - 200	225	48	964	264	30	280	250	219	89
ICB 100-65-315 - 100	221	18	555	241	-	-	-	-	115
ICB 100-65-315 - 112	221	18	564	241	-	-	-	-	115
ICB 100-65-315 - 132	221	18	691	241	-	-	-	-	115
ICB 100-65-315 - 160	221	18	840	276	-	210	180	231	125
ICB 100-65-315 - 180	221	18	871	276	-	210	180	231	125
ICB 100-65-315 - 200	225	18	976	276	-	210	180	231	125
ICB 125-80-160 - 90	188	15	470	189	-	-	-	-	56
ICB 125-80-160 - 100	188	15	543	229	-	-	-	-	62
ICB 125-80-160 - 112	188	15	552	229	-	-	-	-	62
ICB 125-80-160 - 132	188	15	679	229	-	-	-	-	62
ICB 125-80-160 - 160	188	15	828	264	-	210	180	219	71
Pump	Bmax	g1	~H	h	U	n4	n5	w	~G
ICB 125-80-160 - 180	188	20	859	264	5	210	180	219	71
ICB 125-80-160 - 200	225	65	964	264	50	280	250	219	71
ICB 125-80-200 - 90	202	15	470	189	-	-	-	-	63
ICB 125-80-200 - 100	202	15	543	229	-	-	-	-	69
ICB 125-80-200 - 112	202	15	552	229	-	-	-	-	69
ICB 125-80-200 - 132	202	15	679	229	-	-	-	-	69
ICB 125-80-200 - 160	202	15	828	264	-	210	180	219	78
ICB 125-80-200 - 180	202	20	859	264	5	210	180	219	78
ICB 125-80-200 - 200	225	65	964	264	50	280	250	219	78
ICB 125-80-250 - 100	229	18	543	229	-	-	-	-	91
ICB 125-80-250 - 112	229	18	552	229	-	-	-	-	91
ICB 125-80-250 - 132	229	18	679	229	-	-	-	-	91
ICB 125-80-250 - 160	229	18	828	264	-	210	180	219	100
ICB 125-80-250 - 180	229	18	859	264	-	210	180	219	100
ICB 125-80-250 - 200	229	23	964	264	5	280	250	219	100
ICB 125-80-315 - 112	240	18	564	241	-	-	-	-	129
ICB 125-80-315 - 132	240	18	691	241	-	-	-	-	129
ICB 125-80-315 - 160	240	18	840	276	-	280	250	231	139
ICB 125-80-315 - 180	240	18	871	276	-	280	250	231	139

ICB 125-80-315 - 200	240	18	976	276	-	280	250	231	139
ICB 125-100-200 - 100	217	18	543	229	-	-	-	-	90
ICB 125-100-200 - 112	217	18	552	229	-	-	-	-	90
ICB 125-100-200 - 132	217	18	679	229	-	-	-	-	90
ICB 125-100-200 - 160	217	23	828	264	5	210	180	219	99
ICB 125-100-200 - 180	217	23	859	264	5	210	180	219	99
ICB 125-100-200 - 200	225	48	964	264	30	280	250	219	99
ICB 125-100-250 - 100	227	18	565	251	-	-	-	-	100
ICB 125-100-250 - 112	227	18	574	251	-	-	-	-	100
ICB 125-100-250 - 132	227	18	701	251	-	-	-	-	100
ICB 125-100-250 - 160	227	18	850	286	-	220	180	241	109
ICB 125-100-250 - 180	227	18	881	286	-	220	180	241	109
ICB 125-100-250 - 200	227	23	986	286	5	280	250	241	109
ICB 125-100-315 - 132	257	18	691	241	-	-	-	-	139
ICB 125-100-315 - 160	257	18	840	276	-	280	250	231	150
ICB 125-100-315 - 180	257	18	871	276	-	280	250	231	150
ICB 125-100-315 - 200	257	18	976	276	-	280	250	231	150
ICB 150-125-250 - 132	249	18	701	251	-	-	-	-	114
ICB 150-125-250 - 160	249	18	850	286	-	280	250	241	123
ICB 150-125-250 - 180	249	18	881	286	-	280	250	241	123
ICB 150-125-250 - 200	249	18	986	286	-	280	250	241	123
ICB 150-125-315 - 160	263	20	840	276	-	280	250	231	149
ICB 150-125-315 - 180	263	20	871	276	-	280	250	231	149
ICB 150-125-315 - 200	263	20	976	276	-	280	250	231	149
ICB 200-150-250 - 160	293	20	850	286	-	280	250	241	163
ICB 200-150-250 - 180	293	20	881	286	-	280	250	241	163
ICB 200-150-250 - 200	293	20	986	286	-	280	250	241	163

Flange dimensions DN _s , DN _b *)																	
ISO PN16						ISO PN25						ANSI Class 150RF					
DN	C	d	D	K	L	DN	C	d	D	K	L	NPS	C	d	D	K	L
25	16	65	115	85	4x14	-	-	-	-	-	-	1	16	51	115	79,5	4x16
32	18	78	140	100	4x19	32	20	78	140	100	4x19	1 1/2	18	73	140	98,5	4x16
40	19	88	150	110	4x19	40	19	88	150	110	4x19	1 1/2	19	73	150	98,5	4x16
50	20	102	165	125	4x19	50	20	102	165	125	4x19	2	20	92	165	120,5	4x19

65	20	122	185	145	4x19	65	22	122	185	145	8x19	2 1/2	20	105	185	139,5	4x19
80	20	128	200	160	8x19	80	24	138	200	160	8x19	3	20	128	200	152,5	4x19
100	24	157	230	180	8x19	100	24	162	235	190	8x22	4	24	157	230	190,5	8x19
125	24	186	255	210	8x19	125	26	186	270	220	8x22	5	24	186	255	216	8x22
150	25,5	216	285	240	8x22	-	-	-	-	-	-	6	25,5	216	285	241,5	8x22
200	29	270	345	295	12x22	-	-	-	-	-	-	8	29	270	345	298,5	12x22

*) ... For size of flanges, as well as, the nominal pressure refer to data sheet / order confirmation. See *Design coding system*, as well.

Visit our website for the latest version of this document and more information:
www.gouldspumps.com



ENGINEERED FOR LIFE

ITT Goulds Pumps
240 Fall Street
Seneca Falls, NY 13148
USA