GOULDS PUMPS

Installation, Operation and Maintenance Instruction

ICB

ITT

Table of Contents

1 Introduction and Safety

1.1 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 https://www.gouldspumps.com/en-US/Tools-and-Resources/Literature/ 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 https://www.gouldspumps.com

1.2 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 http://www.gouldspumps.com/literature.

1.3 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 the 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:

WARNING:
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.

ATEX:

WARNING:
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.

1.4 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.

Table 1: 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		Safety Apparel: • 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		Receiving: 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.
WARNING		Alignment: 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.
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
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.

WARNING		Noise: Sound pressure levels may exceed 80 dbA in operating process plants. Clear visual warnings or other indicators should be available to those entering an area with unsafe noise levels. Personnel should wear appropriate hearing protection when working on or around any equipment, including pumps. Consider limiting personnel's exposure time to noise or, where possible, enclosing equipment to reduce noise. Local law may provide specific guidance regarding exposure of personnel to noise and when noise exposure reduction is required.
WARNING		Temperature: Equipment and piping surfaces may exceed 130ºF (54ºC) in operating process plants. Clear visual warnings or other indicators should alert personnel to surfaces that may reach a potentially unsafe temperature. Do not touch hot surfaces. Allow pumps operating at a high temperature to cool sufficiently before performing maintenance. If touching a hot surface cannot be avoided, personnel should wear appropriate gloves, clothing, and other protective gear as necessary. Local law may provide specific guidance regarding exposure of personnel to unsafe temperatures.

1.5 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:

Description of ATEX

The ATEX directives are a specification enforced in Europe for electrical and non-electrical equipment installed in Europe. ATEX deals with the control of potentially explosive atmospheres and the standards of equipment and protective systems used within these atmospheres. The relevance of the ATEX requirements is not limited to Europe. You can apply these guidelines to equipment installed in any potentially explosive atmosphere.

Guidelines for compliance

Compliance is fulfilled only when you operate the unit within its intended use. Do not change the conditions of the service without the approval of an ITT representative. When you install or maintain explosion proof products, always comply with the directive and applicable standards (for example, IEC/EN 60079-14).

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 https://www.gouldspumps.com/en-US/Tools-and-Resources/Literature/IOMs/ 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:

Figure 1: Typical ATEX pump nameplate

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

II - Group – Non Mining Equipment

2G – Category – Category 2 – Gas

Ex – required by ISO 80079 – 36:2016

h – h indicates mechanical equipment

IIB – Gas Group

T1 – T4 – Permitted Maximum Surface Temperature

Gb – Atmosphere + Equipment Protection Level

Table 2: Temperature class definitions

Code	Maximum permissible surface temperature in °C | °F	Maximum permissible liquid temperature in °C | °F
T1	440 | 824	372 | 700
T2	290 | 554	267 | 513
T3	195 | 383	172 | 342
T4	130 | 266	107 | 225
T5	Option not available	Option not available
T6	Option not available	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.

1.6 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.

2 Safety Regulations

2.1 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

Ⓔx 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.

Ⓔx 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

Ⓔx 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

Ⓔx 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 6.4 Switch on drive on page 30, as well.

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

Ⓔx 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.

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

In Limits of Operation, *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 of these operating Instructions must be taken into consideration.

⟨Ex⟩
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

⟨Ex⟩ 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.

⟨Ex⟩ 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

⟨Ex⟩ 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

⟨Ex⟩ 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 and 7.4 Cleaning of pump on page 34.

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

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

2.2 Use acc. to Regulations

Speed, Pressure, Temperature

Ⓔx 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

Ⓔx 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

Ⓔx 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.

2.3 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.

3 Transportation and Storage

3.1 Inspect the delivery

3.1.1 Inspect the package

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. File a claim with the shipping company if anything is out of order.
   If the product has been picked up at a distributor, make a claim directly to the distributor.

3.1.2 Inspect the unit

1. Remove packing materials from the product.
   Dispose of all packing materials in accordance with local regulations.
2. Inspect the product to determine if any parts have been damaged or are missing.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.
   For your personal safety, be careful when you handle nails and straps.
4. Contact your sales representative if anything is out of order.

3.2 Transportation guidelines

3.2.1 Pump handling

WARNING:
Dropping, rolling or tipping units, or applying other shock loads, can cause property damage and/or personal injury. Ensure that the unit is properly supported and secure during lifting and handling.

CAUTION:
Risk of injury or equipment damage from use of inadequate lifting devices. Ensure lifting devices (such as chains, straps, forklifts, cranes, etc.) are rated to sufficient capacity.

3.2.2 Pump handling and lifting

Precautions for moving the pump

Use care when moving pumps. Consult with a lifting and rigging specialist before lifting or moving the pump to avoid possible damage to the pump or injury to personnel.

WARNING:
Dropping, rolling or tipping units, or applying other shock loads, can cause property damage and/or personal injury. Ensure that the unit is properly supported and secure during lifting and handling.

CAUTION:
Risk of injury or equipment damage from use of inadequate lifting devices. Ensure lifting devices (such as chains, straps, forklifts, cranes, etc.) are rated to sufficient capacity.

Close the suction and discharge ends of the pump with plugs for transport and storage.

Precautions for lifting the pump

WARNING:

- Dropping, rolling or tipping units, or applying other shock loads, can cause property damage and/or personal injury. Ensure that the unit is properly supported and secure during lifting and handling.
- Risk of serious personal injury or equipment damage. Proper lifting practices are critical to safe transport of heavy equipment. Ensure that practices used are in compliance with all applicable regulations and standards.
- Lifting and handling heavy equipment poses a crush hazard. Use caution during lifting and handling and wear appropriate Personal Protective Equipment (PPE, such as steel-toed shoes, gloves, etc.) at all times. Seek assistance if necessary.
- Safe lifting points are specifically identified in this manual. It is critical to lift the equipment only at these points. Integral lifting eyes or eye bolts on pump and motor components are intended for use in lifting the individual components only.

NOTICE:

- Make sure that the lifting equipment supports the entire assembly and is only used by authorized personnel.
- Do not attach sling ropes to shaft ends.

Lifting the pump

Hoist the pump using a suitable sling under solid points such as the casing, flanges, or frame.

Figure 2: Pump lifting

3.3 Storage guidelines

3.3.1 Pump storage requirements

Storage requirements depend on the amount of time that you store the unit. The normal packaging is designed only to protect the unit during shipping.

Length of time in storage	Storage requirements
Upon receipt/short-term (less than six months)	• Store in a covered and dry location.
Long-term (more than six months)	• Store in a covered and dry location. • Store the unit free from heat, dirt, and vibrations. • Rotate the shaft by hand several times at least every three months. • 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 machines surfaces and packing with moisture protection may be necessary

3.3.2 Frostproofing

Table 3: Situations when the pump is or is not frostproof

Situation	Condition
Operating	The pump is frostproof.

Situation	Condition
Immersed in a liquid	The pump is frostproof.
Lifted out of a liquid into a temperature below freezing	The impeller might freeze.

4 Product Description

4.1 General description

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 pumps 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)

Table 4: Design coding system key

Position	Description
(0)	Name of Model ICB - ISO block pump
(1)	Suction Nozzle mm | in
(2)	Discharge Nozzle in mm
(3)	Nominal diameter of impeller in mm
(4)	Shaft sealing S1 - Single-mechanical seal acc. DIN 24960 l1k / EN 12756 form U S4 - Single-mechanical seal acc. DIN 24960 l1k / EN 12756 form U with Quench (throttle bush)
(5)	Material Impeller N = Cast Iron (0.6025) L = Ductile Iron (0.7043) V = Carbon Steel (1.4408) W = Duplex (1.4517)
(6)	Material pump casing (same coding as impeller, cast iron not available)
(7)	Stub shaft 2 - without shaft sleeve (Duplex 1.4462 std)
(8)	IEC Motor size

Mechanical seals

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

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

NOTICE:
For further details about mechanical seals, as well as the dangers of accidents, connected to them refer to Monitoring and Mechanical seals.

Shaft sealing

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 mechanical seals is contained in the particular "Mounting Instruction of Shaft Sealing".

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

Type	Nominal size d1 of mechanical seal	Type	Nominal size d1 of mechanical 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		

Bearing

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

4.2 Nameplate information

Pump nameplate

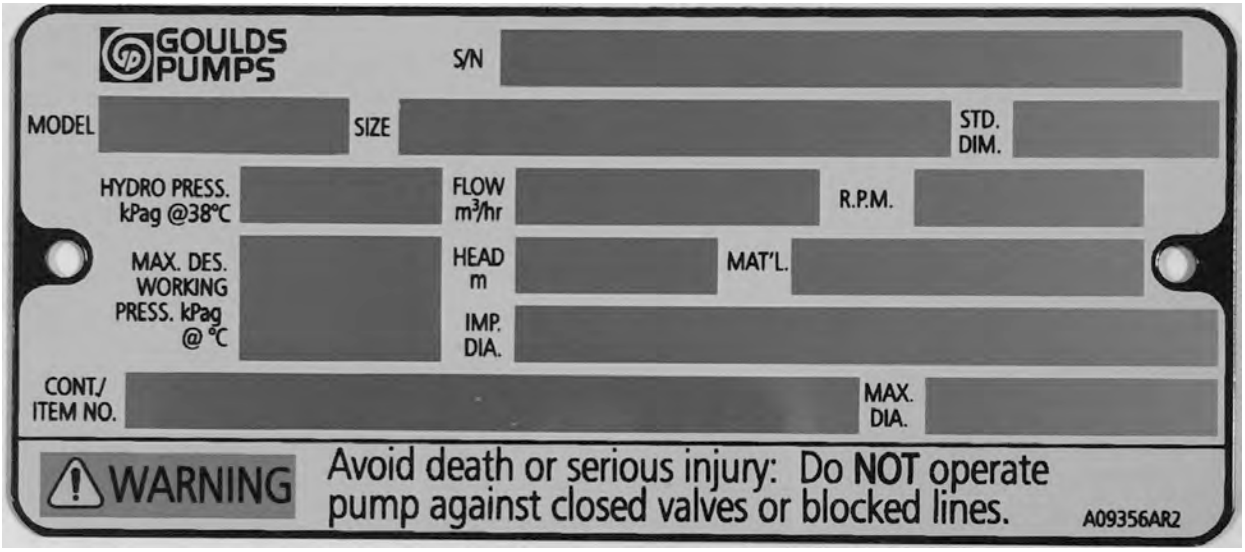


Figure 3: Pump nameplate

Nameplate Field	Explanation
S/N	Serial number of the pump
MODEL	Pump Model
SIZE	Size of Pump
STD DIM	ANSI Std designation – Not applicable ISO Pumps
HYDRO PRESS	Pump Test Pressure in kPag
FLOW	Rated pump flow in cubic metres per hour
RPM	Rated pump speed in revolutions per minute
MAX DESIGN WORKING PRESS	Maximum Design pressure in kPag at rated temperature in degrees Centigrade
HEAD	Rated pump head in metres
MATL	Material of which the pump is constructed
IMP DIA	Impeller diameter fitted
CONT/ITEM NO	Contract or tag number
MAX DIA	Maximum impeller diameter

5 Installation

5.1 Pre-installation

Precautions

WARNING:

- When installing in a potentially explosive environment, ensure that the motor is properly certified.
- All equipment being installed must be properly grounded to prevent unexpected discharge. Discharge can cause equipment damage, electric shock, and result in serious injury. Test the ground lead to verify it is connected correctly.

NOTICE:

- Electrical connections must be made by certified electricians in compliance with all international, national, state and local regulations.
- Supervision by an authorized ITT representative is recommended to ensure proper installation. Improper installation may result in equipment damage or decreased performance.

5.1.1 Pump location guidelines

WARNING:
Lifting and handling heavy equipment poses a crush hazard. Use caution during lifting and handling and wear appropriate Personal Protective Equipment (PPE, such as steel-toed shoes, gloves, etc.) at all times. Seek assistance if necessary.

WARNING:
Assembled units and their components are heavy. Failure to properly lift and support this equipment can result in serious physical injury and/or equipment damage. Lift equipment only at the specifically identified lifting points. Lifting devices such as swivel hoist rings, shackles, slings and spreaders must be rated, selected, and used for the entire load being lifted.

Guideline	Explanation/comment
Keep the pump as close to the liquid source as practically possible.	This minimizes the friction loss and keeps the suction piping as short as possible.
Make sure that the space around the pump is sufficient.	This facilitates ventilation, inspection, maintenance, and service.
If you require lifting equipment such as a hoist or tackle, make sure that there is enough space above the pump.	This makes it easier to properly use the lifting equipment and safely remove and relocate the components to a safe location.
Protect the unit from weather and water damage due to rain, flooding, and freezing temperatures.	This is applicable if nothing else is specified.

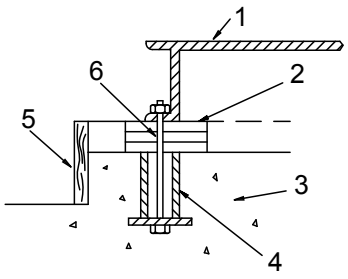
Guideline	Explanation/comment
Do not install and operate the equipment in closed systems unless the system is constructed with properly-sized safety devices and control devices.	Acceptable devices: • Pressure relief valves • Compression tanks • Pressure controls • Temperature controls • Flow controls If the system does not include these devices, consult the engineer or architect in charge before you operate the pump.
Take into consideration the occurrence of unwanted noise and vibration.	The best pump location for noise and vibration absorption is on a concrete floor with subsoil underneath.
If the pump location is overhead, undertake special precautions to reduce possible noise transmission.	Consider a consultation with a noise specialist.

5.1.2 Foundation requirements

Requirements

- The location and size of the foundation bolt holes must match those shown on the assembly drawing provided with the pump data package.
- The foundation must weigh between two and three times the weight of the pump.
- Provide a flat, substantial concrete foundation in order to prevent strain and distortion when you tighten the foundation bolts.
- The concrete foundation must have sufficient firmness according to DIN 1045 or equal standard.

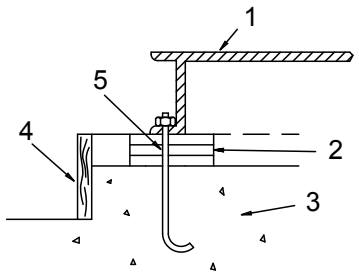
Sleeve-type bolts



Item	Description
1.	Baseplate
2.	Shims
3.	Foundation
4.	Sleeve
5.	Dam
6.	Bolt

Figure 4: Sleeve type bolts

J-type bolts



Item	Description
1.	Baseplate
2.	Shims or wedges
3.	Foundation
4.	Dam
5.	Bolt

Figure 5: J-type bolts

5.2 Piping checklists

5.2.1 General piping checklist

Precautions

WARNING:

- Risk of premature failure. Casing deformation can result in misalignment and contact with rotating parts, causing excess heat generation and sparks. Flange loads from the piping system, including those from the thermal expansion of the piping, must not exceed the limits of the pump.
- Risk of serious personal injury or property damage. Fasteners such as bolts and nuts are critical to the safe and reliable operation of the product. Ensure appropriate use of fasteners during installation or reassembly of the unit.
  - Use fasteners of the proper size and material only.
  - Replace all corroded fasteners.
  - Ensure that all fasteners are properly tightened and that there are no missing fasteners.

NOTICE:

Vary the capacity with the regulating valve in the discharge line. Never throttle the flow from the suction side. This action can result in decreased performance, unexpected heat generation, and equipment damage.

5.2.2 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.

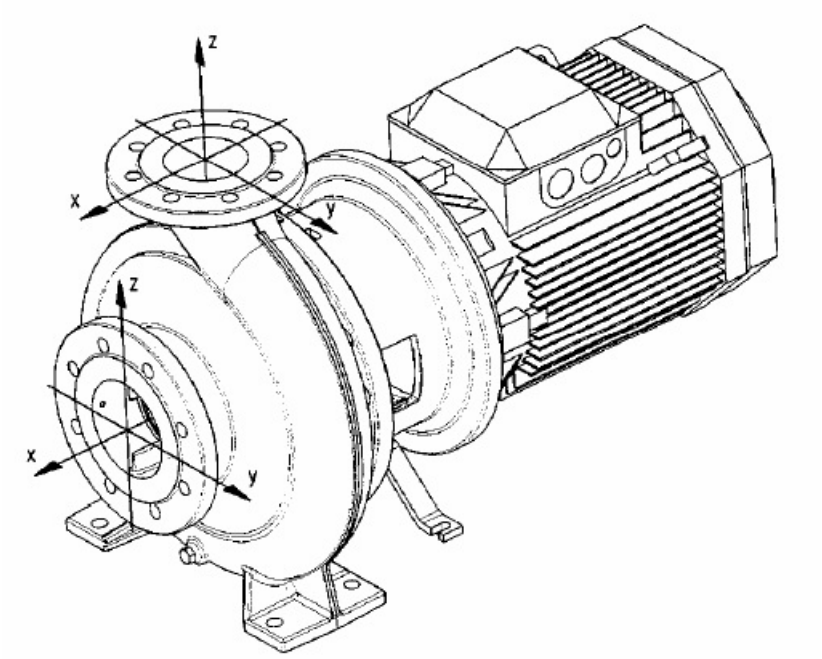


Figure 6: Permitted Nozzle loads and torques at pump Nozzle

Table 5: Permitted Nozzle loads and torques at pump Suction Nozzle

Sizes	Suction nozzle								
	∅DN	Forces in N				Torques in Nm			
		Fx	Fy	Fz	∑F	Mx	My	Mz	∑M
40-25-160	40	700	620	560	1100	730	500	590	1070
40-25-200	40	700	620	560	1100	730	500	590	1070
40-25-250	40	700	620	560	1100	730	500	590	1070
50-32-160	50	920	840	760	1450	780	560	650	1150
50-32-200	50	920	840	760	1450	780	560	650	1150
50-32-250	50	920	840	760	1450	780	560	650	1150
50-32-315	50	920	840	760	1450	780	560	650	1150
65-40-160	65	1180	1040	950	1850	840	620	670	1230
65-40-200	65	1180	1040	950	1850	840	620	670	1230
65-40-250	65	1180	1040	950	1850	840	620	670	1230
65-40-315	65	1180	1040	950	1850	840	620	670	1230
80-50-160	80	1400	1260	1150	2200	900	650	730	1320
80-50-200	80	1400	1260	1150	2200	900	650	730	1320
80-50-250	80	1400	1260	1150	2200	900	650	730	1320
80-50-315	80	1400	1260	1150	2200	900	650	730	1320
100-65-160	100	1880	1680	1520	2950	980	700	810	1450
100-65-200	100	1880	1680	1520	2950	980	700	810	1450
100-65-250	100	1880	1680	1520	2950	980	700	810	1450
100-65-315	100	1880	1680	1520	2950	980	700	810	1450
125-80-160	125	2210	2000	1800	3480	1180	840	1070	1710

125-80-200	125	2210	2000	1800	3480	1180	840	1070	1710
125-80-250	125	2210	2000	1800	3480	1180	840	1070	1710
125-80-315	125	2210	2000	1800	3480	1180	840	1070	1710
125-100-200	125	2210	2000	1800	3480	1180	840	1070	1710
125-100-250	125	2210	2000	1800	3480	1180	840	1070	1710
125-100-315	125	2210	2000	1800	3480	1180	840	1070	1710
150-125-250	150	2800	2520	2270	4400	1400	980	1150	2050
150-125-315	150	2800	2520	2270	4400	1400	980	1150	2050
200-150-250	200	3750	3360	3030	5850	1820	1290	1490	2700

Table 6: Permitted Nozzle loads and torques at pump Discharge Nozzle

Sizes	Discharge nozzle								
	∅DN	Forces in N				Torques in Nm			
		Fx	Fy	Fz	∑F	Mx	My	Mz	∑M
40-25-160	25	420	400	480	730	500	340	400	730
40-25-200	25	420	400	480	730	500	340	400	730
40-25-250	25	420	400	480	730	500	340	400	730
50-32-160	32	500	480	590	930	620	420	480	900
50-32-200	32	500	480	590	930	620	420	480	900
50-32-250	32	500	480	590	930	620	420	480	900
50-32-315	32	500	480	590	930	620	420	480	900
65-40-160	40	620	560	700	1100	730	500	590	1060
65-40-200	40	620	560	700	1100	730	500	590	1060
65-40-250	40	620	560	700	1100	730	500	590	1060
65-40-315	40	620	560	700	1100	730	500	590	1060
80-50-160	50	840	760	920	1450	780	560	650	1150
80-50-200	50	840	760	920	1450	780	560	650	1150
80-50-250	50	840	760	920	1450	780	560	650	1150
80-50-315	50	840	760	920	1450	780	560	650	1150
100-65-160	65	1040	950	1180	1850	840	620	670	1230
100-65-200	65	1040	950	1180	1850	840	620	670	1230
100-65-250	65	1040	950	1180	1850	840	620	670	1230
100-65-315	65	1040	950	1180	1850	840	620	670	1230
125-80-160	80	1260	1150	1400	2200	900	650	730	1320
125-80-200	80	1260	1150	1400	2200	900	650	730	1320
125-80-250	80	1260	1150	1400	2200	900	650	730	1320
125-80-315	80	1260	1150	1400	2200	900	650	730	1320
125-100-200	100	1680	1520	1880	2950	980	700	810	1450
125-100-250	100	1680	1520	1880	2950	980	700	810	1450
125-100-315	100	1680	1520	1880	2950	980	700	810	1450
150-125-250	125	2000	1800	2210	3480	1180	840	1070	1710
150-125-315	125	2000	1800	2210	3480	1180	840	1070	1710
200-150-250	150	2520	2270	2800	4400	1400	980	1150	2050

5.2.3 Final Control

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

5.2.4 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 errected. 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.

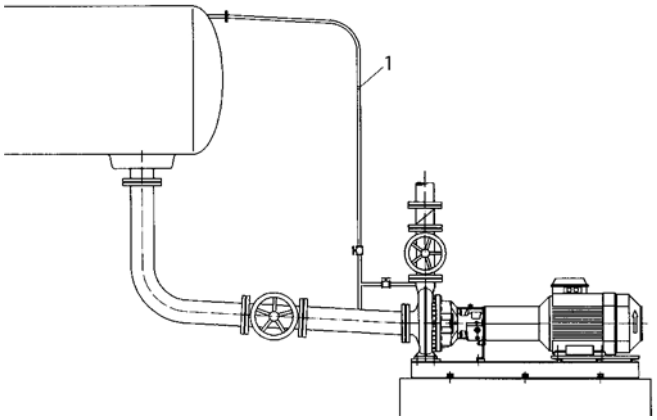
NOTICE:
The size of these insulating pads will vary, depending on circumstances, and should therefore be determined by an experienced specialist.

5.2.5 Connection of Piping to the Pump

NOTICE:
The pump must not be used as fixed point for the piping. The permitted piping loads must not be exceeded, refer to .

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 air-tight 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 up-stream 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



Item No.	Description
1.	Vent line

Figure 7: Vent line

- When laying the pipes, make sure that the pump is accessible for maintenance, installation and disassembly.
- Notice "Permitted Forces on Flanges" ().
- 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".

5.2.6 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".

5.3 Drive

Note the Operating Instructions of the motor manufacturer.

⟨Ex⟩ 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).

5.4 Final Control

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

6 Commissioning, Startup, Operation, and Shutdown

6.1 Preparation for startup

WARNING:

- Risk of serious physical injury or death. Exceeding any of the pump operating limits (e.g. - pressure, temperature, power, etc.) could result in equipment failure, such as explosion, seizure, or breach of containment. Assure that the system operating conditions are within the capabilities of the pump.
- Risk of death or serious injury. Leaking fluid can cause fire and/or burns. Ensure all openings are sealed prior to filling the pump.
- Breach of containment can cause fire, burns, and other serious injury. Failure to follow these precautions before starting the unit may lead to dangerous operating conditions, equipment failure, and breach of containment.
- Risk of explosion and serious physical injury. Do not operate pump with blocked system piping or with suction or discharge valves closed. This can result in rapid heating and vaporization of pumpage.
- Risk of breach of containment and equipment damage. Ensure the pump operates only between minimum and maximum rated flows. Operation outside of these limits can cause high vibration, mechanical seal and/or shaft failure, and/or loss of prime.

WARNING:

- Risk of death, serious personal injury, and property damage. Heat and pressure buildup can cause explosion, rupture, and discharge of pumpage. Never operate the pump with suction and/or discharge valves closed.
- Running a pump without safety devices exposes operators to risk of serious personal injury or death. Never operate a unit unless appropriate safety devices (guards, etc.) are properly installed.
- Failure to disconnect and lock out driver power may result in serious physical injury or death. Always disconnect and lock out power to the driver before performing any installation or maintenance tasks.
    - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
    - Refer to driver/coupling/gear manufacturer's installation and operation manuals (IOM) for specific instructions and recommendations.

Precautions

WARNING:
The mechanical seal used in an Ex-classified environment must be properly certified.

CAUTION:
When a cartridge mechanical seal is used, ensure that the set screws in the seal locking ring are tightened and that the centering clips have been removed prior to startup. This prevents seal or shaft sleeve damage by ensuring that the seal is properly installed and centered on the sleeve.

NOTICE:

- Verify the driver settings before you start any pump. Refer to the applicable drive equipment IOMs and operating procedures.

NOTICE:
You must follow these precautions before you start the pump:

- Flush and clean the system thoroughly to remove dirt or debris in the pipe system in order to prevent premature failure at initial startup.

6.2 Start the pump

NOTICE:

- Risk of equipment damage due to dry operation. Immediately observe the pressure gauges. If discharge pressure is not quickly attained, stop the driver immediately, reprime, and attempt to restart the pump.

1. Fully close the discharge valve, depending on system conditions.
2. Start the driver.
3. Slowly open the discharge valve until the pump reaches the desired flow.
4. Immediately check the pressure gauge to ensure that the pump quickly reaches the correct discharge pressure.
5. If the pump fails to reach the correct pressure, perform these steps:
   a) Stop the driver.
   b) Restart the driver.
6. Monitor the pump while it is operating:
   a) Check the pump for bearing temperature, excessive vibration, and noise.
   b) If the pump exceeds normal levels, then shut down the pump immediately and correct the problem.
7. Repeat steps 5 and 6 until the pump runs properly.

6.3 Initial start-up

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

1. There is no need to lubricate the pump before starting it up.
2. Pump and suction pipe must be filled completely with liquid when starting up.
3. Turn pump unit once again by hand and check that it moves smoothly and evenly.
4. Turn pump unit once again by hand and check that it moves smoothly and evenly.
5. Check that lantern guard sheets are mounted and that all safety devices are operational.
6. Switch on any existing sealing or flushing piping. For quantities and pressures refer to data sheet and / or order confirmation.

7. Open valve in suction /intake pipe.
8. Set discharge side valve to approximately 25% of rated flow quantity. With pumps with a discharge branch rated width less than 200, the valve can remain closed when starting up.
9. Secure, that unit is electrically connected according to all regulations and with all safety devices.
10. Check direction of rotation by switching on and off briefly. It must be the same as the directional arrow on the drive lantern.

6.4 Switch on drive

1. 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.

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

NOTICE:
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.

NOTICE:

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 8.1 Operation troubleshooting on page 42.

6.5 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.

NOTICE:
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.

6.6 Limits of operation

Flow limits

WARNING:
Risk of serious physical injury or death. Exceeding any of the pump operating limits (e.g. - pressure, temperature, power, etc.) could result in equipment failure, such as explosion, seizure, or breach of containment. Assure that the system operating conditions are within the capabilities of the pump.

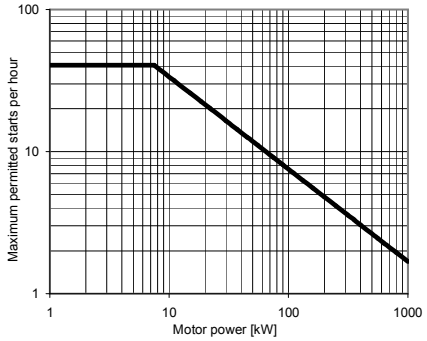
- Do not exceed the output given on the motor name plate.
- Avoid sudden changes in temperature (temperature shocks).

These flow limits are valid unless other data is available in the curves or data sheets:

$Q_{min} = 0.1 \times Q_{BEP}$	Short-term operation
$Q_{min} = 0.3 \times Q_{BEP}$	Continuous operation
$Q_{max} = 1.2 \times Q_{BEP}$	Continuous operation
Q_{BEP} = Flow in efficiency optimum	

Permitted number of starts

Do not start the pump more than the number of times shown in this chart:



For pumps that use electric motors, do not start the motor more than the number of times listed in the motor operation instructions. If two different numbers are shown, the lower number of starts is the limit.

6.7 Pump operation precautions

General considerations

WARNING:

- Risk of serious personal injury or property damage. Dry running may cause rotating parts within the pump to seize to non-moving parts. Do not run dry.
- Risk of explosion and serious physical injury. Do not operate pump with blocked system piping or with suction or discharge valves closed. This can result in rapid heating and vaporization of pumpage.

Operation at reduced capacity

WARNING:

- Risk of breach of containment and equipment damage. Excessive vibration levels can cause damage to bearings, stuffing box, seal chamber, and/or mechanical seal. Observe pump for vibration levels, bearing temperature, and excessive noise. If normal levels are exceeded, shut down and resolve.
- Risk of equipment damage and serious physical injury. Heat build-up can cause rotating parts to score or seize. Observe pump for excessive heat build-up. If normal levels are exceeded, shut down and resolve.

NOTICE:
Cavitation can cause damage to the internal surfaces of the pump. Ensure net positive suction head available ($NPSH_A$) always exceeds NPSH required ($NPSH_3$) as shown on the published performance curve of the pump.

Operation under freezing conditions

NOTICE:
Do not expose an idle pump to freezing conditions. Drain all liquid that will freeze that is inside the pump and any auxiliary equipment. Failure to do so can cause liquid to freeze and damage the pump. Note that different liquids freeze at different temperatures. Some pump designs do not drain completely and may require flushing with a liquid that doesn't freeze.

6.8 Abrasive Media

⟨Ex⟩ 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.

6.9 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.

6.10 Shut down

1. 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.
2. Switch off motor (make sure it runs down quietly).
3. Close the valve on suction side.
4. Close auxiliary circuit.
5. On danger of freezing empty pump and pipes completely.
6. If pump remains under pressure and temperature when stationary: leave existing sealing and flushing systems switched on.
7. 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).

7 Maintenance

7.1 Maintenance schedule

Maintenance inspections

A maintenance schedule includes these types of inspections:

- Routine maintenance
- Routine inspections
- Three-month inspections
- Annual inspections

Shorten the inspection intervals appropriately if the pumped fluid is abrasive or corrosive or if the environment is classified as potentially explosive.

Routine maintenance

Perform these tasks whenever you perform routine maintenance:

- Lubricate the bearings.
- Inspect the seal.

Routine inspections

Perform these tasks whenever you check the pump during routine inspections:

- Check for unusual noise vibration, and bearing temperatures.
- Check the pump and piping for leaks.
- Analyze the vibration.*
- Inspect the discharge pressure.
- Inspect the temperature.*

NOTICE:
*If equipped, temperature and vibration levels can be retrieved by using your i-ALERT monitoring sensor and app.

Three-month inspections

Perform these tasks every three months:

- Check that the foundation and the hold-down bolts are tight.

Annual inspections

Perform these inspections one time each year:

- Check the pump capacity.
- Check the pump pressure.
- Check the pump power.

If the pump performance does not satisfy your process requirements, and the process requirements have not changed, then perform these steps:

1. Disassemble the pump.
2. Inspect it.

3. Replace worn parts.

7.2 Mechanical seals

NOTICE:
Before opening the pump, it is essential that you note Safety Regulations and Dismantling and repair of pump.

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".

7.3 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.

7.4 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:
Ⓔx The pump must not be cleaned with pressurised water - water will get into the bearings.

7.5 Disassembly precautions

WARNING:

- Failure to disconnect and lock out driver power may result in serious physical injury or death. Always disconnect and lock out power to the driver before performing any installation or maintenance tasks.
    - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
    - Refer to driver/coupling/gear manufacturer's installation and operation manuals (IOM) for specific instructions and recommendations.
- Risk of serious personal injury. Applying heat to impellers, propellers, or their retaining devices can cause trapped liquid to rapidly expand and result in a violent explosion. This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Never apply heat to aid in their removal unless explicitly stated in this manual.
- Handling heavy equipment poses a crush hazard. Use caution during handling and wear appropriate Personal Protective Equipment (PPE, such as steel-toed shoes, gloves, etc.) at all times.

- Precautions must be taken to prevent physical injury. The pump may handle hazardous and/or toxic fluids. Proper personal protective equipment should be worn. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.
- Risk of serious physical injury or death from rapid depressurization. Ensure pump is isolated from system and pressure is relieved before disassembling pump, removing plugs, opening vent or drain valves, or disconnecting piping.
- Risk of serious personal injury from exposure to hazardous or toxic liquids. A small amount of liquid will be present in certain areas like the seal chamber upon disassembly.

CAUTION:

- Avoid injury. Worn pump components can have sharp edges. Wear appropriate gloves while handling these parts.

7.6 General remarks

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

NOTICE:
When disassembling the pump pay attention to Safety Regulations and Transport, Handling.

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

NOTICE:
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.

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

NOTICE:
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.

7.7 General

Ⓔx 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.

7.8 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: Motor lantern screen removal on page 36.

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.

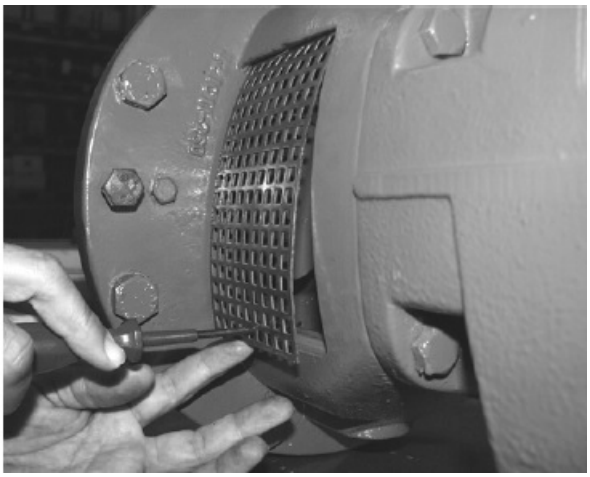


Figure 8: Motor lantern screen removal

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.

7.9 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.

1. Drain volute casing (102V) via drain plug (912.11).

2. Loosen screws of existing sealing or flushing piping.
3. Loosen screws of support food (183) from the foundation (not existing on all sizes).
4. 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 dismounting.
5. Loosen hex head bolt (901.11) from the casing.
6. Using the jack screws provided (901.42), separate the Back Pull Out Assembly from the casing.

7.10 Removal of Impeller

CAUTION:
A worn impeller and/or pump housing can have very sharp edges. Wear protective gloves.

If the impeller has back vanes check the axial clearance "a" between the impeller (230) and casing cover (161) before you continue the dismounting. Refer to sect. 8.7.1.

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

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

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).
2. Draw off the impeller (230) with two screw drivers or pry bars. Remove key (940.31).

Figure 9: Place in vertical position to prevent tipping

NOTICE:

Be sure to align the pry bars with the impeller vanes in order to prevent damage to the impeller.

3. For further dismounting the back pullout assembly should be placed in a vertical position.

CAUTION:

Dropping, rolling or tipping units, or applying other shock loads, can cause property damage and/or personal injury. Ensure that the unit is properly supported and secure during lifting and handling.

7.11 Remove the Shaft Sealing

Before you remove casing cover refer to *Mounting Instructions for Shaft Sealing*.

1. Unfasten hexagonal nut (902.32) (not available on all pump sizes) and take casing cover (161) out of bearing bracket (344).

7.12 Removal of Stub Shaft

1. Loosen screws (920.41) and pull motor with stub shaft (210) out of the motor lantern (341).
2. 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.

7.13 Preassembly inspections

7.13.1 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 mechanical seal, ball bearings and seals (flat seal, O-rings).

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

In most cases it make sense, if damaged absolutely necessary, to renew the mechanical 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

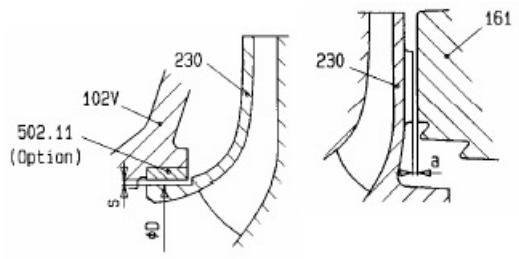


Figure 10: Suction side of impeller (shown on left), Back vanes of impeller (shown on right)

100-65-315
125-80-315
125-100-315
150-125-315

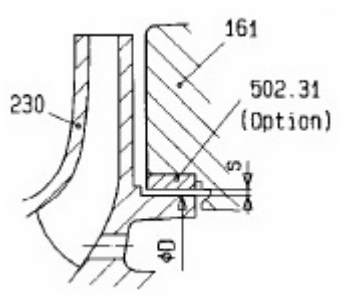


Figure 11: Drive side of impeller (only with pump size shown below)

Nominal diameter D (mm)			60 68	85	100 120 135	155 175	220
Radial clearances (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				

Ⓔx 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:

1. Renew impeller (230) and wear ring. Then the original measures are restored.
2. 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. Re-machining of the volute casing and / or casing cover is required. Please contact the factory for details and assistance.

7.14 Reassembly

7.14.1 Mounting

1. 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 re-assembling 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 dismounting will be easier.

   NOTICE:
   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.

2. For mounting of stub shaft refer to *Mounting of Stub Shaft*.
3. For mounting of mechanical seal refer to separate "Mounting Instruction of Shaft Sealing" and 7.10 Removal of Impeller on page 37.
4. 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 Clearance at impellerchapter.
5. 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.

7.14.2 Mount the stub shaft

1. Insert key in the motor stump.
2. Put anti-galling compound onto the motor stump (see Mounting, *General*).
3. Push stub shaft up the motor shaft to measure A (see *Stub shaft mounting* image and chart).
4. 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.
5. 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).
6. 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.

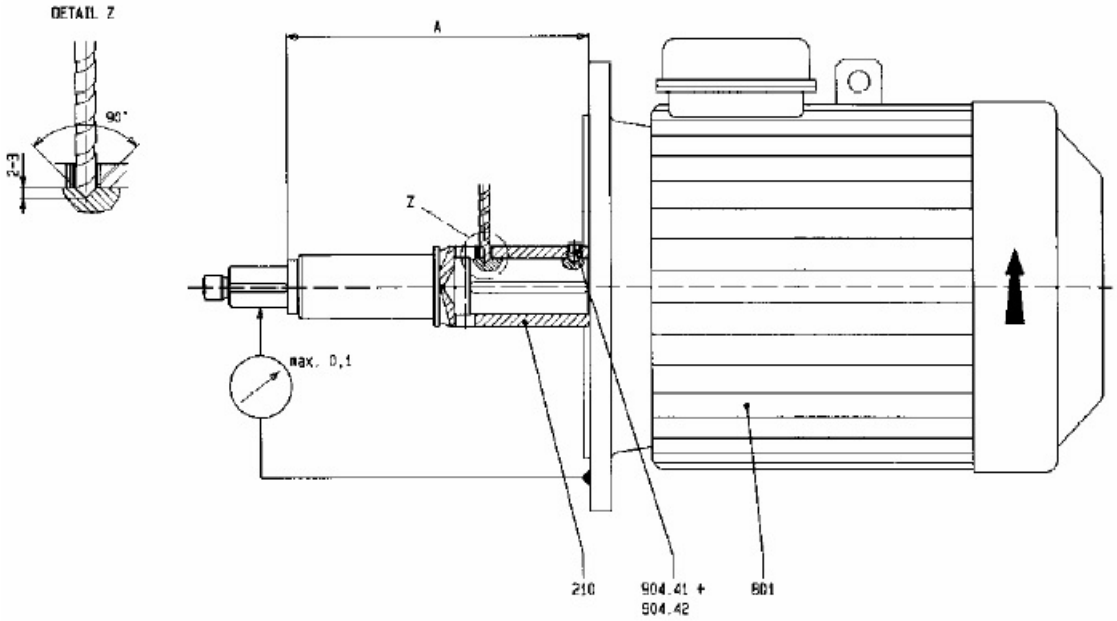


Figure 12: Stub shaft mounting

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

8 Troubleshooting

8.1 Operation troubleshooting

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 of these Operating Instructions should be particularly taken into account. If necessary, the written agreement of the manufacturer must be obtained.

Table 7: Troubleshooting procedure

Symptom	Cause	Remedy
Discharge too low	Back-pressure too high	• 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	• 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	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

Symptom	Cause	Remedy
	Density and/or viscosity of liquid handled is too high	Seek assistance
Discharge stops after a time	Flow too little	Increase min. flow (open discharge valve, bypass)
	Pump or suction/intake pipe blocked	Clean
	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
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

Symptom	Cause	Remedy
	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 compensator's, 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
Pump not running quietly	Flow too little	Increase min. flow (open discharge valve, bypass)
	Pump and/or pipes not completely filled with liquid	• Fill • Vent
	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)
	Inner components suffering from wear	Replace worn parts
	Impeller out of balance	• 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)	• Change (support pipes, use compensator's, etc.) • Is foundation plate/frame properly cast in place?
	Bearing damaged	Replace
	System-related vibrations (resonance)	Seek assistance

Symptom	Cause	Remedy
Temperature in pump too high	Flow too little	Increase min. flow (open discharge valve, bypass)
	Pump and/or pipes not completely filled with liquid	• Fill • Vent
	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)
Temperature in shaft sealing too high	Lines and roughness at shaft	Replace parts
	Deposits on mechanical seal	• 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	Throttle discharge valve
	Flow too big	Reduce flow (throttle discharge valve)
	Inner components suffering from wear	Replace worn parts
	Forces in pipeline too high (pump unit under strain)	• Change (support pipes, use compensator’s, etc.) • Is foundation plate/frame properly cast in place?
	Bearing damaged	Replace
	Relief fittings insufficient	• 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)	• Change (support pipes, use compensator’s, etc.) • Is foundation plate/frame properly cast in place?
	Sealing insufficient	• Tighten screws • Replace sealing
Leakage rate at shaft sealing too high	Lines and roughness at shaft	Replace parts
	Deposits on mechanical seal	If necessary provide additional rinsing or quench
	Impeller out of balance	• 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)	• Change (support pipes, use compensator’s, etc.) • Is foundation plate/frame properly cast in place?

9 Spare parts, Spare pumps

9.1 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.

	Number of pumps (incl. stand-by pumps) 2 3 4 5 6/7 8/9 10/+						
Spare Parts	Number of spare parts						
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.

9.2 Stand-by pumps

NOTICE:
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).

NOTICE:
Store stand-by pumps according to Storage / longer periods of non- operation.

10 Appendix

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

10.1.1 Safety Instructions

NOTICE:
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!

⟨Ex⟩ 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.

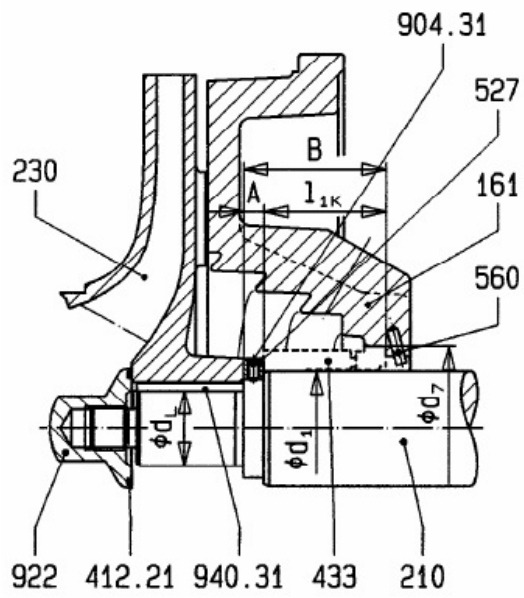
The following descriptions are only valid commonly, as far as they refer to the inner design of the mechanical seal. For possible particularities refer to the data sheet of the mechanical seal or instruction of the mechanical seal-manufacturer.

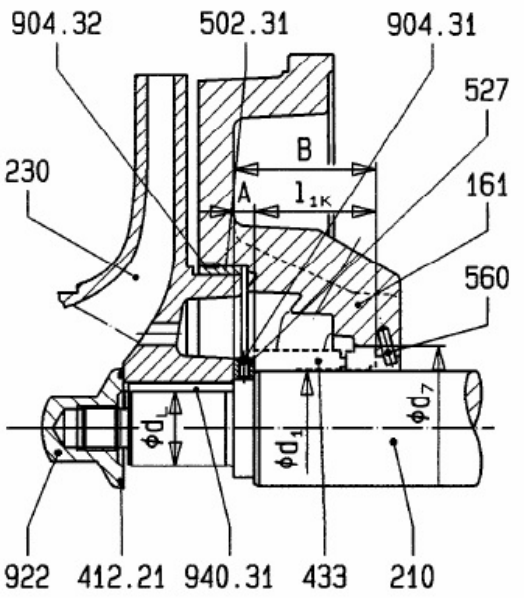
10.1.2 Design Description

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	∅d_1	∅d_7	l_{1K}	A	B	∅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!

10.1.3 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 7.11 Remove the Shaft Sealing on page 38.
- 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).

  Clean drilling for stationary seal rng (∅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 dismounted mechanical seal can be reconditioned by the manufacturer and serve as a replacement mechanical seal.

10.1.4 Installation of a mechanical seal

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

⟨Ex⟩ 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.

NOTICE:
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.

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

10.2.1 Safety Instructions

NOTICE:
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!

⟨Ex⟩ 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.

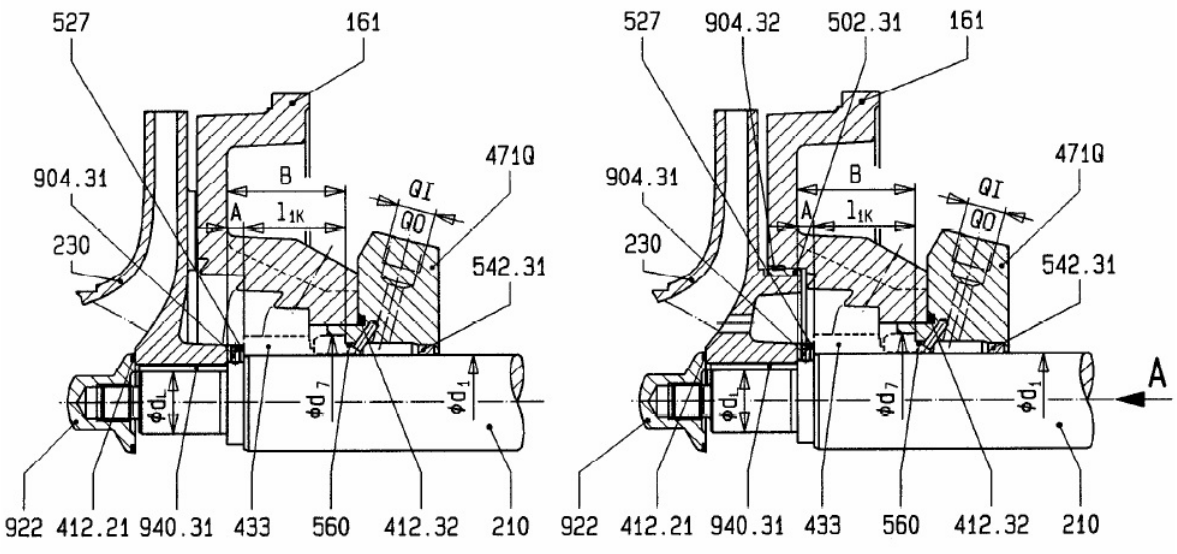
10.2.2 Description

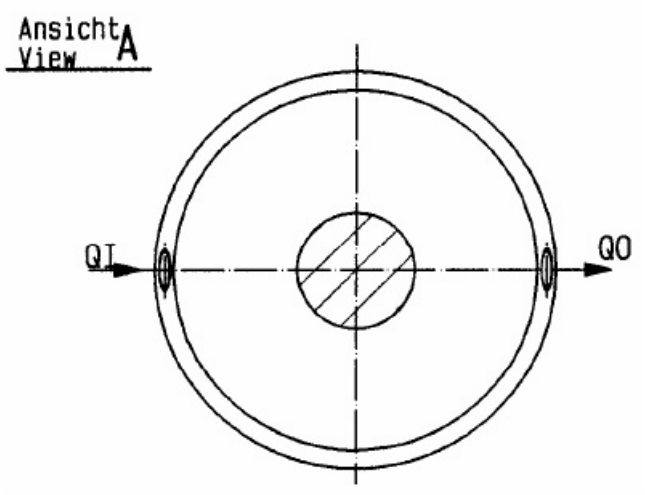
This shaft seal is a single mechanical seal with installation dimensions acc. EN 12756 (DIN 24960) design "K", form "U". API plan 62 / ISO plan 09. The resistance of the materials in the mechanical seal chamber (especially of elastomeres) against the quench liquid has to be noticed.

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

NOTICE:
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.





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	∅d_1	∅d_7	l_{1K}	A	B	∅d_L	QI, Q0
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!

10.2.3 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 7.11 Remove the Shaft Sealing on page 38.
- 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 dismounted mechanical seal can be reconditioned by the manufacturer and serve as a replacement mechanical seal.

10.2.4 Installation of mechanical seal

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

⟨Ex⟩ 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.

NOTICE:
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!).

NOTICE:

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 of Installation, Operation and Maintenance Instruction.

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

10.3 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.

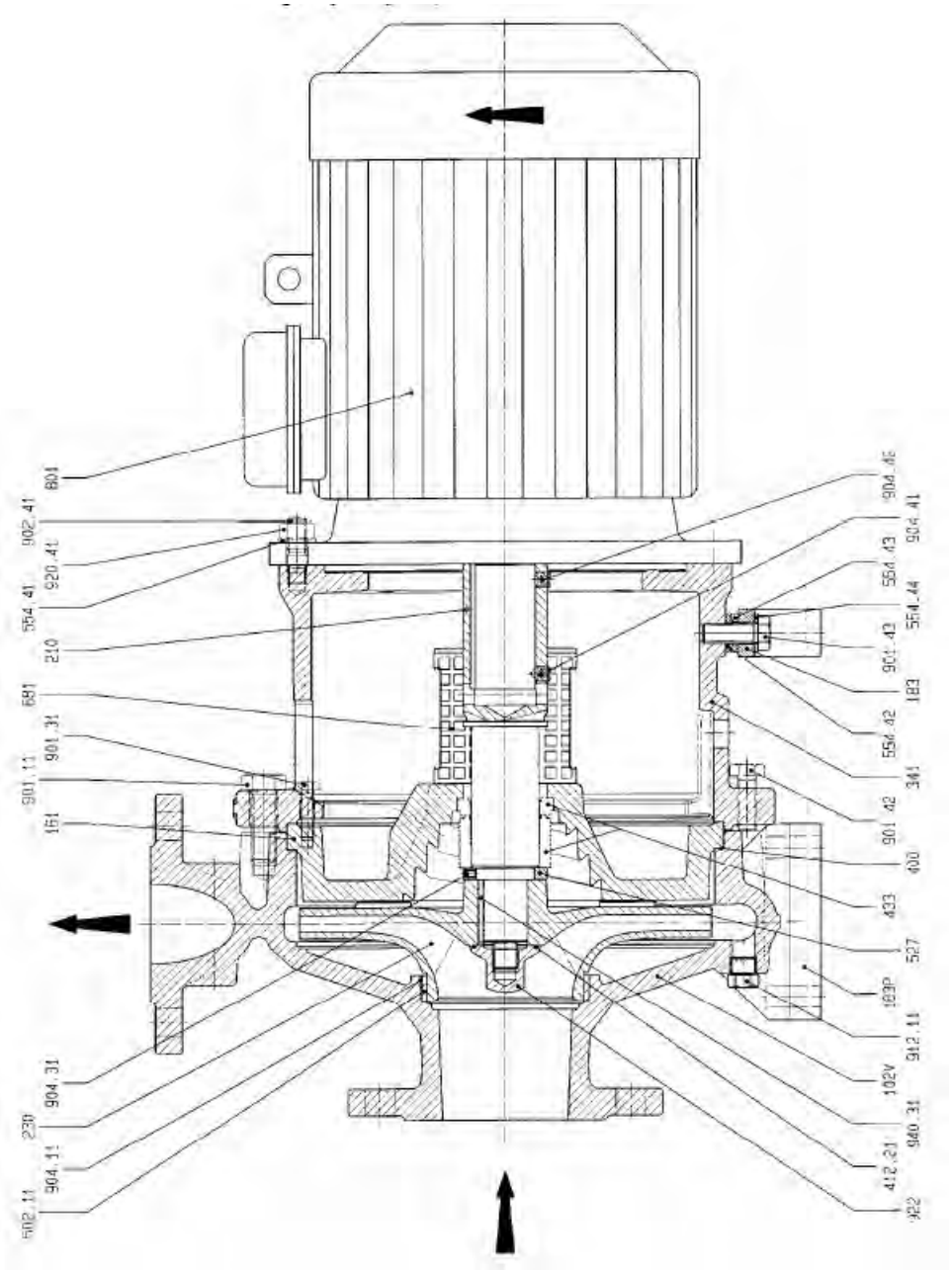


Table 8: Valid for

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

No.	Part name:
183 ***)	Support foot
183P **)	Pump alignment
210	Stub shaft
230	Impeller
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

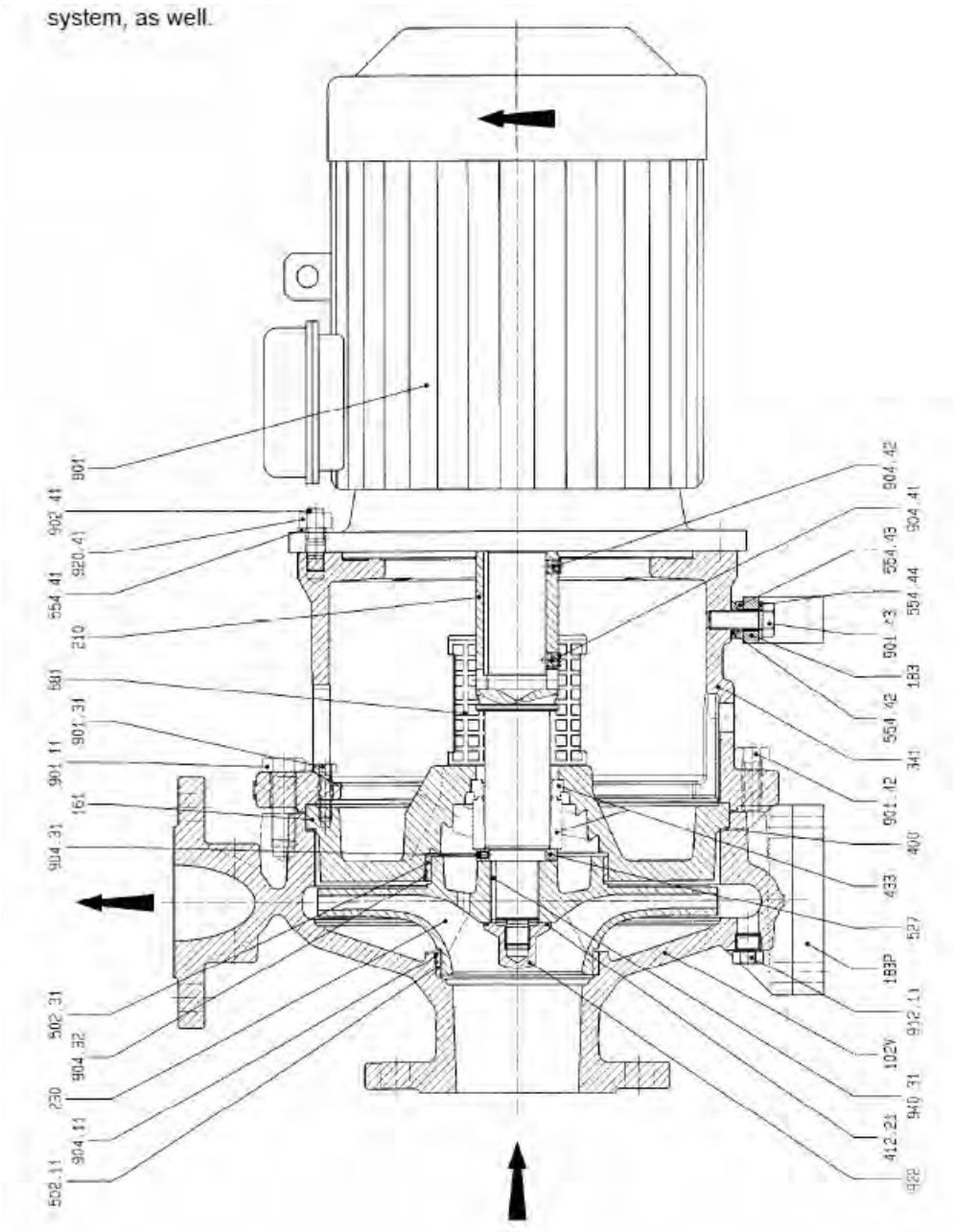
*) … optional

**) … not for all designs

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

10.4 Design: S1...2 Single-mech. seal, unbalanced (DIN 24960, l_{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 4.1 General description on page 17 *Design Coding System*, as well.



Valid for type

Table 9:

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

No.	Part name:
400	Gasket
412.21	O-ring
433	Mechanical seal
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

10.5 Design: S4...2 Single mech. seal, unbalanced (DIN 24960, l_{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.

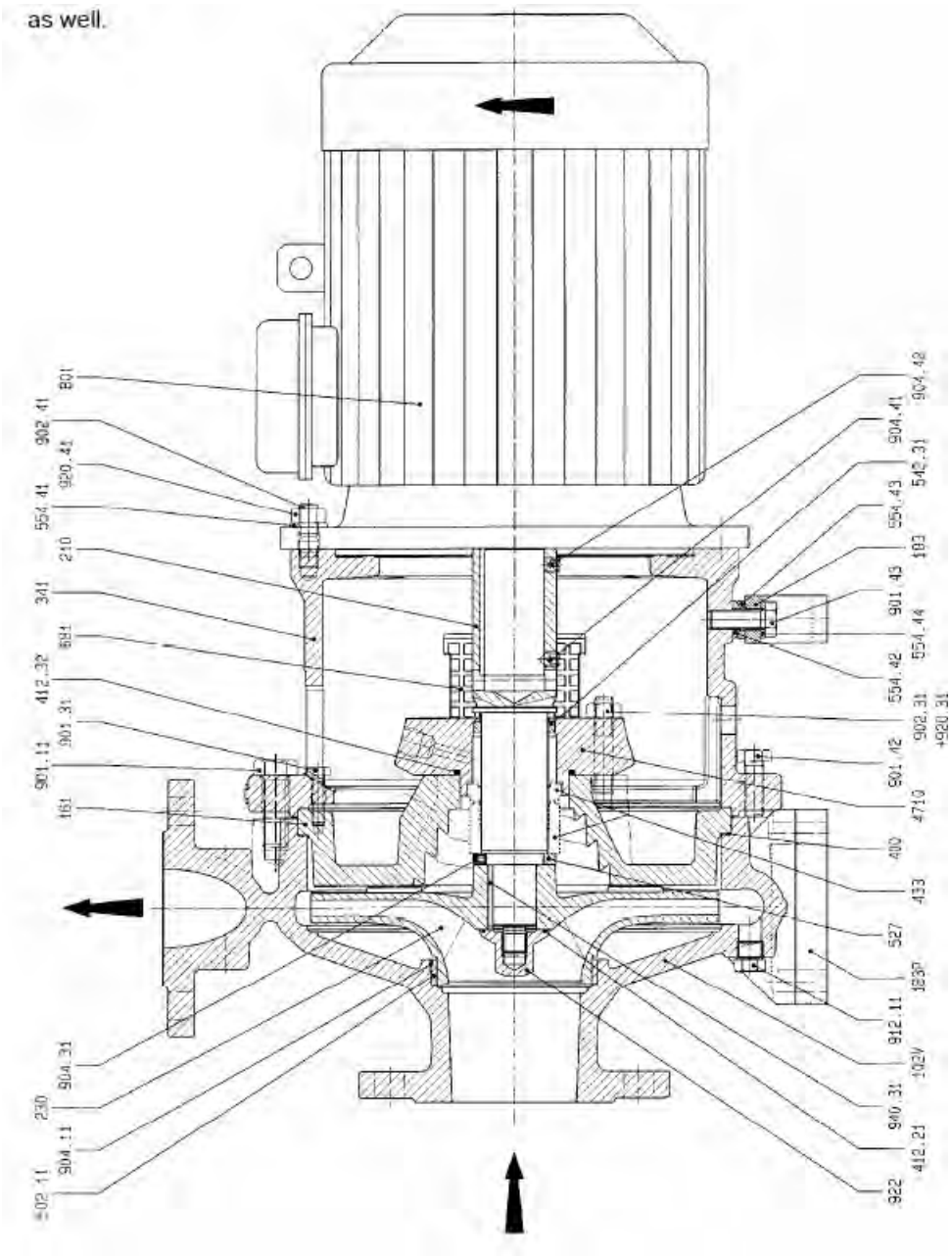


Table 10:

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

No.	Part name:
183 ***)	Support foot
183P **)	Pump alignment
210	Stub shaft
230	Impeller
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

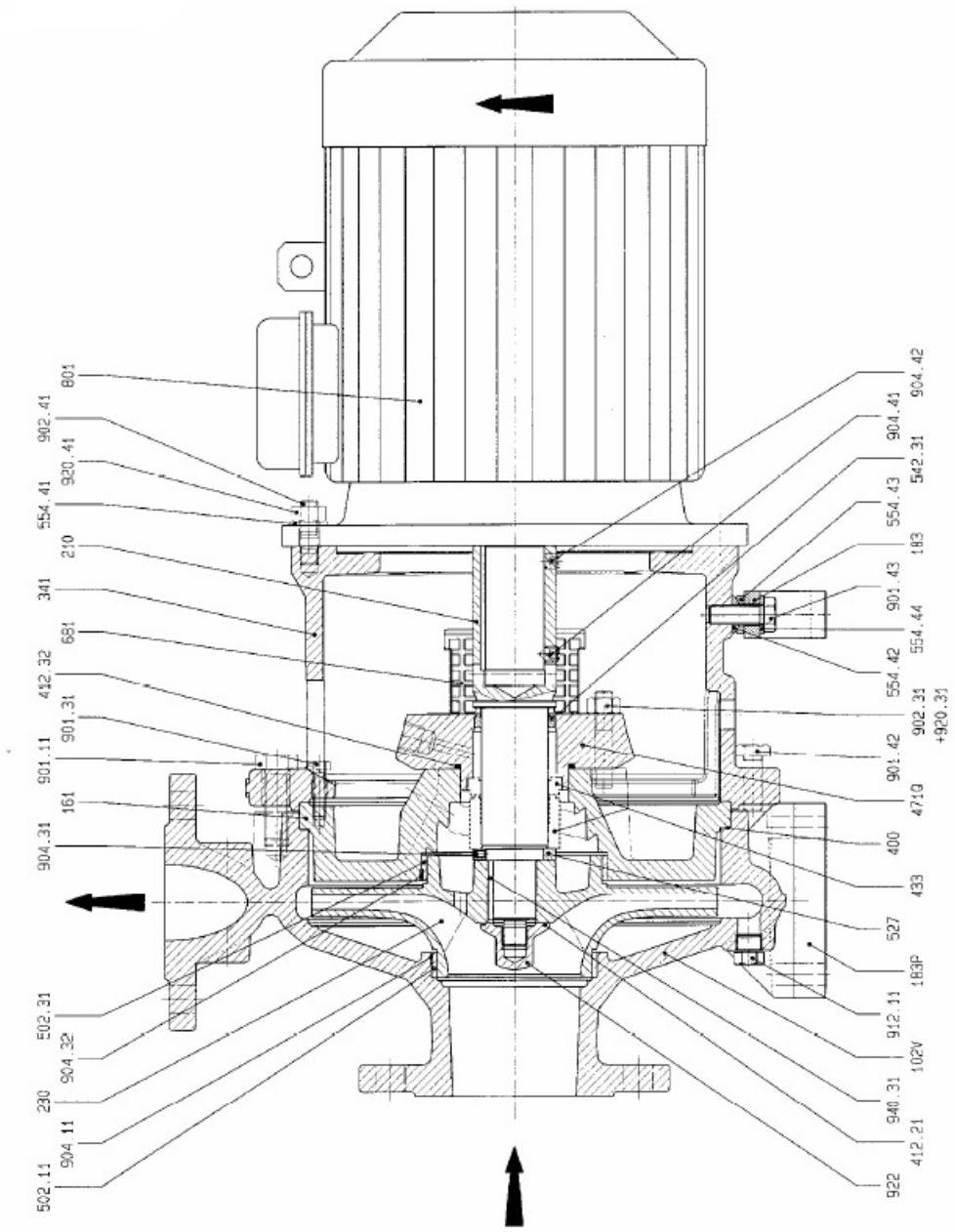
*) … optional

**) … not for all designs

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

10.6 Design: S4...2 Single mech. seal, unbalanced (DIN 24960, l_{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 11:

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

No.	Part name:
400	Gasket
412.21	O-ring
433	Mechanical seal
471Q	Quench cover
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

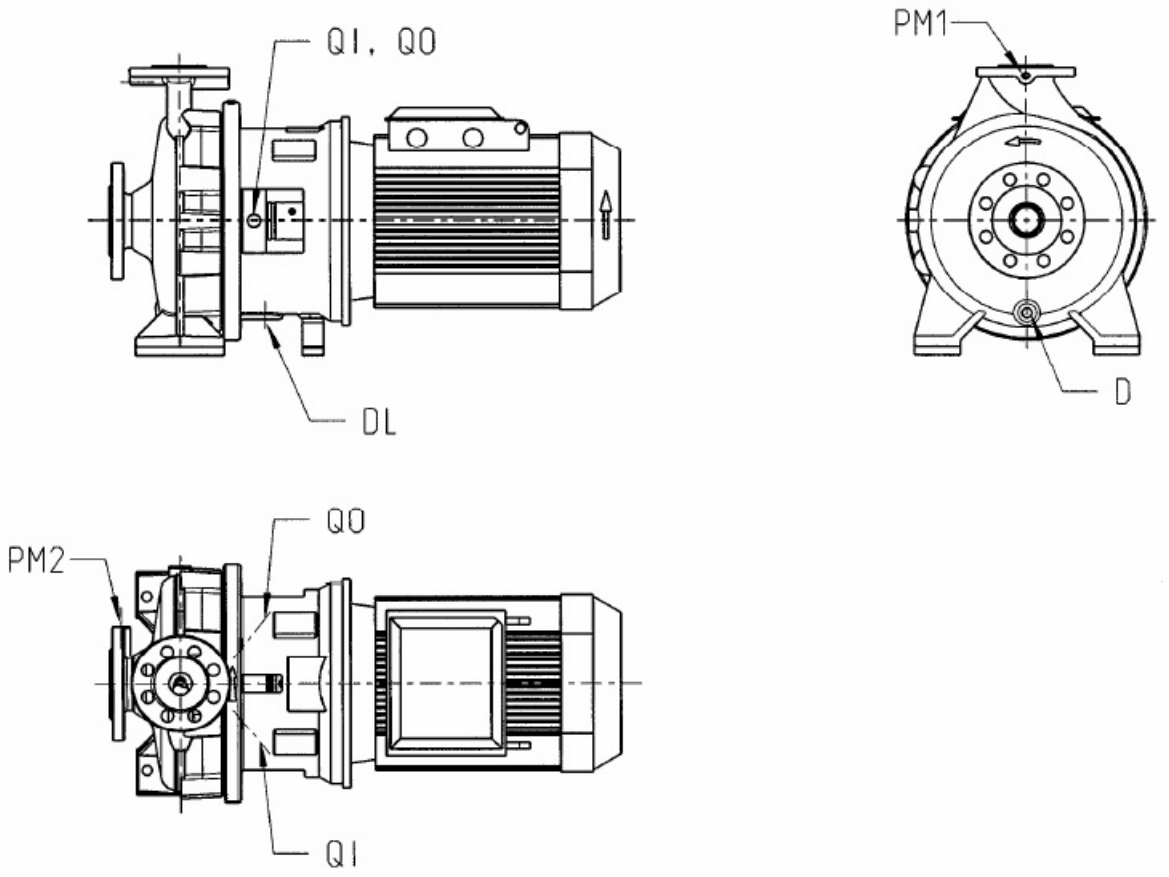


Figure 13: Connections:

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*.

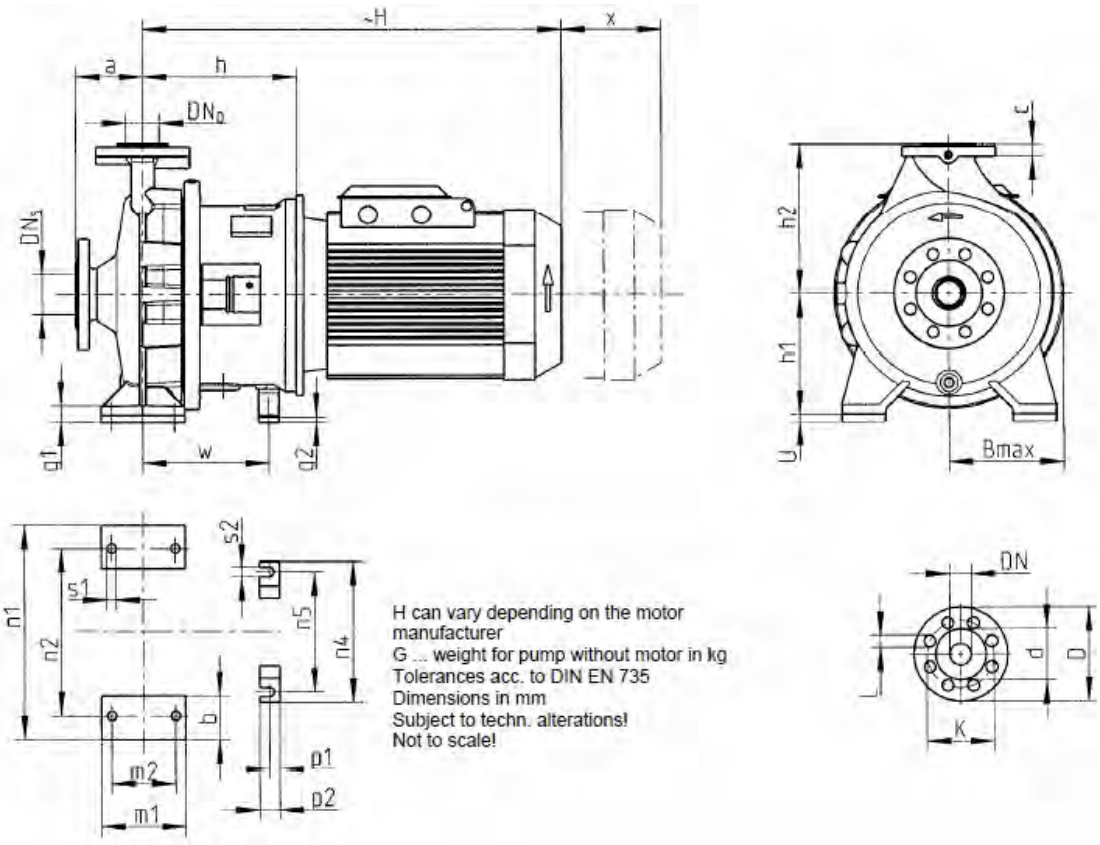


Figure 14: Dimensional drawing

Pump	DN_S	DN_D	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_D*)																	
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.

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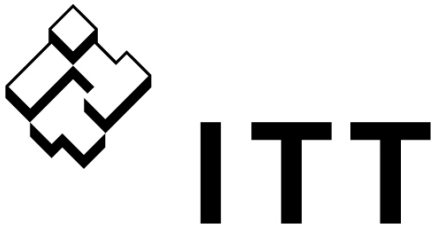

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