Operating Instruction for Liquid-Ring Vacuum Pumps
Contents

1 Security 3
  1.1 Identification of Safety Instructions in the Operating Manual 3
  1.2 Qualification and Training of Operating Personnel 3
  1.3 Hazards in the Event of Non-Compliance with the Safety Instructions 3
  1.4 Compliance with Regulations Pertaining to Safety at Work 3
  1.5 Safety Instructions relevant for Operation 3
  1.6 Safety Instructions relevant for Maintenance, Inspection and Assembly Work 4
  1.7 Unauthorized Alterations and Production of Spare Parts 4
  1.8 Unauthorized Modes of Operation 4

2 Transport and Intermediate Storage 4
  2.1 Transport 4
  2.2 Intermediate Storage 4
  2.2.1 Internal Preservation 4
  2.2.2 Preservation Control 4
  2.2.3 Removal of Preservation 4

3 Description 5
  3.1 Design 5
  3.2 Place of Operation 5

4 Mounting 5
  4.1 Installation 5
  4.1.1 Fresh Water Operation 5
  4.1.2 Separator with partial Backflow of Coolant 6
  4.2 Connected Loads 6
  4.3 Direction 6
  4.4 Coupling Protection 6
  4.5 Piping 7
  4.5.1 General Remarks 7
  4.5.2 Suction Pipeline 7
  4.5.3 Pressure Pipeline 7
  4.5.4 Additional Connections 75
  Starting Operation/ Stopping Operation 7
  5.1 Preparations for Initial Operation 7
  5.2 Initial Starting 7
  5.3 Restarting 7
  5.4 Stopping Operation 7

6 Service/Maintenance 7
  6.1 Supervision of Operation 7
  6.1.1 Shaft Bearing 8
  6.1.2 Mechanical Seal 8
  6.2 Maintenance 8
  6.2.1 Preparation 8
  6.2.2 Dismounting 8
  6.2.2.1 Pump 8
  6.2.2.2 Dismounting of Mechanical Seal 8
  6.2.2.3 Motor 8
  6.2.3 Mounting 8
  6.2.3.1 General Remarks 8
  6.2.3.2 Mounting of the Motor 8
  6.2.3.3 Mounting of Mechanical Seal 9

7 Disturbance 10

8 Pump View and List of Spare Parts 11
  8.1 GS22U0 11
  8.2 GS22U1 12
  8.3 ZS22U1 (GP24U1) 13
General
The most important operational data are mentioned on the type label. The sound pressure produced by the liquid-ring vacuum pump does not exceed the value 70 dB(A).

1 Security
This operating manual gives basic instructions which are to be observed during installation, operation and maintenance of the pump. It is therefore imperative that this manual be read by the responsible personnel/operator prior to assembly and commissioning. It is always to be kept available at the installation site.
It is not only the general safety instructions contained under this main heading safety that are to be observed but also the specific information provided under the other main headings.

1.1 Identification of Safety Instructions in the Operating Manual
Safety instructions given in this manual non-compliance with which would affect safety are identified by the following symbol:

see DIN 4844-W9

or where electrical safety is involved, with

see DIN 4844-W8

Instructions non-compliance with which would give rise to malfunctioning of the machinery are identified by the word

CAUTION

It is imperative that signs affixed to the machine, e.g.
- arrow indicating the direction of rotation
- symbols indicating fluid connections
be observed and kept legible.

1.2 Qualification and Training of Operating Personnel
The personnel responsible for operation, maintenance, inspection and assembly must be adequately qualified. Scope of responsibility and supervision of the personnel must be exactly defined by the plant operator. If the staff does not have the necessary knowledge, they must be trained and instructed, which may be performed by the machine manufacturer or supplier on behalf of the plant operator. Moreover the plant operator is to make sure that the contents of the operating manual are fully understood by the personnel.

1.3 Hazards in the Event of Non-Compliance with the Safety Instructions
Non-compliance with the safety instructions may produce a risk to the personnel as well as to the environment and the machine and results in a loss of any right to claim damages.
For example, non-compliance may involve the following hazards:
- Failure of important functions of the machine/plant
- Failure of specified procedures of maintenance and repair
- Exposure of people to electrical, mechanical and chemical hazards
- Endangering the environment owing to hazardous substances being released

1.4 Compliance with Regulations Pertaining to Safety at Work
When operating the pump, the safety instructions contained in this manual, the relevant national accident prevention regulations and any other service and safety instructions issued by the plant operator are to be observed.

1.5 Safety Instructions relevant for Operation
- If hot or cold machine components involve hazards, they must be guarded against accidental contact.
- Guards for moving parts (e.g. coupling) must not be removed from the machine while in operation.
- Any leakage of hazardous (e.g. explosive, toxic, hot) fluids (e.g. from the shaft seal) must be drained away so as to prevent any risk occurring to persons or the environment. Statutory regulations are to be complied with.
- Hazards resulting from electricity are to be precluded (see, for example, the VDE Specifications and the bye-laws of the local power supply utilities).
1.6 Safety Instructions relevant for Maintenance, Inspection and Assembly Work

It shall be the plant operator’s responsibility to ensure that all maintenance, inspection and assembly work is performed by authorized and qualified personnel who have adequately familiarized themselves with the subject matter by studying this manual in detail.

Any work on the machine shall only be performed when it is at a standstill, it being imperative that the procedure for shutting down the machine described in this manual be followed.

Pumps and pumps units which convey hazardous media must be decontaminated.

On completion of work all safety and protective facilities must be re-installed and made operative again.

Prior to restarting the machine, the instructions listed under Initial commissioning are to be observed.

1.7 Unauthorized Alterations and Production of Spare Parts

Any modifications may be made to the machine only after consultation with the manufacturer. Using spare parts and accessories authorised by the manufacturer is in the interest of safety. Use of other parts may exempt the manufacturer from any liability.

1.8 Unauthorized Modes of Operation

The reliability of the machine delivered will be only guaranteed if it is used in the manner intended, in accordance with our order documentation, especially with the order confirmation.

The limit values specified in the data sheet must under no circumstances be exceeded.

2 Transport and Intermediate Storage

2.1 Transport

When transporting the complete pump unit by crane, mount the ropes as shown in the figure.

CAUTION The crane facility and the ropes must be of sufficient capacity. The ring loop of the motor must not be used for transport of the complete pump unit.

2.2 Intermediate Storage

On delivery, all pumps are preserved. Thus, they can be stored for 6-12 months. If the storage time is longer or the pumps are not in operation, they must receive additional preservation on the inside. The preservation means (please consult us) depends on the used materials and conditions of operation.

The storage room must be roofed and well ventilated. Avoid temperatures below zero and high humidity.

2.2.1 Internal Preservation

Fill the pump with the preservating means and slowly turn the rotor manually. Close the suction branch securely and the pressure branch securely.

2.2.2 Preservation Control

Check the filling level of the pump and turn the rotor by hand at regular intervals of 3 months. Refill preservation means, if necessary.

2.2.3 Removal of Preservation

Prior to operation, the pump must be rinsed thoroughly. In the case of additional preservation, the preservation means on the inside must at first be removed.
3 Description

3.1 Design

Single-stage or multi-stage liquid ring vacuum unit-construction pump, available in different construction materials, with or without an electric drive unit. Shaft sealed by different mechanical seals.

3.2 Place of Operation

The pump unit must be freely accessible for the purpose of supervision, servicing, maintenance, mounting and dismounting. Avoid using it in corrosive and very dusty surroundings. The limiting values of the electric drive unit with regard to the insulation material class and the types of protection must be observed. For other drive units supplied, see the enclosed separate operating instructions. The minimum suction pressure depends on the temperature and the type of the coolant used. The pressure must not fall below the value specified in Fig. 3.2a.

The minimum suction pressure depends on the temperature and the type of the coolant used. The pressure must not fall below the value specified in Fig. 3.2a.

<table>
<thead>
<tr>
<th>Type</th>
<th>Suction pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS/(GP)</td>
<td>50/(150) mbar</td>
</tr>
<tr>
<td>ZS</td>
<td>50 mbar</td>
</tr>
</tbody>
</table>

Fig. 3.2a Minimum permissible suction pressure

These specifications are independent of the relative air humidity and refer to a coolant temperature of 15°C. Higher temperatures reduce the suction ability. The maximum temperature of the air intake must not exceed 100°C. The coolant temperature may be max. 80°C.

CAUTION Continued operation below the specified suction pressures may lead to the pump being damaged.

For vacuum operation, a maximum outlet pressure of 1100 mbar is permitted if the coolant flow according to Fig. 3.2b is observed.

<table>
<thead>
<tr>
<th>Suction pressure [mbar]</th>
<th>Coolant flow [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>0,23</td>
</tr>
<tr>
<td>150</td>
<td>0,23(0,52)</td>
</tr>
<tr>
<td>300</td>
<td>0,21(0,42)</td>
</tr>
<tr>
<td>400</td>
<td>0,18(0,36)</td>
</tr>
<tr>
<td>500</td>
<td>0,16(0,29)</td>
</tr>
<tr>
<td>600</td>
<td>0,13(0,22)</td>
</tr>
<tr>
<td>700</td>
<td>0,10(0,16)</td>
</tr>
</tbody>
</table>

Fig. 3.2b Coolant flow

Applies to dry air suction t=20°C and coolant temperature of 15°C with water as the coolant.

4 Mounting

4.1 Installation

The vacuum pump must be mounted horizontally on a pedestal, with the connecting sleeve facing upwards. The pedestal must be even and must have fasteners and a sufficient load capacity.

4.1.1 Fresh Water Operation

Fresh water operation will be preferred, on condition that sufficient fresh water can be provided as coolant. The supplied fresh water and air are completely removed on the delivery side and replaced by new fresh water. Fresh water is taken directly from the normal water pipeline (Fig. 4.1.1a) or from a pre-settling tank with a float valve (Fig. 4.1.1b).

CAUTION For compressor operation, the maximum differential pressure may be 1 bar. The coolant flow specified in Fig. 3.2b must be observed. The air and steam mixture to be evacuated and the coolant must be free of abrasive solids. Flow sustained even if a small amount of suspended matter or liquid inclusions in the air are present. A continuous supply of coolant must be guaranteed to dissipate the heat which develops and to compensate any loss of coolant.
When the fresh water is taken directly from the water pipeline, observe the values specified in Fig. 3.2b strictly. A flow meter is used to determine the fresh water flow. It is also possible to determine the penetrating liquid flow by measuring the penetrating liquid for a certain period of time. The pressure of the supply pipe must never exceed 0.03 bar. A considerable deviation from the specified values leads to the pump unit being damaged.

If a presettling tank is used, the fresh water is automatically primed in by the pump after it is initially filled. During operation, the water level of the tank should be above the centre line of the pump.

4.1.2 Separator with partial Backflow of Coolant

This operating mode is used if there is not sufficient fresh water available as the coolant or if other liquids are used as coolants. (Fig. 4.1.2a). The coolant is taken from the separator and lead back to the pump.

The loss of coolant must be permanently compensated during continuous operation. If the pump heats up considerably, a cooler with a small flow resistance must be installed between the separator and the pump or sufficient coolant must be supplied which compensates for the loss of coolant. The steam pressure must never exceed the temperature of the coolant. It is also possible to reduce the period of operation. In this case, a separate cooling system or the constant supply of coolant can be avoided. However, extra coolant must be added at predefined intervals. The steam pressure temperature of the coolant used indicates the limit of use. The liquid level of the separator should be above the centre line of the pump.

4.2 Connected Loads

Work must only be executed when electricity is switched off. Make sure that the system cannot be powered on accidentally.

Prior to connecting the pump to the power system, fill it with pumped liquid. The pump must by no means be operated without liquid!

The pump must be connected according to international national requirements as well as according to the requirements of the local mains system. Voltage and frequency must correspond to the winding of the electric drive. For details of the respective winding, see the type label. The motor must not be operated without motor protection facility. For motors with explosion protection, the range of temperature of the motor indicated on the type label must correspond to the range of the fuel gas.

4.3 Direction

Switch on the motor briefly in order to check the direction of rotation. The motor must not reach its operational speed. The direction of rotation must correspond to the arrow indicating the direction of rotation on top of the pump. If the direction of rotation is not correct, perform the relevant modifications at the phase-sequence.

4.4 Coupling Protection

The pump must not be operated if coupling protection is not fitted. If this coupling protection is not supplied by the manufacturer, the operator of the pump must supply it himself.
4.5 Piping

4.5.1 General Remarks

The nominal widths of the pipes must be at least as wide as those of the pump connection joints. Avoid sudden changes of diameter. The pipes must be gathered and secured right in front of the pump so that their weight does not affect the pump. Measuring equipment for supervision of the pump operation is required. Prior to operation, all parts in contact with liquids must be thoroughly cleaned.

4.5.2 Suction Pipeline

The suction pipeline must be as short as possible. Integrated fittings must be vacuum-tight. To avoid a backflow of air and coolant if operation is interrupted, a backflow valve must be provided inside the suction pipe which has a resistance as low as possible. The installation of a vacuum limiter is recommended to prevent the suction pressure from becoming too low.

4.5.3 Pressure Pipeline

The pressure specified in section 3.2 must not be exceeded. The installation of a stop valve is not compulsory.

4.5.4 Additional Connections

The position and dimensions for required additional connections, such as manometer connections and the process water connection are to be taken from the pump tags or from the sectional drawings in the Operating Instructions.

5 Starting Operation/ Stopping Operation

5.1 Preparations for Initial Operation

Prior to starting up, any existing stop slide within the pressure pipeline must be completely opened. Half of the pump must be filled with coolant. Moreover, the liquid level in the pre-settling tank or the separator must be checked and corrected, if necessary.

CAUTION: If there is a stop slide within the pressure pipeline, make sure that the pump cannot be started and can be stopped.

5.2 Initial Starting

The pump must not be started until the stop valve of the coolant pipeline is closed so as to avoid overloading of the motor. If a pre-settling tank or a separator is used, it is not necessary to close the coolant pipeline. If a stop valve is installed in the suction pipeline, the stop valve in the suction pipeline must be completely opened after starting up and the coolant flow must be adjusted according to the operating mode.

5.3 Restarting

Do not restart the pump until the pump shaft stands still.

CAUTION: Backflow of liquid must not result in a change of direction of rotation of the pump. If this is the case, mechanical seals dependent on direction of rotation may be damaged.

5.4 Stopping Operation

Depending on the operating mode in question, the stop valve in the coolant pipeline must be closed at first. Close any existing stop valve in the suction pipeline. Switch off the motor and ensure that the motor comes to a quiet stop. After standstill of slide, close any fitted stop valve in the pressure pipeline. If the pumped liquid reaches temperatures below zero and/or if longer periods of standstill occur, the pump must be drained completely and be preserved (see section 2.2.1).

6 Service/Maintenance

6.1 Supervision of Operation

Ensure that the pump runs free of vibration and smoothly. The pump must by no means be operated without liquid. There is only a minimal or invisible loss of leakage (steam) if the mechanical seals function correctly. Do not operate the pump for a longer period with a closed stop valve. The maximum permitted environmental temperature is 40°C. The storing temperature measured at the motor or pump casing may exceed the environmental temperature by 50°C. It must not exceed 90°C. Only operate the pump at a higher temperature with the manufacturer's approval. Installed pumps must be powered on and off briefly once a week in order to guarantee that they are ready for operation.
6.1.1 Shaft Bearing
Under normal operation conditions, replace the motor bearings after 20,000 hours of operation or at the latest after 2.5 years. In the case of bad operation conditions, as e.g. a high environmental temperature or a corrosive and dusty environment, the motor bearings must be checked at an earlier date and, if necessary, be replaced.

6.1.2 Mechanical Seal
The mechanical seals are maintenance-free. If leakages occur after a longer period of operation, replace the complete seal.

6.2 Maintenance

6.2.1 Preparation
In order to make sure that the pump cannot be started, separate the power cable from the motor. Secure the unit against accidental switch-on.

Close the stop valve of the pressure and suction pipelines. The pump casing must have reached the environmental temperature and be drained of liquid and pressure.

6.2.2 Dismounting
By no means use force while dismounting the pump. Separate the pump from the piping and any additional connections. Loosen the fasteners at the footing. For fixed parts of the casings, impellers and couplings, use appropriate dismounting facilities.

Pump
Continue dismounting the pump as described in the drawings on pages 11 to 13. Mark the position and sequence of the pump parts for later mounting.

Dismounting of Mechanical Seal
When replacing the mechanical seal, the entire pump or part of it must be dismounted. For pumps with two mechanical seals, first remove the bearing cover (360). Loosen tie bolts (905) and remove the bearing casing (350) by means of an appropriate dismounting facility. Remove deflector (507) and rotating part of the mechanical seal (433.1) from the shaft.

To dismount the motor-side mechanical seal, the pump must be dismantled until the casing (100,100.1) can be removed together with the complete motor-side mechanical seal. The counter ring can now be pushed out from the rear of the relevant part of the casing.

Motor
The complete pump can remain in the piping. First of all, remove the coupling protection (681) and loosen the hexagon screws (901.4) of the coupling. After having loosened the hexagon socket head cap screws (914), remove the motor from the pump.

6.2.3 Mounting

General Remarks
Prior to mounting, all parts must be cleaned thoroughly. Remove remaining parts of the seals. Slight scratches and grooves on the shaft near the shaft seal and on other sealing surfaces of the casings are to be polished with linen. If this is not possible, replace the parts. Flat packings must always be renewed. Check O rings for damage and replace them, if necessary.

Mounting is effected in the reverse order of dismounting. The sealing surfaces of the casings are to be covered with a sealing compound which is compatible with the coolant and air. Heat up the coupling joints of rigid couplings to approximately 250°C prior to mounting them onto the shaft.

The starting torques for the tie bolts and locking screws non lubricated condition are displayed in fig. 6.2.3.1a.

<table>
<thead>
<tr>
<th>Thread</th>
<th>M 10</th>
<th>M 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque Nm</td>
<td>30</td>
<td>50</td>
</tr>
</tbody>
</table>

Abb. 6.2.3.1a Starting torque

Mounting of the Motor
For initial mounting of motor and pumps with rigid coupling, first of all, remove the motorside coupling half (844.1). Subsequently, put this part onto the motor shaft. This coupling half must be next to the motor shaft collar. Tighten screws (904.1), join motor and pump centrically without tilting them. Tighten screws (901.1) between motor and intermediate flange (722) and then coupling screws (901.4).

CAUTION The inner parts of the pump will be damaged if motor and pump are connected and the motorside or pumpside coupling half has been installed incorrectly or not at all.
Mounting of Mechanical Seal

**CAUTION** When mounting the mechanical seals, you must proceed very carefully and with precision.

Do not touch the surfaces of the seal. Do not damage the sealing parts. To facilitate the mounting, moisten elastomer with low-surface tension water.

Mechanical seals and sealing parts with elastomer made of EP rubber must by no means come in contact with oil or grease.

The shape of spare mechanical seals may differ from those of the installed mechanical seal. However, the dimensions of the spare mechanical seal are the same and for that reason it can be replaced.

To avoid distortion of the counter-ring, mechanical seals with double PTFE-wrapped sealing rings are additionally secured by a leading pin inside the casing. The pin must be removed when replacing the type of mechanical seals and when using a type with different O ring material.

For details of the individual types of mechanical seals observe the following procedures.

**CAUTION** Observe the enclosed, separate mounting instructions for those types of mechanical seals which are not listed.

1. Stressed mechanical seal independent of direction of rotation with elastomer bellows (fig. 6.2.3.3a)

   Carefully press angle collar (1) together with counter ring (2) into the counter ring fit. Twist the rotating unit (3,4,5) onto the shaft as far as the counter ring. Put on supporting ring and mount circlip (932*).

   For mechanical seals within the bearing casing (350*), mount circlip (932.1*) first and then twist the supporting washer (6) together with the rotating part of the mechanical seal (5,4,3) onto the shaft up to the circlip (932.1*).

2. Stressed mechanical seal dependent on direction of rotation with conical springs (fig. 6.2.3.3b)

   Insert O Ring (1) into counter ring fit and carefully press counter ring (2) into it. Push mechanical seal (3) onto the shaft as far as the counter ring. Press O Ring (4) into the mechanical seal by means of the supporting ring. The pivot of the pressure spring (6) must be situated in the groove of the mechanical seal ring. Put on locking ring (7). Mount circlip (932*).

   For mechanical seals within the bearing casing (350*), first mount the circlip (932.1*). Subsequently, push locking ring (7), pressure spring (6), supporting washer (5), O ring (4) and mechanical seal ring (3) onto the shaft. The pivot of the pressure spring (6) must also be situated in the groove of the mechanical seal ring (3).
## 7 Disturbance

To eliminate disturbance, the pump must have reached the environmental temperature and must be drained of air and pressure.

The chart shows a list of potential errors and their possible causes. For errors which are not listed here or which have other reasons, please consult us.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Elimination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump is blocked</td>
<td>Check coolant flow, reduce or cool necessary</td>
</tr>
<tr>
<td>Coupling fault</td>
<td>Seal piping</td>
</tr>
<tr>
<td>Suction pressure insufficient</td>
<td>Increase speed</td>
</tr>
<tr>
<td>Suction pressure too high</td>
<td>Reduce speed</td>
</tr>
<tr>
<td>Storage temperature too high</td>
<td>Replace inner parts</td>
</tr>
<tr>
<td>Pump operates badly</td>
<td>Replace shaft seal</td>
</tr>
<tr>
<td>Leakage at the casings</td>
<td>Replace shaft seal</td>
</tr>
<tr>
<td>Motor protection activated</td>
<td>Replace shaft seal</td>
</tr>
<tr>
<td>Pump is becoming too hot</td>
<td>Check coolant flow, reduce or cool necessary</td>
</tr>
<tr>
<td>Cooling flow too high or too hot</td>
<td>Seal piping</td>
</tr>
<tr>
<td>Leakage of piping</td>
<td>Seal piping</td>
</tr>
<tr>
<td>Direction of rotation incorrect</td>
<td>Check and change phase sequence, if necessary</td>
</tr>
<tr>
<td>Speed too low</td>
<td>Increase speed</td>
</tr>
<tr>
<td>Speed too high</td>
<td>Reduce speed</td>
</tr>
<tr>
<td>Coolant flow too low</td>
<td>Increase coolant flow</td>
</tr>
<tr>
<td>Wear of inner parts</td>
<td>Replace inner parts</td>
</tr>
<tr>
<td>Coolant flow too high</td>
<td>Reduce coolant flow</td>
</tr>
<tr>
<td>Shaft seal damaged</td>
<td>Replace shaft seal</td>
</tr>
<tr>
<td>Counter pressure too high</td>
<td>Reduce cooling liquid</td>
</tr>
<tr>
<td>Connecting screws, seals</td>
<td>Tighten connecting screws, replace seals</td>
</tr>
<tr>
<td>Entrained liquid too high</td>
<td>Reduced entrained liquid</td>
</tr>
<tr>
<td>Problems via piping</td>
<td>Check pipe connections/pump fasteners/bearing distance of pipe clips</td>
</tr>
<tr>
<td>Defective bearing</td>
<td>Replace bearing</td>
</tr>
<tr>
<td>Motor protection unit set incorrectly or defective</td>
<td>Check motor protection unit, replace it, if necessary</td>
</tr>
<tr>
<td>Impeller blocked</td>
<td>Clean interior parts from particles and impurities</td>
</tr>
<tr>
<td>Inlet blocked</td>
<td>Open stop slide in the suction pipeline</td>
</tr>
</tbody>
</table>

*Please consult us*
## Pump View and List of Spare Parts

### 8.1 GS22U0

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Casing</td>
</tr>
<tr>
<td>137</td>
<td>Port plate</td>
</tr>
<tr>
<td>161</td>
<td>Casing cover</td>
</tr>
<tr>
<td>210</td>
<td>Shaft</td>
</tr>
<tr>
<td>230</td>
<td>Impeller</td>
</tr>
<tr>
<td>345</td>
<td>Foot mounted lantern bracket</td>
</tr>
<tr>
<td>411.1</td>
<td>Joint ring</td>
</tr>
<tr>
<td>433</td>
<td>Mechanical seal</td>
</tr>
<tr>
<td>554</td>
<td>Washer</td>
</tr>
<tr>
<td>681</td>
<td>Coupling guard</td>
</tr>
<tr>
<td>722</td>
<td>Intermediate flange</td>
</tr>
</tbody>
</table>

A: Vacuum gauge connection G¼

B: Connection for auxiliary liquid G¼

C: Drain connection G 1/8

### Part No. Designation

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Casing</td>
</tr>
<tr>
<td>137</td>
<td>Port plate</td>
</tr>
<tr>
<td>161</td>
<td>Casing cover</td>
</tr>
<tr>
<td>210</td>
<td>Shaft</td>
</tr>
<tr>
<td>230</td>
<td>Impeller</td>
</tr>
<tr>
<td>345</td>
<td>Foot mounted lantern bracket</td>
</tr>
<tr>
<td>411.1</td>
<td>Joint ring</td>
</tr>
<tr>
<td>433</td>
<td>Mechanical seal</td>
</tr>
<tr>
<td>554</td>
<td>Washer</td>
</tr>
<tr>
<td>681</td>
<td>Coupling guard</td>
</tr>
<tr>
<td>722</td>
<td>Intermediate flange</td>
</tr>
</tbody>
</table>

A: Vacuum gauge connection G¼

B: Connection for auxiliary liquid G¼

C: Drain connection G 1/8

### When ordering spare parts, please indicate serial no., type no. and parts no. by all means.
When ordering spare parts, please indicate serial no., type no. and parts no. by all means.

A: Vacuum gauge connection G¼
B: Connection for auxiliary liquid G¼
C: Drain connection G¼/₆
8.3 ZS22U1 (GP24U1)

A: Vacuum gauge connection G¼
B: Connection for auxiliary liquid G¼
C: Drain connection G½

When ordering spare parts, please indicate serial no., type no. and parts no. by all means.
Declaration of Conformity
As defined by machinery directive 98/37/EC Annex II A

Herewith we declare that the pump unit supplied with mounted electric drive) complies with the following provisions applying to it

EC-machinery directive (98/37/EC, Annex I No. 1)
EC-low voltage directive (73/23/EEC)

Applied harmonized standards
EN 1012-2
EN 292-1
EN 292-2
EN 294
EN 953
EN 60204-1 section 16
EN 60034-5
EN 294

In case of a modification of the pump unit without being coordinated with us this declaration will not longer be valid.

___________________
(QM-Supervisor)

1) other driving motor see separate declaration of conformity

Declaration by the manufacturer
As defined by machinery directive 98/37/EC, Annex II B

Herewith we declare that the pump supplied without driving motor is intended to be incorporated into machinery or assembled with other machinery to constitute machinery covered by this directive and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the directive, version 98/37/EC.

Applied harmonized standards
EN 1012-2
EN 292-1
EN 292-2

In case of a modification of the pump without being coordinated with us this declaration will not longer be valid.

___________________
(QM-Supervisor)