Operating Instructions

VZ Series

VZ 30/50/110/140/180
VZ 110G/140G/180G

Liquid Ring Vacuum Pumps

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Issue: 02/2010
Supersedes issue: 01/2010
Doc./ Item no.: 1096.0806
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1 Important basic information

These operating instructions form part of the technical documentation of the system in accordance with the EC machinery directive.

These operating instructions comply with machinery directive 2006/42/EC of the European Parliament and the Council on the approximation of the laws, regulations and administrative provisions of the Member States relating to machinery, Appendix I, Paragraph 1.7.4.

These operating instructions are addressed to the person in charge of the plant, who is obliged to provide them to the staff responsible for system set-up, connection, operation and maintenance.

He must ensure that all information included in the operating instructions and the enclosed documents have been read and understood.

The operating instructions must be kept at a designated and easily accessible place and consulted at the slightest doubt.

The manufacturer does not accept liability for damage to persons, animals, objects or the system itself incurred by improper use, non-observance or incomplete observance of the safety precautions included in these operating instructions or by modifications to the system or use of improper spare parts.

These operating instructions are the exclusive copyright of Speck Pumpen Vakuumtechnik GmbH

Scope of supply

- Liquid ring vacuum pump
- Operating instructions
- Motor (optional)
- Coupling / coupling guard (optional)
- Base plate (optional)
- Accessories (optional):
  - separator
  - gas ejector
  - ball check valves
  - vacuum check valve
  - drainage valve

Technical support address

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Warranty and liability

Generally, the “General Conditions of Sale and Delivery” of Speck Pumpen Vakuumtechnik GmbH apply. They were provided to the operator at the time of contract conclusion at the latest.

Warranty and liability claims arising from personal injury and material damage are excluded if one of the following conditions applies:

- improper use of the liquid ring vacuum pump
- improper mounting, commissioning, operation and maintenance of the liquid ring vacuum pump
- operation of the liquid ring vacuum pump despite defective safety devices
- non-observance of the notes in the operating instructions
- unauthorized constructional changes to the liquid ring vacuum pump
- inadequate maintenance, repair and servicing measures
- catastrophic events caused by foreign bodies or acts of God

These operating instructions are the form part of the pump/aggregate.

- apply to all series mentioned herein.
- describe safe and proper operation during all operational phases.
- must be stowed safely throughout the entire service life of the machine.
- must be handed over to future owners of the machine.

-
1.1 Target groups

<table>
<thead>
<tr>
<th>Target group</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator</td>
<td>► Keep these instructions available at the location of the system, also for later consultation.</td>
</tr>
<tr>
<td></td>
<td>► Advise staff to read and observe these instructions and the provided documents, particularly the safety precautions and warnings.</td>
</tr>
<tr>
<td></td>
<td>► Observe additional provisions and regulations related to the system.</td>
</tr>
<tr>
<td>Qualified staff, assembler</td>
<td>► Read, observe and adhere to these operating instructions and all applicable documents, particularly the safety precautions and warnings.</td>
</tr>
</tbody>
</table>

Tab. 1 Target groups and their tasks

1.2 Applicable documents

<table>
<thead>
<tr>
<th>Document</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATEX additional instructions</td>
<td>Operation in potentially explosive areas (only applicable to pumps designed for use in potentially explosive areas)</td>
</tr>
<tr>
<td>Declaration of conformity</td>
<td>Conformity with standards</td>
</tr>
</tbody>
</table>

Tab. 2 Applicable documents
1.3 Warnings and symbols

<table>
<thead>
<tr>
<th>Warning</th>
<th>Security level</th>
<th>Consequences of non-observance</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANGER</td>
<td>imminently hazardous situation</td>
<td>death, severe personal injuries</td>
</tr>
<tr>
<td>WARNING</td>
<td>potentially hazardous situation</td>
<td>death, severe personal injuries</td>
</tr>
<tr>
<td>CAUTION</td>
<td>potentially dangerous situation</td>
<td>minor personal injuries</td>
</tr>
<tr>
<td>CAUTION</td>
<td>potentially dangerous situation</td>
<td>material damage</td>
</tr>
</tbody>
</table>

Tab. 3 Warnings and consequences of non-observance

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Safety sign" /></td>
<td>Safety sign</td>
</tr>
<tr>
<td></td>
<td>► Observe all measures marked with the safety sign to avoid personal injuries or death.</td>
</tr>
<tr>
<td><img src="image" alt="Safety sign" /></td>
<td>Safety sign</td>
</tr>
<tr>
<td></td>
<td>► Observe all measures marked with the safety sign to avoid personal injuries or death by electric shock.</td>
</tr>
<tr>
<td><img src="image" alt="Instruction for action" /></td>
<td>Instruction for action</td>
</tr>
<tr>
<td>1., 2., …</td>
<td>Multi-step instruction for action</td>
</tr>
<tr>
<td><img src="image" alt="Pre-requisite" /></td>
<td>Pre-requisite</td>
</tr>
<tr>
<td><img src="image" alt="Cross-reference" /></td>
<td>Cross-reference</td>
</tr>
<tr>
<td><img src="image" alt="Information, note" /></td>
<td>Information, note</td>
</tr>
</tbody>
</table>

Tab. 4 Symbols and meaning

1.4 Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump</td>
<td>Liquid ring vacuum pump without drive, components or accessories</td>
</tr>
<tr>
<td>Aggregate</td>
<td>Complete liquid ring vacuum pump including pump, drive, components and accessories</td>
</tr>
<tr>
<td>Auxiliary operating systems</td>
<td>Devices for operating the vacuum pump aggregate</td>
</tr>
<tr>
<td>Separator</td>
<td>Device for separating gaseous from liquid media</td>
</tr>
<tr>
<td>Gas ejector</td>
<td>Device for operating the vacuum pump aggregate for deep vacuum</td>
</tr>
<tr>
<td>Vacuum check valve</td>
<td>Device for limiting the created vacuum</td>
</tr>
<tr>
<td>Drainage valve</td>
<td>Device for limiting the filling level in the vacuum pump</td>
</tr>
</tbody>
</table>

Tab. 5 Terminology and meaning
2  Safety

2.1  Intended use

• Observe all provisions included in the operating instructions.
• Observe all safety instructions.
• Comply with inspection and maintenance intervals.
• Use the aggregate exclusively for delivery of the permissible media to be pumped (General technical data, page 32).
• Operate the pump/aggregate with permissible operating liquid only (General technical data, page 32).
• Prevent dry running:
  – The sealing rings of the mechanical seals will be damaged within only few seconds.
  – Ensure that the pump/aggregate is only operated with sufficient operating liquid, never without operating liquid.
• Prevent cavitation:
  – Install a vacuum check valve.
  – Comply with the temperature limits of the operating liquid and the medium to be pumped.
  – Observe the limit values for inlet pressure and pressure difference.
  – Do not operate the pump when the fitting in the suction pipe is closed.
• Prevent overheating:
  – Do not operate the pump/aggregate when fittings are closed.
• Prevent motor damage:
  – Observe the maximum flow rate for delivery of liquids.
  – Observe the switching frequency of the aggregate.
  – The motor protection switch must not be set to a value above nominal current.
• Any use other than the intended use must be agreed with the manufacturer.

2.2  Potential misuse

• Observe the operating limits of the pump/aggregate concerning temperature, pressure, speed, density and viscosity (Operating limits, page 30).
• The higher the density of the operating liquid, the higher the motor power consumption. Observe the permissible density to protect the aggregate against overload.
• When delivering solid laden liquids, observe the solid content limit values (General technical data, page 32).
• Do not combine multiple limit values (Operating limits, page 30).
• Prevent sudden pressure changes of the gas to be extracted.
• Prevent sudden temperature changes of the gas to be extracted or operating liquid.
• Do not use in rooms where explosive gases may be present unless the pump/aggregate has been expressly intended for such purpose.
• Do not extract, deliver or compact explosive, inflammable, aggressive or toxic media unless the aggregates have been expressly intended for such purpose.
• Unauthorized opening of the pump/aggregate results in the forfeiture of any and all claims for defects.

2.3  General safety instructions

2.3.1  Product safety

The pump/aggregate has been designed in accordance with state-of-the-art technology and the generally acknowledged rules on safety. Yet, operation of this pump/aggregate may present a threat to the life or physical health of the user or third parties and impair the pump/aggregate and other property.

• Only operate the pump/aggregate in a technically flawless condition and in accordance with the provisions, safety precautions and warnings included in these operating instructions.
• Keep these operating instructions as well as all supplied documents complete and legible and ensure that they can be accessed by staff at all times.
• Refrain from any operating methods which may put staff or uninvolved third parties at risk.
• In case of defects having safety implications: shut down the pump/aggregate immediately and consult the person in charge to rectify the defect.
• In addition to the overall documentation, all legal or other safety and accident prevention regulations as well as all applicable standards and guidelines of the respective country of operation must be observed.

2.3.2  Obligations of the operator

2.3.2.1  Safety-conscious working

• Only operate the pump/aggregate in a technically flawless condition and in accordance with the provisions, safety precautions and warnings included in these operating instructions.
• Ensure and verify compliance with:
  – intended use
  – legal or other safety and accident prevention regulations
  – safety regulations applying to handling hazardous substances
  – applicable standards and guidelines of the respective country of operation
• Provide for protective equipment.

2.3.2.2  Staff qualification

• Ensure that staff involved in pump/aggregate operation has read and understood these operating instructions and all applicable documents, particularly all safety, maintenance and servicing information, prior to starting work.
• Define clear roles and responsibilities and arrange for staff monitoring.
• All works must only be carried out by technically qualified staff:
  – assembly, servicing, maintenance works
  – works on electrical equipment
• Staff undergoing training must only work on the pump/aggregate under the supervision of technically qualified staff.
### 2.3.2.3 Safety devices

- Provide for the following safety devices and ensure their proper functioning:
  - for hot, cold and moving parts: on-site protection against contact with the pump/aggregate
  - when electrostatic charging is likely to occur: provide for grounding

### 2.3.2.4 Warranty

- During the warranty period, conversion works, repairs and modifications are subject to approval by the manufacturer.
- Use original parts or parts approved by the manufacturer only.

### 2.3.3 Obligations of the staff

- Notes attached to the pump/aggregate must be observed and kept legible, e.g. arrows indicating the direction of rotation, symbols indicating fluid connections.
- Guards for protection against contact with hot, cold and moving parts must not be removed during operation.
- If required, use protective equipment.
- Do not expose parts of the body to the vacuum.
- Works on the pump/aggregate must only be carried out at standstill.
- Prior to carrying out any assembly or maintenance works, de-energize the motor and protect it against restart.
- Having completed all works on the pump/aggregate, duly re-assemble the safety devices.

### 2.4 Residual risks

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>① Long and loose hair may become entangled in the protective covers of the motor and the shaft coupling.</td>
</tr>
</tbody>
</table>
| ① The rotating pump shaft between the bearing bracket and the shaft sealing casing may catch and wind up long and loose hair.  
  ➤ Wear a hairnet |
| ① Risk of injuries caused by flying objects, which were inserted in the openings of the motor fan cover or in the openings of the coupling protection.  
  ➤ Do not insert any objects! |
| ① Risk of burns/scalds when getting in contact with hot surfaces or hot media!  
  ➤ Do not touch!  
  ➤ Wear protective gloves! |
| ① Risk of injuries caused by operating liquid escaping from a defective mechanical seal!  
  ➤ Shut down the pump!  
  ➤ Repair the pump! |

### 2.5 Special risks

#### 2.5.1 Potentially explosive area

- (⇒ ATEX additional instructions)
3 Design and functioning

3.1 Marking

3.1.1 Nameplate

Fig. 1 Nameplate (example)

1 Pump type
2 Plant number

3.1.2 ATEX plate

Fig. 2 ATEX plate (example)

1 Explosion protection classification

3.1.3 Pump type code

Fig. 3 Pump type code (example)

1 Series
2 Size
3 Type
4 Mechanical seal
5 Material design code
6 Counting number

3.2 General description

The vacuum pumps of the VZ series are horizontal, two-stage liquid ring vacuum pumps with radial suction/pressure connection. The internal control of the media to be pumped is realized by means of inter casings.

The VZ 30/50/110/140/180 types are vacuum pump aggregates. The electrical drive (1) is modularly screwed to the vacuum pump. The extended motor shaft (3) of machines in close coupled version simultaneously serves as pump shaft (3). A maintenance-free mechanical seal (2) in the shaft sealing casing is used to seal the shaft.
The VZ 110G/140G/180G types are vacuum pumps in base plate version. The electrical drive is connected to the vacuum pump shaft via a coupling.

The pump shaft (1) is supported by sealed deep groove ball bearings (3) on both sides. Usually, pump and motor are mounted onto one base plate. Two maintenance-free mechanical seals (2) in the shaft sealing casings are used to seal the pump shaft (1).

The vacuum pumps of the VZ series are able to deliver low liquid flow rates. The discharged operating liquid can be re-used when using a separator.

### 3.3 Design and functional principle

The vacuum pump is operated in accordance with the liquid ring principle. The impeller is positioned off-centre in the cylindrical pump casing. It transfers the drive power to a liquid ring, which forms concentrically to the casing when the vacuum pump is started.

The gaseous medium remaining in the casing is distributed around the impeller due to the lower density in the hub area. As the impeller is positioned off-centre to the casing, the available space for the gas between the surface of the liquid and the hub becomes crescent-shaped.

This way, the remaining space for the gas between the blades expands and shrinks during each rotation.

### 3.4 Shaft sealings

#### 3.4.1 Mechanical seal

- Mechanical seals may slightly leak for functional reasons.
  - Single mechanical seal, not pressure-relieved, dependent on the direction of rotation, EN 12756 (standard).
  - Double-acting mechanical seal, not pressure-relieved, independent of the direction of rotation (special version VZ 110G/140G/180G).
4 Transport, storage and disposal

The following accident prevention regulations have to be observed prior to following transport and handling regulations:
- BGV D8 winches, lifting and pulling devices
- BGV D6 load lifting devices

4.1 Transport

Observe weight data (→ Weight, page 32)

4.1.1 Unpacking and inspection on delivery

1. Unpack the pump/aggregate on delivery and inspect it for transport damage.
2. Report any transport damage to the manufacturer immediately.
3. Dispose of packaging material according to local regulations.

4.1.2 Manual transport

<table>
<thead>
<tr>
<th>Type</th>
<th>Sex</th>
<th>Age</th>
<th>Rate per shift</th>
<th>Rate per shift</th>
<th>Rate per shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting</td>
<td>Men</td>
<td>- 16</td>
<td>20</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17 - 19</td>
<td>35</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 - 45</td>
<td>55</td>
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<td>25</td>
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<td></td>
<td>&gt; 45</td>
<td>50</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Lifting</td>
<td>Women</td>
<td>- 16</td>
<td>13</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>13</td>
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<td>8</td>
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<td>15</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 45</td>
<td>13</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Carrying</td>
<td>Men</td>
<td>- 16</td>
<td>20</td>
<td>13</td>
<td>-</td>
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<tr>
<td>Carrying</td>
<td>Women</td>
<td>- 16</td>
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<td>9</td>
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<td></td>
<td>&gt; 45</td>
<td>13</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Lifting and</td>
<td>Expectant</td>
<td>10 (5)</td>
<td>5 (legal draft)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>carrying</td>
<td>mothers</td>
<td>(legal draft)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Bavarian State Office for Occupational Safety, Occupational Medicine and Safety Technology

Tab. 6 Maximum weights for manual lifting

- Suitable lifting gear and means of transport must be used for components exceeding the max. weights!
4.2 Storage

Pumps/aggregates treated by the factory have been provided with an anticorrosive coating. When properly stored indoors, the pump/aggregate is protected for a maximum of 3 months. In case of longer storage periods, the pump/aggregate has to be treated with a preserving agent again (\textit{\(\rightarrow\) 4.3 Preservation}).

For storing pumps/aggregates which have already been in use the preparations specified in Section 4.3 Preservation must be made.

Applied preserving agents (\textit{\(\rightarrow\) page 34})

\textbf{CAUTION}

Risk of material damage caused by improper storage!

\begin{itemize}
  \item Lift the pump/aggregate accordingly.
  \item Store the pump/aggregate accordingly.
  \begin{itemize}
    \item Close all openings with blank flanges, plugs or plastic covers.
    \item Make sure the storage room meets the following conditions:
    \begin{itemize}
      \item dry
      \item frost-free
      \item vibration-free
      \item protected
      \item constant humidity
    \end{itemize}
    \item Turn the pump shaft once per month.
    \item Make sure the pump shaft and bearing change their rotational position in this process.
  \end{itemize}
\end{itemize}

4.3 Preservation

\begin{itemize}
  \item Lift the pump/aggregate accordingly.
  \item Use appropriate collecting trays. For the position of drainage bores (\(U_u, U_{u1}\)), refer to the dimension drawing (\textit{\(\rightarrow\) Dimension drawing, page 35 et seq.)
  \begin{itemize}
    \item Unscrew the screw plugs of all drainage bores (\(U_u, U_{u1}\)).
    \item Drain the operating liquid (water).
    \item Occasionally rotate the pump shaft/motor shaft towards the direction of rotation of the pump.
    \item Continue with this process until no more liquid escapes.
    \item Plug all drainage bores with screw plugs.
    \item Remove the pipes from the suction, pressure and process water connections.
    \item Plug the outlet nozzle and the process water connection by means of blank flanges.
    \item Fill in preserving agent into the open inlet nozzle. Observe the filling volumes (\textit{\(\rightarrow\) Filling volumes preservation, page 34}).
    \item Plug the inlet nozzle with a blank flange.
    \item Switch the aggregate shortly on and off to allow for a proper distribution of the preserving agent.
    \item Unscrew the screw plugs of all drainage bores (\(U_u, U_{u1}\)) and the operating liquid connection (\(U_h\)).
    \item Drain the preserving agent into collecting trays.
    \item Occasionally rotate the pump shaft/motor shaft towards the direction of rotation of the pump.
    \item Continue with this process until no more preserving agent escapes.
    \item Close the suction, pressure and operating liquid connection (\(U_h\)) using transport or sealing covers.
    \item Plug all drainage bores (\(U_u, U_{u1}\)) with screw plugs.
  \end{itemize}
\end{itemize}
4.3.2 Preservation outside the system

**CAUTION**
Risk of material damage caused by improper preservation!

Shut down the pump/aggregate
(⇒ Shut-down, page 20;⇒ Return to manufacturer, page 22).

1. Use appropriate collecting trays. For the position of drainage bores (U_e, U_e1), refer to the dimension drawing (⇒ Dimension drawing, page 35 et seq.)
   - Plug all drainage bores (U_e, U_e1) with screw plugs.
   - Close the operating liquid connection (U_B) using a blank flange.
   - Fill in preserving agent into the open inlet or outlet nozzle until the agent becomes visible. Observe the filling volumes (⇒ Filling volumes preservation, page 34).
   - Occasionally rotate the pump shaft/motor shaft towards the direction of rotation of the pump.
   - Continue this process until the preserving agent appears approx. 50 mm below the upper edge of the inlet/outlet nozzle.
   - Unscrew the screw plugs of all drainage bores (U_e, U_e1) and the operating liquid connection (U_B).
   - Drain the preserving agent into collecting trays.
   - Occasionally rotate the pump shaft/motor shaft towards the direction of rotation of the pump.
   - Continue with this process until no more preserving agent escapes.
   - Close the suction, pressure and operating liquid connection (U_B) using transport or sealing covers.
   - Plug all drainage bores (U_e, U_e1) with screw plugs.

4.4 Removing preserving agent

1. Use cleaning agents which are appropriate for your respective application.
2. Rinse off preserving agent and collect it together with the rinsing agent.
3. Dispose of preserving agent according to local regulations.
4. For storage periods exceeding 6 months:
   - Replace elastomer components made of EP rubber (EPDM).
   - Check all elastomer components (O-rings, shaft sealings) for proper elasticity and replace if required.

4.5 Disposal

**WARNING**
Risk of intoxication and environmental damage caused by media to be pumped!

- Prior to disposing the pump/aggregate:
  - Collect escaping media to be pumped and dispose of separately in accordance with local regulations.
  - Neutralize residues of media to be pumped in the pump/aggregate.
  - Remove preserving agent (⇒ page 13)
  - Disassemble plastic parts and dispose of in accordance with local regulations.

- Assign an authorized company to dispose of the pump/aggregate to prevent the risk of environmental damage!
5 Set-up and connection

For pumps/aggregates in potentially explosive areas (ATEX additional instructions)

**CAUTION**
Risk of material damage caused by contamination!
- Do not remove transport locks until immediately before setting up the pump/aggregate.
- Do not remove covers, transport and sealing caps until immediately before connection of the pipes to the pump/aggregate.

5.1 Preparing set-up

5.1.1 Checking ambient conditions
- Make sure the required ambient conditions are maintained (Ambient conditions, page 33).
- For pump-aggregate set-up at an altitude of > 1000 m above sea level, consult the manufacturer.

5.1.2 Minimum clearances for heat dissipation
Observe the minimum clearances (Minimum clearances for heat dissipation, page 33).

5.1.3 Preparing installation site
- Make sure the installation site meets the following conditions:
  - the pump/aggregate is freely accessible from all sides
  - sufficient space for installing/disassembling the pipes as well as for maintenance and repair works, particularly for installation/disassembly of the pump/aggregate and the motor, is provided for
  - the pump/aggregate is not exposed to external vibrations (bearing damage)
  - frost protection

5.1.4 Preparing foundation and surface
- Set-up options:
  - with concrete foundation
  - with steel foundation frame
  - without foundation
- Make sure foundation and surface meet the following conditions:
  - level
  - clean (free of oil, dust or other contaminations)
  - load carrying capacity is in accordance with the dead weight of the aggregate and all operating forces
  - adequate aggregate stability
  - with concrete foundation:
    - standard concrete of strength class B 25

5.1.5 Removing preserving agent
- If the pump/aggregate is commissioned directly after set-up and connection: remove preserving agent prior to set-up (Removing preserving agent, page 14).

5.2 Set-up with foundation

- Only possible with base plate.

**CAUTION**
Risk of material damage caused by distortion of the base plate!
- Position and fix the base plate on the foundation as follows.

5.2.1 Set-up with foundation
1. Lift the aggregate (Transport, page 11).
2. Hook the foundation bolts from below into the base plate fixing holes.
3. Place the aggregate on the foundation. Insert the foundation bolts into the provided anchoring holes.

4. Use steel washers to align the aggregate to height and system dimensions as follows:
   - Place 1 steel washer (2) at the left and right hand side of each foundation bolt (1).
   - With > 750 mm clearances between the anchoring holes, an additional steel washer (3) must be positioned in the middle of each side of the base plate.
5. Make sure the steel washers are in surface contact with the base plate.
6. Use the integrated spirit level to check whether the aggregate is level end to end and side to side with a maximum allowable tilt of 1 mm/m.
7. Repeat this process until the base plate has been correctly aligned.

5.2.2 Fixing aggregate
- Filling the base plate with mortar grout improves the dampening behaviour.
1. Fill the anchoring holes with mortar grout.
2. When the mortar grout has set, bolt down the base plate with the specified torque at three points (Tightening torques, page 33).
3. Before tightening the remaining bolts, compensate for any unevenness in the surface using metal spacing shims next to each bolt.
4. Make sure the base plate is not distorted.
5.3 Set-up without foundation

With base plate

- Hexagon nut
- Levelling foot

Fig. 11 Set-up without foundation

1. Lift the aggregate (→ Transport, page 11).
2. Mount the four levelling feet as illustrated.
3. Position the aggregate on the surface.
4. Adjust the base plate height by means of the levelling feet as illustrated above:
   - Use the wrench to hold the hexagon nut at the levelling foot (3).
   - Loosen the hexagon nut (1).
   - The height can be adjusted by turning the hexagon nut (2).
   - Tighten the hexagon nut (1) (→ Tightening torques, page 33).
   - Use the integrated spirit level to check whether the aggregate is level end to end and side to side with a maximum allowable tilt of 1 mm/m.
   - Repeat this process until the base plate has been correctly aligned.

5.4 Set-up on torsion-resistant level surface/frame

Installation position: horizontal, inlet and outlet nozzle pointing vertically up.

VZ 30/50:

- Hexagon nut
- Motor feet

Fig. 12 Set-up of VZ 30/50

1. Lift the aggregate (→ Transport with lifting gear, page 11).
2. Position the aggregate on the surface/frame.
3. Screw the aggregate to the surface/frame in a stress-free manner.

5.5 Installing motor

Only necessary if aggregate set-up is completed at the installation site (VZ 110G/140G /180G).

CAUTION
Risk of material damage caused by knocks and bumps!

- Do not tilt the coupling halves when slipping them on.
- Do not knock on or hit any pump components.

1. Apply a razor-thin layer of molybdenum disulfide (e.g. Molykote®) to the pump and motor shaft.
2. Insert the fitting keys.
3. Without mounting rig:
   - Remove the rubber buffers
   - Heat the coupling halves to approx. 100 °C
4. Slip on the pump and motor-side coupling halves until the shaft end is flush with the coupling hub.
   - Make sure to keep the required clearance between the coupling halves (→ Fine adjustment of coupling, page 17).
5. Tighten the grub screws on both coupling halves.
6. Lift the motor and put it down on the base plate.
7. Adjust the motor shaft to the height of the pump shaft using suitable shims for the motor.
8. Screw in and slightly tighten the motor screws (→ Motor adjustment, page 17).
5.6 Planning pipe system

5.6.1 Dimensioning supports and connections

**CAUTION**
Risk of material damage if the pipes apply excessive forces and torques to the pump/aggregate!
► Make sure the permissible values are complied with (→ DIN ISO 9908).

1. Calculate the piping forces and observe all operating conditions:
   - cold/warm
   - empty/filled
   - depressurized/pressurized
   - position changes
2. Make sure the pipe supports have permanent low-friction properties and do not seize up due to corrosion.
3. If required, provide for pipe compensators.

5.6.2 Specifying nominal diameter

1. Nominal suction pipe diameter ≥ nominal suction connection diameter
2. Nominal pressure pipe diameter ≥ nominal pressure connection diameter.

5.6.3 Specifying pipe lengths

1. Dimension the suction, pressure and operating liquid pipes as short as possible.
2. Increase the pipe cross-sections when using long suction, pressure and operating liquid pipes.
   ► The pressure pipe must not rise more than 1 m vertically or diagonally upwards.

5.6.4 Changes in cross-section and direction

1. Avoid radii of curvature of less than 1.5 times the nominal pipe diameter.
2. Avoid sudden changes of cross-section and direction along the piping.

5.6.5 Safety and control devices

5.6.5.1 Avoiding contamination

1. Integrate filters in the suction pipe.
2. Install a differential pressure gauge with contact manometer to monitor the contamination process.

5.6.5.2 Avoiding backflow

► Install a ball check valve between the suction pipe and the suction connection of the pump to prevent operating liquid from flowing back into the suction pipe after pump/aggregate shut-down.

5.6.5.3 Isolating and shutting off pipes

► For maintenance and repair works
► Provide for shut-off devices in the suction, pressure and operating liquid pipes.

5.6.5.4 Provisions for measuring operating conditions

1. Provide for manometers in the suction and pressure pipe to allow for pressure measuring.
2. Provide for a power sensor at the motor side.

5.7 Connecting pipes

5.7.1 Providing for clean piping

**CAUTION**
Risk of material damage caused by pump/aggregate contamination!
► Make sure the inside of the pump/aggregate is kept free of contamination.

1. Clean all piping parts and fittings prior to assembly.
2. Make sure no flange seals project inwards.
3. Make sure no sealing material (Teflon tape, adhesive) projects inwards.
4. Remove any blank flanges, plugs, protective foils and/or protective paint from the flanges.

5.7.2 Installing suction pipe

1. Remove the transport and sealing covers from the pump/aggregate.
2. Avoid air pockets: Lay out the pipes with a continuous slope down to the pump/aggregate.
3. Make sure no seals project inwards.
4. Make sure no sealing material (Teflon tape, adhesive) projects inwards.
5. Install a ball check valve in the suction pipe to prevent operating liquid from flowing into the suction pipe at standstill.

5.7.3 Installing pressure pipe

1. Remove the transport and sealing covers from the pump/aggregate.
2. Install the pressure pipe.
3. The pressure pipe must not rise more than 1 m vertically or diagonally upwards.
4. Avoid liquid-filled bags (siphon): Lay out the pipes with a continuous slope from the vacuum pump/vacuum pump aggregate.
5. Make sure no seals project inwards.
6. Make sure no sealing material (Teflon tape, adhesive) projects inwards.

5.7.4 Stress-free pipe connections

For the layout of piping, observe VDMA standard sheet 24277 on stress-free pipe connections.
5.8 Fine adjustment of coupling

Only for VZ 110G/140G/180G

CAUTION
Risk of material damage caused by improper coupling adjustment!
► Accurately adjust the motor to the pump in case of height, lateral or angular offset.
► For detailed information and special couplings: (⇒ Manufacturer's specifications).

5.8.1 Checking coupling adjustment

Auxiliary means, tools, material:
- feeler gauge
- straightedge
- dial gauge (possible with couplings with spacer)
- other suitable tools, e.g. laser adjustment tool

1 Gage
2 Straightedge
Fig. 14 Checking coupling adjustment

1. Coupling protection has been disassembled.
2. Take the measurements at the circumference of the coupling in two planes with a 90° offset.
3. Check the light gap towards the outer diameter using a straightedge (1):
   - Position the straightedge over both coupling halves.
   - Adjust the motor if you detect a light gap at the outer diameter (⇒ Motor adjustment, page 17).
4. Check the gap size using a feeler gauge (2):
   - Permissible gap size (⇒ Dimension drawing, page 35 et seq.).
   - Use a feeler gauge to measure the gap (A) between the coupling halves.
   - If the measured gap size is impermissible, adjust the motor (⇒ Motor adjustment, page 17).
5. Install the coupling protection.

5.9 Motor adjustment

1. Adjust the motor in a way which ensures that the coupling halves are accurately aligned and use adjustment shims if required.
2. Check the motor adjustment.
3. Repeat the adjustment process if height or angular offset have not yet been fully compensated.
4. Then, tighten the motor screws.

5.10 Electrical connection

Risk of death from electric shock!
► Any electrical works must be carried out by qualified electricians only.
► Observe the IEC 30364 (DIN VDE 0100) and for potentially explosive areas the IEC 60079 (DIN VDE 0165) standard.

DANGER
Risk of death from rotating parts!
► Make sure to only operate the pump/aggregate with all covers (fan hood) installed.

5.10.1 Motor connection

Observe the specifications of the motor manufacturer.
1. Connect the motor in accordance with the circuit diagram.
2. Exclude any risk associated with electric power.
3. Install an Emergency-Stop button.

5.10.2 Checking direction of rotation

DANGER
Risk of death from rotating parts!
► Use protective equipment when carrying out any works on the pump/aggregate.
► Keep an adequate distance to rotating parts.

CAUTION
Risk of material damage caused by dry running or incorrect direction of rotation!
► Fill the pump/aggregate with operating liquid up to the middle of the shaft (⇒ Filling, page 18).

1. Switch the motor on and immediately off again.
2. Check whether the direction of rotation of the motor is in accordance with the arrow indicating the direction of rotation on the pump/aggregate.
3. In case of deviating direction of rotation: Swap the two phases.
6 Operation

For pumps/aggregates in potentially explosive areas (ATEX additional instructions)

6.1 Preparations for commissioning

6.1.1 Identifying pump type
► Identify the pump/aggregate type (Nameplate, page 9).
① Pump/aggregate types vary, e.g. with regard to material, suction capacity, type of shaft sealing, auxiliary operating systems.

6.1.2 Removing preserving agent
① Only required for treated pumps/aggregates.
► Remove preserving agent (Removing preserving agent, page 14).

6.1.3 Checking shut-down period
► Shut-down periods > 1 year: contact the manufacturer and ask for required measures.
► Shut-down periods < 1 year: take all steps as required for commissioning (Commissioning, page 18).

6.1.4 Filling
1. Remove the screw plug from port U (Dimension drawing, page 35 et seq.).
2. Fill the pump/aggregate with operating liquid (water) maximally up to the middle of the shaft.
3. When operating liquid escapes from port U, stop the filling process.
4. Screw the screw plug into port U (Dimension drawing, page 35 et seq.).
5. Open the suction-side fitting.
6. Open the pressure-side fitting.
7. Make sure all ports and connections are tight.

6.2 Commissioning

6.2.1 Switch-on
✓ Pump/aggregate correctly set up and connected
✓ Motor correctly set up and connected
✓ Coupling adjustment checked (VZ 110G/140G/180G)
✓ All connections are stress-free and sealed
✓ If available: auxiliary operating systems ready for operation
✓ All safety devices installed and checked for proper functioning
✓ Pump/aggregate correctly prepared and filled

DANGER
Risk of injuries caused by running pump/aggregate!
► Do not touch a running pump/aggregate.
► Do not carry out any works while the pump/aggregate is in operation.
6.2.2 Switch-off

**WARNING**

Risk of injuries caused by vacuum or harmful media to be pumped and operating liquid!

- Use protective equipment when carrying out any works on the pump/aggregate.

1. Close the fitting at the operating liquid side.
2. Switch off the motor.
3. Open the ventilation port (if available), fitting.
4. Check all connecting screws and tighten if required (only after initial commissioning).

6.3 Setting the operating liquid flow rate

6.3.1 Continuous-flow cooling

- Switch on the aggregate.
- Set the pressure in the operating liquid pipe to max. 0.2 bar overpressure (Diagram Fig. 15)

6.3.2 Open circulation cooling

- Switch on the aggregate.
- Set the pressure in the operating liquid pipe to max. 0.2 bar overpressure (Diagram Fig. 16, 17, 18)

- Observe the permissible operating liquid temperature (Operating liquid, page 32)
6.3.3 Closed circulation cooling

► Switch on the aggregate.
► Set the pressure in the operating liquid pipe to a value which is 0.1 bar smaller than the compression pressure (Diagram Fig. 19)

► Observe the permissible operating liquid temperature (Operating liquid, page 32)

Fig. 19 Closed circulation cooling

Tab. 7 Legend of symbols

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Suction connection</td>
</tr>
<tr>
<td>L</td>
<td>Ventilation port</td>
</tr>
<tr>
<td>D</td>
<td>Pressure connection</td>
</tr>
<tr>
<td>A</td>
<td>Overflow</td>
</tr>
<tr>
<td>U</td>
<td>Circulation liquid</td>
</tr>
<tr>
<td>F</td>
<td>Fresh liquid</td>
</tr>
<tr>
<td>VK</td>
<td>Feed-in cooling agent</td>
</tr>
<tr>
<td>RK</td>
<td>Return cooling agent</td>
</tr>
<tr>
<td>TIC</td>
<td>Temperature</td>
</tr>
<tr>
<td>PIC</td>
<td>Pressure</td>
</tr>
<tr>
<td>LIC</td>
<td>Filling level</td>
</tr>
</tbody>
</table>

Tab. 8 Measures to be taken when putting the pump out of operation

<table>
<thead>
<tr>
<th>Vacuum pump is</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>shut down while remaining ready for operation</td>
<td>▶ Shortly operate (approx. 5 minutes) the pump at intervals of at least one month but not exceeding 3 months (Commissioning, page 18).</td>
</tr>
<tr>
<td>shut down for a longer period of time</td>
<td>▶ Implement measures in accordance with the condition of the operating liquid (Table 8 Measures depending on the behaviour of the operating liquid).</td>
</tr>
<tr>
<td>drained</td>
<td>▶ Close all fittings.</td>
</tr>
<tr>
<td>disassembled</td>
<td>▶ Disconnect the motor from the power supply and secure it against unauthorized switch-on.</td>
</tr>
<tr>
<td>stored</td>
<td>▶ Observe the measures to be implemented for storage (Storage, page 12)</td>
</tr>
</tbody>
</table>

Tab. 9 Measures depending on the behaviour of the operating liquid

<table>
<thead>
<tr>
<th>Operating liquid</th>
<th>Duration of shut-down (process-dependent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short</td>
</tr>
<tr>
<td>Water</td>
<td>▶ Drain pump/aggregate and separator.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Other media</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.4 Decommissioning

⚠️ WARNING
Risk of injuries caused by vacuum or harmful media to be pumped and operating liquid!
► Use protective equipment when carrying out any works on the pump/aggregate.
► Reliably collect escaping media to be pumped and dispose of in an environmentally-friendly way.

6.5 Re-commissioning

Shut-down periods > 1 year:
1. Prepare commissioning (Preparations for commissioning, page 18).
2. Perform commissioning procedures (Commissioning, page 18).
3. Monitor the vacuum pump/vacuum pump aggregate following commissioning (Monitoring, page 21).

6.6 Operating stand-by aggregate

✔ Stand-by pump/aggregate filled

Operate the stand-by aggregate at least once per week.
7 Maintenance and servicing

- For pumps/aggregates in potentially explosive areas (⇒ ATEX additional instructions).
- A qualified service team provides support for assembly and repair works. Provide a certificate documenting the safety of the media to be pumped (DIN safety data sheet or certificate of conformity when ordering this service (⇒ Certificate of conformity, page 41).

7.1 Monitoring

- Inspection intervals depend on the operational strain on the pump/aggregate.

RISK OF ELECTRIC SHOCK

Risk of death from electric shock!
- Any electrical works must be carried out by qualified electricians only.
- Observe the IEC 30364 (DIN VDE 0100) and for potentially explosive areas the IEC 60079 (DIN VDE 0165) standard.

DANGER

Risk of injuries caused by running pump/aggregate!
- Do not touch a running pump/aggregate.
- Do not carry out any works on the running aggregate.

WARNING

Risk of injuries caused by vacuum and harmful media to be pumped and operating liquid!
- Use protective equipment when carrying out any works on the pump/aggregate.

1. Check at appropriate intervals:
   - deposits on pump, aggregate and separator (if available)
   - compliance with the operating liquid flow rate
   - compliance with the operating liquid temperature
   - compliance with the max. permissible compression pressure
   - compliance with the limit values applicable to the delivery of liquids
   - power consumption of the drive
   - contamination of the drive
   - contamination of filters (if available)
   - running noise of the rolling bearings (VZ 110G/140G/180G/motors)
   - normal operating conditions unchanged
   - wear on elastic coupling elements (only VZ 110G/140G/180G)

2. For trouble-free operation, ensure the following:
   - no dry running
   - no leaks
   - no cavitation
   - open gate valves at the suction side
   - free and clean filters
   - no unusual running noise or vibrations
   - no impermissible leaks at the shaft sealing
   - proper functioning of the auxiliary operating systems (if available)

3. Check shaft sealing:
   - Mechanical seals are maintenance-free sealing systems.
     - In case of leaks: Have the mechanical seal with auxiliary seals replaced by service staff or the manufacturer. Have auxiliary operating systems (if available) checked for proper functioning.

7.2 Rinsing off contaminations

DANGER

Risk of injuries caused by hot, harmful or environmentally hazardous media to be pumped!
- Do not rinse when delivering harmful or environmentally hazardous media with the aggregate.
- Use protective equipment when carrying out any works on the pump/aggregate.

7.2.1 Minor fine-grained contamination

1. Switch on the pump/aggregate.
2. Remove the screw plugs Ue (⇒ Dimension drawing, page 35 et seq.).
3. Collect contamination and escaping operating liquid and dispose of in an environmentally-compatible way.
4. Screw in the screw plugs.

7.2.2 Major fine-grained contamination

- Replace screw plugs Ue by fittings.
- Close fittings before switching on the pump/aggregate.
- Fill the pump/aggregate with operating liquid up to the middle of the shaft.
1. Switch on the pump.
2. Open the fittings for drainage.
3. Collect contamination and escaping operating liquid and dispose of in an environmentally-compatible way.
7.3 Preventing calcification

Calcification results in excessive wear of moistened pump parts and increases the power consumption of the drive.

![Equilibrium curve](image)

- Operating liquid: water
- Water temperature 17 °C
- pH value and carbonate hardness should intersect at a point which lies max. 0.2 above the equilibrium curve to avoid deposits and excessive corrosion in the vacuum pump/vacuum pump aggregate.
- Treat the operating liquid with a suitable agent.

7.4 Disassembly

**DANGER**

- Do not touch a running pump/aggregate.
- Do not carry out any works while the pump/aggregate is in operation.
- Prior to carrying out any assembly or maintenance works, de-energize the motor and protect it against restart.

**RISK OF ELECTRIC SHOCK**

- Any electrical works must be carried out by qualified electricians only.
- Observe the IEC 30364 (DIN VDE 0100) and for potentially explosive areas the IEC 60079 (DIN VDE 0165) standard.

**WARNING**

- Use protective equipment when carrying out any works on the pump/aggregate.
- Make sure the pump/aggregate is depressurized.
- After having drained the pump, reliably collect operating liquid and media to be pumped and dispose of in an environmentally-compatible way.

7.4.1 Return to manufacturer

- Pump/aggregate shut down.
- Pump/aggregate depressurized.
- Pump completely drained.
- Electrical connections isolated and motor secured against re-start.
- Auxiliary operating systems shut down, depressurized and drained (if available).
- Connecting line disassembled.
- Manometer lines, manometer and fixtures removed.

1. Loosen fixing screws.
2. Lift the pump/aggregate out of the system (→ Transport, page 11).
3. Decontaminate pump/aggregate.
4. Attach transport and sealing cover.
5. Send a certificate of conformity to the manufacturer. If required, request a certificate of conformity from the manufacturer.

7.4.2 Spare parts

- Spare parts are available from your supplier or the manufacturer.

The following data are required for spare part orders.

- Number of the pump/aggregate (→ Nameplate, page 9).
- Type of pump/aggregate (→ Nameplate, page 9).
- Item number of spare part (→ Cross-sectional drawing, page 36 et seq.).
- Designation of spare part (→ Cross-sectional drawing, page 36 et seq.).
- Number of spare parts.

7.4.3 Pump/aggregate repairs

1. The following must be observed during assembly:
   - Worn parts must be replaced by original spare parts.
   - Remove the old seals and insert new ones in a distortion-proof manner.
   - The required tightening torques must be observed (→ Tightening torques, page 33).
2. Clean all parts.
3. Install the pump/aggregate into the system (→ Set-up and connection, page 14).
7.4.4 Disassembly of VZ 30/50

Cross-sectional drawing VZ 30/50 (→ page 36)
✓ The aggregate has been removed from the system and is positioned in a clean and level assembly area.

1. Disassembly of suction casing
   - Position the aggregate on the fan hood.
   - Loosen the screws (914) on the suction casing (106).
   - Take off the suction casing (106).

2. Disassembly of inter casings, stage casings and impellers
   - Remove the inter casing (137).
   - Remove the O-ring (412).
   - Remove the stage casing (110).
   - Pull the impeller (230) off the motor shaft.
   - Remove the fitting key (940.1) from the motor shaft.
   - Remove the inter casing (137.1).
   - Remove the O-ring (412).
   - Remove the stage casing (110.1).
   - Pull the impeller (230.1) off the motor shaft.
   - Remove the fitting key (940) from the motor shaft.
   - Remove the inter casing (137.2).
   - Remove the O-ring (412).

3. Disassembly of discharge casing
   - Loosen the nuts (920) on the motor flange.
   - Pull off the discharge casing (107).

4. Disassembly of mechanical seal
   - Pull the rotating unit of the mechanical seal (047) off the motor shaft.
   - Pull the spacer ring (504) off the motor shaft.
   - Loosen the hexagon head screws (901) on the motor flange.
   - Remove the O-ring (412).
7.4.7 Preparations for assembly

**CAUTION**
Improper assembly results in pump/aggregate damage!

- Assemble the pump/aggregate in accordance with the principal rules of mechanical engineering.
- Use original spare parts only.
- For pump/aggregate assembly, consult the corresponding cross-sectional drawing.
- Assemble the pump/aggregate in a clean and level assembly area.

The following must be observed during assembly:
- Replace seals.
- Install only clean parts.
- Install only inspected and flawless parts.
- Keep the sliding surfaces of the mechanical seal free of dirt and grease.
- Observe the specified tightening torques (→ Tightening torques, page 33).

Please verify that the spring of mechanical seal 047 is always right-handed while that of mechanical seal 047.1 is left-handed (→ refer to Fig. 21 and 22).

---

7.4.8 Assembly of VZ 30/50

1. Installation of mechanical seal with rotating unit
   - Position the motor on the fan hood.
   - Push the spacer ring (504) onto the motor shaft.
   - Moisten the auxiliary seal of the rotating unit (047) with lubricant (grease containing PTFE).
   - Push the rotating unit (047) onto the motor shaft by a screwing movement in the sense of winding of the spring.

2. Pre-assembly of discharge casing
   - Screw the stud bolts (902) into the discharge casing (107).

3. Installation of mechanical seal, stationary unit
   - Moisten the auxiliary seal of the stationary unit with lubricant (alcohol, water).
   - Manually push the stationary unit (047) into the discharge casing (107).

4. Installation of discharge casing
   - Adjust the discharge casing (107) (pressure connection opposite the motor foot), force it onto the motor flange and fasten (550, 920).
   - Push the cylindrical pin (562) into the small bore on the discharge casing (107).

5. Installation of inter casings, stage casings and impellers
   - Screw the inter casing (137.2) into the discharge casing (107).
   - The flushing hole in the inter casing must be positioned above the flushing channel in the discharge casing (107).
   - Insert an O-ring (412) into the discharge casing (107).
   - Push the fitting key (940) into the motor shaft.
   - Push the impeller (230.1) onto the motor shaft.
   - The impeller blades must be tilted in the direction of rotation.
   - Force the stage casing (110.1) into the discharge casing (107).
   - Push the cylindrical pin (562) into the bore of the stage casing (110.1).
   - Insert the inter casing (137.1) into the stage casing (110.1).
   - Insert an O-ring (412) into the stage casing (110.1).
   - Push the fitting key (940.1) into the motor shaft.
   - Push the impeller (230) onto the motor shaft.
   - The impeller blades must be tilted in the direction of rotation.
   - Force the stage casing (110) into the stage casing (110.1).
   - Push the cylindrical pin (562) into the bore of the stage casing (110.1).
   - Insert the inter casing (137) into the stage casing (110).
   - Insert an O-ring (412) into the stage casing (110).

6. Installation of suction casing
   - Adjust the suction casing (106) (suction connection opposite the motor foot) and force it into the stage casing (110).
   - For gas ejector operation, a guide plate (170) has to be placed inside the suction casing.
   - Plug screws (914) into the suction casing (106) and fasten it to the discharge casing (107).
   - Screw in all screw plugs (903) with new seals.
   - Put the aggregate on the motor feet.
   - Verify unobstructed movement of the aggregate. Rotate the fan wheel.
7.4.9 Assembly of VZ 110/140/180

1. Installation of mechanical seal with rotating unit
   - Position the motor on the fan hood.
   - Push the spacer sleeve (525) onto the motor shaft.
   - Moisten the auxiliary seal of the rotating unit (047) with lubricant (grease containing PTFE).
   - Push the rotating unit (047) onto the motor shaft by a screwing movement in the sense of winding of the spring.

2. Installation of mechanical seal with stationary unit
   - Moisten the auxiliary seal of the stationary unit with lubricant (alcohol, water).
   - Manually push the stationary unit (047) into the suction casing (106).

3. Installation of suction casing
   - Force the suction casing (106) onto the motor flange. Adjust the suction connection in parallel with the terminal box of the motor and screw it to the motor flange (550, 901).
   - For gas ejector operation, a guide plate (170) has to be placed inside the suction casing.
   - Push the cylindrical pin (562) into the bore of the suction casing (106).

4. Installation of inter casings, stage casings and impellers
   - Insert the inter casing (137) into the suction casing (106).
   - Insert an O-ring (412) into the suction casing (106).
   - Push the fitting key (940) into the motor shaft.
   - Push the impeller (230) onto the motor shaft.
   - The impeller blades must be tilted in the direction of rotation.
   - Force the stage casing (110) into the suction casing (106).
   - Push the cylindrical pin (562) into the bore of the stage casing (110).
   - Insert the inter casing (137.1) into the stage casing (110).
   - Insert an O-ring (412) into the stage casing (110).
   - Push the fitting key (940.1) into the motor shaft.
   - Push the impeller (230.1) onto the shaft.
   - The impeller blades must be tilted in the direction of rotation.
   - Force the stage casing (110.1) into the stage casing (110).
   - Push the cylindrical pin (562) into the bore of the stage casing (110.1).
   - Insert the inter casing (137.2) into the stage casing (110.1).
   - Insert an O-ring (412) into the stage casing (110.1).

5. Installation of discharge casing
   - Force the discharge casing (107) into the stage casing (110.1). Adjust the feet of the discharge/suction casing in parallel.
   - Plug screws (901.1) into the discharge casing (107) and screw it to the suction casing (106).
   - Insert an O-ring (412.1) into the discharge casing.
   - Force the bearing cover (360) into the discharge casing, adjust it and fasten it to the discharge casing by means of screws (914).
   - Screw in all screw plugs (903.3) with new seals.
   - Put the aggregate on the pump feet.
   - Verify unobstructed movement of the aggregate. Rotate the fan wheel.

7.4.10 Assembly of VZ 110G/140G/180G

1. Installation of mechanical seal (047) with rotating unit
   - Push the washer (550) onto the drive side of the pump shaft (211).
   - Moisten the auxiliary seal of the rotating unit (047) with lubricant (grease containing PTFE).
   - Push the rotating unit (047) onto the pump shaft by a screwing movement in the sense of winding of the spring.

2. Installation of mechanical seal (047) with stationary unit
   - Moisten the auxiliary seal of the stationary unit with lubricant (alcohol, water).
   - Manually press the stationary unit (047) into the shaft sealing casing (411).

3. Installation of bearing at the drive side
   - Vertically clamp the pump shaft (211) - drive side pointing up - between the protective jaws of a bench vice.
   - Push the shaft sealing casing (411) onto the pump shaft.
   - Press-fit the deep groove ball bearing (320) into the bearing housing (330).
   - Push the bearing housing (330) and the deep groove ball bearing onto the pump shaft (211).
   - Fasten the locking ring (360) to the pump shaft (211).
   - Centre the bearing cover (360.1) on the bearing housing (330) and adjust it.
   - Insert screws into the bearing cover (360.1) and fasten the bearing cover (360.1) to the bearing housing (330).
   - Push the fitting key (940) into the pump shaft (drive side).

4. Installation of suction casing
   - Position the suction casing (106) horizontally (outside pointing up).
   - Insert the pump shaft (211) into the suction casing (106), centre the shaft sealing casing (441) in the suction casing and adjust it to the bearing housing (330) (opening in the bearing bracket pointing towards the pump foot).
   - Insert the screws (901.2) into the bearing bracket and screw it to the suction casing (106).
   - Rotate the suction casing (106) 180° (drive side of the pump shaft pointing down).
   - Push the grooved pin (561) into the bore of the suction casing (106).

For gas ejector operation, a guide plate (170) has to be placed inside the suction casing.
5. Installation of inter casings, stage casings and impellers
   - Insert the inter casing (137) into the suction casing (106).
   - Insert an O-ring (412) into the suction casing (106).
   - Push the fitting key (940) into the pump shaft.
   - Push the impeller (230) onto the motor shaft.
   - The impeller blades must be tilted in the direction of rotation.
   - Force the stage casing (110) into the suction casing (106).
   - Push the cylindrical pin (562) into the bore of the stage casing (110).
   - Insert the inter casing (137.1) into the stage casing (110).
   - Insert an O-ring (412) into the stage casing (110).
   - Push the fitting key (940.1) into the pump shaft.
   - Push the impeller (230.1) onto the shaft.
   - The impeller blades must be tilted in the direction of rotation.
   - Force the stage casing (110.1) into the stage casing (110).
   - Push the cylindrical pin (562) into the bore of the stage casing (110.1).
   - Insert the inter casing (137.2) into the stage casing (110.1).
   - Insert an O-ring (412) into the stage casing (110.1).

6. Installation of the discharge casing (107)
   - Force the discharge casing (107) into the stage casing (110.1).
   - Adjust the feet of the discharge/suction casing in parallel.
   - Plug screws (901.1) into the discharge casing (107) and screw it to the suction casing (106).

7. Installation of mechanical seal (047) with rotating unit
   - Push the washer (550) onto the pump shaft.
   - Moisten the auxiliary seal of the rotating unit (047.1) with lubricant (grease containing PTFE).
   - Push the rotating unit (047.1) onto the pump shaft by a screwing movement in the sense of winding of the spring.

8. Installation of mechanical seal (047) with stationary unit
   - Moisten the auxiliary seal of the stationary unit with lubricant (alcohol, water).
   - Manually push the stationary unit (047.1) into the shaft sealing casing (411).

9. Installation of bearing
   - Insert an O-ring (412.1) into the discharge casing.
   - Force the shaft sealing casing (441) into the discharge casing and adjust.
   - Push the bearing housing (330) onto the shaft sealing casing and adjust.
   - Insert the screws (901.2) into the discharge casing and tighten them.
   - Press-fit the deep groove ball bearing (320) into the bearing bracket (330).
   - Centre the bearing cover (360) on the bearing bracket (330) and adjust it.
   - Insert the screws (901) into the bearing bracket (330) and tighten them.
   - Screw in all screw plugs (903.3) with new seals.
   - Position the pump horizontally.
   - Verify unobstructed movement of the pump. Rotate the pump shaft.
8 Troubleshooting

⚠️ DANGER

Risk of injuries caused by running aggregate!
► Do not touch the running aggregate.
► Do not carry out any works on the running aggregate.
► Prior to carrying out any assembly or maintenance works, de-energize the motor and protect it against restart.

⚠️ RISK OF ELECTRIC SHOCK

Risk of death from electric shock!
► Any electrical works must be carried out by qualified electricians only.
► Observe the IEC 30364 (DIN VDE 0100) and for potentially explosive areas the IEC 60079 (DIN VDE 0165) standard.

⚠️ WARNING

Risk of injuries caused by vacuum and harmful media to be pumped and operating liquid!
► Use protective equipment when carrying out any works on the pump/aggregate.
► Make sure the pump/aggregate is depressurized.
► Drain the pump. Reliably collect operating liquid and media to be pumped and dispose of in an environmentally-compatible way.

If the machine operator is not able to rectify occurring defects himself, he has to call the person responsible for machine maintenance. If the maintenance staff is not able to rectify the defect, the manufacturer has to be informed accordingly. The manufacturer will provide troubleshooting support if he gets a detailed description of the defect.

Technische support address
Speck Pumpen Vakuumtechnik GmbH
Regensburger Ring 6 – 8, 91154 Roth / Germany
PO Box 1453, 91142 Roth / Germany
Phone: +49 (0) 9171 809 0
Fax: +49 (0) 9171 809 10
E-mail: info@speck-pumps.de
Internet: www.speck-pumps.de

<table>
<thead>
<tr>
<th>Defect</th>
<th>Cause</th>
<th>Rectification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor does not start</td>
<td>Motor</td>
<td>Check the power supply, check the motor</td>
</tr>
<tr>
<td>One phase of the power supply is interrupted</td>
<td></td>
<td>Check the power supply</td>
</tr>
<tr>
<td>Two phases of the power supply are interrupted</td>
<td></td>
<td>Check the power supply</td>
</tr>
<tr>
<td>The motor protection switch has tripped</td>
<td></td>
<td>Switch on the motor protection switch</td>
</tr>
<tr>
<td>The motor is blocked</td>
<td></td>
<td>Check the motor</td>
</tr>
<tr>
<td>Pump is blocked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impeller/inter casing is subject to corrosion</td>
<td></td>
<td>Use rust remover to overcome the blockage of the pump</td>
</tr>
<tr>
<td>Ice inside the pump (solidified operating liquid)</td>
<td></td>
<td>Carefully heat up and defrost the pump</td>
</tr>
<tr>
<td>Contaminations or foreign bodies inside the pump</td>
<td></td>
<td>Flush/disassemble the pump, clean it</td>
</tr>
<tr>
<td>Pump calcification</td>
<td></td>
<td>Desccale the pump</td>
</tr>
<tr>
<td>Blocked/defective impeller</td>
<td></td>
<td>Provide for a correct gap size of the inter casing/impeller or replace</td>
</tr>
<tr>
<td>Defective motor bearing</td>
<td></td>
<td>Replace the motor bearing</td>
</tr>
<tr>
<td>Defect</td>
<td>Cause</td>
<td>Rectification</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>--------------------------------------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>Motor protection triggered</td>
<td>Short-circuit in the motor winding</td>
<td>► Check the motor winding</td>
</tr>
<tr>
<td></td>
<td>Motor protection switch has not been</td>
<td>► Check setting/replace the motor protection</td>
</tr>
<tr>
<td></td>
<td>correctly set/ is defective</td>
<td>switch</td>
</tr>
<tr>
<td></td>
<td>Motor overload</td>
<td>► Check/reduce the operating liquid flow rate</td>
</tr>
<tr>
<td></td>
<td>Excessive backpressure in the outlet</td>
<td>► Reduce backpressure</td>
</tr>
<tr>
<td></td>
<td>nozzle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excessive share of liquid in the suction</td>
<td>► Reduce the share of liquid</td>
</tr>
<tr>
<td></td>
<td>flow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blocked suction-side fitting</td>
<td>► Open the suction-side fitting</td>
</tr>
<tr>
<td></td>
<td>Motor or pump blocked</td>
<td>► Motor does not start</td>
</tr>
<tr>
<td></td>
<td>Excessive power consumption of the motor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motor overload</td>
<td>► Check/reduce the operating liquid flow rate</td>
</tr>
<tr>
<td></td>
<td>Excessive backpressure in the outlet</td>
<td>► Reduce backpressure</td>
</tr>
<tr>
<td></td>
<td>nozzle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excessive share of liquid in the suction</td>
<td>► Reduce the share of liquid</td>
</tr>
<tr>
<td></td>
<td>flow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blocked suction-side fitting</td>
<td>► Open the suction-side fitting</td>
</tr>
<tr>
<td></td>
<td>Density/viscosity of the operating liquid</td>
<td>► Use an operating liquid complying with the</td>
</tr>
<tr>
<td></td>
<td>is too high</td>
<td>density recommended in the data sheet. Contact the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>manufacturer</td>
</tr>
<tr>
<td></td>
<td>Impeller rubs against the inter casing</td>
<td>► Disassemble the pump, properly set the inter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>casing/impeller gap size</td>
</tr>
<tr>
<td></td>
<td>Pump contamination/calcification</td>
<td>► Flush/descale/disassemble the pump, clean it</td>
</tr>
<tr>
<td>Pump does not produce vacuum</td>
<td>Lacking operating liquid</td>
<td>► Check the operating liquid supply</td>
</tr>
<tr>
<td></td>
<td>Leak in the suction pipe</td>
<td>► Check/seal the suction pipe and connections</td>
</tr>
<tr>
<td></td>
<td>Wrong direction of rotation of the motor</td>
<td>► Check direction of rotation/swap the 2 phases if</td>
</tr>
<tr>
<td></td>
<td></td>
<td>need be</td>
</tr>
<tr>
<td>Insufficient vacuum</td>
<td>Leaking system</td>
<td>► Check the system, seal leaking spots</td>
</tr>
<tr>
<td></td>
<td>Excessive operating liquid flow rate</td>
<td>► Reduce operating liquid flow rate</td>
</tr>
<tr>
<td></td>
<td>Insufficient operating liquid flow rate</td>
<td>► Increase operating liquid flow rate</td>
</tr>
<tr>
<td></td>
<td>Operating liquid too hot</td>
<td>► Cool down the operating liquid</td>
</tr>
<tr>
<td></td>
<td>Leak in the suction pipe</td>
<td>► Check/seal the suction pipe and connections</td>
</tr>
<tr>
<td></td>
<td>Wrong direction of rotation of the motor</td>
<td>► Check direction of rotation/swap the 2 phases if</td>
</tr>
<tr>
<td></td>
<td></td>
<td>need be</td>
</tr>
<tr>
<td></td>
<td>Motor speed too low</td>
<td>► Increase speed, contact the manufacturer</td>
</tr>
<tr>
<td></td>
<td>Gas or liquid channels subject to</td>
<td>► Descale/disassemble the pump, clean it</td>
</tr>
<tr>
<td></td>
<td>calcification</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal components are subject to wear</td>
<td>► Replace the affected components</td>
</tr>
<tr>
<td></td>
<td>Worn-out control valve</td>
<td>► Replace the control valve</td>
</tr>
<tr>
<td></td>
<td>Worn-out shaft sealing</td>
<td>► Replace the shaft sealing</td>
</tr>
<tr>
<td></td>
<td>Amount of drained liquid too small</td>
<td>► Provide for free drainage of the liquid and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ensure that the connections are not obstructed</td>
</tr>
<tr>
<td></td>
<td>Pump has not been correctly dimensioned</td>
<td>► Replace the pump</td>
</tr>
<tr>
<td>Strange noise</td>
<td>Pump cavitation</td>
<td>► Install an anti-cavitation valve or equip the</td>
</tr>
<tr>
<td></td>
<td>Excessive share of steam in the suction</td>
<td>suction pipe with a ventilation valve</td>
</tr>
<tr>
<td></td>
<td>flow</td>
<td>► Reduce the share of steam or provide for</td>
</tr>
<tr>
<td></td>
<td></td>
<td>condensation upstream the pump</td>
</tr>
<tr>
<td></td>
<td>Suction-side fitting closed (excessive</td>
<td>► Open the suction-side fitting or provide for</td>
</tr>
<tr>
<td></td>
<td>inlet pressure)</td>
<td>cavitation protection</td>
</tr>
<tr>
<td></td>
<td>Excessive operating liquid flow rate</td>
<td>► Reduce operating liquid flow rate</td>
</tr>
<tr>
<td></td>
<td>Excessive speed</td>
<td>► Reduce speed, contact the manufacturer</td>
</tr>
<tr>
<td>Defect</td>
<td>Cause</td>
<td>Rectification</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>------------------------------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>Leaking pump</td>
<td>Defective shaft sealing</td>
<td>▶ Replace the shaft sealing</td>
</tr>
<tr>
<td></td>
<td>Defective casing sealing</td>
<td>▶ Provide the pump with new sealing</td>
</tr>
<tr>
<td></td>
<td>Worn-out casing components</td>
<td>▶ Replace the affected components</td>
</tr>
<tr>
<td></td>
<td>Loosened connecting screws/screw plugs</td>
<td>▶ Tighten the screws, replace the sealing</td>
</tr>
<tr>
<td>Pump does not run smooth</td>
<td>Excessive operating liquid flow rate</td>
<td>▶ Reduce operating liquid flow rate</td>
</tr>
<tr>
<td></td>
<td>Overload in the pipe system</td>
<td>▶ Check the pipe connections/pump fixation</td>
</tr>
<tr>
<td></td>
<td>Air pocket in the pipe</td>
<td>▶ Change the pipe system layout</td>
</tr>
<tr>
<td></td>
<td>Pump distorted/improperly adjusted</td>
<td>▶ Check adjustment/re-adjust</td>
</tr>
<tr>
<td></td>
<td>Resonance vibrations in the pipe system</td>
<td>▶ Check the pipe connections and, if required, use a compensator</td>
</tr>
<tr>
<td></td>
<td>Imbalanced impeller</td>
<td>▶ Balance/replace impeller</td>
</tr>
<tr>
<td></td>
<td>Deposits on the impeller</td>
<td>▶ Clean/replace impeller</td>
</tr>
<tr>
<td></td>
<td>Defective pump or motor bearing</td>
<td>▶ Replace pump or motor bearing</td>
</tr>
</tbody>
</table>

Tab. 10 Troubleshooting
9 Technical data

9.1 Operating limits

- Inlet pressure
- Compression pressure
- Pressure difference
- Medium to be pumped
- Operating liquid
- Speed
- Switching frequency

### VZ 30/50

<table>
<thead>
<tr>
<th>Pressure</th>
<th>[mbar]</th>
<th>Operating liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. inlet pressure</td>
<td>33</td>
<td>Temperature [°C]</td>
</tr>
<tr>
<td>Perm. compression pressure</td>
<td>200</td>
<td>Max. 80</td>
</tr>
<tr>
<td>Perm. pressure difference</td>
<td></td>
<td>Min. -10</td>
</tr>
<tr>
<td></td>
<td>Max.</td>
<td>Density [kg/m³]</td>
</tr>
<tr>
<td></td>
<td>Min.</td>
<td>Max. 1200</td>
</tr>
<tr>
<td>Medium to be pumped</td>
<td></td>
<td>Viscosity [mm²/s]</td>
</tr>
<tr>
<td>Temperature</td>
<td>[°C]</td>
<td>Max. 90</td>
</tr>
<tr>
<td>Dry</td>
<td>160</td>
<td>Speed [min⁻¹]</td>
</tr>
<tr>
<td>Saturated</td>
<td>80</td>
<td>Max. 3500</td>
</tr>
</tbody>
</table>

Tab. 11 Operating limits VZ 30/50

### VZ 110/110G

<table>
<thead>
<tr>
<th>Pressure</th>
<th>[mbar]</th>
<th>Operating liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. inlet pressure</td>
<td>33</td>
<td>Temperature [°C]</td>
</tr>
<tr>
<td>Perm. compression pressure</td>
<td>1500</td>
<td>Max. 100</td>
</tr>
<tr>
<td>Perm. pressure difference</td>
<td></td>
<td>Min. -10</td>
</tr>
<tr>
<td></td>
<td>Max.</td>
<td>Density [kg/m³]</td>
</tr>
<tr>
<td></td>
<td>Min.</td>
<td>Max. 1200</td>
</tr>
<tr>
<td>Medium to be pumped</td>
<td></td>
<td>Viscosity [mm²/s]</td>
</tr>
<tr>
<td>Temperature</td>
<td>[°C]</td>
<td>Max. 90</td>
</tr>
<tr>
<td>Dry</td>
<td>200</td>
<td>Speed [min⁻¹]</td>
</tr>
<tr>
<td>Saturated</td>
<td>100</td>
<td>Max. 1750</td>
</tr>
</tbody>
</table>

Tab. 12 Operating limits VZ 110/110G

### VZ 140/140G

<table>
<thead>
<tr>
<th>Pressure</th>
<th>[mbar]</th>
<th>Operating liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. inlet pressure</td>
<td>33</td>
<td>Temperature [°C]</td>
</tr>
<tr>
<td>Perm. compression pressure</td>
<td>1500</td>
<td>Max. 100</td>
</tr>
<tr>
<td>Perm. pressure difference</td>
<td></td>
<td>Min. -10</td>
</tr>
<tr>
<td></td>
<td>Max.</td>
<td>Density [kg/m³]</td>
</tr>
<tr>
<td></td>
<td>Min.</td>
<td>Max. 1200</td>
</tr>
<tr>
<td>Medium to be pumped</td>
<td></td>
<td>Viscosity [mm²/s]</td>
</tr>
<tr>
<td>Temperature</td>
<td>[°C]</td>
<td>Max. 90</td>
</tr>
<tr>
<td>Dry</td>
<td>200</td>
<td>Speed [min⁻¹]</td>
</tr>
<tr>
<td>Saturated</td>
<td>100</td>
<td>Max. 1750</td>
</tr>
</tbody>
</table>

Tab. 13 Operating limits VZ 140/140G
### VZ 180/180G

<table>
<thead>
<tr>
<th>Pressure</th>
<th>mbar</th>
<th>Operating liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. inlet pressure</td>
<td>33</td>
<td>Temperature</td>
</tr>
<tr>
<td>Perm. compression pressure</td>
<td>1500</td>
<td>Min.</td>
</tr>
<tr>
<td>Perm. pressure difference</td>
<td></td>
<td>Max.</td>
</tr>
<tr>
<td>Max.</td>
<td>1500</td>
<td>Density</td>
</tr>
<tr>
<td>Min.</td>
<td>200</td>
<td>Max.</td>
</tr>
<tr>
<td>Medium to be pumped</td>
<td></td>
<td>Viscosity</td>
</tr>
<tr>
<td>Temperature</td>
<td>[°C]</td>
<td></td>
</tr>
<tr>
<td>Dry</td>
<td>200</td>
<td>Speed</td>
</tr>
<tr>
<td>Saturated</td>
<td>100</td>
<td>Max.</td>
</tr>
</tbody>
</table>
| Tab. 14 Operating limits VZ 180/180G

#### 9.1.1 Media to be pumped
- dry and wet gases which are not explosive, inflammable, aggressive or toxic
- air or air-steam mixtures
  - which are free of solids
  - which contain small amounts of light particulate matters

#### 9.1.2 Operating liquid
- water having a pH value of 6 to 9, free of solids
- for other pH values or operating liquids, please consult the manufacturer

#### 9.1.3 Switching frequency
The max. switching frequency of 20 switching cycles per hour should not be exceeded.
9.2 General technical data

The following data refer to standard values. For deviating data, please consult the manufacturer.

9.2.1 Weight

<table>
<thead>
<tr>
<th>Type</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>VZ 30</td>
<td>31</td>
</tr>
<tr>
<td>VZ 50</td>
<td>34</td>
</tr>
<tr>
<td>VZ 110</td>
<td>92</td>
</tr>
<tr>
<td>VZ 110G</td>
<td>73</td>
</tr>
<tr>
<td>VZ 140</td>
<td>110</td>
</tr>
<tr>
<td>VZ 140G</td>
<td>75</td>
</tr>
<tr>
<td>VZ 180</td>
<td>132</td>
</tr>
<tr>
<td>VZ 180G</td>
<td>85</td>
</tr>
</tbody>
</table>

Tab. 15 Weight

9.2.2 Sound level

<table>
<thead>
<tr>
<th>Type</th>
<th>1m measured surface sound pressure level L [dB (A)] *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 Hz</td>
</tr>
<tr>
<td>VZ 30</td>
<td>60</td>
</tr>
<tr>
<td>VZ 50</td>
<td>60</td>
</tr>
<tr>
<td>VZ 110/110G</td>
<td>65</td>
</tr>
<tr>
<td>VZ 140/140G</td>
<td>65</td>
</tr>
<tr>
<td>VZ 180/180G</td>
<td>65</td>
</tr>
</tbody>
</table>

* Measured surface sound pressure level in acc. with DIN EN ISO 3744, at 1 m distance with average throttling (80 mbar abs.) and connected pipes, tolerance ± 3 dB (A)

Tab. 16 Sound pressure level

9.2.3 Drive power

<table>
<thead>
<tr>
<th>Type</th>
<th>Rated motor power [kW]</th>
<th>Rated motor speed [min⁻¹]</th>
<th>Direction of rotation as seen from the drive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 Hz</td>
<td>60 Hz</td>
<td>50 Hz</td>
</tr>
<tr>
<td>VZ 30</td>
<td>1.1</td>
<td>1.5</td>
<td>2850</td>
</tr>
<tr>
<td>VZ 50</td>
<td>1.5</td>
<td>2.2</td>
<td>2850</td>
</tr>
<tr>
<td>VZ 110/VZ 110G</td>
<td>3.0</td>
<td>4.0</td>
<td>1450</td>
</tr>
<tr>
<td>VZ 140/VZ 140G</td>
<td>4.0</td>
<td>5.5</td>
<td>1450</td>
</tr>
<tr>
<td>VZ 180/VZ 180G</td>
<td>5.5</td>
<td>8.2</td>
<td>1450</td>
</tr>
</tbody>
</table>

Tab. 17 Drive power

9.2.4 Operating liquid

Water
- having a pH value of 6 to 9, free of solids (e.g. sand)
- for deviating pH values or operating liquids, please consult the manufacturer

9.2.4.1 Flow rate

9.2.4.2 Delivery of liquids
- maximum permissible delivery of water via the inlet nozzle

9.2.4.3 Filling volume

<table>
<thead>
<tr>
<th>Type</th>
<th>Flow rate [l/min]</th>
<th>Max. liquid delivery [m³/h]</th>
<th>Filling volume up to middle of the shaft [l]</th>
</tr>
</thead>
<tbody>
<tr>
<td>VZ 30</td>
<td>3.8</td>
<td>0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>VZ 50</td>
<td>4.5</td>
<td>0.18</td>
<td>1.0</td>
</tr>
<tr>
<td>VZ 110/VZ 110G</td>
<td>16</td>
<td>0.6</td>
<td>4.0</td>
</tr>
<tr>
<td>VZ 140/VZ 140G</td>
<td>16</td>
<td>0.6</td>
<td>5.5</td>
</tr>
<tr>
<td>VZ 180/VZ 180G</td>
<td>16</td>
<td>0.6</td>
<td>7.0</td>
</tr>
</tbody>
</table>

Tab. 18 Filling volumes

9.2.5 Medium to be pumped

Gases and vapours
- dry or wet, not explosive, inflammable, aggressive or toxic
- air or air-steam mixtures which are free of solids
- which contain small amounts of light particulate matters

For explosive, inflammable, aggressive or toxic gases and vapours, please consult the manufacturer.
9.2.6 Operating connections

<table>
<thead>
<tr>
<th>Type</th>
<th>Process water connection</th>
<th>Suction connection</th>
<th>Pressure connection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Size</td>
<td>Shape</td>
<td>Size</td>
</tr>
<tr>
<td>VZ 30</td>
<td>G ¼” T</td>
<td>G 1” G</td>
<td>G 1” T</td>
</tr>
<tr>
<td>VZ 50</td>
<td>G ¼” T</td>
<td>G 1” G</td>
<td>G 1” T</td>
</tr>
<tr>
<td>VZ110</td>
<td>G ¼” T</td>
<td>DN 40 F</td>
<td>DN 40 F</td>
</tr>
<tr>
<td>VZ 110G</td>
<td>G ¼” T</td>
<td>DN 40 F</td>
<td>DN 40 F</td>
</tr>
<tr>
<td>VZ 140</td>
<td>G ½” T</td>
<td>DN 40 F</td>
<td>DN 40 F</td>
</tr>
<tr>
<td>VZ 140G</td>
<td>G ½” T</td>
<td>DN 40 F</td>
<td>DN 40 F</td>
</tr>
<tr>
<td>VZ 180</td>
<td>G ½” T</td>
<td>DN 40 F</td>
<td>DN 40 F</td>
</tr>
<tr>
<td>VZ 180G</td>
<td>G ½” T</td>
<td>DN 40 F</td>
<td>DN 40 F</td>
</tr>
</tbody>
</table>

Shape: T = Thread, F = Flange

Tab. 19 Operating connections

9.2.7 Mechanical seal

All pumps offer mechanical seals with integrated flush. Typical features are
- single seal
- not pressure-relieved
- conical spring
- dependent on the direction of rotation

Special versions
- double-acting mechanical seals
- cartridge units

9.2.8 Ambient conditions

Operation under other ambient conditions has to be agreed with the manufacturer.

<table>
<thead>
<tr>
<th>Temperature [°C]</th>
<th>Relative humidity [%]</th>
<th>Set-up altitude above sea level [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5 to +40</td>
<td>≤ 85</td>
<td>≤ 100</td>
</tr>
</tbody>
</table>

Tab. 20 Ambient conditions

9.2.9 Min. clearances for heat dissipation

<table>
<thead>
<tr>
<th>Type</th>
<th>Min. clearance fan hood – adjacent surface [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>VZ 30/50</td>
<td>35</td>
</tr>
<tr>
<td>VZ 110/140/180</td>
<td>55</td>
</tr>
<tr>
<td>VZ 110G/140G/180G</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 21 Min. clearances for heat dissipation

9.3 Tightening torques

The following values apply to new screws and nuts.
- Tighten the screws crosswise by means of a torque wrench.

9.3.1 Tightening torques for screws

<table>
<thead>
<tr>
<th>Size</th>
<th>Property class</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 8</td>
<td>8.8</td>
<td>25</td>
</tr>
<tr>
<td>M 10</td>
<td>8.8</td>
<td>51</td>
</tr>
<tr>
<td>M 12</td>
<td>8.8</td>
<td>89</td>
</tr>
</tbody>
</table>

Tab. 22 Tightening torques for screws

9.3.2 Tightening torques for screws

(Casing material: EN-GJL-250/ CuZn)

<table>
<thead>
<tr>
<th>Size</th>
<th>Property class</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 6</td>
<td>8.8</td>
<td>8.5</td>
</tr>
<tr>
<td>M 8</td>
<td>8.8</td>
<td>12</td>
</tr>
<tr>
<td>M 10</td>
<td>8.8</td>
<td>25</td>
</tr>
<tr>
<td>M 12</td>
<td>8.8</td>
<td>40</td>
</tr>
<tr>
<td>M 16</td>
<td>8.8</td>
<td>90</td>
</tr>
</tbody>
</table>

Tab. 23 Tightening torques for screws in cast-iron casings

9.3.3 Tightening torques for screws

(Casing material 1.4301/ 1.4571)

<table>
<thead>
<tr>
<th>Size</th>
<th>Property class</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 6</td>
<td>A2/ A4</td>
<td>7.3</td>
</tr>
<tr>
<td>M 8</td>
<td>A2/ A4</td>
<td>17.5</td>
</tr>
<tr>
<td>M 10</td>
<td>A2/ A4</td>
<td>35</td>
</tr>
<tr>
<td>M 12</td>
<td>A2/ A4</td>
<td>60</td>
</tr>
<tr>
<td>M 16</td>
<td>A2/ A4</td>
<td>144</td>
</tr>
</tbody>
</table>

Tab. 24 Tightening torques for screws in stainless steel casings
9.3.4 Tightening torques for screw plugs
(Casing material: EN-GJL-250/ CuZn)

<table>
<thead>
<tr>
<th>Size</th>
<th>Property class</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>G 1/8 A</td>
<td>5.8</td>
<td>12</td>
</tr>
<tr>
<td>G 1/4 A</td>
<td>5.8</td>
<td>15</td>
</tr>
<tr>
<td>G 3/8 A</td>
<td>5.8</td>
<td>30</td>
</tr>
<tr>
<td>G 1/2 A</td>
<td>5.8</td>
<td>40</td>
</tr>
<tr>
<td>G ¾ A</td>
<td>5.8</td>
<td>60</td>
</tr>
</tbody>
</table>

Tab. 25 Tightening torques for screw plugs in stainless steel casings

9.3.5 Tightening torques for cylindrical pipe nipples
(Casing material: EN-GJL-250/ CuZn)

<table>
<thead>
<tr>
<th>Size</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>G 1/4 A</td>
<td>30</td>
</tr>
<tr>
<td>G 1/2 A</td>
<td>65</td>
</tr>
<tr>
<td>G 1 A</td>
<td>230</td>
</tr>
</tbody>
</table>

Tab. 26 Tightening torques for cylindrical pipe nipples

9.3.6 Conical pipe fittings
The above specified tightening torques do not apply to conical screw-in threads. Here, tightness is not achieved by using a specific tightening torque but by additional sealing material (e.g. Teflon® tape, adhesive).

9.4 Permissible forces acting on the pump nozzles

<table>
<thead>
<tr>
<th>Size</th>
<th>Torque [Nm]</th>
<th>Force [N]</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 25</td>
<td>75</td>
<td>250</td>
</tr>
<tr>
<td>DN 40</td>
<td>100</td>
<td>320</td>
</tr>
<tr>
<td>DN 50</td>
<td>140</td>
<td>430</td>
</tr>
</tbody>
</table>

Tab. 27 Permissible forces acting on the pump nozzles

9.5 Preserving agents

Rivolta preserving agent (recommended) or comparable products

<table>
<thead>
<tr>
<th>Type of storage</th>
<th>Period of storage [months]</th>
<th>Inside/outside preservation</th>
<th>Repeat inside/outside treatment [months]</th>
</tr>
</thead>
<tbody>
<tr>
<td>in closed, dry and dust-free rooms</td>
<td>1–3</td>
<td>Rivolta K.S.P.130</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>&gt; 3</td>
<td></td>
<td>(⇒ 1.2 Applicable documents, page 4)</td>
</tr>
</tbody>
</table>

Tab. 28 Preserving agents

9.5.1 Preservation filling volumes

<table>
<thead>
<tr>
<th>Type</th>
<th>Filling volume inside system [litre]</th>
<th>Filling volume outside system [litre]</th>
</tr>
</thead>
<tbody>
<tr>
<td>VZ 30</td>
<td>1</td>
<td>approx. 2.4</td>
</tr>
<tr>
<td>VZ 50</td>
<td>1,2</td>
<td>approx. 2.6</td>
</tr>
<tr>
<td>VZ 110/VZ 100 G</td>
<td>3</td>
<td>approx. 8</td>
</tr>
<tr>
<td>VZ 140/VZ 140 G</td>
<td>4,5</td>
<td>approx. 9.5</td>
</tr>
<tr>
<td>VZ 180/VZ 180G</td>
<td>6</td>
<td>approx. 11</td>
</tr>
</tbody>
</table>

Tab. 29 Preservation filling volumes

9.6 Test pressure for pressure test
Use water for the pressure test. The maximum permissible pressure is 3 bar.

9.7 Accessories
Accessories included within the scope of supply are listed on the delivery note.
10 Appendix

The appendix contains:

- dimensions of the individual aggregates (dimension drawings)
- spare parts designation and position (cross-sectional drawings)
- certificate of conformity
- declaration of conformity

10.1 Dimension drawing VZ 30/50

![Dimension drawing VZ 30/50](image)

**Fig. 23** Dimension drawing VZ 30/50

<table>
<thead>
<tr>
<th>Type</th>
<th>Motor size</th>
<th>a</th>
<th>h3</th>
<th>u1</th>
<th>w</th>
<th>z</th>
<th>z2</th>
<th>A</th>
<th>AB</th>
<th>BB</th>
<th>C</th>
<th>H</th>
<th>HA</th>
<th>HD</th>
</tr>
</thead>
<tbody>
<tr>
<td>VZ 30</td>
<td>80</td>
<td>119</td>
<td>160</td>
<td>43</td>
<td>123</td>
<td>196</td>
<td>433</td>
<td>401</td>
<td>125</td>
<td>153</td>
<td>125</td>
<td>50</td>
<td>80</td>
<td>10</td>
</tr>
<tr>
<td>VZ 50</td>
<td>90S</td>
<td>159</td>
<td>170</td>
<td>43</td>
<td>123</td>
<td>242</td>
<td>473</td>
<td>441</td>
<td>140</td>
<td>170</td>
<td>155</td>
<td>56</td>
<td>90</td>
<td>11</td>
</tr>
</tbody>
</table>

**Tab. 30** Dimension chart VZ 30/50

<table>
<thead>
<tr>
<th>Designation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>U_e</td>
<td>Operation liquid connection</td>
</tr>
<tr>
<td>U_d</td>
<td>Drainage (screw plug)</td>
</tr>
<tr>
<td>U_L</td>
<td>Ventilation valve connection</td>
</tr>
<tr>
<td>U_V</td>
<td>Drainage valve connection</td>
</tr>
</tbody>
</table>

**Tab. 31** Connections VZ 30/50
### 10.2 Cross-sectional drawing VZ 30/50

![Cross-sectional drawing VZ 30/50](image)

<table>
<thead>
<tr>
<th>No.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>047</td>
<td>Mechanical seal</td>
</tr>
<tr>
<td>106</td>
<td>Suction casing</td>
</tr>
<tr>
<td>107</td>
<td>Discharge casing</td>
</tr>
<tr>
<td>110/.1</td>
<td>Stage casing</td>
</tr>
<tr>
<td>137-.2</td>
<td>Inter casing</td>
</tr>
<tr>
<td>230/.1</td>
<td>Impeller</td>
</tr>
<tr>
<td>411</td>
<td>Sealing ring</td>
</tr>
<tr>
<td>412</td>
<td>O-ring</td>
</tr>
<tr>
<td>504</td>
<td>Spacer ring</td>
</tr>
<tr>
<td>550</td>
<td>Washer</td>
</tr>
<tr>
<td>561</td>
<td>Grooved pin</td>
</tr>
<tr>
<td>562</td>
<td>Cylindrical pin</td>
</tr>
<tr>
<td>902</td>
<td>Stud bolt</td>
</tr>
<tr>
<td>903</td>
<td>Screw plug</td>
</tr>
<tr>
<td>914</td>
<td>Hexagon head socket screw</td>
</tr>
<tr>
<td>920</td>
<td>Hexagon nut</td>
</tr>
<tr>
<td>940/.1</td>
<td>Fitting key</td>
</tr>
<tr>
<td>970</td>
<td>Nameplate</td>
</tr>
</tbody>
</table>

Tab. 32 Parts list VZ 30/50
### 10.3 Dimension drawing VZ 110/140/180

**Diagram:**
![Dimension drawing VZ 110/140/180](image)

**Tab. 33 Dimensions VZ 110/140/180**

<table>
<thead>
<tr>
<th>Type</th>
<th>Hz</th>
<th>Motor size</th>
<th>a</th>
<th>m1</th>
<th>m2</th>
<th>z</th>
<th>z2</th>
<th>AD</th>
<th>LB</th>
</tr>
</thead>
<tbody>
<tr>
<td>VZ 110</td>
<td>50/60</td>
<td>100L</td>
<td>239</td>
<td>333</td>
<td>299</td>
<td>659</td>
<td>592</td>
<td>155</td>
<td>303</td>
</tr>
<tr>
<td>VZ 140</td>
<td>50/60</td>
<td>112M</td>
<td>269</td>
<td>363</td>
<td>329</td>
<td>715</td>
<td>648</td>
<td>168</td>
<td>329</td>
</tr>
<tr>
<td>VZ 180</td>
<td>50/60</td>
<td>132S</td>
<td>339</td>
<td>433</td>
<td>399</td>
<td>835</td>
<td>769</td>
<td>188</td>
<td>379</td>
</tr>
</tbody>
</table>

**Tab. 34 Connections VZ 110/140/180**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>U₉</td>
<td>Operation liquid connection</td>
</tr>
<tr>
<td>U₉c</td>
<td>Cavitation protection</td>
</tr>
<tr>
<td>U₉s</td>
<td>Drainage (screw plug)</td>
</tr>
<tr>
<td>U₉l</td>
<td>Ventilation valve connection</td>
</tr>
<tr>
<td>U₉m</td>
<td>Manometer connection</td>
</tr>
<tr>
<td>U₉s3</td>
<td>Sensor connection</td>
</tr>
<tr>
<td>U₉v</td>
<td>Drainage valve connection</td>
</tr>
</tbody>
</table>

---

**Fig. 25** Dimension drawing VZ 110/140/180
10.4 Cross-sectional drawing VZ 110/140/180

<table>
<thead>
<tr>
<th>No.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>047</td>
<td>Mechanical seal</td>
</tr>
<tr>
<td>106</td>
<td>Suction casing</td>
</tr>
<tr>
<td>107</td>
<td>Discharge casing</td>
</tr>
<tr>
<td>110/.1</td>
<td>Stage casing</td>
</tr>
<tr>
<td>137-.2</td>
<td>Inter casing</td>
</tr>
<tr>
<td>230/.1</td>
<td>Impeller</td>
</tr>
<tr>
<td>360</td>
<td>Bearing cover</td>
</tr>
<tr>
<td>411-.3</td>
<td>Sealing ring</td>
</tr>
<tr>
<td>412/.1</td>
<td>O-ring</td>
</tr>
<tr>
<td>525</td>
<td>Spacer sleeve</td>
</tr>
<tr>
<td>550</td>
<td>Washer</td>
</tr>
<tr>
<td>561</td>
<td>Grooved pin</td>
</tr>
<tr>
<td>562</td>
<td>Cylindrical pin</td>
</tr>
<tr>
<td>901/.1</td>
<td>Hexagon head screw</td>
</tr>
<tr>
<td>903-.3</td>
<td>Screw plug</td>
</tr>
<tr>
<td>914</td>
<td>Hexagon socket head screw</td>
</tr>
<tr>
<td>940/.1</td>
<td>Fitting key</td>
</tr>
<tr>
<td>970</td>
<td>Nameplate</td>
</tr>
</tbody>
</table>

Tab. 35 Parts list VZ 110/140/180
### 10.5 Dimension drawing VZ 110G/140G/180G

**Fig. 27** Dimension drawing VZ 110G/140G/180G

<table>
<thead>
<tr>
<th>Designation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_b$</td>
<td>Operation liquid connection</td>
</tr>
<tr>
<td>$U_c$</td>
<td>Cavitation protection</td>
</tr>
<tr>
<td>$U_e/U_{e1}$</td>
<td>Drainage (screw plug)</td>
</tr>
<tr>
<td>$U_v$</td>
<td>Ventilation valve connection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Designation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_m$</td>
<td>Manometer connection</td>
</tr>
<tr>
<td>$U_b$</td>
<td>Sensor connection</td>
</tr>
<tr>
<td>$U_v$</td>
<td>Drainage valve connection</td>
</tr>
</tbody>
</table>

Tab. 36 Connections VZ 110G/140G/180G
10.6 Cross-sectional drawing VZ 110G/140G/180G

Fig. 28 Cross-sectional drawing VZ 110G/140G/180G

<table>
<thead>
<tr>
<th>No.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>047/.1</td>
<td>Mechanical seal</td>
</tr>
<tr>
<td>106</td>
<td>Suction casing</td>
</tr>
<tr>
<td>107</td>
<td>Discharge casing</td>
</tr>
<tr>
<td>110/.1</td>
<td>Stage casing</td>
</tr>
<tr>
<td>137-.2</td>
<td>Inter casing</td>
</tr>
<tr>
<td>211</td>
<td>Shaft</td>
</tr>
<tr>
<td>230/.1</td>
<td>Impeller</td>
</tr>
<tr>
<td>320</td>
<td>Rolling bearing</td>
</tr>
<tr>
<td>330</td>
<td>Bearing housing</td>
</tr>
<tr>
<td>360/.1</td>
<td>Bearing cover</td>
</tr>
<tr>
<td>411-.3</td>
<td>Sealing ring</td>
</tr>
<tr>
<td>412/.1</td>
<td>O-ring</td>
</tr>
<tr>
<td>441</td>
<td>Shaft sealing casing</td>
</tr>
<tr>
<td>550</td>
<td>Washer</td>
</tr>
<tr>
<td>561</td>
<td>Grooved pin</td>
</tr>
<tr>
<td>561.1</td>
<td>Dowel pin</td>
</tr>
<tr>
<td>901-.2</td>
<td>Hexagon head screw</td>
</tr>
<tr>
<td>903-.3</td>
<td>Screw plug</td>
</tr>
<tr>
<td>932</td>
<td>Locking ring</td>
</tr>
<tr>
<td>940-.2</td>
<td>Fitting key</td>
</tr>
</tbody>
</table>

Tab. 37 Parts list VZ 110G/140G/180G
### 10.7 Certificate of conformity

- Please copy this form and return it to the manufacturer together with the pump/pump aggregate.

#### Certificate of conformity

<table>
<thead>
<tr>
<th>Designation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Serial number:</td>
<td></td>
</tr>
</tbody>
</table>

- □ has not been in contact with hazardous substances.
- □ has been used in the area of application of: ________________________________
- □ and has been in contact with the following harmful substances or substances subject to mandatory labelling:

<table>
<thead>
<tr>
<th>Trade name</th>
<th>Chemical designation</th>
<th>Properties (e.g. toxic, inflammable, caustic)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- □ The pump/aggregate has been completely drained, flushed and cleaned both inside and outside in accordance with the operating instructions.
- □ Further handling of the pump/aggregate does not require special safety precautions.
- □ The following safety precautions must be observed when handling the pump/aggregate:

  __________________________________________________________
  __________________________________________________________
  __________________________________________________________

- □ Safety data sheets in accordance with national regulations are enclosed.

#### Legally binding statement

We herewith certify that all data given above are correct and complete and that I, the undersigned, am in a position to confirm this. We acknowledge our liability towards the contractor for any damage arising from incomplete or incorrect data. We agree to hold harmless the contractor against damage claims of third parties due to incomplete or incorrect data. We know that, independent of this statement, we have to take direct liability towards third parties, which particularly refers to the staff of the contractor responsible for handling, repair and maintenance.

<table>
<thead>
<tr>
<th>City, date:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company stamp:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature:</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 38 Certificate of conformity
10.8 Declaration of conformity

**EG - Konformitätserklärung**

**EC declaration of conformity**

**Déclaration "CE" de conformité**

im Sinne der EG-Richtlinie Maschinen 2006/42/EG, Anhang I A
as defined in machinery directive 2006/42/EEC, annex I A
conformément à la directive "CE" relative aux machines 2006/42 CEE, annexe I A
Hiermit erklären wir, dass das Pumpenaggregate
We hereby declare that the pump unit
par la présente nous déclarons que le type de pompe

**Bauart:** V 1 / V 6 / V18 / V15

**type** V / VM / VG / VN / VZ 30 – 180 / VGI

VUVH 26-80
VUVH 80-1600 / VZ110G - VZ180G

in der gelieferten Ausführung, folgenden einschlägigen Bestimmungen entspricht:
corresponds to the following relevant provisions / correspond aux dispositions pertinentes suivantes:

- EG-Maschinenrichtlinie 2006/42/EG
  - machinery directive 2006/42/EEC / directive "CE" relative aux machines 2006/42
  - Die Schutzziele der Niederspannungsrichtlinie werden gemäß Anhang I, Nr. 1.5.1 der
    Maschinenrichtlinie 2006/42/EG eingehalten.
    - The protection objectives of the low-voltage directive are realized according annex I, No. 1.5.1
    - of the EC-Machinery directive 2006/42/EG
    - Les objectifs de protection de la directive basse-tension sont respectés conformément
    - à l'annexe I, n° 1.5.1. de la directive "CE" relatives aux machines 2006/42/EG
  - Elektromagnetische Verträglichkeit – Richtlinie 2004/108/EG
  - Electromagnetic compatibility – directive 2004/108/EG
  - Compatibilité électromagnétique – directive 2004/108/EG

Angewendete harmonisierte Normen, insbesondere
harmonized standards applied, in particular / normes harmonisées utilisées, notamment

- DIN EN 809
- EN ISO 14121-1
- DIN EN 60334-1

Bei einer mit uns nicht abgestimmten technischen Änderung der oben genannten Bauarten, verliert diese
Erklärung ihre Gültigkeit.
If the above mentioned series are technically modified without our approval, this declaration shall no longer be applicable.
Si les gammes mentionnées ci-dessus sont modifiées sans notre approbation, cette déclaration perdra sa validité.

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen ist:
Authorized representative for the compilation of the technical documentation:
Mandataire pour le complément de la documentation technique est:

Roth, 29.12.2009
Ort, Datum
place, date

ppa. Dr.-Ing Pierre Hähre
(Unterschrift Ug. Konstruktion)
(signature Technical Director)

Herbert Mader
SPECK PUMPE
Vakuumpumptechnik GmbH
Regensburger Ring 8-8
91154 Roth

Formblatt: 0231V
Artikel-Nr.: 1096.0196
Erstellt: T. Haennisch
Geprüft: Dr.-Ing. P. Hähre
Stand: 29.12.2009