Operating Instructions

V and VG Series

V-6/30/55/95/130/155/255/330/430
VG-30/55/95/130/155/255
Liquid Ring Vacuum Pumps

English translation of original operating instructions

CE Documentation

It is imperative to read the operating instructions prior to commissioning!

This document as well as all documents included in the appendix is not subject to any update service!

Subject to technical changes.

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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.

CE

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 instructions

- 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.

Scope of supply

- Liquid ring vacuum pump (closed coupled version)
- Operating Instructions
- 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

1.1 Target groups

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

Tab. 1 Target groups and their tasks

1.2 Applicable documents

Document	Purpose
ATEX additional instructions	Operation in potentially explosive areas (only applicable to vacuum pumps designed for use in potentially explosive areas)
Declaration of conformity	Conformity with standards

Tab. 2 Applicable documents

1.3 Warnings and symbols

Warning	Security level	Consequences of non-observance
DANGER	imminently hazardous situation	death, severe personal injuries
WARNING	potentially hazardous situation	death, severe personal injuries
CAUTION	potentially dangerous situation	minor personal injuries
CAUTION	potentially dangerous situation	material damage

Tab. 3 Warnings and consequences of non-observance

Symbol	Meaning
	Safety sign ► Observe all measures marked with the safety sign to avoid personal injuries or death.
	Safety sign ► Observe all measures marked with the safety sign to avoid personal injuries or death by electric shock.
►	Instruction for action
1. , 2. , …	Multi-step instruction for action
✓	Pre-requisite
→	Cross-reference
ⓘ	Information, note

Tab. 4 Symbols and meaning

1.4 Terminology

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

Tab. 5 Terminology and meaning

2 Safety

ⓘ The manufacturer does not accept liability for damage resulting from non-observance of the overall documentation.

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 31).
- Operate the aggregate with permissible operating liquid only (→ General technical data, page 31).
- Observe the operating limits (→ Operating limits, page 29).
- Prevent dry running:
  - The sealing rings of the mechanical seals will be damaged within only few seconds.
  - Ensure that the 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 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 aggregate concerning temperature, pressure, speed, density and viscosity (→ Operating limits, page 29).
- 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 31).
- Do not combine multiple limit values (→ Operating limits, page 29).
- 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 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 aggregate results in the forfeiture of any and all claims for defects.

2.3 General safety instructions

ⓘ The following provisions must be observed prior to executing any works.

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 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 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 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 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 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.
- All warranty and damage claims will expire in case of non-observance of these operating instructions.

2.3.3 Obligations of the staff

- Notes attached to the 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 aggregate must only be carried out at stand-still.
- Prior to carrying out any assembly or maintenance works, de-energize the motor and protect it against restart.
- Having completed all works on the aggregate, duly re-assemble the safety devices.

2.4 Residual risks

⚠ WARNING

Long and loose hair may become entangled in the protective covers of the motor and the shaft coupling.

► Wear a hairnet!

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!

Risk of burns/scalds when getting in contact with hot surfaces or hot media!

► Do not touch!

► Wear protective gloves!

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)

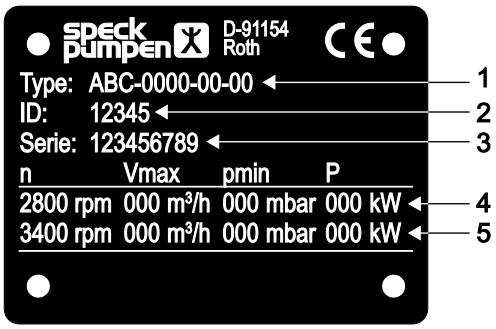
2.5.2 Dangerous media to be pumped

- When dealing with dangerous media to be pumped (e.g. hot, inflammable, explosive, toxic, hazardous to health), observe the safety regulations applying to handling hazardous substances.
- Use protective equipment when carrying out any works on the aggregate.

3 Design and functioning

3.1 Marking

3.1.1 Nameplate



1 Type designation

2 Item identification number (pump / aggregate)

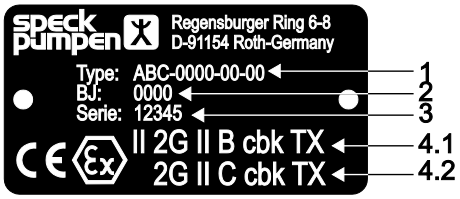
3 Serial number

4 Delivery data at 50 Hz
Nominal speed
Maximum suction volume
Minimum inlet pressure
Power requirements

5 Delivery data at 60 Hz
Nominal speed
Maximum suction volume
Minimum inlet pressure
Power requirements

Fig. 1 Nameplate (example)

3.1.2 ATEX plate



1 Type designation

2 Year of manufacture

3 Serial number

4.1 Explosion protection mark: aggregate inside
4.2 Explosion protection mark: aggregate outside

Fig. 2 ATEX plate (example)

3.1.3 Pump type code

	V	155	55
1			
2			
3			

1 Series

2 Size

3 Material design code

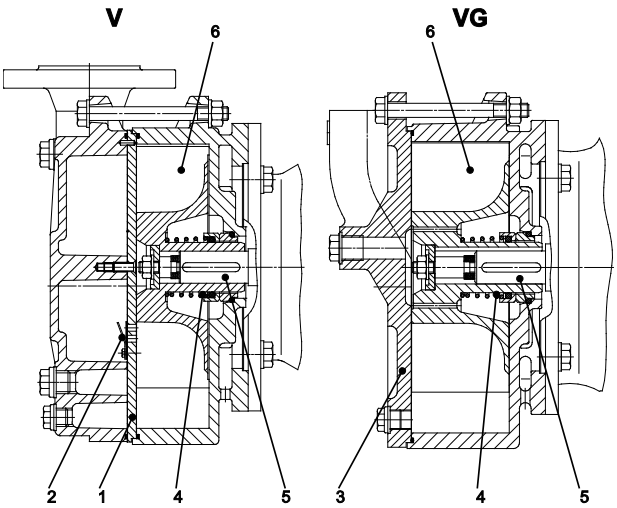
Tab. 6 Pump type code (example)

3.2 General description

The pumps of the V/VG series are horizontal, single-stage liquid ring vacuum pumps with radial inlet and outlet. In pumps of the V series, the internal control of the gas to be pumped is realized by means of inter casings (1) with control slots and additional valve technology (2). In pumps of the VG series, the internal control of the gas is only realized by means of the control slots of the inter casing (3) integrated in the pump cover.

The electrical drive is modularly screwed to the pump (aggregate). A maintenance-free mechanical seal (4) in the shaft sealing casing is used to seal the shaft.

The aggregates of the V/VG series are able to deliver low liquid flow rates. The discharged operating liquid can be re-used when using a separator.



1 Inter casing

2 Valves

3 Pump cover with integrated inter casing

4 Mechanical seal

5 Motor/pump shaft

6 Impeller

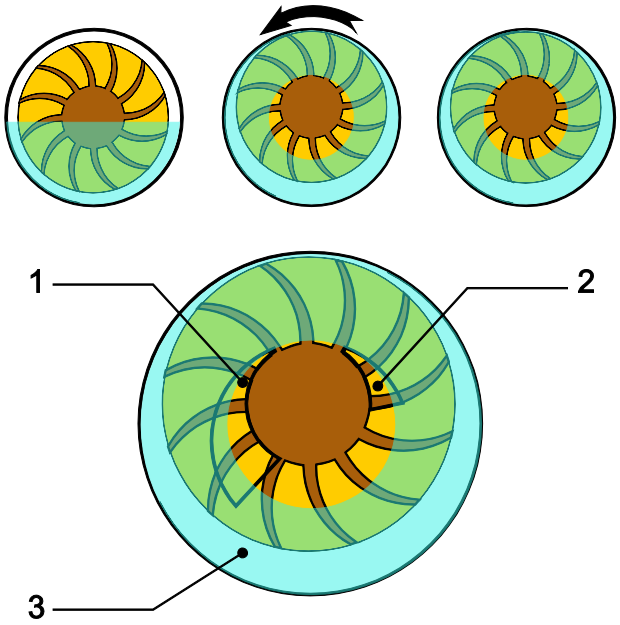
Fig. 3 Description of pump type V/VG

3.3 Design and functional principle

The 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 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.



1 Suction opening

2 Pressure opening

3 Liquid ring

Fig. 4 Functional principle of liquid ring vacuum pumps

The arrangement of suction and pressure openings in the inter casing allows for the suction, compression and discharge of gas. The liquid both serves the sealing between the individual impeller chambers and the absorption of heat produced during compression.

The pump must be permanently supplied with operating liquid during operation as a portion of the liquid continuously escapes from the pump together with the gas. The discharged operating liquid can be separated from the gas by means of a downstream separator and re-used.

3.4 Shaft sealing

3.4.1 Mechanical seal

ⓘ Mechanical seals may slightly leak for functional reasons.

- Single mechanical seal, unbalanced, dependent on the direction of rotation with conical spring

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

ⓘ Weight data (→ Weight, page 31)

4.1.1 Unpacking and inspection on delivery

1. Unpack the 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

CAUTION

Risk of injuries caused by lifting heavy loads!

Observe the permissible weights for lifting and carrying machine components.

Type	Sex	Age	Rate per shift		
			rarely	repeatedly	frequently
			< 5%	5 - 10%	>10-35%
		[Years]	[kg]	[kg]	[kg]
Lifting	Men	– 16	20	13	-
		17 - 19	35	25	20
		20 - 45	55	30	25
		> 45	50	25	20
Lifting	Women	- 16	13	9	-
		17 - 19	13	9	8
		20 - 45	15	10	9
		> 45	13	9	8
Carrying	Men	- 16	20	13	-
		17 - 19	30	20	15
		20 - 45	50	30	20
		> 45	40	25	15
Carrying	Women	- 16	13	9	-
		17 - 19	13	9	8
		20 - 45	15	10	9
		> 45	13	9	8
Lifting and carrying	Expectant mothers		10 (5) (legal draft)	5 (legal draft)	
Source: Bavarian State Office for Occupational Safety, Occupational Medicine and Safety Technology					

Tab. 7 Maximum weights for manual lifting

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

4.1.3 Transport with lifting gear

DANGER

Risk of death or contusions from falling goods to be transported!

► Select lifting gear in accordance with the total weight to be transported.

► Transport the aggregate in horizontal position only.

► Never suspend the aggregate to the ring lug of the motor.

► Attach the lifting gear in accordance with the following figures.

► Do not stand under suspended loads.

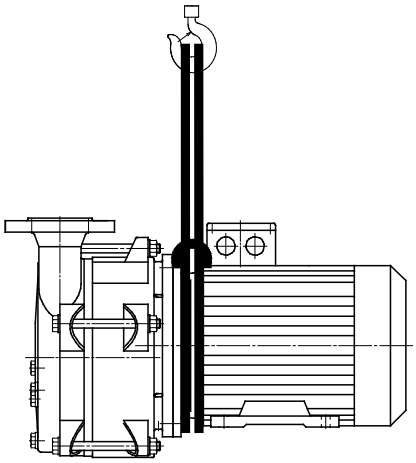


Fig. 5 Attaching lifting gear to the aggregate

► Lift the aggregate accordingly.

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 (→ 4.3 Preservation).

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

Applied preserving agents (→ page 34)

CAUTION

Risk of material damage caused by improper storage!

► Store the aggregate accordingly.

1. Close all openings with blank flanges, plugs or plastic covers.
2. Make sure the storage room meets the following conditions:
   - dry
   - frost-free
   - vibration-free
   - protected
   - constant humidity
3. Turn the motor shaft once per month.
4. Make sure the motor shaft and bearing change their rotational position in this process.

4.3 Preservation

ⓘ Not necessary for rust-proof material

CAUTION

Risk of material damage caused by improper storage!

► Properly apply preserving agent to the inside and outside of the aggregate.

1. Select a preserving agent in accordance with the type and duration of storage (→ page 34).
2. Use preserving agents in accordance with the manufacturer's specifications.
3. Coat all bare metal components positioned inside and outside the pump with preserving agent.
4. Treat the impeller gap with a preserving agent.

4.3.1 Preservation inside the system

CAUTION

Risk of material damage caused by improper preservation!

► Shut down the aggregate (→ Shut-down, page 19).

ⓘ Use appropriate collecting trays. Position of drainage bores (U_e) (→ Dimensional drawings, page 35 et seq.).

- Unscrew the screw plugs of all drainage bores (U_e).
- Drain the operating liquid (water).
- Occasionally rotate the motor shaft towards the direction of rotation of the aggregate.
- Continue with this process until no more liquid escapes.
- Plug all drainage bores with screw plugs.
- Remove the pipes from the suction, pressure and process water connections.
- Plug the outlet nozzle and the process water connection by means of blank flanges/screw plugs.
- Fill in preserving agent into the open inlet nozzle. Observe the filling volumes (→ Filling volumes preservation, page 34).
- Plug the inlet nozzle with a blank flange/screw plugs.
- Switch the aggregate shortly on and off to allow for a proper distribution of the preserving agent.
- Unscrew the screw plugs of all drainage bores (U_e) and the operating liquid connection (U_B).
- Drain the preserving agent into collecting trays.
- Occasionally rotate the motor shaft towards the direction of rotation of the aggregate.
- 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) with screw plugs.

4.3.2 Preservation outside the system

CAUTION

Risk of material damage caused by improper preservation!

► Shut down the aggregate (→ Shut-down, page 19; Return to manufacturer, page 21).

ⓘ Use appropriate collecting trays. Position of drainage bores (U_e) (→ Dimensional drawings, page 35 et seq.).

- Plug all drainage bores (U_e) with screw plugs.
- Close the operating liquid connection (U_B) using a blank flange/screw plug.
- 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 motor shaft towards the direction of rotation of the aggregate.
- Continue this process until the preserving agent appears approx. 30 mm below the upper edge of the inlet/outlet nozzle.
- Unscrew the screw plugs of all drainage bores (U_e) and the operating liquid connection (U_B).
- Drain the preserving agent into collecting trays.
- Occasionally rotate the motor shaft towards the direction of rotation of the aggregate.
- 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) with screw plugs.

4.4 Removing preserving agent

ⓘ Only required for aggregates treated with preserving agent.

CAUTION

Risk of bearing damage caused by excessive water pressure or splash water!

► Do not treat bearing areas with water or steam jet.

CAUTION

Risk of seal damage caused by improper cleaning agents!

► Ensure that cleaning agents do not harm the seals.

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 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 aggregate.
- Remove preserving agent (→ page 12).
- Disassemble plastic parts and dispose of in accordance with local regulations.

► Assign an authorized company to dispose of the aggregate to prevent the risk of environmental damage!

5 Set-up and connection

For 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 aggregate.

► Do not remove covers, transport and sealing caps until immediately before connection of the pipes to the aggregate.

5.1 Preparing set-up

5.1.1 Checking ambient conditions

► Make sure the required ambient conditions are maintained (→ Ambient conditions, page 32).

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

ⓘ Minimum clearances
(→ Clearances for heat dissipation, page 32)

5.1.3 Preparing installation site

► Make sure the installation site meets the following conditions:

- the 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 aggregate, is provided for
- the 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 aggregate is commissioned directly after set-up and connection: remove preserving agent prior to set-up (→ Removing preserving agent, page 12).

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 Placing aggregate on foundation

✓ Auxiliary means, tools, material:

- foundation bolts (→ Set-up drawing)
- steel washers
- non-shrinking mortar grout
- spirit level

1. Lift the aggregate (→ Transport, page 11).
2. Hook the foundation bolts from below into the base plate fixing holes.

ⓘ Observe the manufacturer's specifications when using adhesive anchors.

3. Place the aggregate on the foundation. Insert the foundation bolts into the provided anchoring holes.

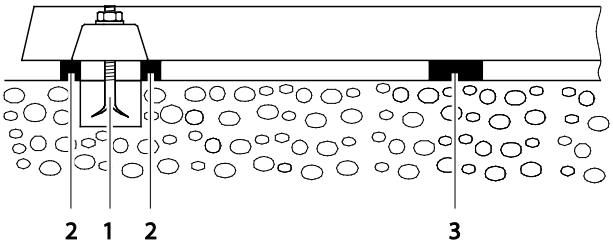


Fig. 6 Set-up with foundation

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.

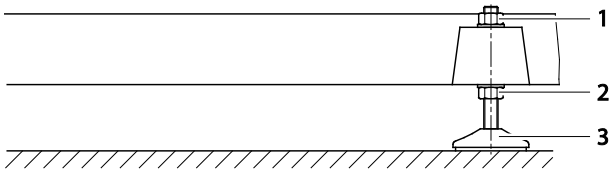
1. Fill the anchoring holes with mortar grout.
2. When the mortar grout has set, bolt down the base plate with the specified torque at three points
   (→ Tightening torques, page 33).
3. Before tightening the remaining bolts, compensate for any unevenness in the surface using metal spacing shims next to each bolt.
4. Make sure the base plate is not distorted.

5.3 Set-up without foundation

ⓘ With base plate

✓ Auxiliary means, tools, material:

- wrench
- spirit level



1 Hexagon nut

2 Hexagon nut

3 Levelling foot

Fig. 7 Set-up without foundation

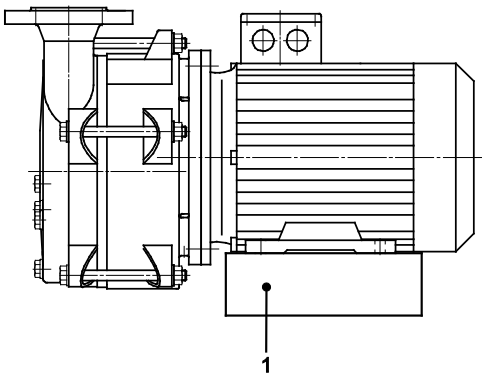
1. Lift the aggregate (→ Transport with lifting gear, page 11).
2. Mount the four levelling feet as illustrated.
3. Position the aggregate on the surface.
4. Adjust the base plate height by means of the levelling feet as illustrated above:
   - Use the wrench to hold the hexagon nut at the levelling 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 level surface/frame

ⓘ Only possible with motor feet

✓ Auxiliary means, tools, material:

- wrench



1 Frame

Fig. 8 Set-up with motor feet

1. Lift the aggregate (→ Transport with lifting gear, page 11).
2. Mount the motor feet as illustrated (→ Dimensional drawings, page 35 et seq.).
3. Position the aggregate on a torsion-resistant level surface/frame.
4. Screw the aggregate to the surface/frame.

5.5 Planning pipe system

5.5.1 Dimensioning supports and connections

CAUTION

Risk of material damage if the pipes apply excessive forces and torques to the 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.

5.5.2 Specifying nominal diameter

ⓘ Size of suction/pressure connections (→ Operating connections, page 32)

► Keep the flow resistance in the pipes as low as possible.

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

5.5.3 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 0.3 m vertically or diagonally upwards.

5.5.4 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.

5.5.5 Safety and control devices

5.5.5.1 Avoiding contamination

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

5.5.5.2 Avoiding backflow

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

5.5.5.3 Provisions for isolating and shutting off pipes

ⓘ For maintenance and repair works

► Provide for shut-off devices in the suction, pressure and process water pipes.

5.5.5.4 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.

5.6 Connecting pipes

5.6.1 Providing for clean piping

CAUTION

Risk of material damage caused by aggregate contamination!

► Make sure the inside of the 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 (sealing tape, adhesive) projects inwards.
4. Remove any blank flanges, plugs, protective foils and/or protective paint from the flanges.

5.6.2 Installing suction pipe

1. Remove transport and sealing covers from the aggregate.
2. Avoid air pockets: lay out the pipes with a continuous slope down to the aggregate.
3. Make sure no seals project inwards.
4. Make sure no sealing material (sealing 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.

5.6.3 Installing pressure pipe

1. Remove transport and sealing covers from the aggregate.
2. Install the pressure pipe.
3. The pressure pipe must not rise more than 0.3 m vertically or diagonally upwards.
4. Avoid air pockets: lay out the pipes with a continuous slope from the aggregate.
5. Make sure no seals project inwards.
6. Make sure no sealing material (sealing tape, adhesive) projects inwards.

5.6.4 Stress-free pipe connection

ⓘ Provide for a stress-free pipe connection in accordance with VDMA standard sheet 24277.

5.7 Electrical connection

⚠ 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 death from rotating parts!

► Make sure to only operate the aggregate with all covers (fan hood) installed.

5.7.1 Motor connection

ⓘ Observe the manufacturer's specifications for the motor.

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

5.7.2 Checking direction of rotation

⚠ DANGER

Risk of death from rotating parts!

► Use protective equipment when carrying out any works on the aggregate.

► Keep an adequate distance to rotating parts.

CAUTION

Risk of material damage caused by dry running or incorrect direction of rotation!

► Pump filled with operating liquid up to the middle of the shaft (→ Filling, page 17).

1. Switch the aggregate 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 aggregate.

ⓘ Wrong direction of rotation may result in damage and escape of operating liquid at the mechanical seal.

⚠ 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.

3. In case of deviating direction of rotation: swap the two phases.

6 Operation

For aggregates in potentially explosive areas
(→ ATEX additional instructions)

6.1 Preparations for commissioning

6.1.1 Identifying pump type

► Identify the pump type (→ Nameplate, page 9).

ⓘ Pump types vary, e.g. with regard to material, suction capacity, type of shaft sealing, auxiliary operating systems.

6.1.2 Removing preserving agent

ⓘ Only required for aggregates treated with preserving agent.

► Remove preserving agent
(→ Removing preserving agent, page 12).

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 17).

6.1.4 Filling

1. Remove the screw plug from port U_V
(→ Dimensional drawing, page 35 et seq.).
2. Fill the pump with operating liquid (water) maximally up to the middle of the shaft.
3. When operating liquid escapes from port U_V, stop the filling process.
4. Screw the screw plug into port U_V
(→ Dimensional 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

✓ Aggregate correctly set up and connected
✓ Motor correctly connected
✓ All connections stress-free and sealed
✓ Pump/aggregate properly prepared and filled
✓ All safety devices installed and checked for proper functioning
✓ Pump/aggregate properly prepared and filled

⚠ DANGER

Risk of injuries caused by running aggregate!

► Do not touch the running aggregate.

► Do not carry out any works on the running 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.

⚠ 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 aggregate.

CAUTION

Risk of material damage caused by dry running!

► Make sure the aggregate has been properly filled.

CAUTION

Risk of cavitation when throttling down the suction flow!

Risk of cavitation when the fitting in the suction pipe is closed!

► Completely open the suction-side fitting and do not use it for controlling the flow rate.

► Open the pressure-side fitting.

CAUTION

Risk of material damage caused by a closed pressure pipe!

► Do not operate the aggregate when the pressure-side fitting is closed.

► Observe the max.permissible operating limits
(→ Operating limits, page 29).

- max.permissible pressure difference
- max.permissible compression pressure
- max.permissible operating liquid temperature
- max.permissible operating liquid viscosity
- max.permissible operating liquid density
- max.permissible temperature of the medium to be pumped

1. Open the pressure-side fitting.
2. Ventilation port (if available): open the fitting.
3. Switch on the motor.
4. Operating liquid: open the fitting.
5. Open the suction-side fitting.
6. Ventilation port (if available): close the fitting as soon as the motor has reached its nominal speed.
7. Provide for a smooth running behaviour of the aggregate.
8. Check the aggregate and connections for tightness.

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 aggregate.

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

CAUTION

Risk of material damage resulting from vacuum condition!

► Aerate the aggregate during switch-off.

► Do not leave the aggregate under vacuum.

ⓘ If the aggregate is not aerated, the mechanical seals will be subject to damage.

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. 9)

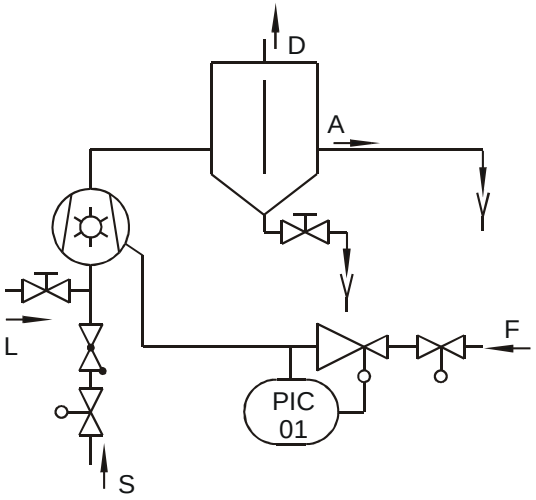


Fig. 9 Continuous-flow cooling

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. 10, 11, 12)

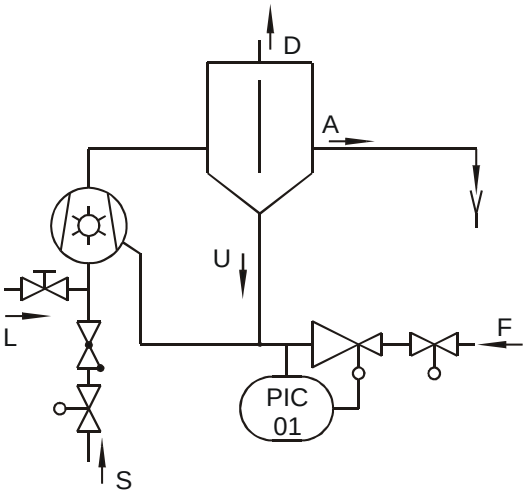


Fig. 10 Open circulation cooling

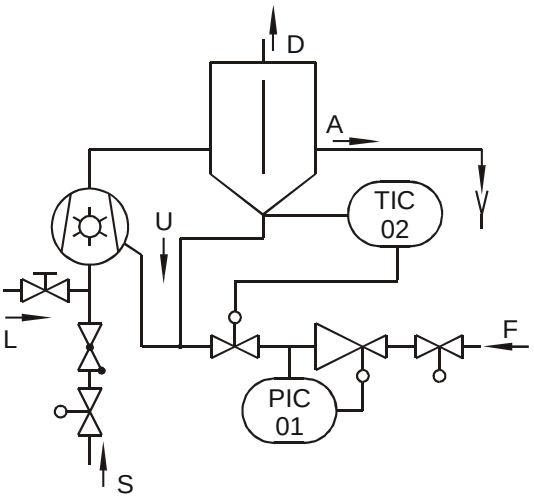


Fig. 11 Open circulation cooling with temperature control

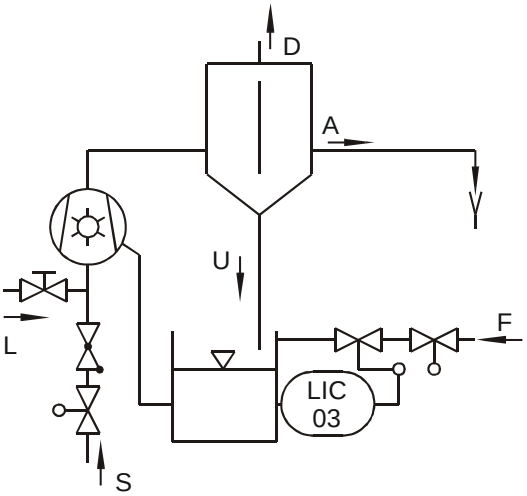


Fig. 12 Open circulation cooling with controlled liquid feed

► Observe the permissible operating liquid temperature (→ Operating limits, page 31)

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. 13)

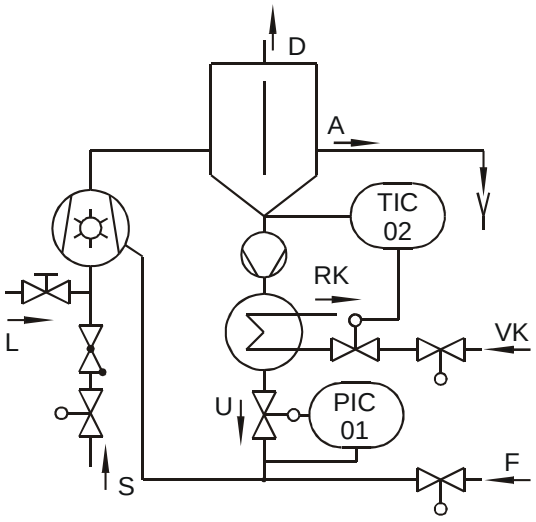


Fig. 13 Closed circulation cooling

► Observe the permissible operating liquid temperature (→ Operating limits, page 31)

Pos.	Meaning
S	Suction connection
L	Ventilation port
D	Pressure connection
A	Overflow
U	Circulation liquid
F	Fresh liquid
VK	Feed-in cooling agent
RK	Return cooling agent
TIC	Temperature
PIC	Pressure
LIC	Filling level

Tab. 8 Legend of symbols

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 aggregate.

► Reliably collect escaping media to be pumped and dispose of in an environmentally-friendly way.

► Implement the following measures when taking the pump/aggregate out of operation:

Aggregate is	Measure
shut down while remaining ready for operation	► Shortly operate (approx. 5 minutes) the aggregate at intervals of at least one month but not exceeding 3 months (→ Commissioning, page 17).
shut down for a longer period of time	► Implement measures in accordance with the condition of the operating liquid (→ Tab. 10 Measures depending on the behaviour of the operating liquid)
drained	► Close all fittings.
disassembled	► Disconnect the motor from the power supply and secure it against unauthorized switch-on.
stored	► Observe the measures to be implemented for storage (→ Storage, page 11).

Tab. 9 Measures to be taken when putting the pump out of operation

Operating liquid	Duration of shut-down (process-dependent)	
	Short	Long
Water	► Drain aggregate and separator.	► Drain aggregate and separator. ► Treat aggregate with a preserving agent (→ Preservation, page 12).
Other media	-	► Drain aggregate and separator. ► Treat aggregate with a preserving agent (→ Preservation, page 12).

Tab. 10 Measures depending on the behaviour of the operating liquid

6.5 Re-commissioning

Shut-down periods > 1 year:

1. Prepare commissioning (→ Preparations for commissioning, page 17).
2. Perform commissioning procedures (→ Commissioning, page 17).
3. Monitor the aggregate following commissioning (→ Monitoring, page 20).

6.6 Operating stand-by aggregate

✓ Stand-by aggregate filled

ⓘ Operate the stand-by aggregate at least once per week.

7 Maintenance and servicing

ⓘ For 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 51).

7.1 Monitoring

ⓘ Inspection intervals depend on the operational strain on the 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.

⚠ 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 aggregate.

1. Check at appropriate intervals:
   - deposits on 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 (motors)
   - normal operating conditions unchanged
2. For trouble-free operation, ensure the following:
   - no dry running
   - tightness
   - 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 aggregate.

7.2.1 Minor fine-grained contamination

1. Switch on the aggregate.
2. Remove the screw plug U_e (→ Dimensional drawings, page 35 et seq.).
3. Collect contamination and escaping operating liquid and dispose of in an environmentally-compatible way.
4. Screw in the screw plug.

7.2.2 Major fine-grained contamination

► Replace screw plug U_e by a fitting.

► Close fittings before switching on the aggregate.

► Fill the aggregate with operating liquid up to the middle of the shaft.

1. Switch on the aggregate.
2. Open the fittings for drainage.
3. Collect contamination and escaping operating liquid and dispose of in an environmentally-compatible way.

7.3 Prevention of corrosion and deposits

When using water as operating liquid, the pump has to be protected against corrosion and deposits. Within this context, certain water quality standards must be met (→ Operating liquid, page 31).

When using operating liquids other than water, please contact the manufacturer.

7.4 Disassembly

⚠ 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 aggregate.

► Make sure the aggregate is depressurized.

► After having drained the aggregate, reliably collect operating liquid and media to be pumped and dispose of in an environmentally-compatible way.

7.4.1 Return to manufacturer

✓ Aggregate shut down
✓ Aggregate depressurized
✓ Aggregate completely drained
✓ Electrical connections isolated and motor secured against re-start
✓ Auxiliary operating systems shut down, depressurized and drained (if available)
✓ Connecting pipes removed
✓ Manometer lines, manometer and fixtures removed

1. Loosen fixing screws.
2. Lift the aggregate out of the system (→Transport, page 11).
3. Decontaminate 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 aggregate (→ Nameplate, page 9)
- Type of aggregate (→ Nameplate, page 9)
- Item number of spare part (→ Cross-sectional drawings, page 36 et seq.)
- Designation of spare part (→ Cross-sectional drawings, page 36 et seq.)
- Number of spare parts

7.4.3 Aggregate repairs

1. The following must be observed during assembly:
   – Worn parts must be replaced by original spare parts.
   – Replace seals.
   – The required tightening torques must be observed (→ Tightening torques, page 33).
2. Clean all parts.
3. Install the aggregate into the system (→ Set-up and connection, page 14).

7.4.4 Disassembly of V-6

ⓘ Cross-sectional drawing V-6 (→ page 36)

✓ The aggregate has been removed from the system and is positioned in a clean and level assembly area.

1. Disassembly of pump casing (101) and inter casing (137)
   – Position the aggregate on the fan hood.
   – Loosen the hexagon socket head screws (914).
   – Remove the pump casing (101).
   – Remove the inter casing (137).
   – Remove the O-ring (412.1) from the shaft sealing casing (441).
2. Disassembly of impeller (230)
   – Pull the impeller (230) off the motor shaft.
   – Remove the fitting key (940) from the motor shaft.
3. Disassembly of mechanical seal (047)
   – Pull the locking ring (932) off the motor shaft.
   – Pull the rotating unit of the mechanical seal (047) off the motor shaft.
   – Push the stationary unit of the mechanical seal (047) out of the shaft sealing casing (441).

7.4.5 Disassembly of V-30/55

ⓘ Cross-sectional drawing V-30/55 (→ page 38)

✓ The aggregate has been removed from the system and is positioned in a clean and level assembly area.

1. Disassembly of pump casing (101) and inter casing (137)
   – Position the aggregate on the fan hood.
   – Loosen the hexagon head screws (901).
   – Take off the pump casing (101).
   – Remove the inter casing (137).
2. Disassembly of impeller (230)
   – Block the impeller (230) in the shaft sealing casing (441).
   – Loosen the hexagon nut (920) on the impeller screw (906) and remove it.
   – Pull the impeller (230) off the motor shaft.
   – Remove the impeller screw (906) with the disc spring stack (950).
3. Disassembly of shaft sealing casing (441)
   – Loosen the hexagon nuts (920.1) on the flange of the shaft sealing casing (441).
   – Pull the shaft sealing casing (441) off the motor flange (800).
4. Disassembly of mechanical seal (047)
   – Pull the rotating unit of the mechanical seal (047) off the impeller hub (230).
   – Push the stationary unit of the mechanical seal (047) out of the shaft sealing casing (441).
5. Disassembly of valve flap (746)
   – Loosen the hexagon head screw (901.1) on the inter casing (137).
   – Remove the valve flap (746) and the steel sheet (598).

7.4.6 Disassembly of V-95/130/155/255/330/430

ⓘ Cross-sectional drawing V-95/130/155 (→ page 40)

ⓘ Cross-sectional drawing V-255 (→ page 41)

ⓘ Cross-sectional drawing V-330/430 (→ page 43)

✓ The aggregate has been removed from the system and is positioned in a clean and level assembly area.

1. Disassembly of pump casing (101) and inter casing (137)
   - Position the aggregate on the fan hood.
   - Loosen the hexagon head screws (901).
   - Take off the pump casing (101).
   - Loosen the hexagon socket countersunk head screw (900) on the inter casing (137).
   - Loosen the screw plug (903) on the pump casing (101) (only V-255).
   - Loosen the hexagon socket head screw (914) (only V-255).
   - Remove the inter casing (137) and the O-ring (412).
2. Disassembly of impeller (230)
   - Block the impeller (230) in the shaft sealing casing (441).
   - Loosen the hexagon nut (920/920.1) on the impeller screw (906) and remove it.
   - Pull the impeller (230) off the motor shaft.
   - Remove the impeller screw (906) and the disc spring stack (950).
3. Disassembly of shaft sealing casing (441)
   - Loosen the hexagon head screws (901.1) on the motor flange (only V-95/130/155/255).
   - Loosen the hexagon nuts (920) on the motor flange (only V-330/430).
   - Pull the shaft sealing casing (441) off the motor flange (800).
4. Disassembly of mechanical seal (047)
   - Pull the rotating unit of the mechanical seal (047) off the impeller hub (230).
   - Push the stationary unit of the mechanical seal (047) out of the shaft sealing casing (441).
5. Disassembly of valve flap (746)
   - Loosen the hexagon head screw (901.2) on the inter casing (137).
   - Remove the valve flap (746) and the steel sheet (598).

7.4.7 Disassembly of VG-30/55

ⓘ Cross-sectional drawing VG-30/55 (→ page 45)

✓ The aggregate has been removed from the system and is positioned in a clean and level assembly area.

1. Disassembly of casing cover (161)
   - Position the aggregate on the fan hood.
   - Loosen the hexagon head screws (901).
   - Take off the casing cover (161).
2. Disassembly of impeller (230)
   - Block the impeller (230) in the shaft sealing casing (441).
   - Loosen the hexagon nut (920) on the impeller screw (906) and remove it.
   - Pull the impeller (230) off the motor shaft.
   - Remove the impeller screw (906) and the disc spring stack (950).
3. Disassembly of shaft sealing casing (441)
   - Loosen the hexagon nuts (920.1) on the flange of the shaft sealing casing (441).
   - Pull the shaft sealing casing (441) off the motor flange (800).
4. Disassembly of mechanical seal (047)
   - Pull the rotating unit of the mechanical seal (047) off the impeller hub (230).
   - Push the stationary unit of the mechanical seal (047) out of the shaft sealing casing (441).

7.4.8 Disassembly of VG-95/130/155/255

ⓘ Cross-sectional drawing VG-95/130/155 (→ page 47 et seq.)

ⓘ Cross-sectional drawing VG-255 (→ page 48)

✓ The aggregate has been removed from the system and is positioned in a clean and level assembly area.

1. Disassembly of casing cover (161)
   - Position the aggregate on the fan hood.
   - Loosen the hexagon head screws (901).
   - Take off the casing cover (161).
   - Remove the O-ring (412) from the shaft sealing casing (441).
2. Disassembly of impeller (230)
   - Block the impeller (230) in the shaft sealing casing (441).
   - Loosen the hexagon nut (920) on the impeller screw (906) and remove it.
   - Pull the impeller (230) off the motor shaft.
   - Remove the impeller screw (906) and the disc spring stack (950).
3. Disassembly of shaft sealing casing (441)
   - Loosen the hexagon head screws (901.1) on the motor flange.
   - Pull the shaft sealing casing (441) off the motor flange (800).
4. Disassembly of mechanical seal (047)
   - Pull the rotating unit of the mechanical seal (047) off the impeller hub (230).
   - Push the stationary unit of the mechanical seal (047) out of the shaft sealing casing (441).

7.5 Assembly

CAUTION

Improper assembly results in aggregate damage!

► Assemble the aggregate in accordance with the principal rules of mechanical engineering.

► Use original spare parts only.

► For 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).

7.5.1 Assembly of V-6

ⓘ Cross-sectional drawing V-6 (→ page 36)

✓ All parts are in a clean and level assembly area.

1. Installation of the stationary unit of the mechanical seal (047)
   - Position the aggregate on the fan hood.
   - Moisten the auxiliary seal of the stationary unit (047) with lubricant (alcohol, water).
   - Lift the stationary unit (047) over the motor shaft and insert it into the shaft sealing casing (441).
   - Manually push the stationary unit into the shaft sealing casing (441) using a force-fitting mandrel (plastic).
2. Installation of the rotating unit of the mechanical seal (047)
   - Plug the assembly sleeve onto the motor shaft and slightly moisten it with lubricant (e.g. grease containing PTFE).
   - Manually slide the rotating unit (047) by means of the assembly sleeve onto the motor shaft using a force-fitting mandrel.
   - Remove the assembly sleeve.
   - Slide the spiral spring and the supporting washer of the mechanical seal onto the motor shaft.
   - Slide the locking ring (932) onto the motor shaft and slip it into the shaft groove.
3. Installation of impeller (230)
   - Insert the fitting key (940) into the motor shaft.
   - Push the impeller (230) onto the motor shaft (cover disc pointing down).
   - Insert an O-ring (412.1) into the groove of the shaft sealing casing (441).
4. Installation of pump casing (101) and inter casing (137)
   - Fix the valve flap (746) to the grooved pins (561) in the pump casing.
   - Insert an O-ring (412) into the groove of the pump casing (101).
   - Fix the inter casing (137) to the grooved pins (561) in the pump casing.
   - Put the pump casing and the inter casing down on the shaft sealing casing and adjust them (suction/pressure connection opposite the motor foot).
   - Fasten the pump casing (101) to the shaft sealing casing (441) using hexagon socket head screws (914).

7.5.2 Assembly of V-30/55

ⓘ Cross-sectional drawing V-30/55 (→ page 38)

✓ All parts are in a clean and level assembly area.

1. Installation of the stationary unit of the mechanical seal (047)
   - Moisten the auxiliary seal of the stationary unit with lubricant (alcohol, water).
   - Manually press the stationary unit (047) into the shaft sealing casing (441).
2. Installation of shaft sealing casing (441)
   - Position the motor on the fan hood.
   - Insert the fitting key (940) into the motor shaft.
   - Adjust the shaft sealing casing (441) (eccentric opposite the motor feet).
   - Force the shaft sealing casing (441) onto the motor flange (800).
   - Screw the hexagon nuts (920.1/550.1) onto the stud bolts (902) and tighten them.
3. Installation of the rotating unit of the mechanical seal (047)
   - Apply a thin layer of lubricant (e.g. grease containing PTFE) onto the impeller hub (230).
   - Push the rotating unit (047) onto the impeller hub (230) by a screwing movement in the sense of winding of the spring.
4. Installation of impeller (230)
   - Apply grease (Molykote®) to the long thread side of the impeller screw (906).
   - Slide the disc spring stack (950) (individual discs alternately strung together; V-30: 5x individual discs, V-55: 8x individual discs) onto the long thread side of the impeller screw (906) and lubricate with grease (Molykote®).
   - Screw the impeller screw (906) with the disc spring stack (950) into the motor shaft.
   - Apply a thin layer of grease (Molykote®) to the motor shaft.
   - Push the impeller (230) onto the motor shaft.
   - Apply a thin layer of liquid sealing compound (Epple 33) to the hub area of the impeller screw (906) on the impeller (230).
   - Slide the washer (550) onto the impeller screw.
   - Screw the hexagon nut (920) onto the impeller screw (906) and slightly tighten it.
5. Setting of impeller gap (230)
   - Position the straightedge onto the face of the shaft sealing casing (441).
   - Adjust the axial direction of the impeller (230). Rotate the impeller screw (906, hexagon socket wrench) until a gap of 0.1 to 0.15 mm remains between the straightedge and the impeller hub. Check the gap size by means of a feeler gauge.
   - Block the impeller (230) to prevent rotation.
   - Tighten the hexagon nut (920). Do not rotate the impeller screw (906) when tightening the hexagon nut (920).
   - Check the impeller gap. Rotate the impeller (230). Check the set gap size in the hub area.
   - Repeat the setting if the actual gap size deviates from the required gap size or the impeller is obstructed.
6. Installation of inter casing (137)
   - Screw the valve flap (746) and the steel sheet (598) to the backside of the inter casing (no counterbores visible) using hexagon head screws (901.1) and washers (550.3). Secure the screws (901.1) against loosening (screw locking, e.g. Loctite®).
   - Apply a thin layer of liquid sealing compound (Epple 33) to the face of the shaft sealing casing (441).
   - Adjust the inter casing (137) to the grooved pins (561.1) on the face of the shaft sealing casing (441).
   - Put the inter casing (137) down on the shaft sealing casing (441).
7. Installation of pump casing (101)
   - Coat the backside (all webs) of the pump casing (101) with liquid sealing compound (Epple 33).
   - Adjust the pump casing (101) (inlet/outlet nozzle opposite the motor feet).
   - Put the pump casing (101) down on the inter casing.
   - Fasten the pump casing (101) to the shaft sealing casing (441) using hexagon head screws (901/550.1).

7.5.3 Assembly of V-95/130/155/255/330/430

ⓘ Cross-sectional drawing V-95/130/155 (→ page 40)

ⓘ Cross-sectional drawing V-255 (→ page 41)

ⓘ Cross-sectional drawing V-330/430 (→ page 43)

✓ All parts are in a clean and level assembly area.

1. Installation of the stationary unit of the mechanical seal (047)
   - Moisten the auxiliary seal of the stationary unit with lubricant (alcohol, water).
   - Manually push the stationary unit (047) (only adjust the stationary unit of V-330/430, due to lock washer (931)) into the shaft sealing casing (441).
2. Installation of shaft sealing casing (441)
   - Position the motor on the fan hood.
   - Insert the fitting key (940) into the motor shaft.
   - Adjust the shaft sealing casing (441) (eccentric opposite the motor feet).
   - Force the shaft sealing casing (441) onto the motor flange (800).
   - Screw the hexagon nuts (920) onto the stud bolts (902) and tighten them (V-330/430 only).
   - Screw the hexagon head screws (901.1/550.1) into the shaft sealing casing (441) and tighten them (V-95/130/155/255 only).
3. Installation of the rotating unit of the mechanical seal (047)
   - Apply a thin layer of lubricant (e.g. grease containing PTFE) onto the impeller hub (230).
   - Push the rotating unit (047) onto the impeller hub (230) by a screwing movement in the sense of winding of the spring.
4. Installation of impeller (230)
   - Apply grease (Molykote®) to the long thread side of the impeller screw (906).
   - Slide the disc spring stack (950) (individual discs alternately strung together; V-95: 9 x individual discs, V-130: 11x individual discs, V-155: 13 x individual discs, V-255: 6 x individual discs, V-330: 4 x individual discs, V-430: 6 x individual discs) onto the long thread side of the impeller screw (906) and coat with grease (Molykote®).
   - Screw the impeller screw (906) with the disc spring stack (950) into the motor shaft.
   - Apply a thin layer of grease (Molykote®) to the motor shaft.
   - Push the impeller (230) onto the motor shaft.
   - Apply a thin layer of liquid sealing compound (e.g. Epple 33) to the hub area of the impeller screw (906) on the impeller (230).
   - Slide the washer (550) onto the impeller screw (906).
   - Screw the hexagon nut (920) onto the impeller screw (906) and slightly tighten it.
5. Setting of impeller gap (230)
   - Put the straightedge onto the supporting surface of the inter casing (137) on the shaft sealing casing (441).
   - Adjust the axial direction of the impeller (230). Rotate the impeller screw (906, hexagon socket wrench) until a gap of 0.1 to 0.15 mm remains between the straightedge and the impeller hub. Check the gap size by means of a feeler gauge.
   - Block the impeller (230) to prevent rotation.
   - Tighten the hexagon nut (920). Do not rotate the impeller screw (906) when tightening the hexagon nut (920).
   - Check the impeller gap. Rotate the impeller (230). Check the set gap size in the hub area again.
   - Repeat the setting if the actual gap size deviates from the required gap size or the impeller is obstructed.
6. Installation of inter casing (137)
   - Screw the valve flap (746) and the steel sheet (598) to the backside of the inter casing (no counterbores visible) using hexagon head screws (901.2). Secure the screws (901.2) against loosening. Use screw locking (e.g. Loctite®).
   - Insert an O-ring (412) into the groove of the pump casing (101).
   - Adjust the inter casing (137) to the grooved pin (562) in the pump casing (101).
   - Force the inter casing (137) into the pump casing (101).
   - V-95/130/155/330/430 only: Fasten the inter casing (137) to the pump casing using a countersunk screw (900).
   - V-255 only: Fasten the inter casing (137) to the pump casing by inserting a hexagon head socket screw (914) through the pump casing (101).
   - V-255 only: Screw a screw plug (903/411) into the pump casing (101) and tighten it.
7. Installation of pump casing (101)
   - Insert an O-ring (412) into the groove of the shaft sealing casing (441).
   - Adjust the pump casing (101) (inlet/outlet nozzle opposite the motor feet).
   - Force the pump casing (101) into the shaft sealing casing (441).
   - V-95/130/155 only: Fasten the pump casing (101) to the shaft sealing casing (441) using hexagon head screws (901/550.1) and hexagon nuts (920.1/550.1).
   - V-255/330/430 only: Fasten the pump casing (101) to the shaft sealing casing (441) using hexagon head screws (901/550.1).

7.5.4 Assembly of VG-30/55

ⓘ Cross-sectional drawing VG-30/55 (→ page 45)

✓ All parts are in a clean and level assembly area.

1. Installation of the stationary unit of the mechanical seal (047)
   - Moisten the auxiliary seal of the stationary unit with lubricant (alcohol, water).
   - Manually press the stationary unit (047) into the shaft sealing casing (441).
2. Installation of shaft sealing casing (441)
   - Position the motor on the fan hood.
   - Insert the fitting key (940) into the motor shaft.
   - Adjust the shaft sealing casing (441) (eccentric opposite the motor feet).
   - Force the shaft sealing casing (441) onto the motor flange (800).
   - Screw the hexagon nuts (920.1/550.1) onto the stud bolts (902) and tighten them.
3. Installation of the rotating unit of the mechanical seal (047)
   - Apply a thin layer of lubricant (e.g. grease containing PTFE) onto the impeller hub (230).
   - Push the rotating unit (047) onto the impeller hub (230) by a screwing movement in the sense of winding of the spring.

4. Installation of impeller (230)
   - Apply grease (Molykote®) to the long thread side of the impeller screw (906).
   - Slide the disc spring stack (950) (individual discs alternately strung together; VG-30: 5x individual discs, VG-55: 8x individual discs) onto the long thread side of the impeller screw (906) and lubricate with grease (Molykote®).
   - Screw the impeller screw (906) with the disc spring stack (950) into the motor shaft.
   - Apply a thin layer of grease (Molykote®) to the motor shaft.
   - Push the impeller (230) onto the motor shaft.
   - Apply a thin layer of liquid sealing compound (Epple 33) to the hub area of the impeller screw (906) on the impeller (230).
   - Slide the washer (550) onto the impeller screw.
   - Screw the hexagon nut (920) onto the impeller nut and slightly tighten it.
5. Setting of impeller gap (230)
   - Position the straightedge onto the face of the shaft sealing casing (441).
   - Adjust the axial direction of the impeller (230). Rotate the impeller screw (906, hexagon socket wrench) until a gap of 0.1 to 0.15 mm remains between the straightedge and the impeller hub. Check the gap size by means of a feeler gauge.
   - Block the impeller (230) to prevent rotation.
   - Tighten the hexagon nut (920). Do not rotate the impeller screw (906) when tightening the hexagon nut (920).
   - Check the impeller gap. Rotate the impeller (230). Check the set gap size in the hub area again.
   - Repeat the setting if the actual gap size deviates from the required gap size or the impeller is obstructed.
6. Installation of casing cover (161)
   - Apply a thin layer of liquid sealing compound (e.g. Epple 33) to the face end.
   - Adjust the casing cover (161) to the grooved pin (561.1) in the shaft sealing casing (441).
   - Put the casing cover (161) down on the shaft sealing casing (441).
   - Fasten the casing cover (161) to the shaft sealing casing (441) using hexagon head screws (901/550.1).

7.5.5 Assembly of VG-95/130/155/255

ⓘ Cross-sectional drawing VG-95/VG130/VG155 (→ page 47 et seq.)

ⓘ Cross-sectional drawing VG 255 (→ page 48)

✓ All parts are in a clean and level assembly area.

1. Installation of the stationary unit of the mechanical seal (047)
   - Moisten the auxiliary seal of the stationary unit with lubricant (alcohol, water).
   - Manually press the stationary unit (047) into the shaft sealing casing (441).
2. Installation of shaft sealing casing (441)
   - Position the motor on the fan hood.
   - Insert the fitting key (940) into the motor shaft.
   - Adjust the shaft sealing casing (441) (eccentric opposite the motor feet).
   - Force the shaft sealing casing (441) onto the motor flange (800).
   - Screw the hexagon head screws (920.1/550.1) onto the stud bolts (902) and tighten them.
3. Installation of the rotating unit of the mechanical seal (047)
   - Apply a thin layer of lubricant (e.g. grease containing PTFE) onto the impeller hub (230).
   - Push the rotating unit (047) onto the impeller hub (230) by a screwing movement in the sense of winding of the spring.
4. Installation of impeller (230)
   - Apply grease (Molykote®) to the long thread side of the impeller screw (906).
   - Slide the disc spring stack (950) (individual discs alternately strung together; VG-95: 9x individual discs; VG-130: 11x individual discs; VG-155: 13x individual discs; VG-255: 6x individual discs) onto the long thread side of the impeller screw (906) and lubricate with grease (Molykote®).
   - Screw the impeller screw (906) with the disc spring stack (950) into the motor shaft.
   - Apply a thin layer of grease (Molykote®) to the motor shaft.
   - Push the impeller (230) onto the motor shaft.
   - Apply a thin layer of liquid sealing compound (Epple 33) to the hub area of the impeller screw (906) on the impeller (230).
   - Slide the washer (550) onto the impeller screw.
   - Screw the hexagon nut (920) onto the impeller nut and slightly tighten it.
5. Setting of impeller gap (230)
   - Position the straightedge onto the face of the shaft sealing casing (441).
   - Adjust the axial direction of the impeller (230). Rotate the impeller screw (906, hexagon socket wrench) until a gap of 0.1 to 0.15 mm remains between the straightedge and the impeller hub (230). Check the gap size by means of a feeler gauge.
   - Block the impeller (230) to prevent rotation.
   - Tighten the hexagon nut (920). Do not rotate the impeller screw (906) when tightening the hexagon nut (920).
   - Check the impeller gap. Rotate the impeller (230). Check the set gap size in the hub area (230) again.
   - Repeat the setting if the actual gap size deviates from the required gap size.
6. Installation of casing cover (161)
   - Insert an O-ring (412) into the groove of the shaft sealing casing (441).
   - Adjust the pump casing (101) (inlet/outlet nozzle opposite the motor feet).
   - Put the casing cover (161) down on the shaft sealing casing (441).
   - VG-95/130/155 only: Fasten the pump casing (101) to the shaft sealing casing (441) using hexagon head screws (901/550.1) and hexagon nuts (920.1/550.1).
   - VG-255 only: Fasten the pump casing (101) to the shaft sealing casing (441) using hexagon head screws (901/550.1).

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 aggregate.
- ► Make sure the 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.

Technical support address

Speck Pumpen Vakuumtechnik GmbH

Regensburger Ring 6 – 8, 91154 Roth / Germany
PO Box 1453, 91142 Roth / Germany

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E-mail: info@speck-pumps.de
Internet: www.speck-pumps.de

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Defect	Cause	Rectification
Motor does not start	**Motor**	►
	One phase of the power supply is interrupted	► Check the power supply, check the motor
	Two phases of the power supply are interrupted	► Check the power supply, check the motor
	The motor protection switch has tripped	► Switch on the motor protection switch
	The motor is blocked	► Check the motor
	Pump is blocked	
	Impeller/inter casing is subject to corrosion	► Use rust remover to overcome the blockage of the pump
	Ice inside the pump (solidified operating liquid)	► Carefully heat up and defrost the pump
	Contaminations or foreign bodies inside the pump	► Flush/disassemble the pump, clean it
	Pump calcification	► Descale the pump
	Blocked/defective impeller	► Provide for a correct gap size of the inter casing/impeller or replace
	Defective motor bearing	► Replace the motor bearing

Defect	Cause	Rectification
Motor protection triggered	Short-circuit in the motor winding	► Check the motor winding
	Motor protection switch has not been correctly set/is defective	► Check setting/replace the motor protection switch
	Motor overload	► Check/reduce the operating liquid flow rate
	Excessive backpressure in the outlet nozzle	► Reduce backpressure
	Excessive share of liquid in the suction flow	► Reduce the share of liquid
	Blocked suction-side fitting	► Open the suction-side fitting
	Motor or pump blocked	► Motor does not start
Excessive power consumption of the motor	Motor overload	► Check/reduce the operating liquid flow rate
	Excessive backpressure in the outlet nozzle	► Reduce backpressure
	Excessive share of liquid in the suction flow	► Reduce the share of liquid
	Blocked suction-side fitting	► Open the suction-side fitting
	Density/viscosity of the operating liquid is too high	► Use an operating liquid complying with the density recommended in the data sheet. Contact the manufacturer
	Impeller rubs against the inter casing	► Disassemble the pump, properly set the inter casing/impeller gap size
	Pump contamination/calcification	► Flush/descale/disassemble the pump, clean it
Pump does not produce vacuum	Lacking operating liquid	► Check the operating liquid supply
	Leak in the suction pipe	► Check/seal the suction pipe and connections
	Wrong direction of rotation of the motor	► Check direction of rotation/swap the 2 phases if need be
Insufficient vacuum	Leaking system	► Check the system, seal leaking spots
	Excessive operating liquid flow rate	► Reduce operating liquid flow rate
	Insufficient operating liquid flow rate	► Increase operating liquid flow rate
	Operating liquid too hot	► Cool down the operating liquid
	Leak in the suction pipe	► Check/seal the suction pipe and connections
	Wrong direction of rotation of the motor	► Check direction of rotation/swap the 2 phases if need be
	Motor speed too low	► Increase speed, contact the manufacturer
	Gas or liquid channels subject to calcification	► Descale/disassemble the pump, clean it
	Internal components are subject to wear	► Replace the affected components
	Worn-out control valve	► Replace the control valve
	Worn-out shaft sealing	► Replace the shaft sealing
	Amount of drained liquid too small	► Provide for free drainage of the liquid and ensure that the connections are not obstructed
	Pump has not been correctly dimensioned	► Replace the pump
Strange noise	Pump cavitation	► Install an anti-cavitation valve or equip the suction pipe with a ventilation valve
	Excessive share of steam in the suction flow	► Reduce the share of steam or provide for condensation upstream the pump
	Suction-side fitting closed (excessive inlet pressure)	► Open the suction-side fitting or provide for cavitation protection
	Excessive operating liquid flow rate	► Reduce operating liquid flow rate
	Excessive speed	► Reduce speed, contact the manufacturer

Defect	Cause	Rectification
Leaking pump	Defective shaft sealing	► Replace the shaft sealing
	Defective casing sealing	► Provide the pump with new sealing
	Worn-out casing components	► Replace the affected components
	Loosened connecting screws/screw plugs	► Tighten the screws, replace the sealing
Pump does not run smooth	Excessive operating liquid flow rate	► Reduce operating liquid flow rate
	Overload in the pipe system	► Check the pipe connections/pump fixation/bearing clearance of the pipe clamps
	Air pocket in the pipe	► Change the pipe system layout
	Pump distorted/improperly adjusted	► Check adjustment/re-adjust
	Resonance vibrations in the pipe system	► Check the pipe connections and, if required, use a compensator
	Imbalanced impeller	► Balance/replace impeller
	Deposits on the impeller	► Clean/replace impeller
	Defective pump or motor bearing	► Replace pump or motor bearing

Tab. 11 Troubleshooting

9 Technical data

9.1 Operating limits

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

V-6/30/55					
Pressure		[mbar]	Operating liquid (water)		
Min. inlet pressure		33	Temperature		[°C]
Perm. compression pressure		1300		Max.	80
Perm. pressure difference				Min.	10
	Max.	1100	Density		[kg/m^3]
	Min.	200		Max.	1200
Medium to be pumped			Viscosity		mm^2/s
Temperature		[°C]		Max.	4
	Dry	200	Speed		[min^{-1}]
	Saturated	100		Max.	3500

Tab. 12 Operating limits V-6/30/55

VG-30/55					
Pressure		[mbar]	Operating liquid (water)		
Min. inlet pressure		70	Temperature		[°C]
Perm. compression pressure		1300		Max.	80
Perm. pressure difference				Min.	10
	Max.	1100	Density		[kg/m^3]
	Min.	200		Max.	1200
Medium to be pumped			Viscosity		mm^2/s
Temperature		[°C]		Max.	4
	Dry	200	Speed		[min^{-1}]
	Saturated	100		Max.	3500

Tab. 13 Operating limits VG-30/55

V-95/130/155/255/330/430					
Pressure		[mbar]	Operating liquid (water)		
Min. inlet pressure		33	Temperature		[°C]
Perm. compression pressure		1300		Max.	80
Perm. pressure difference				Min.	10
	Max.	1100	Density		[kg/m^3]
	Min.	200		Max.	1200
Medium to be pumped			Viscosity		mm^2/s
Temperature		[°C]		Max.	4
	Dry	200	Speed		[min^{-1}]
	Saturated	100		Max.	1750

Tab. 14 Operating limits V-95/130/155/255/330/430

VG-95/130					
Pressure		[mbar]	Operating liquid (water)		
Min. inlet pressure		55	Temperature		[°C]
Perm. compression pressure		1300		Max.	80
Perm. pressure difference				Min.	10
	Max.	1100	Density		[kg/m^3]
	Min.	200		Max.	1200
Medium to be pumped			Viscosity		mm^2/s
Temperature		[°C]		Max.	4
	Dry	200	Speed		[min^{-1}]
	Saturated	100		Max.	1750

Tab. 15 Operating limits VG-95/130

VG-155/255					
Pressure		[mbar]	Operating liquid		
Min. inlet pressure		40	Temperature		[°C]
Perm. compression pressure		1300		Max.	80
Perm. pressure difference				Min.	10
	Max.	1100	Density		[kg/m^3]
	Min.	200		Max.	1200
Medium to be pumped			Viscosity		mm^2/s
Temperature		[°C]		Max.	4
	Dry	200	Speed		[min^{-1}]
	Saturated	100		Max.	1750

Tab. 16 Operating limits VG-155/225

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 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

Type	Flange version Weight [kg]	Thread version Weight [kg]	Motor size
V-6	-	9.3	63
V-30	-	20	80
V-55	-	25	90
V-95	59	-	100L
V-130	67	-	100L
V-155	83	-	112M
V-255	111	-	132S/M
V-330	122	-	132M
	163	-	160M
V-430	155	-	160M
	178	-	160L
VG-30	-	18	80
VG-55	-	22	90
VG-95	52	52	100L
VG-130	55	59	100L
VG-155	71	67	112M
VG-255	102	105	132S/M

Tab. 17 Pump weights

9.2.2 Sound level

Type	1m measured surface sound pressure level L [dB (A)] *	
	50 Hz	60 Hz
V-6	65	62
V/VG-30	68	71
V/VG-55	69	72
V/VG-95	65	68
V/VG-130	65	68
V/VG-155	65	68
V/VG-255	65	68
V-330	70	73
V-430	72	75
* 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. 18 Sound pressure level

9.2.3 Drive power

The following data apply to operating liquids with a kinematic viscosity of $\nu \leq 4$ mm^2/sec.
For operating liquids featuring a higher kinematic viscosity, the drive power has to be adjusted.

Type	Rated motor power [kW]		Rated motor speed [min^{-1}]		Direction of rotation as seen from the drive	Motor size
	50 Hz	60 Hz	50 Hz	60 Hz		
V-6	0.4	0.5	2850	3450	clockwise	63
V/VG-30	0.75	1.1	2850	3450	clockwise	80
V/VG-55	3.0	4.0	2850	3450	clockwise	90
V/VG-95	2.2	3.0	1450	1750	clockwise	100L
V/VG-130	3.0	4.6	1450	1750	clockwise	100L
V/VG-155	4.0	6.2	1450	1750	clockwise	112M
V/VG-255	5.5	-	1450	-	clockwise	132S
		8.2	-	1750		132M
V-330	7.5	13.2	1450	1750	clockwise	132M
						160M
V-430	11.0	18.0	1450	1750	clockwise	160M
						160L

Tab. 19 Drive power

9.2.4 Operating liquid

9.2.4.1 Water

CAUTION

Risk of material damage caused by corrosion and deposits in the pump due to poor water quality!

► If possible, use operating water featuring the following quality.

ⓘ The following recommendations apply to operating water temperatures < 50 °C.

Hydrological data	Max.	Unit of measure
pH value	7.0 – 9.0	-
Conductivity	10…150	mS/m (t = 25 °C)
Total hardness	< 15	°dH
Carbonate hardness	< 4	°dH
Carbonate hardness with hardness stabilisation	< 15	°dH
Chloride Cl	< 100	mg/l
Sulphate SO_4	< 150	mg/l
Ammonium NH_4	< 1	mg/l
Iron Fe	< 0.2	mg/l
Manganese Mn/copper Cu	< 0.1	mg/l
Free of solids / rust	< 0.1	mg/l

Tab. 20 Hydrological data for operating water

► For higher temperatures, the hardness, conductivity and chloride values must be reduced.

CAUTION

Risk of material damage caused by deposits from the overall cycle, which may enter the pump!

► Use non-corrosive materials in the overall cycle.

► Ensure that deposits from the overall cycle cannot enter the pump.

The manufacturer does not accept liability for corrosion damage to pump parts.

The manufacturer recommends seeking the advice of a company specialised in water treatment and water maintenance (e.g. www.schweitzer-chemie.de) to provide adequate corrosion protection.

9.2.4.2 Other operating liquids

When using operating liquids other than water, please contact the manufacturer.

9.2.4.3 Flow rate, delivery of liquids, filling volume

Type	Flow rate [l/min] 80 mbar/15 °C	Max. liquid delivery [m^3/h]	Filling volume up to middle of the shaft [l]
V-6	2.8	0.3	0.1
V-30	3.3	0.4	0.3
V-55	4.8	0.6	0.4
V-95	15	1.8	2.4
V-130	15	1.8	2.8
V-155	15	1.8	3.2
V-255	16.5	2	4.0
V-330	23	2.8	4.3
V-430	27	3.2	4.7
VG-30	3.1	0.4	0.2
VG-55	3.1	0.4	0.3
VG-95	18.5	2.2	2.1
VG-130	20	2.4	2.5
VG-155	21	2.5	2.9
VG-255	22.5	2.7	3.6

Tab. 21 Flow rate, delivery of liquids, 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

Type	Process water connection		Suction connection		Pressure connection	
	Size	Shape	Size	Shape	Size	Shape
V-6	G 1/8	T	G 3/8	T	G 3/8	T
V-30/55	G 1/4	T	G 1	T	G 1	T
V-95/ 130/155	G 1/2	T	DN 40	F	DN 40	F
V-255	G 1/2	T	DN 50	F	DN 50	F
V-330/430	G 1	F	DN 65	F	DN 65	F
VG-30/55	G 1/4	T	G 1	T	G 1	T
VG-95/ 130/155	G 1/2	T	G 1½	T	G 1½	T
VG-95/ 130/155	G 1/2	T	DN 40	F	DN 40	F
VG-255	G 1/2	T	G 2	T	G 2	T
VG-255	G 1/2	T	DN 50	F	DN 50	F
Shape: T = Thread, F= Flange						

Tab. 22 Operating connections

9.2.7 Mechanical seal

All aggregates are fitted with mechanical seals.
Typical features are

- single seal
- not pressure-relieved
- conical spring
- dependent on the direction of rotation

9.2.8 Ambient conditions

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

Temperature [°C]	Relative humidity [%]		Set-up altitude above sea level [m]
	long-term	short-term	
+5 to +40	≤ 85	≤ 100	≤ 1000

Tab. 23 Ambient conditions

9.2.9 Clearances for heat dissipation

Type	Min. clearance fan hood – adjacent surface [mm]
V-6 V/VG-30/55	35
V/VG-95/130/155 V/VG-255 V-330/430	55

Tab. 24 Clearances for heat dissipation

9.2.10 Tightening torques

9.2.10.1 Screws and nuts

► Tighten the screws by means of a torque wrench.

ⓘ The following values apply to new screws and nuts.

Size	Property class	Tightening torque [Nm]
M 8	8.8	25
M 10	8.8	51
M 12	8.8	89

Tab. 25 Tightening torques for screws and nuts

9.2.10.2 Screws in cast-iron casings

► Tighten the screws by means of a torque wrench.

ⓘ The following values apply to new screws in cast-iron casings (EN-GJL-250, CuZn).

Size	Property class	Tightening torque [Nm]
M 6	8.8	8.5
M 8	8.8	12
M 10	8.8	25
M 12	8.8	40
M 16	8.8	90

Tab. 26 Tightening torques for screws in cast-iron casings

9.2.10.3 Stainless steel screws in stainless steel casings

► Tighten the screws by means of a torque wrench.

ⓘ The following values apply to new stainless steel screws.

Size	Property class	Tightening torque [Nm]
M 6	A2/ A4	7.3
M 8	A2/ A4	17.5
M 10	A2/ A4	35
M 12	A2/ A4	60
M 16	A2/ A4	144

Tab. 27 Tightening torques for stainless steel screws in stainless steel casings

9.2.10.4 Screw plugs

ⓘ The following values apply to new screw plugs (steel, brass) in cast-iron casings (EN-GJL-250, CuZn).

Size	Tightening torque [Nm]
G 1/8 A	9
G 1/4 A	20
G 3/8 A	40
G 1/2A	53
G 3/4 A	93
G 1 A	133

Tab. 28 Tightening torques for screw plugs

ⓘ The following values apply to new stainless steel screw plugs in stainless steel casings.

Size	Tightening torque [Nm]
G 1/8 A	13
G 1/4 A	30
G 3/8 A	60
G 1/2A	80
G 3/4 A	140
G 1 A	200

Tab. 29 Tightening torques for stainless steel screw plugs in stainless steel casings

9.2.10.5 Cylindrical pipe nipples

ⓘ The following values apply to new pipe nipples in cast-iron casings (EN-GJL-250, CuZn).

Size	Tightening torque [Nm]
G 1/4 A	23
G 3/8 A	46
G 1/2 A	60
G 3/4 A	120
G 1 A	206
G 1 ½ A	380
G 2	535

Tab. 30 Tightening torques for pipe nipples in cast-iron casings

9.3 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 pump nozzles

Size	Inlet/outlet nozzles	
	Torque [Nm]	Force [N]
DN 25	75	250
DN 40	100	320
DN 50	140	430
DN 65	200	550

Tab. 31 Permissible forces acting on pump nozzles

9.5 Preserving agents

ⓘ Rivolta preserving agent (recommended) or comparable products

Type of storage	Period of storage [months]	Inside/outside preservation	Repeat inside/outside treatment [months]
in closed, dry and dust-free rooms	1–3	Rivolta K.S.P.130	3
	> 3		(→ 1.2 Applicable documents)

Tab. 32 Preserving agents

9.5.1 Preservation filling volumes

Type	Filling volume inside system [l]	Filling volume outside system [l]
V-6	0.1	approx. 0.2
V-30	0.25	approx. 0.5
V-55	0.3	approx. 0.6
V-95	2.2	approx. 5
V-130	2.4	approx. 5.5
V-155	2.8	approx. 6
V-255	3.7	approx. 8
V-330	4.0	approx. 9
V-430	4.2	approx. 9.5

Tab. 33 Filling volumes preservation V series

Type	Filling volume inside system [l]	Filling volume outside system [l]
VG-30	0.15	approx. 0.35
VG-55	0.25	approx. 0.55
VG-95	2.0	approx. 4.5
VG-130	2.1	approx. 5.5
VG-155	2.4	approx. 6.4
VG-255	3.2	approx. 8

Tab. 34 Filling volumes preservation VG series

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 (Dimensional drawings)
- Spare parts designation and position (cross-sectional drawings)
- Certificate of conformity
- EC declaration of conformity

10.1 Dimensional drawing V-6

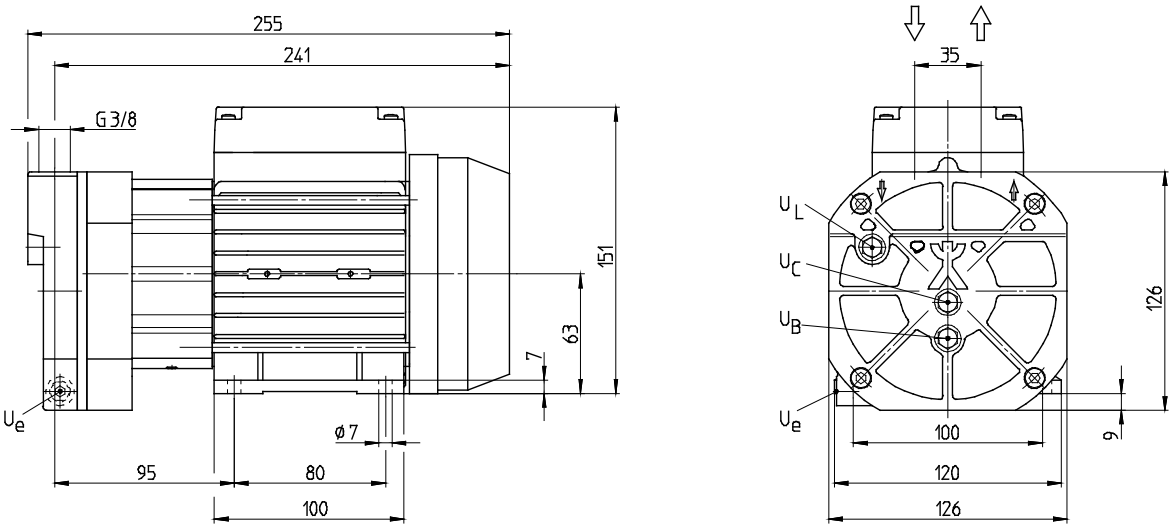

Fig. 14 Dimensional drawing V-6

Designation	Explanation
U_B	Operating liquid connection
U_C	Cavitation protection
U_e	Drainage (screw plug)
U_L	Ventilation valve connection

Tab. 35 Connections V-6

10.2 Cross-sectional drawing V-6

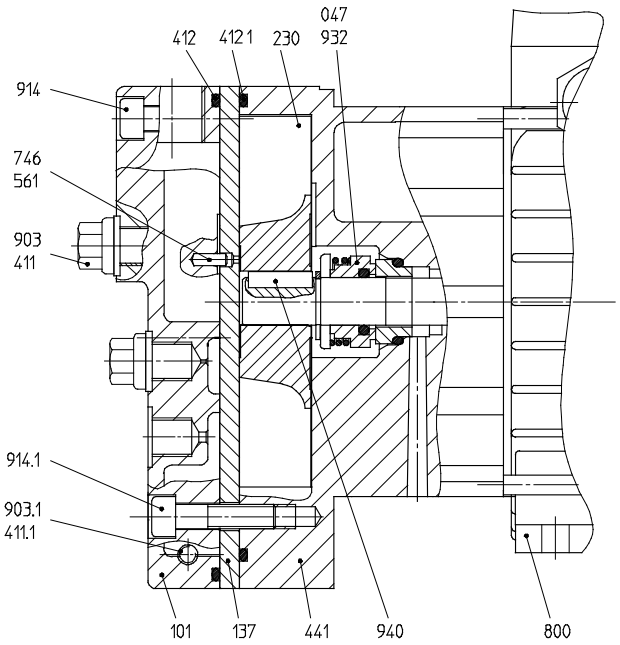

Fig. 15 Cross-sectional drawing V-6

No.	Designation
047	Mechanical seal
101	Pump casing
137	Inter casing
230	Impeller
411/.1	Sealing ring
412/.1	O-ring
441	Shaft sealing casing
561	Grooved pin
746	Valve flap
800	Motor
903/.1	Screw plug
914/.1	Hexagon socket head screw
932	Locking ring
940	Fitting key

Tab. 36 Parts list V-6

10.3 Dimensional drawing V-30/55

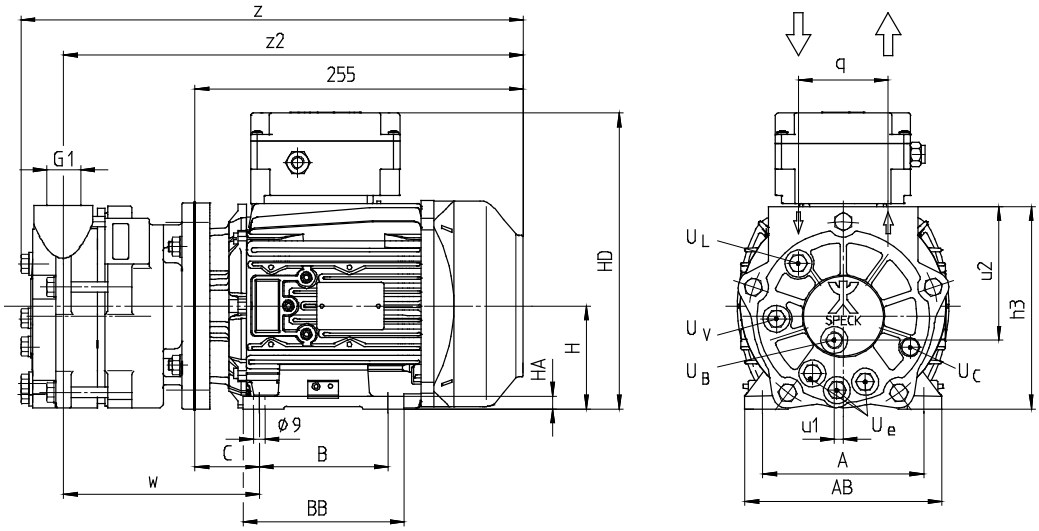

Fig. 16 Dimensional drawing V-30/55

Type	Hz	Motor size	h3	u1	u2	q	w	z	z2	A	AB	B	BB	C	H	HA	HD
V-30	50/60	80	158	7	104	70	152	391	357	125	153	100	125	50	80	10	231
V-55	50/60	90	171	5	110	74	176	409	375	140	170	125	155	56	90	11	240

Tab. 37 Dimension chart V-30/55

Designation	Explanation
U_B	Operating liquid connection
U_C	Cavitation protection
U_e	Drainage (screw plug)
U_L	Ventilation valve connection
U_V	Drainage valve connection

Tab. 38 Connections V-30/55

10.4 Cross-sectional drawing V-30/55

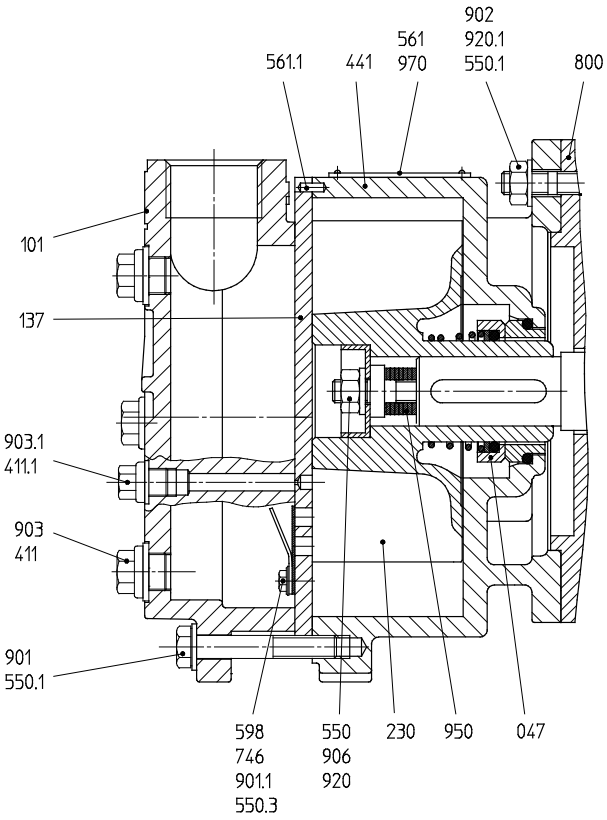

Fig. 17 Cross-sectional drawing V-30/55

No.	Designation
047	Mechanical seal
101	Pump casing
137	Inter casing
230	Impeller
411/.1	Sealing ring
441	Shaft sealing casing
550/.1,550.3	Washer
561/.1	Grooved pin
598	Steel sheet
746	Valve flap
800	Motor
901/.1	Hexagon head screw
902	Stud bolt
903/.1	Screw plug
906	Impeller screw
920/.1	Hexagon nut
950	Disc spring
970	Nameplate

Tab. 39 Parts list V-30/55

10.5 Dimensional drawing V-95/130/155/255

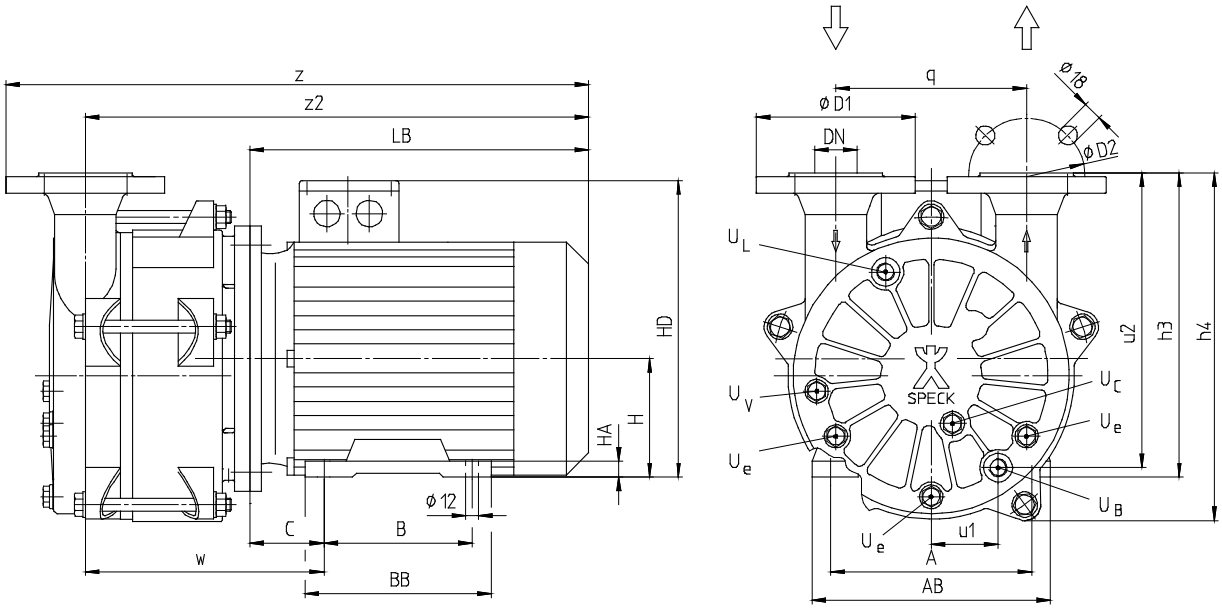

Fig. 18 Dimensional drawing V-95/130/155/255

Type	Hz	Motor size	h3	h4	u1	u2	q	w	z	z2	A	AB	B	BB	C	H	HA	HD	LB
V-95	50/60	100L	275	328	63	278	180	192	507	432	160	195	140	176	63	100	13	255	303
V-130	50/60	100L	275	328	63	278	180	201	516	441	160	195	140	176	63	100	13	255	303
V-155	50/60	112M	287	328	63	278	180	225	550	475	190	225	140	176	70	112	15	280	320
V-255	50	132S	312	370	60	295	200	290	689	606	216	256	140	218	110	132	18	320	426
	60	132M											178						

Tab. 40 Dimension chart V-95/130/155/255

Designation	Explanation
U_B	Operating liquid connection
U_C	Cavitation protection
U_e	Drainage (screw plug)
U_L	Ventilation valve connection
U_V	Drainage valve connection

Tab. 41 Connections V-95/130/155/255

10.6 Cross-sectional drawing V-95/130/155

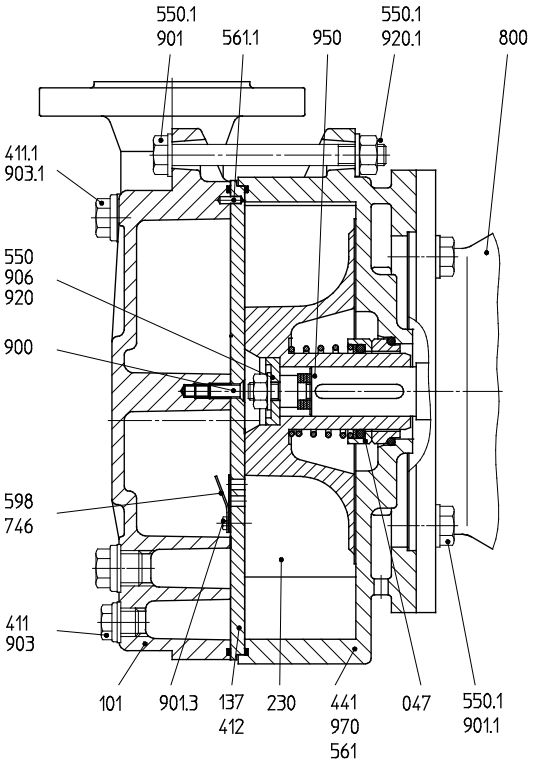

Fig. 19 Cross-sectional drawing V-95/130/155

No.	Designation
047	Mechanical seal
101	Pump casing
137	Inter casing
230	Impeller
411/.1	Sealing ring
412	O-ring
441	Shaft sealing casing
550/.1	Washer
561/.1	Grooved pin
598	Steel sheet
746	Valve flap
800	Motor
900	Screw
901/.1,901.3	Hexagon head screw
903/.1	Screw plug
906	Impeller screw
920/.1	Hexagon nut
950	Disc spring
970	Nameplate

Tab. 42 Parts list V-95/130/155

10.7 Cross-sectional drawing V-255

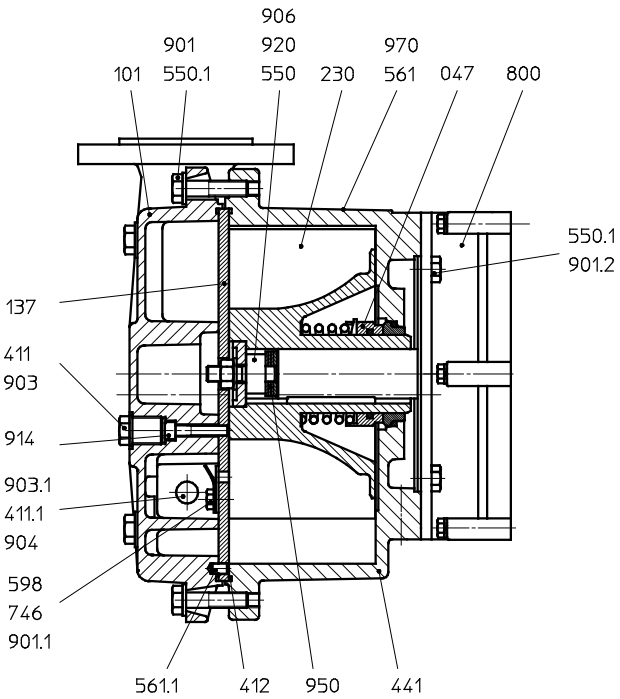

Fig. 20 Cross-sectional drawing V-255

No.	Designation
047	Mechanical seal
101	Pump casing
137	Inter casing
230	Impeller
411/.1	Sealing ring
412	O-ring
441	Shaft sealing casing
550/.1	Washer
561/.1	Grooved pin
598	Steel sheet
746	Valve flap
800	Motor
901-.2	Hexagon head screw
903/.1	Screw plug
904	Threaded pin
906	Impeller screw
914	Screw
920	Hexagon nut
950	Disc spring
970	Nameplate

Tab. 43 Parts list V-255

10.8 Dimensional drawing V-330/430

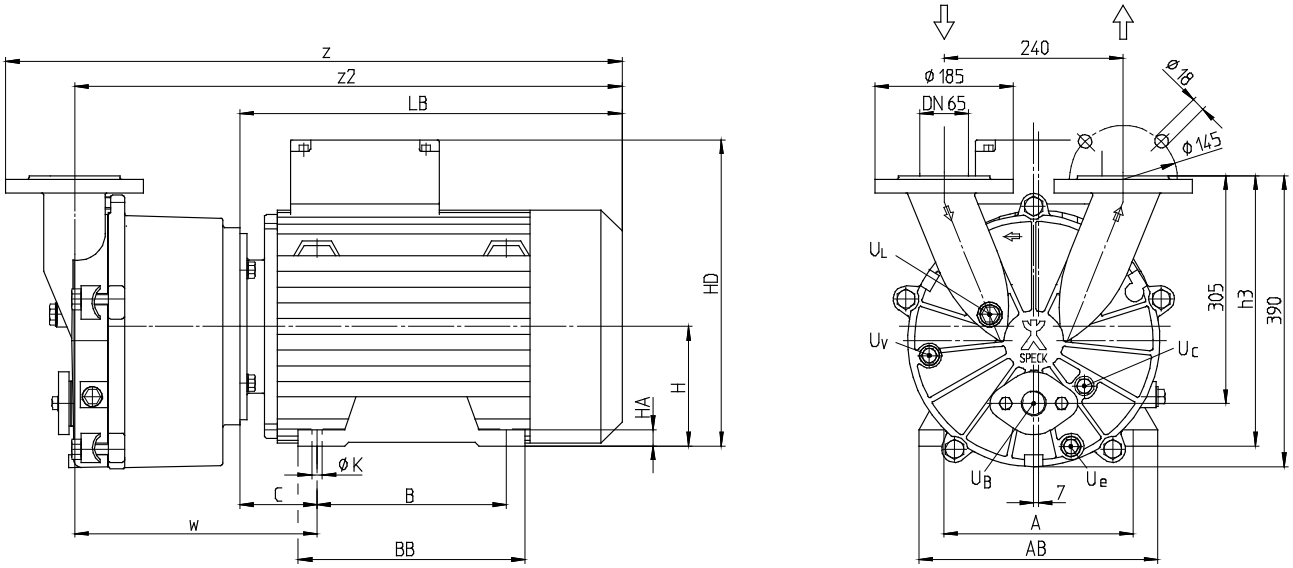

Fig. 21 Dimensional drawing V-330/430

Type	Hz	Motor size	h3	w	z	z2	A	AB	B	BB	C	H	HA	HD	K	LB
V-330	50	132M	353	303	732	639	216	256	178	218	95	132	18	320	12	431
	60	160M	361	311	813	720	254	320	210	260	103	160	22	410	14	512
V-430	50	160M	361	324	826	733	254	320	210	260	103	160	22	410	14	512
	60	160L							254	304						

Tab. 44 Dimension chart V-330/430

Designation	Explanation
U_B	Operating liquid connection
U_C	Cavitation protection
U_e	Drainage (screw plug)
U_L	Ventilation valve connection
U_V	Drainage valve connection

Tab. 45 Connections V-330/430

10.9 Cross-sectional drawing V-330/430

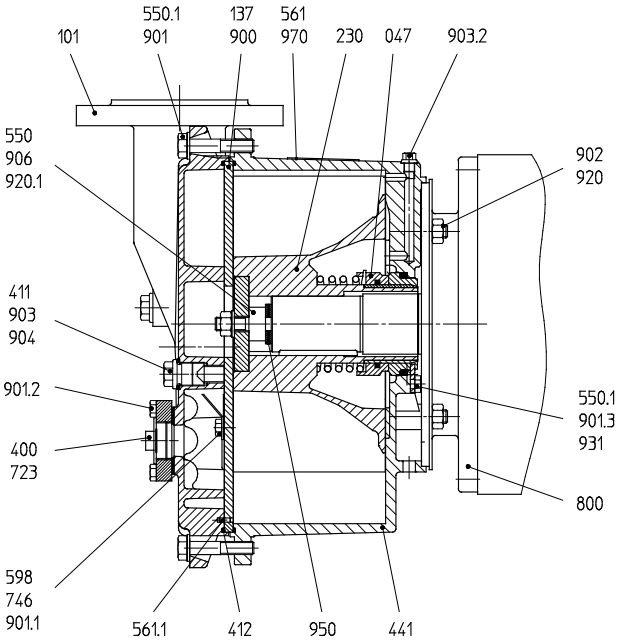

Fig. 22 Cross-sectional drawing V-330/430

No.	Designation
047	Mechanical seal
101	Pump casing
137	Inter casing
230	Impeller
400	Flat gasket
411	Sealing ring
412	O-ring
441	Shaft sealing casing
550/.1	Washer
561/.1	Grooved pin
598	Steel sheet
723	Threaded flange
746	Valve flap
800	Motor
900	Screw
901-.3	Hexagon head screw
902	Stud bolt
903/.2	Screw plug
904	Threaded pin
906	Impeller screw
920/.1	Hexagon nut
931	Lock washer
950	Disc spring
970	Nameplate

Tab. 46 Parts list V-330/430

10.10 Dimensional drawing VG-30/55

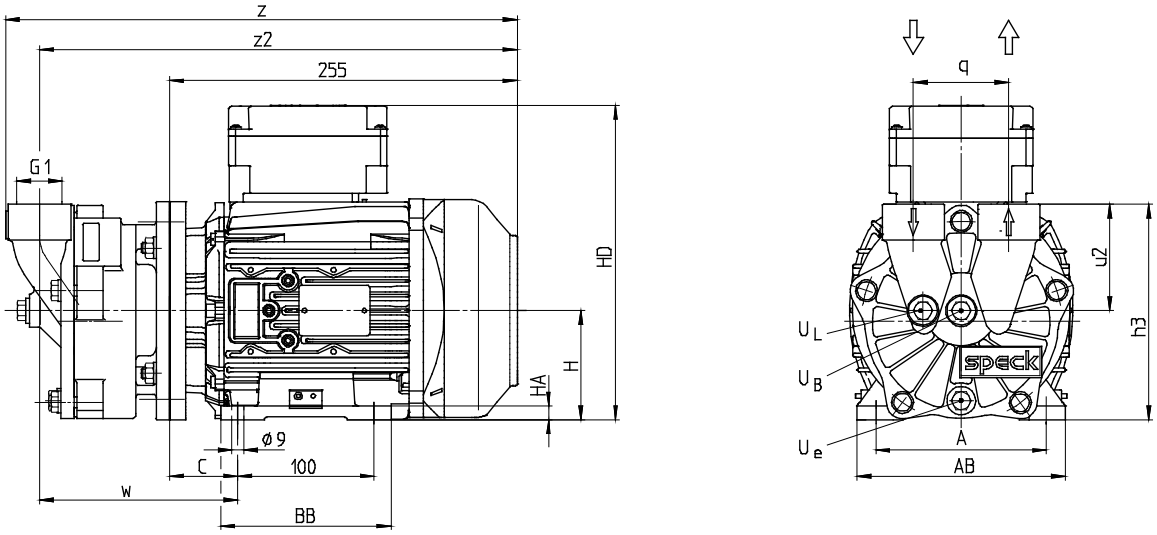

Fig. 23 Dimensional drawing VG-30/55

Type	Hz	Motor size	h3	u2	q	w	z	z2	A	AB	BB	C	H	HA	HD
VG-30	50/60	80	158	78	70	146	375	351	125	153	125	50	80	10	211
VG-55	50/60	90	171	81	74	168	391	367	140	170	155	56	90	11	240

Tab. 47 Dimension chart VG-30/55

Designation	**Explanation**
U_B	Operating liquid connection
U_e/ U_{e1}	Drainage (screw plug)
U_L	Ventilation valve connection

Tab. 48 Connections VG-30/55

10.11 Cross-sectional drawing VG-30/55

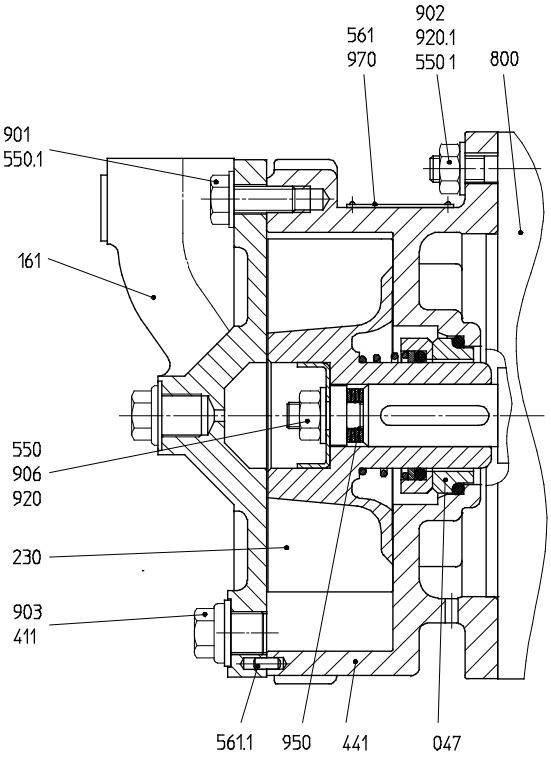

Fig. 24 Cross-sectional drawing VG-30/55

No.	Designation
047	Mechanical seal
161	Casing cover
230	Impeller
411	Sealing ring
441	Shaft sealing casing
550/.1	Washer
561/.1	Grooved pin
800	Motor
901	Hexagon head screw
902	Stud bolt
903	Screw plug
906	Impeller screw
920/.1	Hexagon nut
950	Disc spring
970	Nameplate

Tab. 49 Parts list VG-30/55

10.12 Dimensional drawing VG-95/130/155/255 - thread version

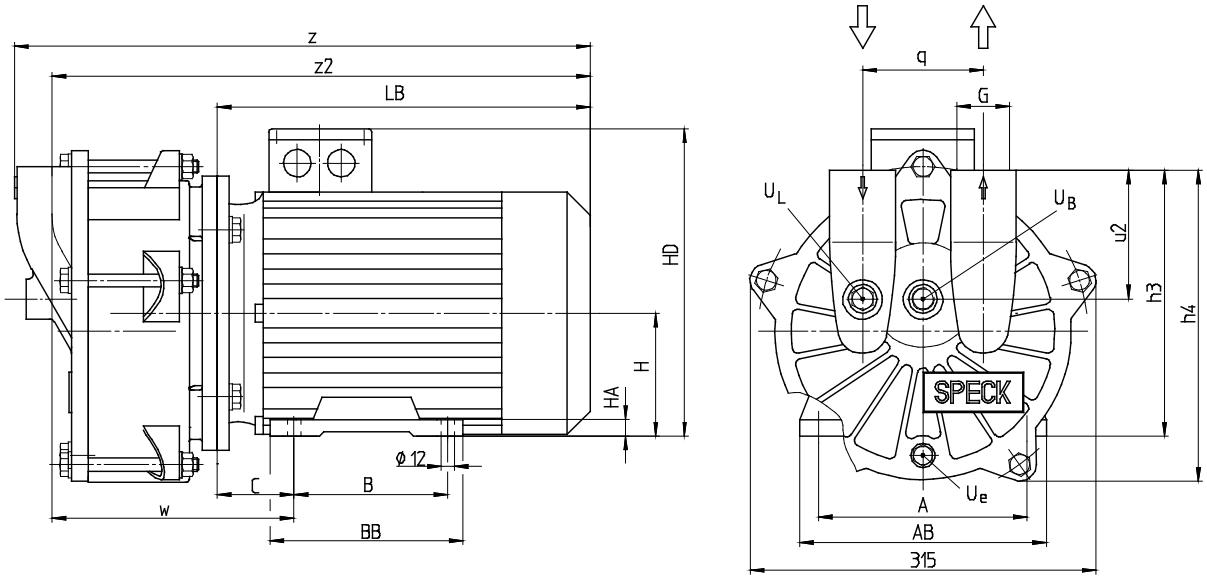

Fig. 25 Dimensional drawing VG-95/130/155/255 - thread version

Type	Hz	Motor size	h3	h4	u2	q	w	z	z2	A	AB	B	BB	C	H	HA	HD	LB
VG-95	50/60	100L	230	283	117	110	189	463	429	160	195	140	176	63	100	13	255	303
VG-130	50/60	100L	230	283	117	110	198	472	438	160	195	140	176	63	100	13	255	303
VG-155	50/60	112M	242	283	117	110	222	506	472	190	225	140	176	70	112	15	280	320
VG-255	50	132S	262	318	120	130	300	656	616	216	256	140	262	318	120	130	300	656
	60	132M										178						

Tab. 50 Dimension chart VG-95/130/155/255 - thread version

Designation	Explanation
U_B	Operating liquid connection
U_e	Drainage (screw plug)
U_L	Ventilation valve connection

Tab. 51 Connections VG-95/130/155/255 - thread version

10.13 Cross-sectional drawing VG-95/130/155 - thread version

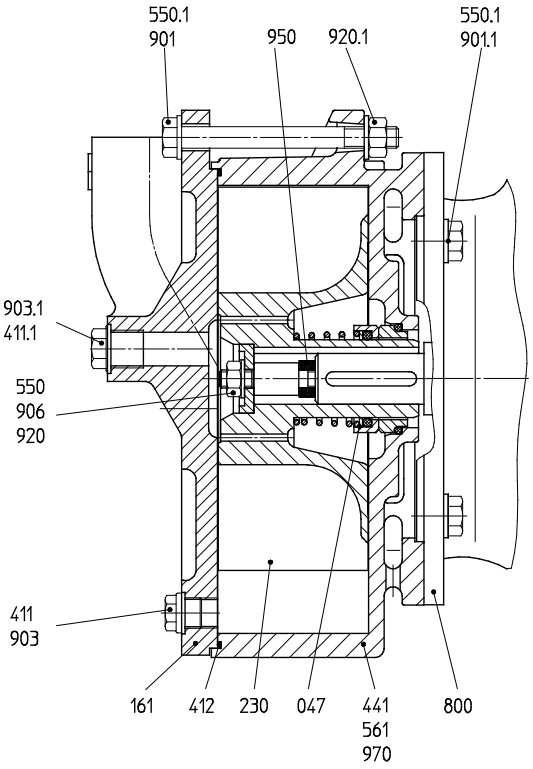

Fig. 26 Cross-sectional drawing VG-95/130/155 - thread version

No.	Designation
047	Mechanical seal
161	Casing cover
230	Impeller
411/.1	Sealing ring
412	O-ring
441	Shaft sealing casing
550/.1	Washer
561	Grooved pin
800	Motor
901/.1	Hexagon head screw
903/.1	Screw plug
906	Impeller screw
920/.1	Hexagon nut
950	Disc spring
970	Nameplate

Tab. 52 Parts list VG-95/130/155 - thread version

10.14 Cross-sectional drawing VG-255 - thread version

ⓘ Drawing also applicable to VG-255 - flange version

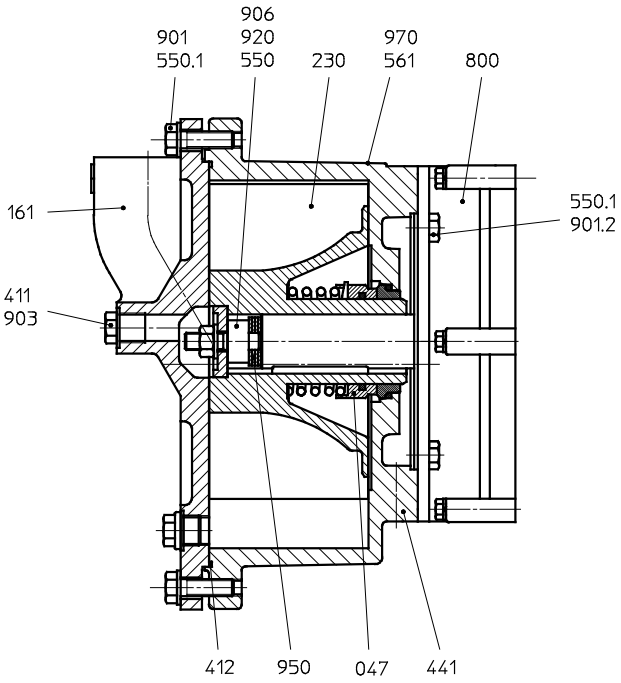

Fig. 27 Cross-sectional drawing VG-255 - thread version

No.	Designation
047	Mechanical seal
161	Casing cover
230	Impeller
411	Sealing ring
412	O-ring
441	Shaft sealing casing
550/.1	Washer
561	Grooved pin
800	Motor
901/.2	Hexagon head screw
903	Screw plug
906	Impeller screw
920	Hexagon nut
950	Disc spring
970	Nameplate

Tab. 53 Parts list VG-255 - thread version

10.15 Dimensional drawing VG-95/130/155/255 - flange version

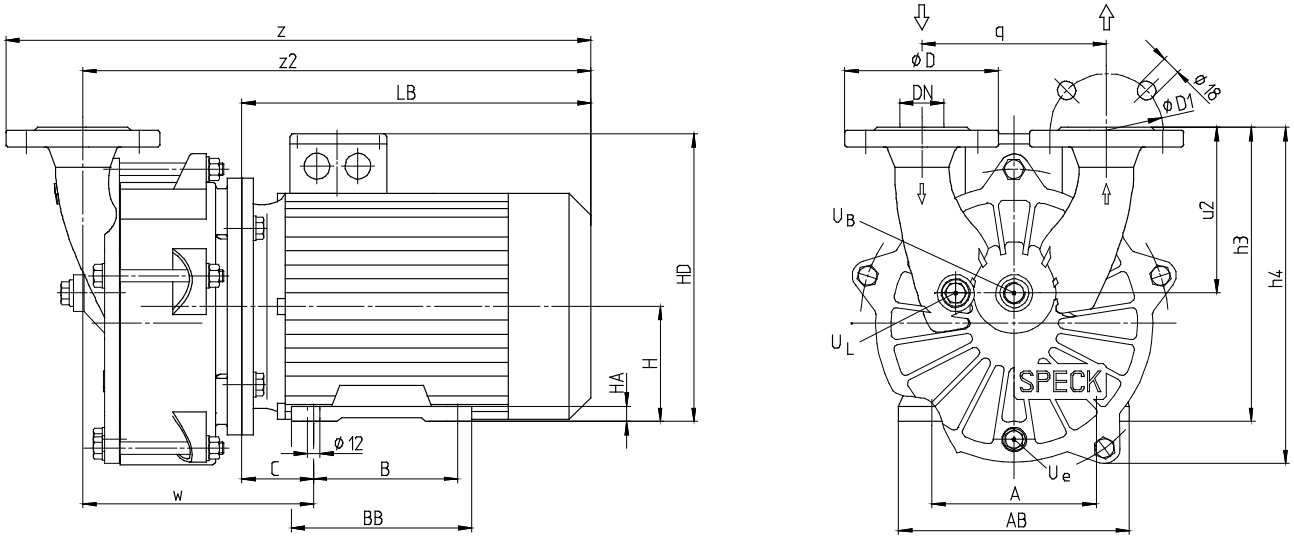

Fig. 28 Dimensional drawing VG 95/130/155/255 - flange version

Type	Hz	Motor size	h3	h4	u2	q	w	z	z2	A	AB	B	BB	C	H	HA	HD	LB
VG-95	50/60	100L	275	328	162	180	192	507	432	160	195	140	176	63	100	13	255	303
VG-130	50/60	100L	275	328	162	180	201	516	441	160	195	140	176	63	100	13	255	303
VG-155	50/60	112M	287	328	162	180	225	550	475	190	225	140	176	70	112	15	280	320
VG-255	50	132S	312	370	170	200	283	689	605	216	256	140	218	110	132	18	320	426
	60	132M										178						

Tab. 54 Dimension chart VG-95/130/155/255 - flange version

Designation	Explanation
U_B	Operating liquid connection
U_e	Drainage (screw plug)
U_L	Ventilation valve connection

Tab. 55 Connections VG-95/130/155/255 - flange version

10.16 Cross-sectional drawing VG-95/130/155 - flange version

ⓘ Cross-sectional drawing VG-255 - flange version→ Cross-sectional drawing VG-255 - thread version, page 48

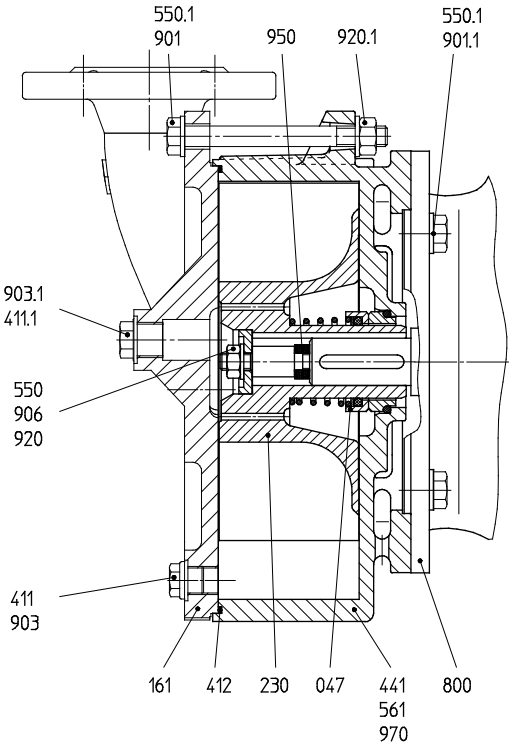

Fig. 29 Cross-sectional drawing VG-95/130/155 - flange version

No.	Designation
047	Mechanical seal
161	Casing cover
230	Impeller
411/.1	Sealing ring
412	O-ring
441	Shaft sealing casing
550/.1	Washer
561	Grooved pin
800	Motor
901/.1	Hexagon head screw
903/.1	Screw plug
906	Impeller screw
920/.1	Hexagon nut
950	Disc spring
970	Nameplate

Tab. 56 Parts list VG-95/130/155 - flange version

10.17 Certificate of conformity

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

Certificate of conformity

The pump/pump aggregate including accessories for which we, the undersigned, have placed an inspection/repair order or which has been returned by us together with this certificate of conformity,

Designation: _____

Type: _____

Serial number: _____

☐ 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:

Trade name	Chemical designation	Properties (e.g. toxic, inflammable, caustic)

☐ The pump/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.

City, date: _____ **Name:** _____

Company stamp: _____ **Signature:** _____

Tab. 57 Certificate of conformity

10.18 EC declaration of conformity

EG - Konformitätserklärung

EC declaration of conformity
Déclaration „CE“ de conformité

Vakuumtechnik GmbH
zertifiziert nach DIN EN ISO 9001 :2008

im Sinne der EG-Richtlinie Maschinen 2006/42/EG, Anhang IA
as defined in machinery directive 2006/42/EEC, annex IA
conformément à la directive “CE” relative aux machines 2006/42 CEE, annexe IA

Hiermit erklären wir, dass das Pumpenaggregat
We herewith declare that the pump unit
par la présente nous déclarons que letype de pompe

Bauart: **V**
type **VG**
VGI
VH
VI
VM
VN
VU
VZ
UniVac
BluVac

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 protection de la directive basse-tension sont respectées conformément à appendice 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 harmonisés utilisées, notamment

- DIN EN 809
- EN ISO 14121-1
- DIN EN 60034-1

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 completion of the technical documentation:
Mandataire pour le complément de la documentation technique est:

Dr. Ing. Pierre Hähre
SPECK PUMPEN
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Roth, 27.07.2012
Ort,Datum
place/lieu / date

ppa. Dr.-Ing. Pierre Hähre
(Unterschrift Ltg. Konstruktion)
(signature Technical Director)
(signature Directeur de Construction)

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