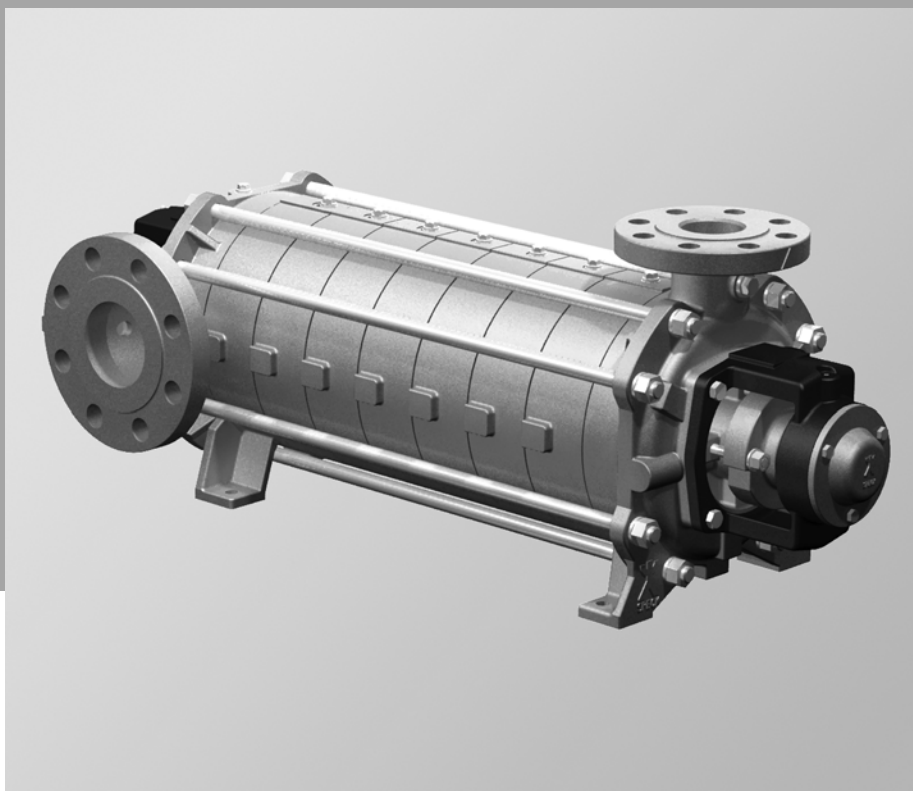


Operating Instructions

ES Series

Multi-stage Horizontal Boiler Feed Pumps

English translation of the 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.

Issue:	Supersedes issue:	Doc./ Item no.:
09/2011	09/2010	1096.0903

Index

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

- Centrifugal pump (ES)
- Operating instructions
- Motor (optional)
- Coupling/coupling guard (optional)
- Base plate (optional)

Technical support address

Speck Pumpen Walter Speck GmbH & Co. KG

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

Phone: +49 (0) 9171 809 0
Fax: +49 (0) 9171 809 10

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

Warranty and liability

Generally, the “General Conditions of Sale and Delivery” of

Speck Pumpen Walter Speck GmbH & Co. KG applies.

They have been 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 machine
- improper mounting, commissioning, operation and maintenance of the machine
- operation of the machine despite defective safety devices
- non-observance of the notes in the operating instructions
- unauthorized constructional changes to the machine
- 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
Declaration of conformity	Conformity with standards
Declaration of incorporation	Conformity with standards

Tab. 2 Applicable documents

1.3 Incorporation of partly completed machinery

Incorporation of partly completed machinery supplied by Speck Pumpen is subject to the respective notes/descriptions included in Chapter 5.6 “Motor installation” (pages 15 et seq.).

1.4 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

1.5 Terminology

Term	Meaning
Pump	Machine without drive, components or accessories
Aggregate	Complete aggregate including pump, drive, components and accessories
Auxiliary operating systems	Devices for operating the 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 pump/aggregate exclusively for delivery of the permissible media to be pumped (→ General technical data, page 27).
- Observe the operating limits and the minimum flow rate depending on size.
- Prevent dry running:
  - The sealing rings of the mechanical seal as well as the plain bearings will be damaged within only few seconds.
  - Ensure that the pump/aggregate is only operated with sufficient medium to be pumped, never without medium to be pumped.
- Prevent cavitation:
  - Completely open the suction-side fitting and do not use it for controlling the flow rate.
  - Do not open the pressure-side fitting beyond the agreed operating point.
- Prevent overheating:
  - Do not operate the aggregate when the pressure-side fitting is closed.
  - Observe the minimum flow rate (→ General technical data, page 27).
- Prevent motor damage:
  - Do not open the pressure-side fitting beyond the agreed operating point.
  - Observe the switching frequency of the aggregate.
  - The motor protection switch must not be set to a value above nominal current.
- Any use other than the intended use must be agreed with the manufacturer.

2.2 Potential misuse

- Observe the operating limits of the pump/aggregate concerning temperature, pressure, speed, flow rate, density and viscosity (→ Operating limit values, page 27).
- The higher the density of the medium to be pumped, the higher the motor power consumption. Observe the permissible density to protect the aggregate against overload. Lower densities are permissible. In this case, adjust the auxiliary systems accordingly.
- Refrain from delivering abrasive and solid laden liquids.
- Do not combine multiple limit values (→ Operating limit values, page 27).
- Prevent sudden temperature changes of the medium to be pumped.
- Do not use in rooms where explosive gases may be present unless the pump/aggregate has been expressly intended for such purpose.
- Do not extract, deliver or compact explosive, inflammable, aggressive or toxic media unless the aggregates have been expressly intended for such purpose.
- Unauthorized opening of the pump/aggregate results in the forfeiture of any and all claims for defects.

2.3 General safety instructions

ⓘ 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 pump/aggregate under the supervision of technically qualified staff.

2.3.2.3 Safety devices

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

2.3.2.4 Warranty

- During the warranty period, conversion works, repairs and modifications are subject to approval by the manufacturer.
- Use original parts or parts approved by the manufacturer only.
- 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 pump/aggregate must be observed and kept legible, e.g. arrows indicating the direction of rotation, symbols indicating media connections.
- Guards for protection against contact with hot, cold and moving parts must not be removed during operation.
- If required, use protective equipment.
- Works on the pump/aggregate must only be carried out at standstill.
- Prior to carrying out any assembly or maintenance works, de-energize the motor and protect it against restart.
- Having completed all works on the pump/aggregate, duly re-assemble the safety devices.

2.4 Residual risks

⚠ WARNING

The rotating pump shaft between the bearing bracket and the shaft sealing casing may catch and wind up long and loose hair.

► Wear a hairnet!

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 guard!

► 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 media to be pumped escaping from a defective mechanical seal!

► Shut down the pump!

► Repair the pump!

2.5 Special risks

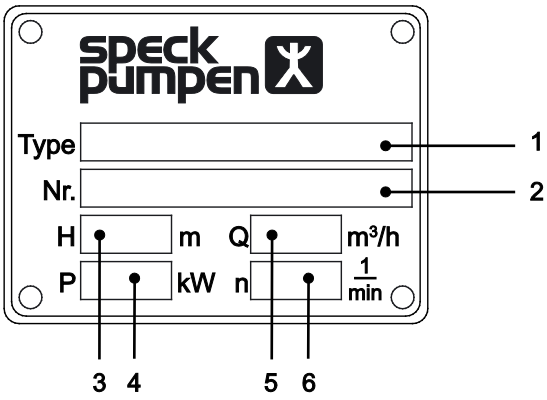
2.5.1 Dangerous media to be pumped

- 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 pump/aggregate.

3 Design and functioning

3.1 Marking

3.1.1 Nameplate



1 Pump type
2 Plant number
3 Total head
4 Power requirements
5 Flow rate
6 Speed

Fig. 1 Nameplate (example)

3.1.2 Pump type code

	ES	**32**	**03**	**LL**	**G1 -**	**30**	**001**
	ES	**32**	**03**	**LL**	**SB -**	**30**	**001**
1							
2							
3							
4							
5							
6							
7							

1 Pump type
2 Pump size
3 Number of stages
4 Shaft bearing (→ Tab. 6)
5 Shaft sealing (→ Tab. 7)
6 Material design
7 Counting number

Tab. 6 Pump type code ES (example)

Code	**LL**	**LL**
Type	ES 320	ES 400/500/650 (PN 40) / 650 (PN63)
Design	1 roller bearing, 1 ball bearing	2 ball bearings

Tab. 7 Shaft bearing code

Code number		**G1**	**G2**	**G4**	**X**	**SB**	**G6**
Type		**ES 320/400/500/650 (PN 40)**					**ES 650 (PN)**
Shaft sealing		Mechanical seal				Packing gland	Mechanical seal
Material		SiC, carbon, FKM			Special version	–	SiC, carbon, FKM
Max. operating pressure	suction side	12 bar 230 psi				–	16 bar 910 psi
	pressure side	12 bar 430 psi	25 bar 430 psi	40 bar 580 psi		40 bar 580 psi	63 bar 910 psi

Tab. 8 Shaft sealing code

3.2 General description

Pumps of the ES series are horizontal centrifugal pumps in segmental design with up to 11 stages.

In all types, the shaft runs in exterior rolling bearings.

Shaft sealing can be realized in two ways:

- packing glands
- single-acting mechanical seals.

After having been initially filled with the medium to be pumped, the pumps are normal priming. They are used for delivery of pure or slightly contaminated aqueous liquids which do not contain abrasive or fibrous particles.

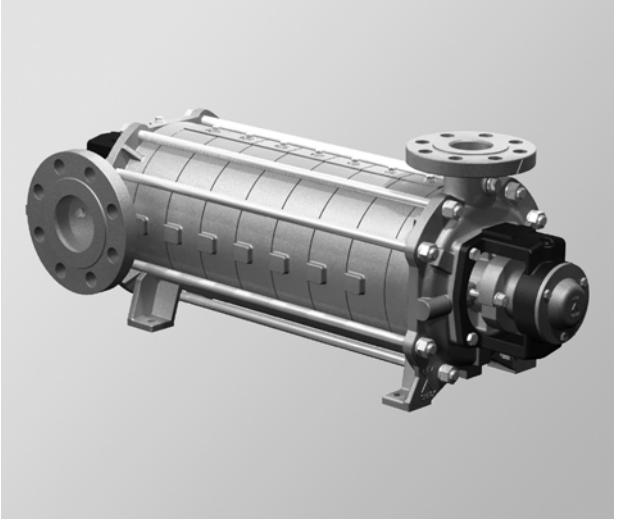
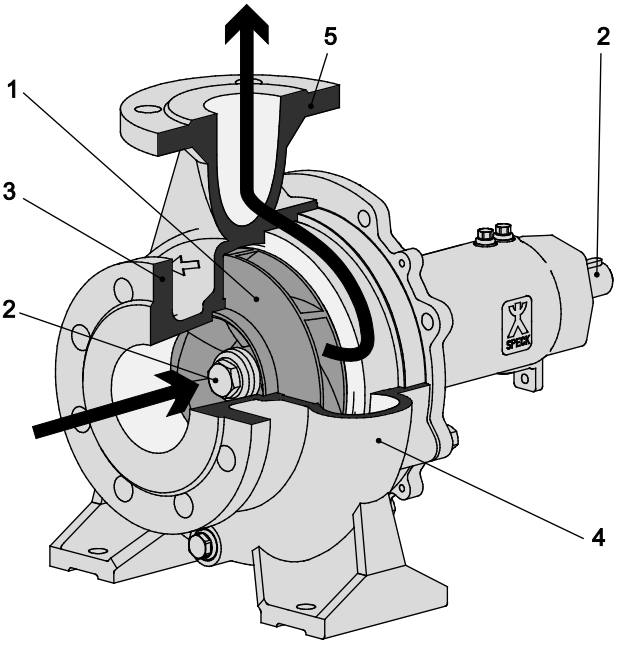


Fig. 2 ES

3.3 Design and functional principle



1 Impeller
2 Shaft
3 Inlet nozzle
4 Volute casing
5 Outlet nozzle

Fig. 3 Mode of operation of a radial impeller pump

Centrifugal pumps are fluid-flow machines. They are used to deliver liquids.

The medium to be pumped, which enters the centrifugal pump through the suction connection, is axially carried away by the rotating impeller. It is diverted in a right angle turn by the radially positioned blades and forced to take a circular path. The downstream diffuser insert then diverts the liquid back to the centre of the shaft before the following impeller captures the liquid in axial direction. The momentum of the liquid is transformed into pressure energy at the outlet area of the pump casing and the liquid is forced into the outlet nozzle.

For this purpose, pumps with radial outlet are accommodated by a pump casing, which is closely attached to the impeller right behind the impeller and which expands to the inside diameter of the outlet flange. Centrifugal pumps with radial impeller are not self-priming and must therefore be filled with liquid prior to commissioning.

If the suction pipe contains too much air during operation (critical volume 8–10 vol.%), the delivery process is usually interrupted.

3.4 Shaft sealing

Type	ES 320 ES 400 ES 500	ES 650 (PN 40)	ES 650 (PN 63)
Packing gland	x	x	-
Mechanical seal	x	x	x

Tab. 9 Matching of shaft sealing and type

3.4.1 Mechanical seal

ⓘ Mechanical seals may slightly leak for functional reasons.

- Single mechanical seal, unbalanced/balanced, dependent on the direction of rotation/independent of the direction of rotation
- The mechanical seals comply with EN 12756.

3.4.2 Packing gland

ⓘ Packing glands slightly leak for functional reasons. The leaks are a prerequisite for proper functioning of the packing glands (medium to be pumped escapes drop by drop).

⚠ CAUTION

Risk of seal damage caused by improper adjustment!

Packing glands running dry will harden and destroy the shaft protection sleeve.

► Observe the guide value for leakage:

– 20 drops per 25 mm shaft/shaft protection sleeve diameter per minute
(ES series 30-60 drops / min., depending on the type).

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 (→ Appendix, page 30 et seq.)

4.1.1 Unpacking and inspection on delivery

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

4.1.2 Manual transport

⚠ 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. 10 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.

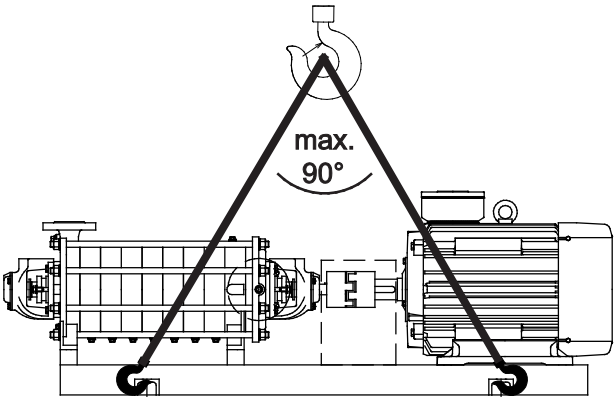


Fig. 4 Attaching lifting gear to the aggregate

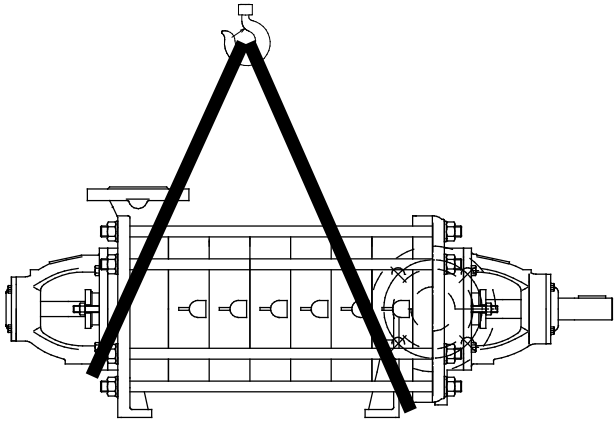


Fig. 5 Attaching lifting gear to the pump

► Lift the pump/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
(→ Preservation, Paragraph 4.3).

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 29)

CAUTION

Risk of material damage caused by improper storage!

► Store the pump/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

CAUTION

Risk of material damage caused by improper preservation!

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

1. Select a preserving agent in accordance with the type and duration of storage (→ page 29)
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. Do not treat pumps incorporating EPDM seals 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 20)

ⓘ Use appropriate collecting trays, position of drainage bores (U_e) (→ Dimension drawing, page 33 et seq.).

- Unscrew the screw plugs of all drainage bores (U_e).
- Drain the medium to be pumped.
- Occasionally rotate the pump shaft/motor shaft towards the direction of rotation of the pump/aggregate.
- Continue with this process until no more medium to be pumped escapes.
- Plug all drainage bores with screw plugs.
- Remove the pipes from the suction and pressure connections.
- Plug the inlet nozzle with a blank flange.
- Fill preserving agent into the open outlet nozzle.
- Plug the outlet nozzle with a blank flange.
- Switch the pump/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).
- Drain the preserving agent into collecting trays.
- Occasionally rotate the pump shaft/motor shaft towards the direction of rotation of the pump/aggregate.
- Continue with this process until no more preserving agent escapes.
- Close the suction and pressure connection 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 pump/aggregate
(→ Shut-down, page 20; Return to manufacturer, page 21)

ⓘ Use appropriate collecting trays, position of drainage bores (U_e) (→ Dimension drawing, page 33 et seq).

- Seal all drainage bores (U_e) with screw plugs.
- Plug the inlet nozzle with a blank flange.
- Fill in preserving agent into the open outlet nozzle until the agent becomes visible.
- Occasionally rotate the pump shaft/motor shaft towards the direction of rotation of the pump/aggregate.
- Continue this process until the preserving agent appears below the upper edge of the outlet nozzle.
- Unscrew the screw plugs of all drainage bores (U_e).
- Drain the preserving agent into collecting trays.
- Occasionally rotate the pump shaft/motor shaft towards the direction of rotation of the pump/aggregate.
- Continue with this process until no more preserving agent escapes.
- Close the suction and pressure connection using transport or sealing covers.
- Plug all drainage bores (U_e) with screw plugs.

4.4 Removing preserving agent

ⓘ Only required for pumps/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:
   – 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 pump.
   – Remove preserving agent (→ page 13)
   – 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

CAUTION

Risk of material damage caused by contamination!

► Do not remove transport locks until immediately before setting up the pump/aggregate.

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

5.1 Preparing set-up

5.1.1 Checking ambient conditions

► Make sure the required ambient conditions are maintained (→ Ambient conditions, page 28).

► 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 28)

5.1.3 Preparing installation site

► Make sure the installation site meets the following conditions:

- the pump/aggregate is freely accessible from all sides.
- sufficient space for installing/disassembling the pipes as well as for maintenance and repair works, particularly for installation/disassembly of the pump/aggregate, 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 pump/aggregate is commissioned directly after set-up and connection: remove preserving agent prior to set-up (→ Removing preserving agent, page 13).

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.

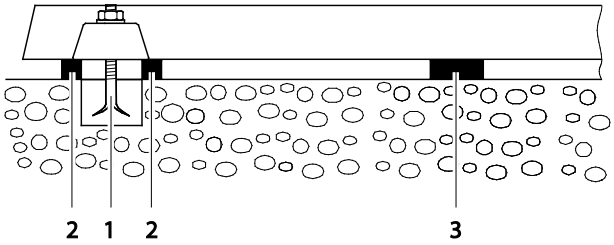


Fig. 6 Set-up with foundation

1. 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.
2. Make sure the steel washers are in surface contact with the base plate.
3. 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.
4. 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.

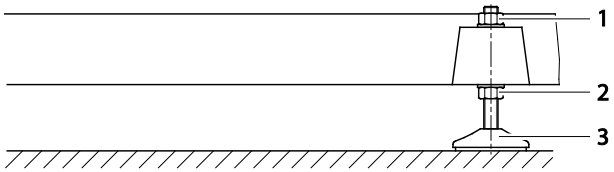
1. Fill the anchoring holes with mortar grout.
2. When the mortar grout has set, bolt down the base plate with the specified torque at three points
   (→ Tightening torques, page 28).
3. Before tightening the remaining bolts, compensate for any unevenness in the surface using metal spacing shims next 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

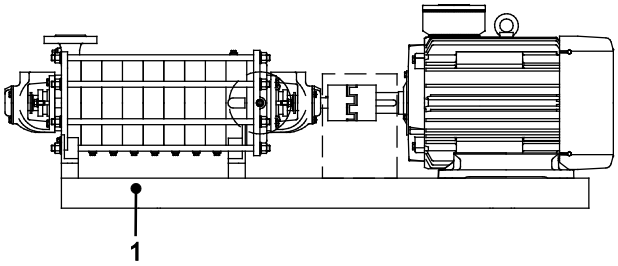
1. Lift the aggregate (→ Transport with lifting gear, page 11).
2. Mount the four levelling feet as illustrated.
3. Position the aggregate on the surface.
4. Adjust the base plate height by means of the levelling feet as illustrated above:
   – Use the wrench to hold the hexagon nut at the levelling 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 28).
   – Use the integrated spirit level to check whether the aggregate is level end to end and side to side with a maximum allowable tilt of 1 mm/m.
   – Repeat this process until the base plate has been correctly aligned.

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

ⓘ Installation position: horizontal, outlet nozzle pointing vertically up

✓ Auxiliary means, tools, material:

– wrench



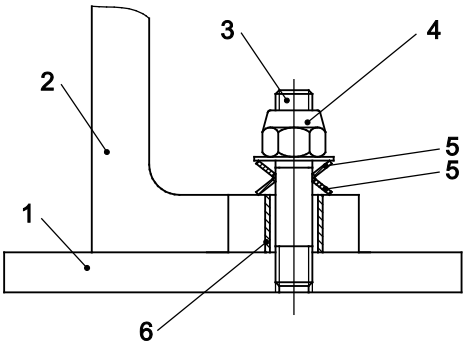
1 Surface/frame

Fig. 8 Set-up on level surface/frame

1. Lift the aggregate (→ Transport, page 11).
2. Position the aggregate on a torsion-resistant level surface/frame.
3. Screw the aggregate to the surface/frame without overtightening the screws.

5.5 Mounting instructions for operation with hot media to be pumped

ⓘ If the pump is operated with hot media, the pump feet must be mounted in a way which allows for longitudinal extension at the pressure side.



1 Base plate

2 Casing foot

3 Screw

4 Self-locking nut

5 Waved washer

6 Guide bushing

Fig. 9 Mounted casing foot allowing for extension induced by hot media

1. After installation of the guide bushing: put on the waved and the plain washer.
2. Screw on and slightly tighten the self-locking nut (the waved washer can still be manually moved).
3. Tighten the self-locking nut by half a turn.

5.6 Motor installation

ⓘ Only necessary if aggregate set-up is completed at the installation site.

CAUTION

Risk of material damage caused by knocks and bumps!

► Do not tilt the coupling halves when slipping them on.

► Do not knock on or hit any pump/motor components.

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

8. Insert the plastic gear ring into the coupling halve at the pump side. Slide the motor coupling into the pump coupling. Make sure to keep the required clearance between the coupling halves
(→ Fine adjustment of coupling, page 17).
9. Screw in and slightly tighten the motor screws.
10. Adjust the coupling (Chapter 5.10, page 17).
11. Tighten the motor screws.
12. Install the coupling guard.

5.7 Planning pipe system

5.7.1 Dimensioning supports and connections

CAUTION

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

► 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.
4. Make sure the media pipes are able to withstand the hydraulic pressures and the temperatures of the medium to be pumped.
5. Do not provide bends or fittings at the inlet nozzle.

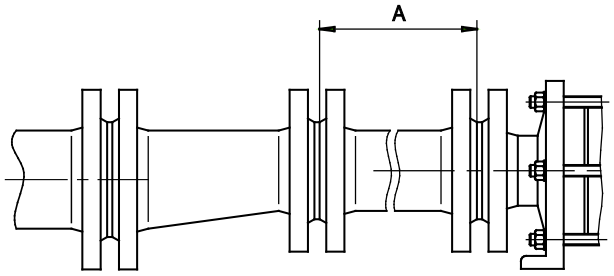
5.7.2 Specifying nominal diameter

ⓘ Size of suction/pressure connections
(→ Operating connections, page 27)

► 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.

5.7.3 Specifying pipe lengths



A ≥ 10 x nominal inlet nozzle diameter

Fig. 10 Specifying pipe lengths

► Comply with the recommended minimum values when installing the pump.

ⓘ When changing the diameter, use off-centre transition pieces to prevent formation of gas bubbles. The conical side has to point downwards (refer to Fig.).

5.7.4 Changes in cross-section and direction

1. Avoid radii of curvature of less than 1.5 times the nominal pipe diameter.
2. Do not provide fittings or bends directly in front of the pump entry.
3. Avoid sudden changes of cross-section and direction along the piping.

5.7.5 Safety and control devices

5.7.5.1 Avoiding contamination

1. Install filters in the suction pipe
(screen cross-section = 3x DN_s, mesh size 0.1 mm).
2. Install a differential pressure gauge with contact manometer to monitor the contamination process.

5.7.5.2 Avoiding backflow

► Put a check valve between the outlet nozzle and the gate valve to prevent the medium to be pumped from flowing back after the aggregate has been switched off.

5.7.5.3 Provisions for isolating and shutting off pipes

ⓘ For maintenance and repair works

► Provide for shut-off valves in the suction and pressure pipe.

5.7.5.4 Provisions for measuring operating conditions

1. For pressure measuring: provide for manometers in the suction and pressure pipe.
2. Provide for a power sensor at the motor side.
3. Provide for temperature measurement at the pump side.

5.8 Connecting pipes

5.8.1 Providing for clean piping

CAUTION

Risk of material damage caused by aggregate contamination!

► Protect the pump/aggregate against contamination.

1. Clean all piping parts and fittings prior to assembly
2. Make sure no flange seals project inwards.
3. Remove any blank flanges, plugs, protective foils and/or protective paint from the flanges.

5.8.2 Installing suction pipe

1. Remove the transport and sealing covers from the pump/aggregate.
2. Lay out the feed pipe with a continuous slope down to the pump/aggregate.
3. Lay out the suction pipe with a continuous slope up to the pump/aggregate.
4. Make sure no seals project inwards.
5. For suction lift mode under ambient pressure:
Install a foot valve in the suction pipe (at least 0.5 m below the highest level of the reservoir) to prevent the pump/aggregate and the suction pipe from running dry at standstill.
6. For gravity feed mode under ambient pressure:
liquid level at least 0.5 m above the centre of the inlet nozzle.
7. Pumping liquid from a higher vacuum reservoir:
Provide for a pressure-relief pipe (1“ ~ 2“), which returns liquid to the reservoir if the max. permissible liquid level is exceeded.

5.8.3 Installing pressure pipe

1. Remove the transport and sealing covers from the pump/aggregate.
2. Install the pressure pipe.
3. Make sure no seals project inwards.

5.8.4 Installing leakage pipe

Version with packing gland:

► Install a leakage collecting pipe

5.8.5 Stress-free pipe connection

CAUTION

Material damage caused by impermissible piping forces acting on the pump nozzles!

► Do not use the pump as anchoring point for the pipe.

► Observe the permissible forces and torques acting on the pump nozzle (Chapter 9.3).

ⓘ For the layout of piping, observe VDMA standard sheet 24277 on stress-free pipe connection.

5.9 Hydrostatic pressure test

ⓘ When subjecting the pipe system to a pressure test, do not apply pressure to the pump if possible. Prevent foreign bodies from entering the pump/aggregate.

CAUTION

Material damage caused by excessive pressure applied to the aggregate!

► Do not exceed the test pressure (max. 1.3 x pressure rating, Chapter 9.2.5).

5.10 Fine adjustment of coupling

CAUTION

Risk of material damage caused by improper coupling adjustment!

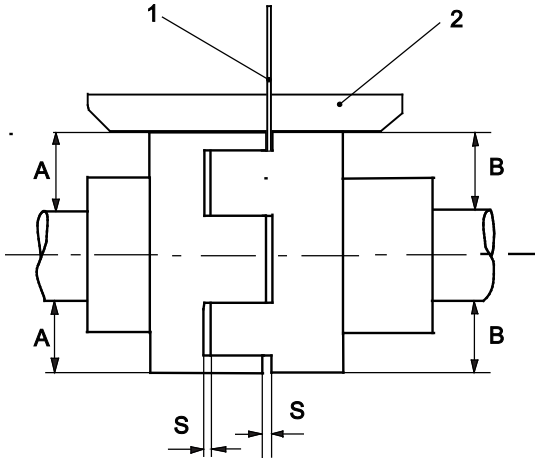
► Accurately adjust the motor to the pump in case of height, lateral or angular offset.

► For detailed information and special couplings: (→ Manufacturer's specifications).

5.10.1 Checking coupling adjustment

✓ Auxiliary means, tools, material:

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



1 Gauge

2 Straightedge

Fig. 11 Checking coupling adjustment

Coupling	s
19/24	2
24/28	2
28/38	2.5
38/45	3
42/45	3
48/60	3.5
55/70	4

Tab. 11 Checking coupling adjustment

5.11 Electrical connection

⚠ RISK OF ELECTRIC SHOCK

Risk of death from electric shock!

► Any electrical works must be carried out by qualified electricians only.

► IEC 30364 (DIN VDE 0100) standard.

⚠ DANGER

Risk of death from rotating parts!

► Make sure to only operate the pump/aggregate with all covers (fan hood, coupling guard) installed.

5.11.1 Motor connection

ⓘ Observe the specifications of the motor manufacturer.

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

ⓘ The electric motor must be protected by an upstream motor protection switch, which is set to I_N (I_N = nominal current).

5.11.2 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!

► Fill the aggregate and pipes with the medium to be pumped (→ Filling and venting, page 19).

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 shaft sealing.

⚠ RISK OF ELECTRIC SHOCK

Risk of death from electric shock!

► Any electrical works must be carried out by qualified electricians only.

► IEC 30364 (DIN VDE 0100) standard.

3. In case of deviating direction of rotation: Swap the two phases at the motor.

6 Operation

6.1 Preparations for commissioning

6.1.1 Identifying pump type

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

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

6.1.2 Removing preserving agent

ⓘ Only required if the pump/aggregate has been treated with preserving agent.

► Remove preserving agent (→ Removing preserving agent, page 13).

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 19).

6.1.4 Filling and venting

1. Fill the aggregate as well as the suction and pressure pipe with the medium to be pumped and vent them.
2. Open the suction-side fitting.
3. Open the pressure-side fitting.
4. Make sure all ports and connections are tight.

6.1.5 Preparing auxiliary operating systems

The manufacturer does not accept liability for damage resulting from the installation or use of auxiliary operating systems manufactured by suppliers other than Speck Pumpen or auxiliary operating systems which have not been approved.

6.2 Commissioning

6.2.1 Switch-on

✓ Pump/aggregate correctly set up and connected
✓ Motor correctly set up and connected
✓ Coupling adjustment checked
✓ Coupling guard installed
✓ All connections stress-free and sealed
✓ If available: auxiliary operating systems ready for operation
✓ All safety devices installed and checked for proper functioning
✓ 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.

⚠ WARNING

Risk of injuries caused by hot pump parts or hot media to be pumped!

► 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!

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

► Do not open the pressure-side fitting beyond the operating point.

CAUTION

Risk of cavitation in case of non-observance of the minimum pressure (NPSH)!

► It must be ensured that the NPSH value of the system (NPSHA) is under all operating conditions higher than the NPSH value of the pumps (NPSHR).

► Observe the NPSH value of the pumps (NPSHR) (Chapter 10, Characteristic curves).

ⓘ Operation below the minimum NPSH value of the pumps may result in material damage caused by cavitation or destruction due to overheating.

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 minimum flow rate (→ Operating limit values, page 27).

1. Open the suction-side fitting.
2. Close the pressure-side fitting.
3. Switch on the motor.
4. Immediately set the operating point by means of the pressure-side fitting, when the nominal speed has been reached.
5. Provide for a smooth running behaviour of the pump aggregate.
6. After the aggregate has been subjected to pressure and operating temperature for the first time, check whether it is tight.
7. With packing gland version:
   Check permissible leakage (30 to 60 drops/min). If the packing gland does not leak, set the leakage rate by re-adjusting the gland nut.

6.2.2 Switch-off

WARNING

Risk of injuries caused by hot pump parts or hot media to be pumped!

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

1. Close the pressure-side fitting.
2. Switch off the motor.
3. Close the suction-side fitting.
4. If available, close the cooling agent inlet for the shaft sealing.
5. Check all connecting screws and tighten if required (only after initial commissioning).

6.3 Decommissioning

WARNING

Risk of injuries caused by hot pump parts or hot media to be pumped!

► 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:

Pump 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 three months (→Commissioning, page 19)
shut down for a longer period of time	► Implement measures in accordance with the condition of the medium to be pumped. (→ Tab.13 Measures depending on the behaviour of the medium to be pumped)
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 12).

Tab. 12 Measures to be taken when putting the pump out of operation

Medium to be pumped	Duration of shut-down (process-dependent)	
	Short	Long
Water	► Drain aggregate and reservoirs.	► Drain aggregate and reservoirs. ► Treat aggregate with a preserving agent (→ Preservation, page 12)
Other media	-	► Drain aggregate and reservoirs. ► Treat aggregate with a preserving agent (→ Preservation, page 12).

Tab. 13 Measures depending on the behaviour of the operating liquid

6.4 Re-commissioning

Shut-down periods > 1 year:

1. Prepare commissioning (→ Preparations for commissioning, page 19).
2. Perform commissioning procedures (→ Commissioning, page 19).
3. Monitor the aggregate following commissioning (→ Monitoring, page 21).

6.5 Operating stand-by aggregate

✓ Stand-by aggregate filled

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

7 Maintenance and servicing

ⓘ 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 39).

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.

► IEC 30364 (DIN VDE 0100) standard.

⚠ DANGER

Risk of injuries caused by running pump/aggregate!

► Do not touch the running aggregate.

► Do not carry out any works on the running aggregate.

⚠ WARNING

Risk of injuries caused by hot aggregate parts or hot media to be pumped!

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

1. Check at appropriate intervals:
   - power consumption of the drive
   - contamination of the drive
   - contamination of filters (if available)
   - running noise of the rolling bearings (pump/motor). If your pump has grease nipples at the bearing brackets, re-lubricate the bearings (Lubrication intervals, chapter 9.5).
   - normal operating conditions unchanged
   - backlash on elastic coupling elements
2. For trouble-free operation, ensure the following:
   - no dry running
   - tightness
   - no cavitation
   - open gate valves at the suction side (if available)
   - free and clean filters (if available)
   - 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 seal
   - In case of leaks: Have the mechanical seal replaced by service staff or the manufacturer. Check auxiliary operating systems (if available) for proper functioning or have them checked.

   Packing gland
   - A leak rate of 30 to 60 drops/min. is required for the packing glands to avoid overheating of the sealing. Completely tight packing glands running dry will damage the shaft or shaft protection sleeve additionally and are subject to wear within short time.

7.2 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.

► IEC 30364 (DIN VDE 0100) standard.

⚠ WARNING

Risk of injuries caused by hot pump parts or hot media to be pumped!

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

► Make sure the aggregate is depressurized.

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

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

7.2.2 Spare parts

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

The following data are required for spare part orders.

- Number of the pump (→ Nameplate, page 9)
- Type of pump (→ Nameplate, page 9)
- Item number of the spare part (→ Cross-sectional drawing, refer to Appendix)
- Designation of the spare part (→ Cross-sectional drawing, refer to Appendix)
- Number of spare parts

7.2.3 Pump repairs

1. The following must be observed during assembly:
   - Worn parts must be replaced by original spare parts.
   - Remove the old seals and insert new ones in a distortion-proof manner
   - Observe the specified tightening torques (→ Tightening torques, page 28).
2. Clean all parts.
3. Install the aggregate into the system (→ Set-up and connection, page 14).

7.2.4 Disassembly of ES (with packing gland)

ⓘ Cross-sectional drawing ES → page 30

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

1. Disassembly of discharge casing
   - Mark the individual components' positions relative to one another (coloured pencil, drawing pin).
   - Vertically position the pump with the drive side pointing down.
   - Loosen the hexagon head screws (901.2) on the cover (360.1), take off the cover and remove the screws.
   - Screw off the shaft nut (921).
   - Screw the bearing housing off the discharge casing and remove it from the pump using a puller. In doing so, the ball bearing is also removed.
   - Loosen the hexagon nuts (920) on the casing bolts (563) and remove them. Pull out the casing bolts.
   - Pull the shaft sleeves with the O-ring (412.1) off the shaft.
   - Screw the nuts off the stay bolts. Remove the gland nut (452).
   - Remove the discharge casing (107).
   - Pull off the shaft sleeve (524). Remove the fitting key (940.5).
2. Disassembly of impellers and stage casings
   - Remove the impeller, stage casing and fitting key (940.4).
   - Take off the diffuser insert (174).
3. Disassembly of suction casing
   - Separate the bearing housing from the suction casing.
   - Loosen the gland nut on the suction casing.
   - Pull off the suction casing (106).
   - Remove the packing gland from the suction casing.
4. Disassembly of shaft with packing gland
   - Horizontally position the shaft with the bearing housing.
   - Remove the fitting key (940.3).
   - Screw off the bearing cover (360.1).
   - Remove the locking ring (932) and the washer (551) from the shaft.
   - Pull the bearing housing with the roller bearing off the shaft. With pumps featuring a ball bearing, the bearing housing must be removed from the shaft using a puller. In doing so, the ball bearing is also removed.
   - Pull the inner ring of the roller bearing off the shaft using a puller
   - Pull the shaft sleeves with the O-ring (412.1) off the shaft. Remove the fitting key (940.1).

7.2.5 Disassembly of ES (with mechanical seal)

ⓘ Cross-sectional drawing ES → page 30

The pump has been removed from the system and is stored in a clean and level assembly area.

1. Disassembly of discharge casing
   - Mark the individual components' positions relative to one another (coloured pencil, drawing pin).
   - Vertically position the pump with the drive side pointing down.
   - Loosen the hexagon head screws (901) on the cover (360), take off the cover and the screws.
   - Screw off the shaft nut (921).
   - Screw the bearing housing off the discharge casing and remove it from the pump using a puller. In doing so, the ball bearing is also removed.
   - Loosen the hexagon nuts (920) on the casing bolts (563) and remove them. Pull out the casing bolts.
   - Pull the shaft sleeves with the splash ring off the shaft.
   - Screw the nuts off the stay bolts. Remove the mechanical seal housing (441).
   - Pull the mechanical seal with the sleeve off the shaft.
   - Remove the discharge casing (107).
   - Pull off the shaft sleeve (523).
2. Disassembly of impellers and stage casings
   - Remove the impeller, stage casing and fitting key (940.2).
   - Take off the diffuser insert (174).
3. Disassembly of suction casing
   - Separate the bearing housing from the suction casing.
   - Screw the nuts off the stay bolts. Loosen the mechanical seal housing on the suction casing.
   - Pull off the suction casing (106).
4. Disassembly of shaft with mechanical seal
   - Horizontally position the shaft with the bearing housing.
   - Remove the fitting key (940.3).
   - Screw off the bearing cover (360.1).
   - Remove the locking ring (932) and the washer (551) from the shaft.
   - Pull the bearing housing with the roller bearing off the shaft. With pumps featuring a ball bearing, the bearing housing must be removed from the shaft using a puller. In doing so, the ball bearing is also removed.
   - Pull the inner ring of the roller bearing off the shaft using a puller.
   - Remove the shaft sleeves with the splash ring.
   - Take off the mechanical seal housing with the counter ring.
   - Remove the O-ring (412.2).
   - Pull off the mechanical seal with the shaft sleeve.
   - Remove the O-ring (412.1) and the shaft sleeve (523.1).

7.3 Assembly

7.3.1 Preparations for assemby

CAUTION

Improper assembly results in pump damage!

- ► Assemble the pump in accordance with the principal rules of mechanical engineering.
- ► Use original spare parts only.
- ► For pump 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 the seals.
- Install only clean parts.
- Install only inspected and flawless parts.
- Apply Molykote® lubricant to all threads and fits (except for sealing fits).
- Apply oil or Molykote® type G lubricant to the sliding surfaces of the impellers.
- All marks must be aligned with each other.
- All O-rings have to be replaced.
- Keep the sliding surfaces of the mechanical seal free of dirt and grease.
- Observe the specified tightening torques (→ Tightening torques, page 28).

7.3.2 Assembly of ES (with packing gland)

ⓘ Cross-sectional drawing ES → page 30

1. Pre-assembly of shaft
   - Install the fitting key (940.1) in the shaft.
   - Slide the shaft sleeve (524.1) onto the shaft.
   - Install the O-ring (412.1) and the shaft sleeve (523).
   - Press-fit the inner ring of the roller bearing and fix it by means of a washer (551) and locking ring (932). If the pump is fitted with a ball bearing, the ball bearing has to be forced into the bearing housing and completely pre-assembled on the shaft.
2. Pre-assembly of bearing housing (roller bearing)
   - Install the radial shaft sealing ring in the bearing housing. Observe the installation position.
   - Press-fit the rolling bearing (320) into the bearing housing (330). The bearings have to be lubricated prior to installation (use lithium-saponified grease only)
3. Installation of bearing housing
   - Sliding the pre-assembled bearing housing onto the shaft
   - Slide the gland nut from the pressure side over the shaft.
   - Fix the shaft to the bearing housing.
4. Installation of suction casing
   - Insert the packing gland. Observe the number of rings and the position of the cut surfaces. (Refer to Section 7.2.9)
   - Screw the stay bolt (902) into the casing.
   - Vertically clamp in the shaft and slide the casing from the top over the shaft.
   - Screw the bearing housing to the suction casing.
5. Installation of stages and impellers
   - Insert the O-ring (412).
   - Insert the fitting key in the shaft. Install the impellers (230), diffuser inserts and stage casings. Verify that the foot of the 1st stage points to the inlet nozzle. Position O-rings (412) between the individual stages.
   - Install the shaft sleeve (524).
6. Installation of discharge casing
   - Install the packing gland (refer to suction casing).
   - Screw in the stay bolts.
   - Position the discharge casing on the last stage and adjust it.
   - Fix the casing bolts with washers and nuts. Adjust the pump and tighten the nuts crosswise.
7. Installation of bearing housing
   - Force the radial shaft sealing ring into the bearing housing.
   - Slide the gland nut over the shaft and slightly fasten it using screws.
   - Install the O-ring (412.1) and the shaft sleeve with the splash ring.
   - Position the bearing housing on the discharge casing and fix it using screws.
   - The shaft has to be firmly clamped and fixed towards the suction-side bearing housing.
   - Press-fit the ball bearing.
   - Screw in the shaft nut. The nut has to be secured either with a lock washer or Loctite®.
   - Install all screw plugs with seals.
   - Tighten the suction-side bearing cover.
   - Insert the fitting key (940.3) and turn the shaft. Ensure that the shaft can be manually turned.

7.3.3 Assembly of ES (with mechanical seal)

ⓘ Cross-sectional drawing ES → page 30

1. Pre-assembly of shaft
   - Press-fit the bearing ring (roller bearing) and fix it by means of a washer and locking ring. Slide the shaft sleeve with the splash ring onto the shaft. The fitting key (940.1) must not be inserted.
2. Pre-assembly of bearing housing
   - Refer to 7.2.7.2
3. Pre-assembly of mechanical seals
   - Press the counter ring into the mechanical seal housing. Ensure a tight fit. The sliding surfaces must not be damaged or contaminated.
   - Install the rotating unit onto the shaft sleeve. Observe the adjustment dimensions. If mechanical seals with clamping screws are used, the clamping screws have to be secured with Loctite®.
4. Install the bearing housing on the shaft and vertically clamp in the shaft.
   - Push the mechanical seal housing onto the shaft. Insert the O-ring (412.2).
   - Install the shaft sleeve with the mechanical seal from the top on the shaft.
   - Install the O-ring (412.1) and the sleeve (523.1).
5. Installation of suction casing
   - Screw the stay bolt into the casing.
   - Install the suction casing over the shaft and screw it to the bearing bracket. Observe the nozzle position.
   - Plug the mechanical seal housing onto the stay bolts and slightly tighten the nuts by hand. Observe the O-ring seat.

6. Installation of stages and impellers
   - Insert the O-ring (412).
   - Insert the fitting key in the shaft. Install the impellers (230), diffuser inserts and stage casings. Verify that the foot of the 1st stage points to the inlet nozzle. Position O-rings (412) between the individual stages.
   - Install the shaft sleeve (523).
   - Pre-assemble the discharge casing with the stay bolts and install it onto the pump. Fix the casing bolts with washers and nuts. Adjust the pump casing and tighten the casing bolts crosswise.
7. Install the shaft sleeve with the mechanical seal. Position the mechanical seal housing with the O-ring (412.2) on the discharge casing. Fasten it with both stay bolts and nuts until fingertight.
   - Slide the shaft sleeve with the splash ring onto the shaft.
   - Press the radial shaft sealing ring into the bearing bracket.
   - Install the bearing housing on the discharge casing and fasten the screws tightly.
8. Press-fit the ball bearing. The force fitting tool must be in contact with the outer and inner ring.
   - Tighten the shaft nut.
9. Position the pump horizontally and turn the shaft.
   - Fasten the nuts on the stay bolts of the mechanical seal housing.
   - Fasten the bearing cover using screws.
   - Screw all screw plugs with seals into the casings and stage casings.
   - Insert the grease nipples into the bearing housing. Only with roller bearings and open ball bearings.

7.3.4 Replacing packing gland

7.3.4.1 Disassembly of packing gland

1. Loosen the hexagon nuts (920) on the gland nut (452). Remove the hexagon nuts and washers (550.1).
2. Remove the gland nut (452).
3. Remove the rings of the placking gland (461) with the packing extractor.

7.3.4.2 Assembly of packing gland

ⓘ Check whether you have selected the right sealing material and the correct size before installing a new set of packing glands. Use exactly fitting packing gland sizes and lengths only. If pre-pressed packing rings are not available, ring blanks have to be manufactured. Precise ring blanks can be produced by means of a cutting device for packings.

ⓘ If you do not have a special cutting device for packings, the packing string can be bent over a shaft or a pipe with identical diameter and cut. Diagonal cut is preferred over jump jointed cut. Improved sealing efficiency!

► Do not use sharp objects for inserting the rings. Insert the rings into the packing gland compartment with a 90° offset of the cut surfaces. Press-fit the packing by means of the gland nut (452) to ensure that it tightly fits to the packing gland compartment. Loosen the gland nut and re-fasten by applying medium force.

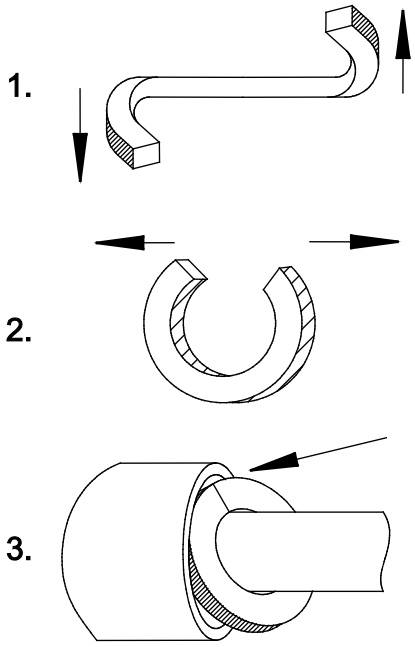


Fig. 12 Schematic drawing of the packing gland installation

1. Axially bend up the gland ring.
2. Radially bend up the gland ring.
3. Insert the gland rings one after another into the packing gland compartment with a 90° offset of the cut ends.
4. Push the gland nut onto the shaft.
5. Screw the washer (550.1) and the hexagon nuts (920) onto the stay bolts (902). Tighten the hexagon nuts and press the packing gland through the gland nut into the packing gland compartment
6. Loosen the hexagon nuts.
7. Fasten the hexagon nuts until fingertight.

7.3.4.3 Shrinking of packing gland

1. Start the aggregate with sufficient leakage at the packing gland.
2. Re-adjust the gland nut by carefully and continuously tightening the hexagon nuts until the leakage is reduced to the recommended minimum value.
3. Check the temperature of the packing gland and shaft. In case of overheating, slightly release the gland nut to return to normal temperature through increased leakage.
4. Repeat the setting process (clearance approx. 10-15 min.) until the leakage is reduced to the required minimum value.

ⓘ When temperature and leakage are in balance, maintenance and inspection intervals are rather long.

8 Troubleshooting

⚠ DANGER

Risk of injuries caused by running pump/aggregate!

- ► Do not touch a running pump/aggregate.
- ► Do not carry out any works on the running aggregate.
- ► 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 hot pump parts or hot media to be pumped!

- ► Use protective equipment when carrying out any works on the pump/aggregate.
- ► Make sure the pump/aggregate is depressurized.

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 Walter Speck GmbH & Co. KG

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

Phone: +49 (0) 9171 809 0
Fax: +49 (0) 9171 809 10
E-mail: info@speck-pumps.de
Internet: www.speck-pumps.de

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	
	Ice inside the pump (solidified medium to be pumped)	► Carefully heat up and defrost the pump
	Contaminations or foreign bodies inside the pump	► Flush/disassemble the pump, clean it
	Impeller blocked through calcification	► Descale the pump
	Defective motor bearing	► Replace the motor bearing
Motor protection triggered	Motor overload	► The specified operating point has not been complied with
	Motor or pump blocked	► Motor does not start
	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

Defect	Cause	Rectification
Excessive power consumption of the motor	Pump contamination/calcification	► Flush/descale/disassemble the pump, clean it
	Packing gland too tight	► Re-adjust the packing gland
Pump does not deliver medium to be pumped	Suction-side fitting closed	► Open the suction-side fitting
	Suction pipe blocked	► Check/clean suction pipe and filters
	Wrong direction of rotation of the motor	► Check direction of rotation/swap the 2 phases if need be
	Pump not vented	► Vent the pump, fill the pump and suction pipe
Flow rate too low	Contaminations in the suction opening	► Clean the inlet nozzle
	Internal components are subject to wear	► Replace the affected components
	Leaking system	► Check the system, seal leaking spots
	Pump has not been correctly dimensioned	► Replace the pump
	Pump cavitation	► Check the temperature of the medium to be pumped/cool down the medium to be pumped.
	Packing gland is too loose	► Re-tighten the gland nuts
	The suction height is too high or the inlet height too low	► Check the tank filling level. Open the suction-side fitting. Clean the filter in the suction pipe.
Total head too low	Motor speed too low	► Increase speed, contact the manufacturer
	Excessive friction loss	► Use larger pipe cross-sections
	Excessive backpressure	► Check the operating point. Clean the pipe.
Excessive flow rate	System pump pressure too low	► Install a throttle valve at the pressure side
Overheating of the pump	Excessive outlet pressure	► Reduce the pressure loss/increase the pipe cross-section
	Viscosity of the medium to be pumped is too high	► Observe the limit values
	Pressure-side fitting is closed	► Comply with the minimum flow rate / install a bypass at the pressure side
	Temperature of the medium to be pumped is too high	► Cool down the medium to be pumped
Strange noise	Pump cavitation	► Reduce the temperature of the medium to be pumped, check NPSH
	Excessive share of steam in the suction flow	► Reduce the temperature of the medium to be pumped, check NPSH
	Suction-side fitting closed	► Open the suction-side fitting
Leaking pump	Defective shaft sealing	► Replace the shaft sealing
	Defective casing sealing	► Provide the pump with new sealing
	Loosened connecting screws/screw plugs	► Tighten the screws, replace the sealing
	Packing gland: excessive leakage rate	► Re-tighten the packing gland/replace sealing rings

Tab. 14 Troubleshooting

9 Technical data

9.1 Operating limit values

- Casing pressure
- Compression pressure
- Medium to be pumped
- Speed
- Flow rate
- Switching frequency

9.1.1 Operating limit values ES (PN 40)

ES 320 / 400 / 500 / 650		
Max. casing pressure		40 bar
Max. permissible compression pressure		40 bar
Max. permissible operating pressure		
Version with packing gland		40 bar
Version with mechanical seal		Depending on the employed mechanical seal → Tab. Shaft sealing code, page 9
Speed	50 Hz	2900 1/min
	60 Hz	3400 1/min
Temperature of the medium to be pumped		
Version with packing gland		105 °C
Version with mechanical seal		120 °C

Tab. 15 Operating limit values ES (PN 40)

9.1.2 Operating limit values ES (PN 63)

ES 650		
Max. casing pressure		63 bar
Max. permissible compression pressure		63 bar
Max. permissible operating pressure		
Speed	50 Hz	2900 1/min
Temperature of the medium to be pumped		
Version with mechanical seal		120 °C

Tab. 16 Operating limit values ES (PN 63)

9.1.3 Cooled packing gland

ⓘ We also offer cooled packing glands as special version for higher temperatures. For detailed data, refer to the name-plate.

9.1.4 Media to be pumped

Liquids

- water or condensate
- free of abrasive contaminations
- without solid content
- near boiling point
- matched to the casing materials

9.1.5 Flow rates

Refer to Appendix: Characteristic curves

The pump must not be operated beyond the size-dependent power ranges (min./ max. flow rate).

9.1.6 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

Pump	Weight [kg]	Additional weight per additional stage [kg]
ES 3202	61	12
ES 4002	75	13
ES 5002	81	15
ES 6502	123	20

Tab. 17 Weight

9.2.2 Sound level

Type	1m measured surface sound pressure level L [dB (A)] *	
	50 Hz	60 Hz
320	74	77
400	76	79
500	76	79
650	78	81
* Measured surface sound pressure level in acc. with DIN EN ISO 3744, at 1 m distance with average throttling (cavitation-free operation) and connected pipes, tolerance ± 3 dB (A)		

Tab. 18 Sound pressure level

9.2.3 Drive power

Refer to Appendix: Characteristic curves

9.2.4 Direction of rotation of the pump

Type	Direction of rotation View from drive to pump
ES	in clockwise direction

Tab. 19 Direction of rotation of the pump

9.2.5 Hydrostatic pressure test

Test pressure (PN 40) = 1.3 x nominal pressure ($P_{max.}$ 52 bar)

Test pressure (PN 63) = 1.3 x nominal pressure ($P_{max.}$ 82 bar)

9.2.6 Operating connections

Chapter Connections→ page 32

9.2.7 Packing gland

The shaft sealing is realized by means of a packing gland at both sides.

ⓘ ES 650 (PN 63) is only available with mechanical seal.

9.2.8 Mechanical seal

Pumps with mechanical seals

For detailed data, refer to the nameplate.

Also refer to Chapter 3.3

9.2.9 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	
-20 to +40	≤ 55	≤ 80	≤ 1000

Tab. 20 Ambient conditions

9.2.10 Clearances for heat dissipation

Motor size	Min. clearance between fan hood and adjacent surface [mm]
Size 132 - 180	55
Size 200 - 225	75
Size ≥ 250	100

Tab. 21 Min. clearances for heat dissipation

9.2.11 Tightening torques

9.2.11.1 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 5	8.8	5.7
M 6	8.8	9.9
M 8	8.8	25
M 10	8.8	51
M 12	8.8	89

Tab. 22 Tightening torques for screws and nuts

9.2.11.2 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, EN-GJL-400).

Size	Property class	Tightening torque [Nm]
M 5	8.8	4.0
M 6	8.8	8.5
M 8	8.8	12
M 10	8.8	25
M 12	8.8	40

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

9.2.11.3 Screw plugs

ⓘ The following values apply to new screw plugs (Steel, brass) in cast-iron casings (EN-GJL-250, EN-GJL-400).

Size	Tightening torque [Nm]
G 1/8 A	9
G 1/4 A	20
G 3/8 A	40
G 1/2 A	45

Tab. 24 Tightening torques for screw plugs in cast-iron casings

9.2.11.4 Casing bolts

Pump size	Bolt	M_A (Nm)
320 /400 /500	M 16	80 (1-3 stages) 100 (> 3 stages)
650	M 18	120 (1-3 stages) 140 (> 3 stages)

Tab. 25 Tightening torques for casing bolts

9.3 Permissible forces / torques acting on the pump nozzles

ⓘ Flanges in acc. with DIN EN 1092-2, PN 40

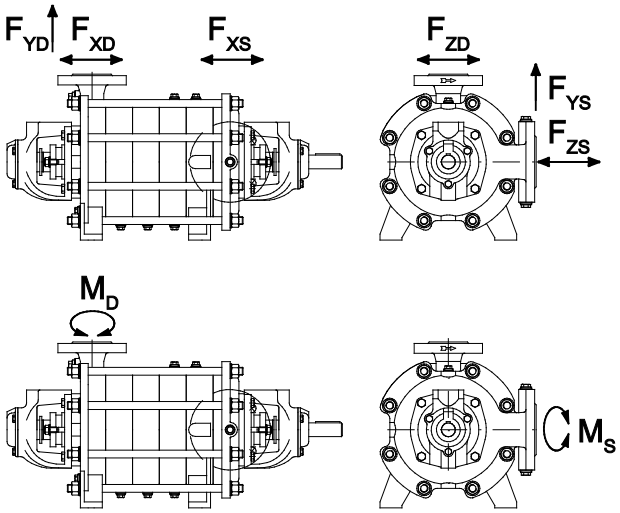


Fig. 13 Permissible forces / torques acting on pump nozzles

Pump	Suction casing			Discharge casing		
	F_{XS} [N]	F_{YS} [N]	F_{ZS} [N]	F_{XD} [N]	F_{YD} [N]	F_{ZD} [N]
ES 320	1700	2100	1500	1400	2400	1200
ES 400	1900	2300	1600	1600	2600	1300
ES 500	2100	2400	1700	1800	2700	1400
ES 650	2200	2400	1800	1900	2800	1500

Tab. 26 Permissible forces acting on pump nozzles

Pump	Suction casing	Discharge casing
	M_S [Nm]	M_D [Nm]
ES 320	200	80
ES 400	250	110
ES 500	300	140
ES 650	350	170

Tab. 27 Permissible torques acting on pump nozzles

9.4 Preserving agents

ⓘ Rivolta K.S.P.130 preserving agent (recommended) or comparable products

Type of storage	Period of storage [months]	Inside/ outside preserva-tion	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. 28 Preserving agents

9.5 Lubrication intervals

9.5.1 Lubrication spots

- Lubrication spots are recognizable by the bearing housings with integrated grease nipples.
- Roller bearings at the drive side and open ball bearings of sizes ES 500 and ES 650 can be re-lubricated. (Refer to Chapter 9.5.5)

ⓘ If the pump does not contain grease nipples ex works, life-time lubricated bearings have been used. Life-time lubricated bearings cannot be re-lubricated.

9.5.2 Lubricant quality

► Use lithium-based complex saponified grease only.

ⓘ Recommended: Renolit Duraplex EP 2.

Service temperature -30°C to +160°C

9.5.3 Operating temperature of bearing

► The bearing temperature (measured on the bearing bracket) should not exceed the room temperature by more than 50°C and must not be higher than 80°C. It should be checked at least 1x per week. Due to re-lubrication, the bearing temperature may be temporarily 5-10°C higher until excess grease in the bearings has been used up.

► The bearings have to be cleaned and lubricated after 10.000 operating hours.

9.5.4 Re-lubrication intervals

Operating speed of the pump	Re-lubrication interval
2900 1/min	1500 h
3400 1/min	1000 h

Tab. 29 Re-lubrication intervals

9.5.5 Re-lubrication volumes

Pump	Drive side	Pressure side
ES 320	5 g	-
ES 400	6 g	-
ES 500	6 g	6 g
ES 650	7 g	7g

Tab. 30 Lubricant volume

9.6 Accessories

Accessories included in the scope of supply are listed on the delivery note.

10 Appendix

ⓘ The appendix contains:

- Spare parts designation and position (cross-sectional drawings)
- Aggregate dimensions (dimension drawings)
- Characteristic curves of pump types
- Certificate of conformity
- EC declaration of conformity

10.1 Cross-sectional and dimension drawings, characteristic curves

10.1.1 Cross-sectional drawings

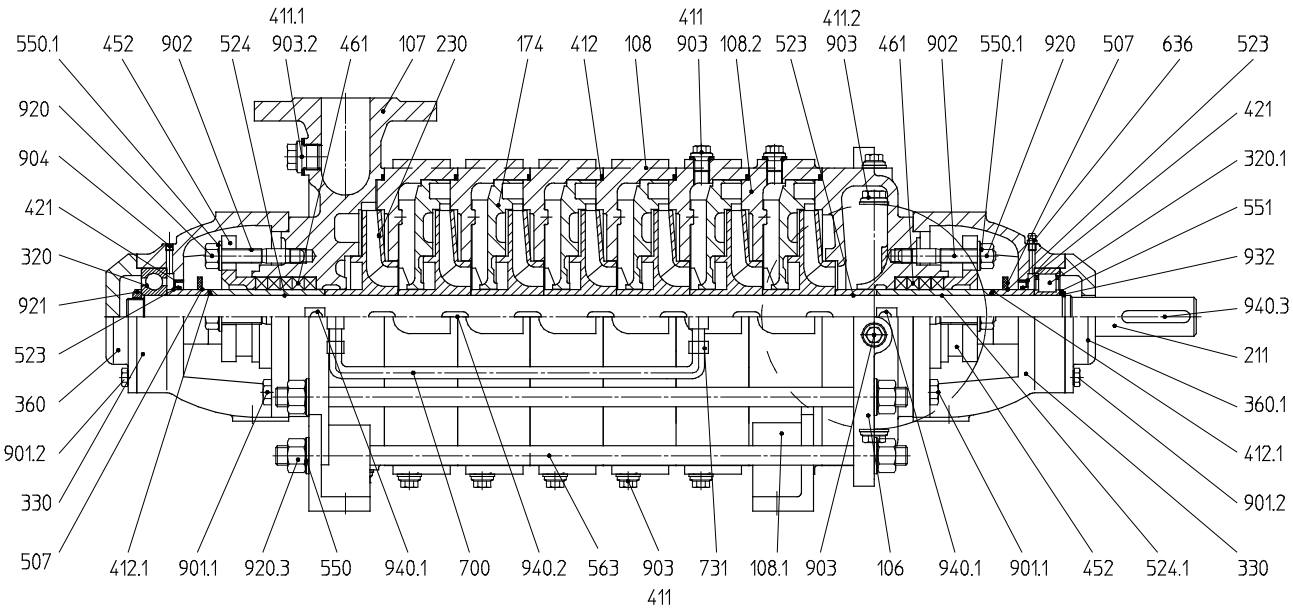


Fig. 14 Cross-sectional drawing ES with packing gland

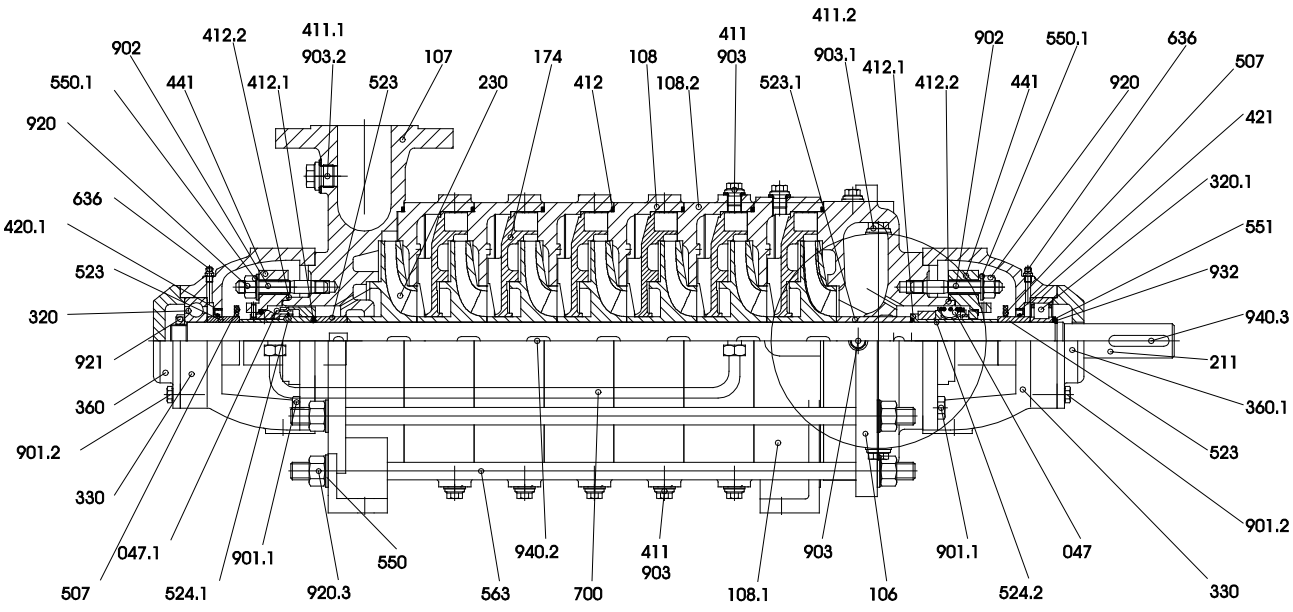


Fig. 15 Cross-sectional drawing ES with mechanical seal

No.	Designation	No.	Designation
047/-.1	Mechanical seal	507	Splash ring
106	Suction casing	523/-.1	Shaft sleeve
107	Discharge casing	524/-.1	Shaft sleeve
108/-.1	Stage casing	550/-.1	Washer
161	Casing cover	551	Washer
174	Diffuser insert	562/-.1	Cylindrical pin
211	Shaft	563	Casing bolts
230	Impeller	636	Lubrication nipple
320/-.1	Rolling bearing	901/-.2	Hexagon head screw
330	Bearing housing	902	Stay bolts
360/-.1	Bearing cover	903/-.2	Screw plug
411/-.2	Sealing ring	914	Hexagon socket head screw
412/-.2	O-ring	920/-.3	Hexagon nut
441	Shaft sealing casing	921	Shaft nut
461	Packing gland	932/-.1	Locking ring
421	Radial shaft sealing ring	940/-.1	Fitting key
452	Gland nut		

Tab. 31 Parts list

10.1.2 Connections

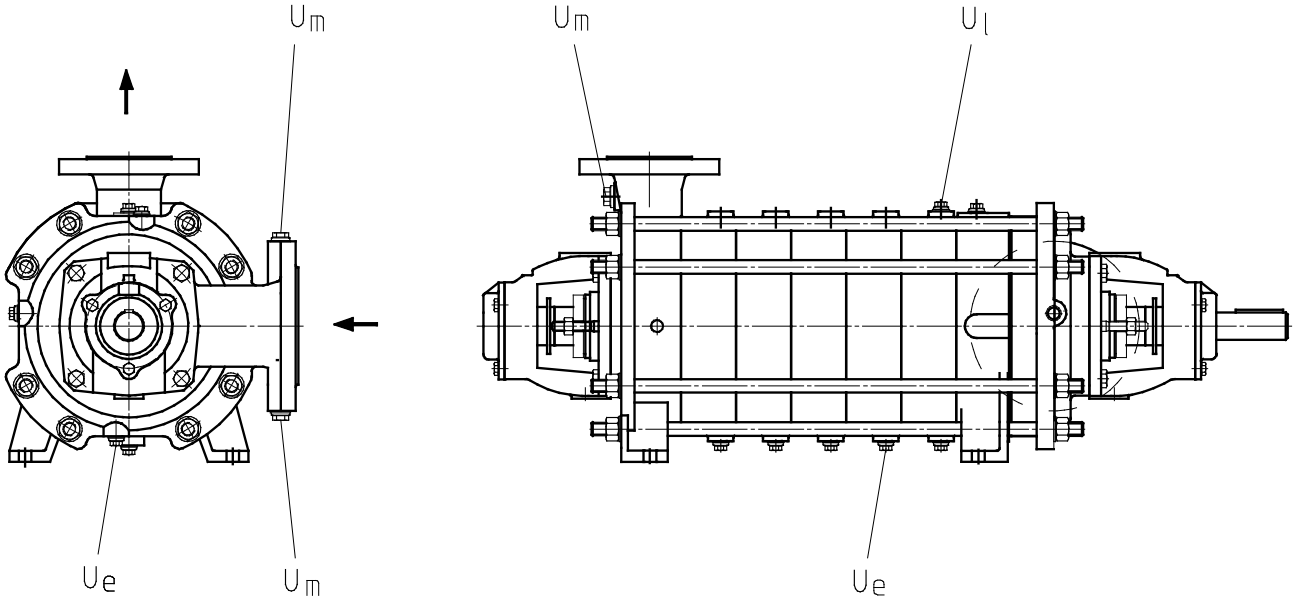


Fig. 16 Connection positions

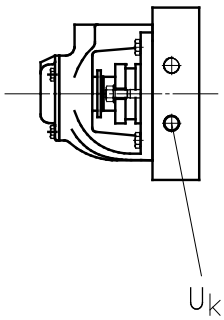


Fig. 17 Cooling connection of packing gland

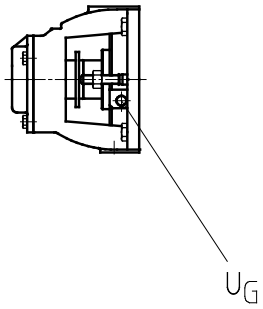


Fig. 18 Rinsing connection of mechanical seal

Designation	Connections	Size		
		ES 320	ES 400 / 500	ES 650
U_{e1}	Drainage (screw plug)	G 1/4	G 1/4	G 1/4
U_{e2}	Drainage (screw plug)	-	G 1/4	G 1/4
U_{e3}	Drainage (screw plug)	G 1/4	G 1/4	G 1/4
U_G	Connection of the rinsing fluid	G 1/4	G 1/4	-
Uk	Cooling water connection	G 1/4	-	-
U_l	Vent (screw plug)	G 1/4	G 1/4	G 1/4
U_{m1}	Manometer connection	G 3/8	G 3/8	G 1/2
U_{m2}	Manometer connection	G 1/2	G 1/2	G 1/2

Tab. 32 Connection size

10.1.3 Dimension drawings ES 320, ES 400, ES 500

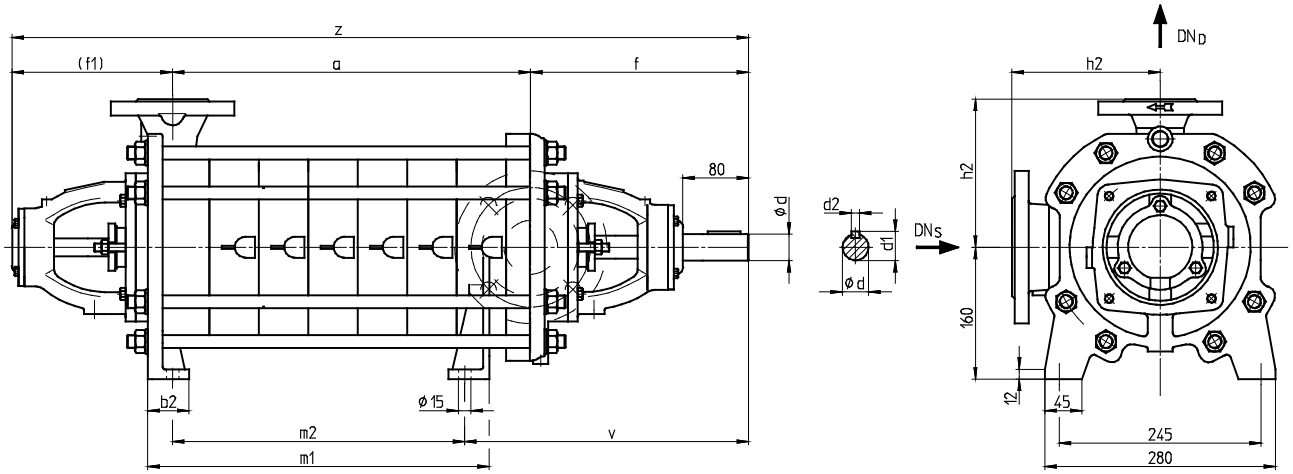
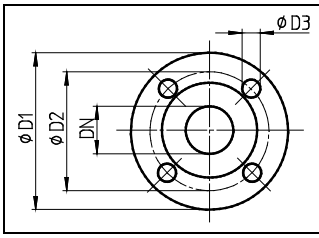


Fig. 19 Dimension drawing ES 320, ES 400, ES 500

Type	Stages	Pump dimensions													
		a	m1	m2	z	b2	d	d1	d2	f	f1	h2D	h2S	l	v
ES 320	2	118	103	53	522	45	28	31	8	230	174	180	180	60	295
	3	173	158	108	577										
	4	228	213	163	632										
	5	283	268	218	687										
	6	338	323	273	742										
	7	393	378	328	797										
	8	448	433	383	852										
	9	503	488	438	907										
	10	558	543	492	962										
	11	613	598	548	1017										
ES 400	2	135	115	55	597	50	32	35	10	265	197	180	180	80	345
	3	195	175	115	657										
	4	255	235	175	717										
	5	315	295	235	777										
	6	375	355	295	837										
	7	435	415	355	897										
	8	495	475	415	957										
	9	555	535	475	1017										
ES 500	2	153	133	63	625	55	32	35	10	275	197	200	200	80	365
	3	218	198	128	690										
	4	283	263	193	755										
	5	348	328	258	820										
	6	413	393	323	885										
	7	478	458	388	950										
	8	543	523	453	1015										

Tab. 33 Pump dimensions ES 320, ES 400, ES 500



Type	Suction flange					Pressure flange				
	PN	DN	D1	D2	D3	PN	DN	D1	D2	D3
ES 320	PN 16	50	165	125	4 x 19	PN 40	32	140	100	4 x 19
ES 400	PN 16	65	185	145	4 x 19	PN 40	40	150	110	4 x 19
ES 500	PN 16	80	200	160	8 x 19	PN 40	50	165	125	4 x 19

Tab. 34 Flange dimensions ES 320, ES 400, ES 500

ⓘ Flange dimensions in acc. with DIN EN 1092-2

10.1.4 Dimension drawings ES 650

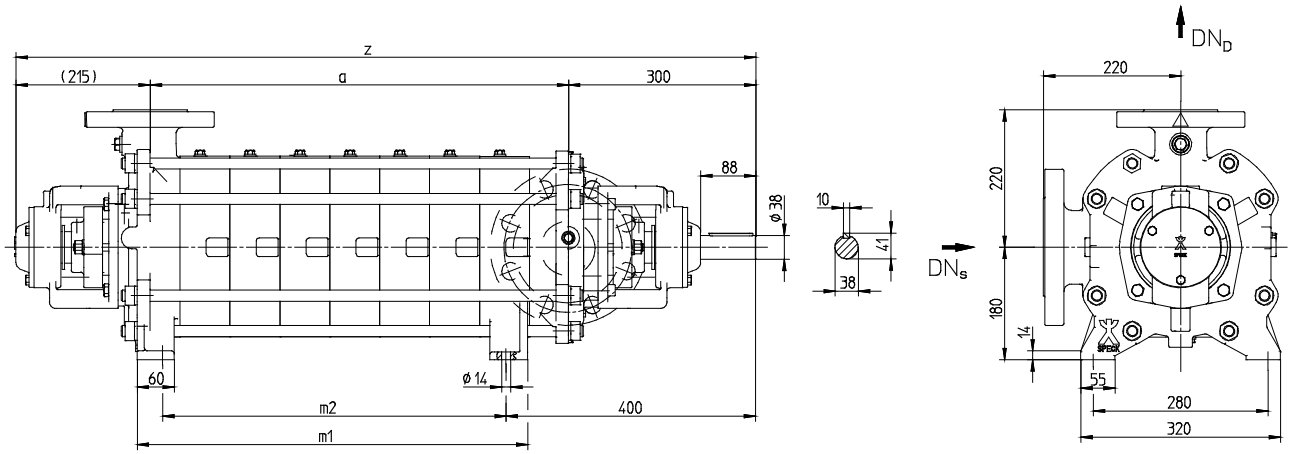
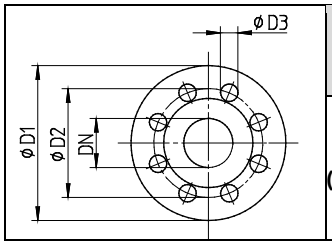


Fig. 20 Dimension drawing ES 650

Type	Stages	Pump dimensions			
		a	m1	m2	z
ES 650 (PN 40)	2	190	146	65	705
	3	270	226	145	785
	4	350	306	225	865
	5	430	386	305	945
	6	510	466	385	1025
	7	590	546	465	1105

Tab. 35 Pump dimensions ES 650 (PN 40)

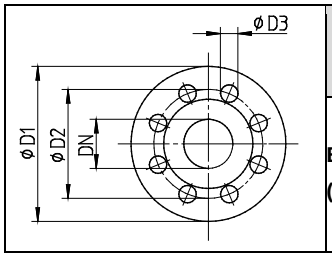


Type	Suction flange					Pressure flange				
	PN	DN	D1	D2	D3	PN	DN	D1	D2	D3
ES 650 (PN 40)	PN 16	100	220	180	8 x 19	PN 40	65	185	145	8 x 19

Tab. 36 Flange dimensions ES 650 (PN 40)

Type	Stages	Pump dimensions			
		a	m1	m2	z
ES 650 (PN 63)	7	590	546	465	1105
	8	670	626	545	1185
	9	750	706	625	1265
	10	830	786	705	1345

Tab. 37 Pump dimensions ES 650 (PN 63)



Type	Suction flange					Pressure flange				
	PN	DN	D1	D2	D3	PN	DN	D1	D2	D3
ES 650 (PN 63)	PN 63	100	250	200	8 x 28	PN 63	65	205	160	8 x 23

Tab. 38 Flange dimensions ES 650 (PN 63)

ⓘ Flange dimensions in acc. with DIN EN 1092-2

10.1.5 Characteristic curves ES 320

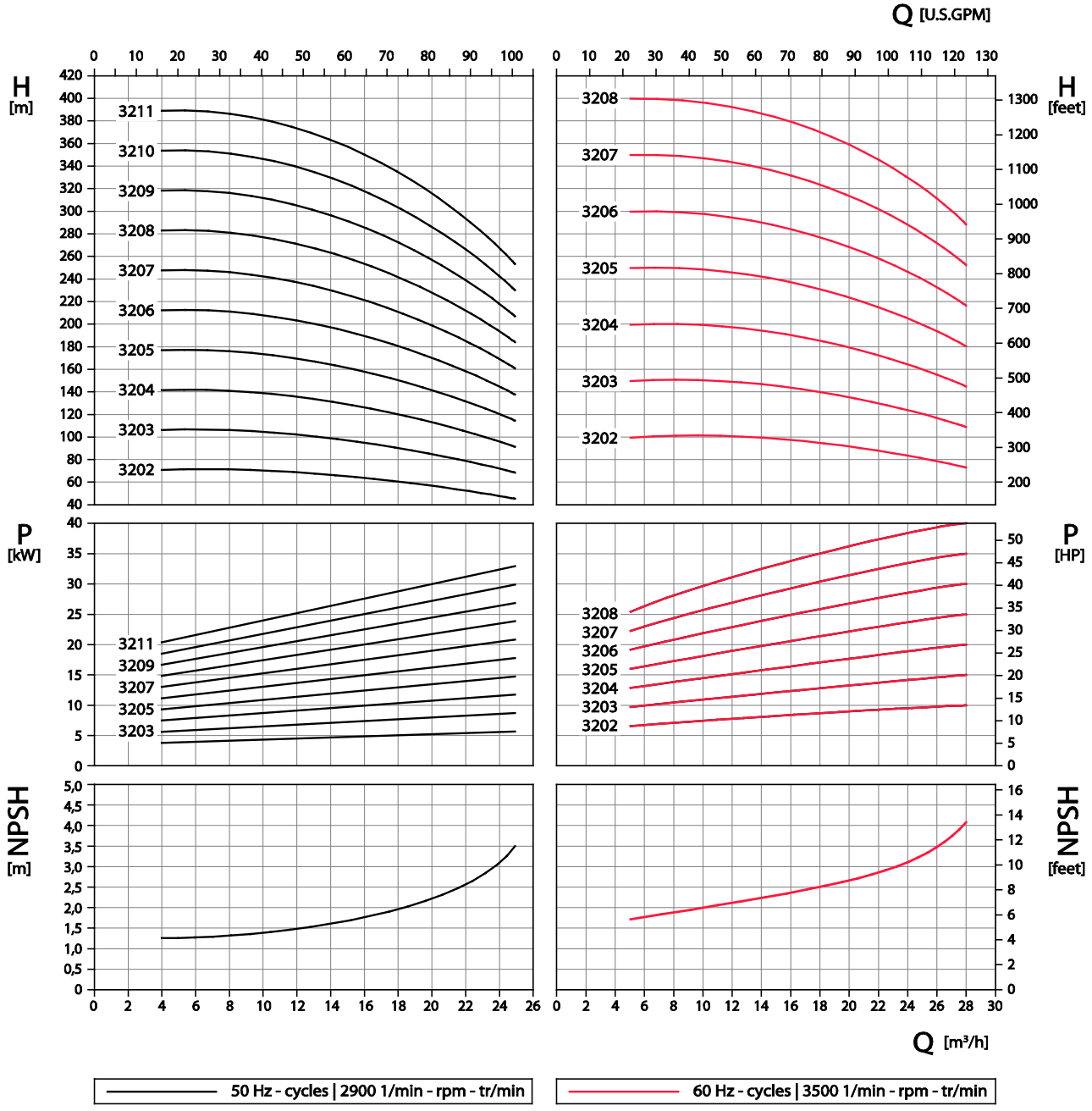


Fig. 21 Characteristic curves ES 320

Test conditions

The characteristic curves apply to the delivery of water with a temperature of 20°C at nominal speed. Total head, flow rate and power requirement tolerances are specified in EN ISO 9906. Deviating properties of the media to be pumped affect the characteristic curves.

10.1.6 Characteristic curves ES 400

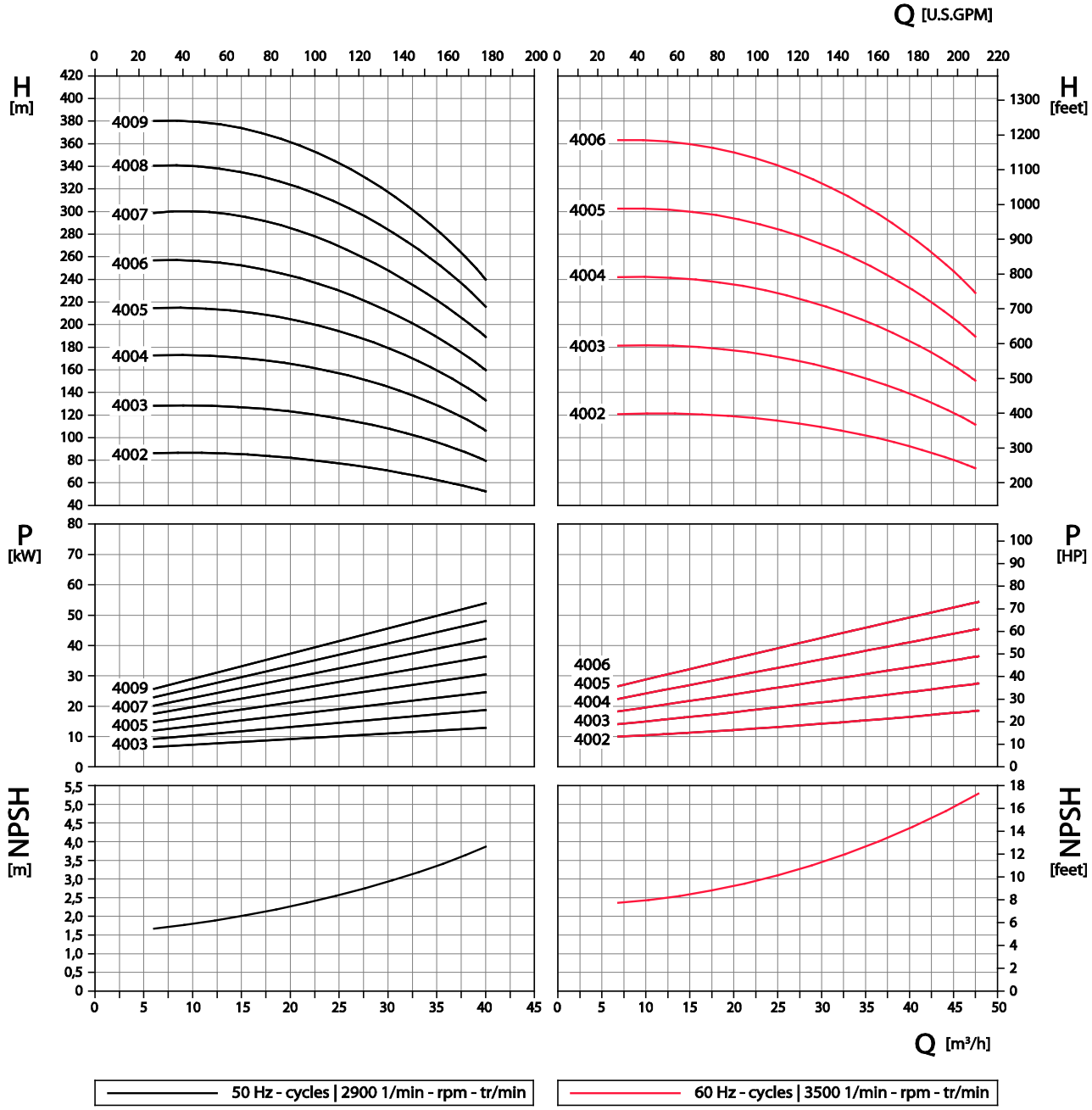


Fig. 22 Characteristic curves ES 400

Test conditions

The characteristic curves apply to the delivery of water with a temperature of 20°C at nominal speed. Total head, flow rate and power requirement tolerances are specified in EN ISO 9906. Deviating properties of the media to be pumped affect the characteristic curves.

10.1.7 Characteristic curves ES 500

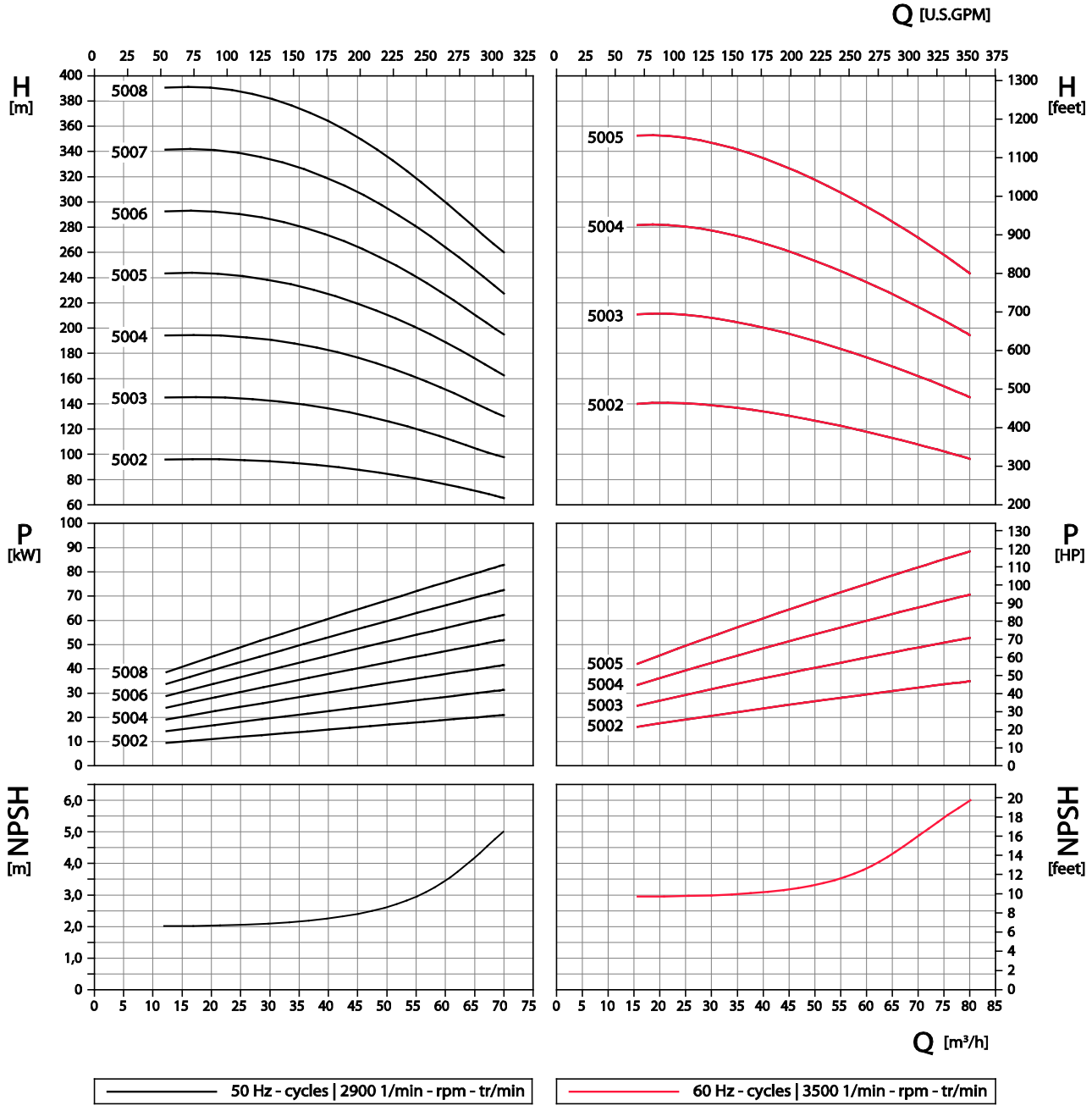


Fig. 23 Characteristic curves ES 500

Test conditions

The characteristic curves apply to the delivery of water with a temperature of 20°C at nominal speed. Total head, flow rate and power requirement tolerances are specified in EN ISO 9906. Deviating properties of the media to be pumped affect the characteristic curves.

10.1.8 Characteristic curves ES 650 (PN 40 and PN 63)

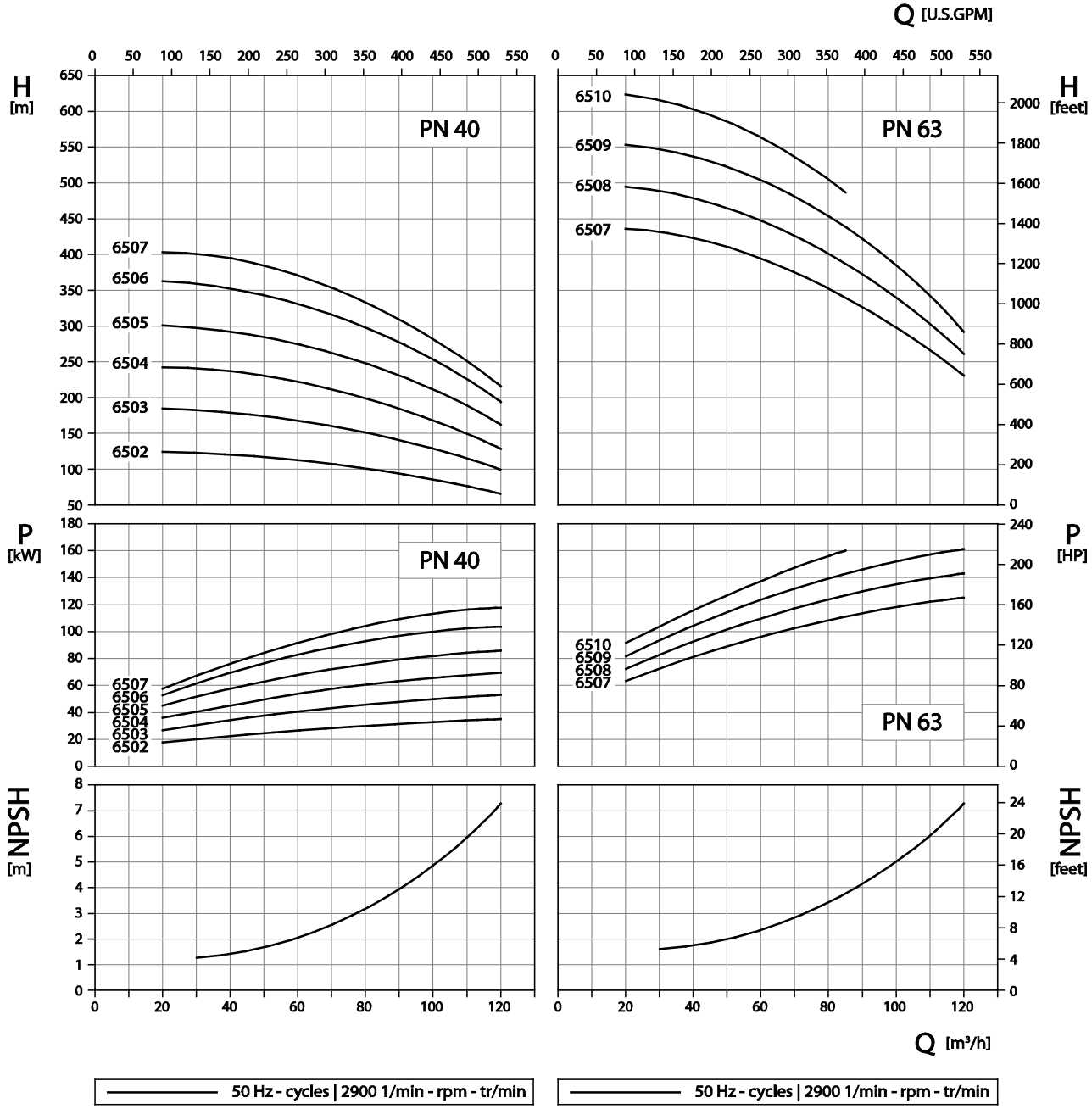


Fig. 24 Characteristic curves ES 650 (PN 40 and PN 63)

Test conditions

The characteristic curves apply to the delivery of water with a temperature of 20°C at nominal speed. Total head, flow rate and power requirement tolerances are specified in EN ISO 9906. Deviating properties of the media to be pumped affect the characteristic curves.

10.2 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. 39 Certificate of conformity

10.3 EC declaration of conformity

EG - Konformitätserklärung

EC declaration of conformity
Déclaration „CE“ de conformité

Walter Speck GmbH & Co.KG
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/EC, annex IA
conformément à la directive "CE" relative aux machines 2006/42/CE, annexe IA

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

Bauart: *type*

LY-2081 / LY-2181
Y-2951 / Y-2841 / LNY / LSY / YS
Y-2041 / Y-2051 / NPY / QY
PY - 2071 – PY - 2773
MY-1
ME-101 / ME-303 / ME-125-1/2 / SFY
Y/CY-4081 / 4091 / 5081 / 5091 / 6091
HY / GY / DY / AGY
DS-60 –DS 960 / DS-1100 –DS 1700
SAP 1 - 8
T-201 – T 2001 / TP-280 / TP-550
TM 401 - 601 / TK 401 - 601
SK 20 – SK 65 GRD
ASK 20 – ASK 65 GRD
TN 20 – TN 100
AMZ 25 – AMZ 65
MZ 35 – MZ 40 / IMZ GRD
ES

.....

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/EC / directive „CE“ relative aux machines 2006/42/CE
- **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/EC
  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/CE
- **Elektromagnetische Verträglichkeit – Richtlinie 2004/108/EG**
  Electromagnetic compatibility – directive 2004/108/EC
  Compatibilité électromagnétique – directive 2004/108/CE

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:

Herbert Mader
SPECK PUMPEN Walter Speck GmbH & Co. KG
Regensburger Ring 6-8
91154 Roth

Roth, 06.06.2011
Ort,Datum
place/lieu / date

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

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Ust. ID.Nr. DE133786671 St.-Nr. 247/174/51909
PhG: SPECK PUMPEN ROTH Beteiligungs-GmbH, Roth
Registergericht Nürnberg HRB 15472
Geschäftsleitung: Wolfgang Krüger

Formblatt: 0221W
Artikel-Nr.: 1096.0195

Erstellt: T. Hahn/A. Eschenbacher
Geprüft: Dr.-Ing. P. Hähre
Stand: 06.06.2011