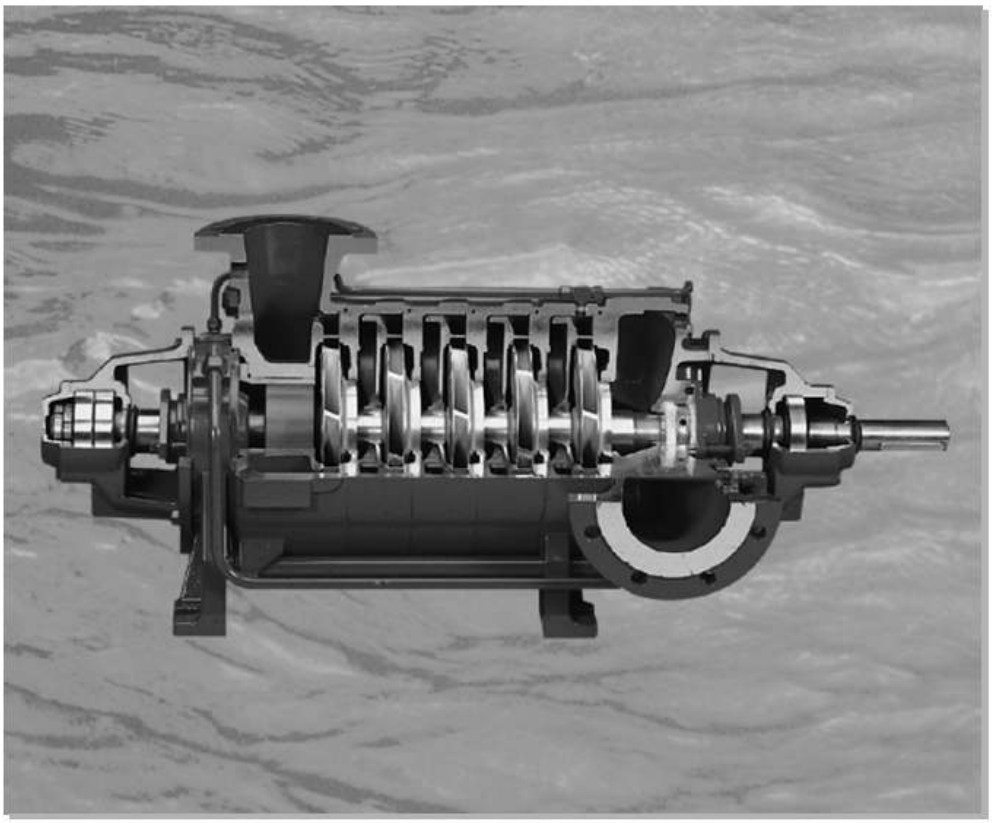
RITZ Pumpen

Betriebsanleitung
Operating Instructions
Instructions de service

Baureihe • Series • Série **49**



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Für Lieferungen innerhalb der EU gilt:

• bei kompletten Aggregaten (Pumpe und Motor):

EG-Konformitätserklärung im Sinne der EG-Richtlinie Maschinen 89/392/EWG, Anhang II A

Hiermit erklären wir, daß das Pumpenaggregat

Baureihe 49

in der gelieferten Ausführung folgenden einschlägigen Bestimmungen entspricht:
EG-Richtlinie Maschinen i.d.F. 93/44/EWG, Anh. I Nr.1.

Angewendete harmonisierte Normen, insbesondere
EN 809, EN 292 T1, EN 292 T2, EN 60034, EN 60204-T1.

• bei Pumpen ohne Motor

Herstellererklärung im Sinne der EG-Richtlinie Maschinen 89/392/EWG, Anhang II B

Hiermit erklären wir, daß die Pumpe

Baureihe 49

in der gelieferten Ausführung zum Einbau in eine Maschine oder zum Zusammenbau mit anderen Maschinen zu einer Maschine bestimmt ist und daß ihre Inbetriebnahme solange untersagt ist, bis festgestellt wurde, daß die Maschine, in die o.g. eingebaut werden soll, den Bestimmungen der EG-Richtlinie Maschinen i.d.F. 93/44/EWG entspricht.

Angewendete harmonisierte Normen, insbesondere
EN 809, EN 292 T1, EN 292 T2.

The following applies for deliveries within the EC:

• for complete sets (pump and motor):

EC Declaration of Conformity as defined by Machinery Directive 89/392EEC Annex II A

We hereby declare that the pump set

type 49

in its delivery state complies with the following provisions:
Machinery Directive (93/44EEC, Annex 1 No. 1).

Applied harmonised standards in particular
EN 809, EN 292 T1, EN 292 T2, EN 60034, EN 60204-T1.

• for pumps without motors:

Declaration by the manufacturer as defined by Machinery Directive 89/392EEC Annex II B

We hereby declare that the pump

type 49

in its delivery state is intended to be incorporated into machinery or assembled with other machinery to constitute machinery covered by this directive and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the povisions of the directive as amended by 93/44EEC.

Applied harmonised standards in particular
EN 809, EN 292 T1, EN 292 T2.

Les livraisons au sein de la CE sont régies par la déclaration ci-après :

• pour les groupes complets (pompe + moteur) :

Déclaration "CE" de conformité au sens défini par la directive "CE" relative aux machines 89/392/CEE, Annexe II A

Par la présente, nous déclarons que le groupe

série 49

est conforme aux dispositions suivantes dont il relève :
directive "CE" relative aux machines (93/44/CEE, Annexe 1, No. 1).

Normes harmonisées utilisées, notamment
EN 809, EN 292 T1, EN 292 T2, EN 60034, EN 60204-T1.

• pour les pompes sans moteur:

Déclaration du constructeur conformément à la directive "CE" relative aux machines 89/392CEE, Annexe II B

Par la présente, nous déclarons que la pompe

série 49

est destinée à être intégrée à une machine ou combinée à d'autres machines pour former un ensemble, et que sa mise en service est interdite tant que la machine à laquelle elle doit être intégrée n'a pas été déclarée conforme aux dispositions de la directive 93/44/CEE.

Normes harmonisées utilisées, notamment
EN 809, EN 292 T1, EN 292 T2.

Franz Apeltauer
Manager of Quality System

Index

Page

ENGLISH

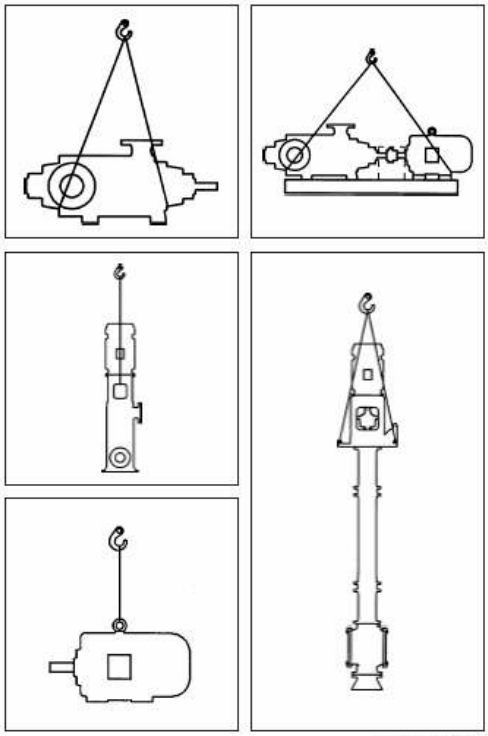
These instructions must be read in conjunction with the separate User's Safety Manual and the Motor Operating Instructions.

1. Handling and intermediate storage

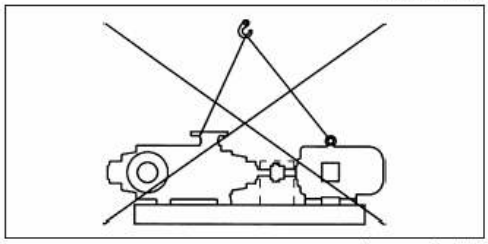
1.1 Handling

- Always take the weight and centre of gravity into consideration.
- Never use the motor eye bolts when slinging assembled pump sets.

Examples of correctly handling the pump, motor and set:



Proper handling



Improper handling

1.2 Unpacking

Check that the delivery is complete and undamaged. Any missing parts or damage must be confirmed by the carrier on the original freight note and reported to us immediately.

1.3 Intermediate storage

- Seal the suction and delivery branches, using closure caps, plugs or blank flanges.
- Store in dry, dust free conditions protected from frost or excessive heat.
- Turn the rotating assembly on the shaft or coupling a few times every 2 weeks and leave in a different angular position.
- Long-term storage (over 3 month) preservation required.
- Long-term storage (over 2 years) renew the lubricants before installing the pump.

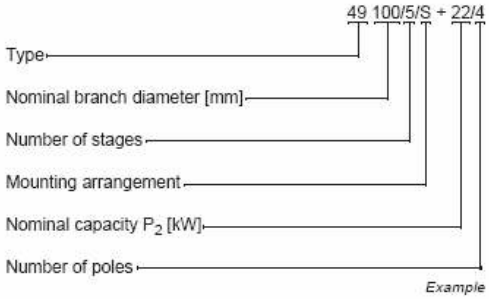
1.4 Preservation

If requested, we will preserve your pumps before delivery.

2. Description

High pressure pumps of the type 49 are non self priming, multistage ring section pumps in a single flow construction. They are available in various mounting arrangements and with different impellers.
Please see the contractual documents for details of the supplied design.

2.1 Designation



Example

For a description of mounting arrangements, see paragraph 2.3.

2.2 Construction

Please refer also to the sectional drawings in paragraph 7.4.

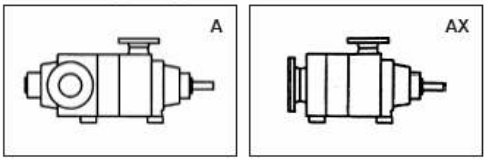
2.2.1 Shaft and bearings

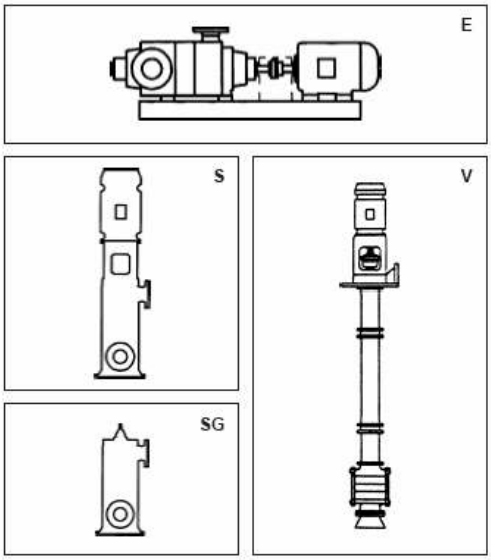
The shaft is protected against wear by shaft protection sleeves on both sides. Shaft and bearings are rated for continuous, heavy-duty operation.

2.2.2 Shaft sealing

The fitted shaft sealing arrangements are described in detail in the contract documentation.
Packed gland must be used when pumping gaseous media. If a mechanical seal is used, make sure that the seal housing is permanently vented.

2.3 Mounting arrangements





For V mounting arrangement please refer to supplementary instructions.

2.4 Dimensions, weights, centres of gravity, capacity

Information on request.
For weights refer to the contract documentation.

2.5 Installation requirements

CAUTION

- Protect motors and pumps from the weather.
- Ensure that the workplace is adequately ventilated/heated/cooled and observe noise protection requirements.
- Check that access to the pump set (or its components) at the point of installation is adequate and safe.
  Openings must be large enough.
- Adequately rated lifting equipment must be available.

2.5.1 Space required for operation and maintenance

- Ensure that sufficient space is left for subsequent maintenance requirements.
- The set should be easily accessible from all sides.
- The motor cooling fan requires adequate clearance around the cowl. Ensure that the air inlet and outlet areas are unobstructed.

2.5.2 Foundations

- Concrete plinths must be adequately supported in order to ensure smooth and safe operation.
- **Length:** At least 100 mm longer than the baseplate.
- **Width:** The foundation bolts should be at least 100 mm in front of the edge of the foundation.
- **Height:** 20-30 mm below final position of underside of baseplate. If the plinth is to be tiled, make an additional allowance in order to avoid damaging the tiles should the set have to be removed.
- The holes in the plinth should be of suitable length for the foundation bolts used.
- The depth of the foundation should be sufficient to prevent frost.
- Plinths which rest on a structural floor or ceiling should be integrated into the original construction using bridging reinforcement.
- Foundations should contain sufficient mass in order to dampen system vibrations.
- Do not place rubber, cork, feather and/or resilient mats between baseplate and plinth.

2.5.3 Supply connections

Check that all supplies (power, water etc.) necessary for installation and later operation are available at the intended pump position.

3. Mounting/installation

CAUTION

Care and attention to detail during installation are essential for a trouble-free operation. Incorrect procedures during installation may create hazards for personnel or property or lead to premature failure of the pump.

3.1 Preliminary checks

Check that the dimensions of the plinth/foundation are in accordance with the drawings.

3.2 Mounting of pump and motor (arrangement A, AX)

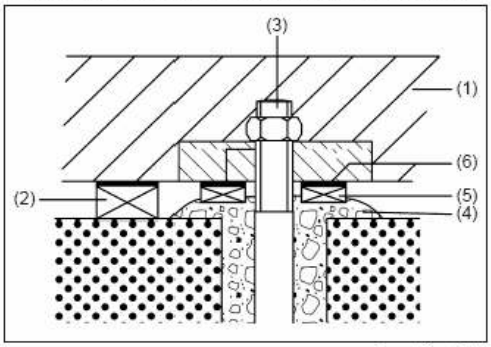
See also para. 3.3.

- Common baseplate mounted pump and motor: Adjust the axial clearance between pump and motor shaft ends.
- Separately mounted pump and motor: Secure the pump onto the plinth and align it. Then secure the motor and align it with the pump.

3.3 Installation of assembled pump sets

3.3.1 Horizontal pumps with base plate-mounted drive motors (E)

- Before lowering the set into position clean the plinth surface and remove any limewash to ensure sound bonding.
- Hang the foundation bolts with nuts in the baseplate fixing holes.
- Lower the set into position on the plinth surface.
- Place temporary chocks (2) underneath the baseplate (1).



Foundation bolts

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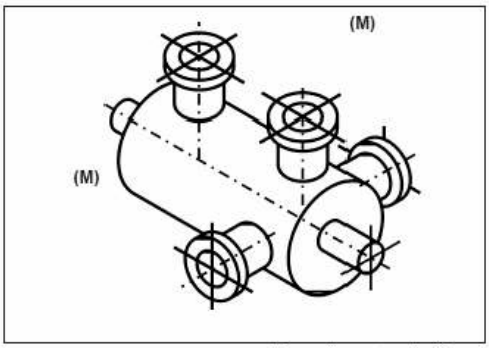
- Check the alignment of pumps on the flange machined surfaces using a spirit level. A margin of error of 1 mm in 1 m is allowed.



Pump alignment on the flanges

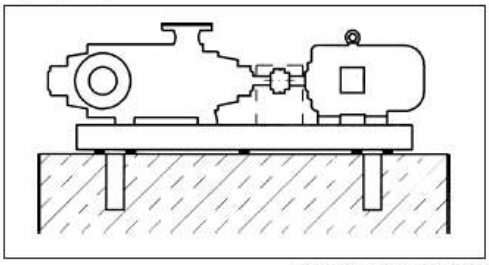
- Pour the foundation bolts (3) into place with cement (4) leaving it proud around the bolts (see figure foundation bolts).
- Before the cement sets, insert machined packing pieces (5) on both sides of each foundation bolt. These pieces should be attached leaving a minimum distance from the baseplate (1).
- When the cement has set, pack the gap with metal shims of suitable thickness.
- Remove the temporary chocks (2).

3.3.2 Alignment of flexible couplings (E)

CAUTION

Pump and motor shafts were carefully aligned before delivery. Displacement can occur during transport thus coupling alignment must be checked before pourring the baseplate.

- Correct vertical misalignment by packing under the baseplate. For baseplates of up to 1600 mm only place packing in the drive motor or pump area. Larger baseplates require multiple packing.

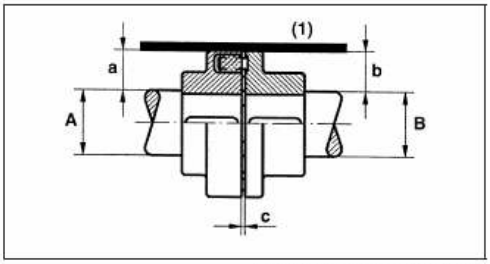


Correcting vertical alignment

- Correct lateral misalignment between pump and motor by slackening the motor fastening bolts, aligning the motor with the pump and re-tightening.
- Tighten foundation bolts.

After tightening the foundation bolts, the shaft must be free to be turned by hand without any tight spots (construction with packed glands: Packed glands must be slackened for this test!). Alignment errors may cause premature failing of bearings or couplings and result in noisy running.

3.3.2.1 Alignment using a straight steel edge



Aligning with a straight steel edge

- Place the straight edge (1) axially across the top of the pump and coupling halves.
- Measure the distances (a) and (b) between the straight edge and the shafts.
- If the diameter of the pump and motor shaft is equal, then: a = b.
- If the diameters differ, then: a + 1/2A = b + 1/2B.
- Repeat the exercise in various positions (displaced by approx. 90°). The requirements for equal or unequal shaft diameters must be fulfilled in all positions.
- Check the clearance between the coupling halves (dimension c). For flexible claw-type couplings this should be:

Coupling Size (outside diameter)	Distance c
80-140 mm	2-4 mm
160-225 mm	2-6 mm
250-400 mm	3-8 mm

Table 1: distance between the coupling halves

The distance c must be the same in all positions.

3.3.2.2 Alignment with dial gauges

High rotational speeds and/or spacer type couplings require more precise alignment using dial gauges.

- Align the coupling halves in both axial and radial directions.
- Maximum permissible axial discrepancy on the coupling face is 0.05 mm. Preferred value > 0.03 mm. (measure on the outside!).
- Maximum permissible radial discrepancy of coupling periphery is 0.10 mm. Preferred value > 0.05 mm.

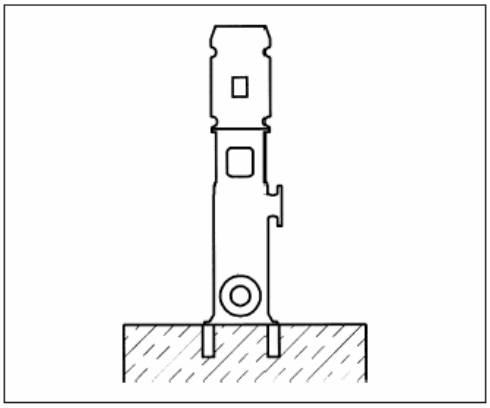
3.3.3 Close coupled vertical pumps (arrangement S):

This pump arrangement may be installed on a plinth, concrete foundation, structured steelwork or directly in the pipeline, depending upon pump size and local conditions.

Mounting arrangement S:

- Fasten the set, inclusive of baseplate or steel mounting plate, to the concrete plinth using foundation bolts.
- Align the pump (see para. 3.3.1).
- Provide a baseplate or steel mounting plate.
- Grout the foundation bolts with cement and allow to set.

- Grout voids under the plates with non-shrinking cement mortar.



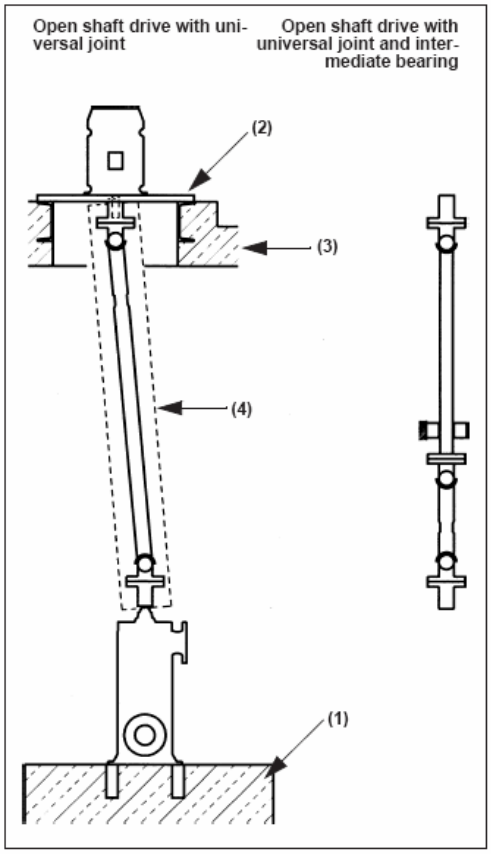
Mounting arrangement S

- Adjust the axial clearance between the coupling halves of the flexible coupling (see para. 3.3.2.1, table 1). Further alignment of the coupling is not required.
- Fasten both coupling halves on the shaft journals with the grub screws to prevent axial displacement.

3.3.4 Vertical standing pumps, drive via cardan shaft (SG arrangement)

Observe the instructions specific to the type of shaft drive supplied.

- The foundation (1) should be adequately dimensioned for the weight and centre of gravity of the pump, the power of the motor and the vibration characteristics of the complete pump set.
- **For installation and alignment of the pumps on the foundations** refer to para. 3.3.3, S arrangement.
- The motor should be carried on a support plate or frame (2) over the opening in the structural floor (3).
- Position the motor so that the pump and motor shafts are exactly in line. If site conditions make this impossible, a deviation of the drive shaft of 5° from the vertical is acceptable.
- The dimensions between motor and pump shaft ends specified on the assembly drawing must be adhered to.
- Pack the motor support plate/ frame so as to achieve this dimension.
- Grout in the foundation bolts and allow to harden.
- Tighten foundation bolts.
- Installation of motor on a concrete floor: Grout the motor support plate/frame.
- Provide guarding (4) to the drive shaft assembly in accordance with the regulations concerning accident prevention.



Mounting arrangement SG

3.3.5 Pourring and other final checks

CAUTION

- After aligning and fixing the pump set in position, pour the baseplate with rapid hardening, non-shrinking cement mortar, plugging where necessary to achieve full compaction.
- Allow to set for at least 48 hours.
- Retighten the foundation bolts.
- Check the alignment of pump and motor.

3.4 Piping

Non-binding suggestions for proper design and installation of the pipework (the exact design of the pipework must remain the responsibility of the project manager!).

3.4.1 General

- Provide support for the piping on both sides of the pump and attach it unstressed onto the pump. Please observe the max. permissible branch loads (refer to para. 7.2).
- After the piping has been connected, check the running of the pump and alignment of coupling.
- Use bellow expansion joints with linear reducers.

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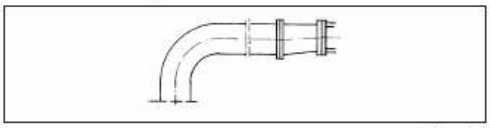
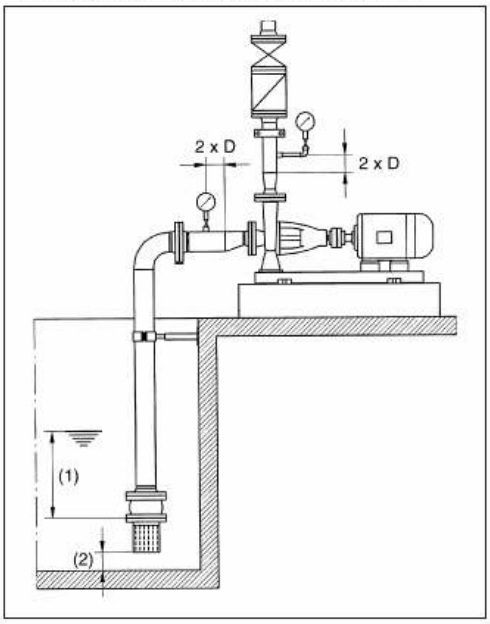
- Alterations in the length of the piping caused by harsh temperatures and other strains can be prevented by the use of anchorages on both sides of the pump.
- The pipework should be short and direct and changes of direction should be avoided where possible.

3.4.2 Suction Pipe



suction pipe

- The maximum flow rate is 2 m/s (when pumping the maximum capacity).
- Do not fit a row of quarter bends on different levels.

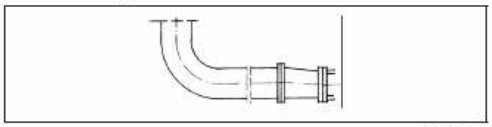


Instructions for laying the suction branch

- The pipe should be laid at an inclined angle to the pump (at least 1 %).
- The pipework must be completely vented and sealed.
- Provide a separate suction pipe for each pump.
- When operating the pump in suction mode without a foot valve, provide a vacuum installation.
- Ensure that air pockets are not formed in the suction pipe.
- **Minimum submergence (1):**
  $Hm = v^2/2g+0.1$

  Hm = minimum submergence
  v = flow rate when pumping maximum capacity
  g = local gravitational constant = 9.81 m/s²
- The distance from the floor of the container (2) must be at least half the diameter of the pipe.

3.4.3 Inlet pipe



inlet pipe

- Should be laid as the suction pipe but with the pipe at an angle sloping away from the pump (at least 1 %).
- Fit a return flow stop before the pump.

3.4.4 Discharge pipe

- Lay piping at an angle sloping upwards.
- Maximum flow rate 2.5 m/s (note the fall in meters).
- Ensure that the piping is free of tight spots.
- The pipes must be laid so that the danger of deposits blocking other pumps is avoided.
- Flange and piping must be designed in accordance with the maximum pressure.
- Avoid air pockets and vent high points if necessary.
- Differing pipe diameters cause variations in flow rate and therefore need to be avoided.
- Install a sluice valve and return flow stop in order to prevent pressure surges at a sudden stop of pump set (for example, if the set experiences a sudden power loss).

3.4.5 Pressure tests

CAUTION

- Observe the relevant directives.
- Adhere to permitted nominal pressure levels for individual components.

3.4.6 Auxiliary pipe connections

Sealing and flushing media:
- Connect the pipes.
- Install a regulating valve and a magnet valve (closed without current).
- Blocking and flushing pressure must be at least 0.5 bar above the maximum pressure of the pump.
- Set the amounts of blocking and flushing media with the regulating valve.

Quench media:
- Discharge media without pressure into the quench chamber.
- When using pumps which are fitted with a dual-action mechanical seal in tandem arrangement then fit the quench container approx. 1.5 m above the mechanical seal.

4. Commissioning and shut-down

4.1 Commissioning

CAUTION

Before switching on the pump ensure that the following points have been checked and carried out:
- Check the alignment between pump and motor when operating horizontal pumps with flexible coupling (see para. 3.3.2).
- Check that the fastening bolts of pump and motor are secure.
- Check that the installation of the pump ensures easy access to the functional controls.

4.1.1 Bearings

See para. 5.2.1.

4.1.2 Shaft sealing

Observe any specific instructions, cross-sections, dimension sheets or appendices.

4.1.2.1 Gland packing

- Use the loose gland packing which has been delivered along with the set.
- Tighten the gland gently and evenly by hand.
- Gland packing must not be allowed to stick to the shaft. The shaft must remain freely moveable.

4.1.2.2 Mechanical seal

For pumps with a single mechanical seal with quench arrangement and quench reservoir: Depending on the liquid to be pumped the quench reservoir should be filled to half its capacity with water or other liquid.

4.1.3 Filling and venting

- Close the discharge isolation valve and, if fitted, open the inlet isolating valve.
- Fill the pump with the liquid to be pumped, venting the trapped air by removing the plugs on the pump casing. If arranged for operation on a suction lift then use a filling funnel or pipe.
- If vent screws are present on the suction or pressure side of the casing, open them to let air escape.
- When a positive head is available from charged delivery system, the pump can be back filled through the delivery non-return valve by-pass or lifting lever (if fitted).
- Turn the pump shaft several times by hand. **The pump is vented when air bubbles no longer escape from the vent holes.**
- Fill the auxiliary valves for sealing and flushing media with water and purge the system of any air. Close the screw plugs and the vent plugs.

CAUTION

- **Pumps fitted with mechanical seal:** Open the vent plugs of the seal cavity (where fitted). Fill the seal cavity with water and purge the system of air.
- **Pumps fitted with mechanical seal and quick aerator:** Loosen sealing cap of air intake catch before commissioning (approx. 2 turns). Do not remove cap completely to avoid dirt penetration.
- Before starting check the seal cavity for trapped air. The seal may be seriously damaged by dry running! After checking, replace the plugs.
- **Function of a mechanical seal:** Two slide faces rub against each other and are lubricated by a liquid film at the same time. In the case of single-action mechanical seals, the film is formed by a pumping medium. A leakage of between 0.2 and 5 ml/h is possible depending on running smoothness, pressure, rotational speed and shaft diameter (mechanical seals are wearing parts for which no guarantee can be given).

4.1.4 Electrical connections

Electrical installations may only be carried out by qualified personnel in compliance with IEEE Regulations and Statutory Requirements.

CAUTION

- The motor must be provided with motor protection switch.
- The electricity supply provided must match the motor nameplate details.
- The motor terminal links must be positioned to suit the supply and the proposed starting arrangement.

4.1.5 Checking the direction of rotation

The rotational direction must comply with the marking on the pump. Use a rotating field gauge. If a gauge is not available then, providing that the pump contains water or is separated from the drive, the motor can be briefly activated and then immediately shut off to carry out the test. If the rotation has to be reversed, then arrange for this to be carried out by an electrician.

CAUTION

Do not run the pump backwards!

4.2 Safety precautions

Do not operate the pump set before fixing guards for moving parts such as the coupling etc. If guards are not delivered with pump then they must be provided by the installer before operation. The guards must be installed to prevent damaging of objects or injuring persons by hit, entanglement and getting caught. Do not reach under guards with hands!

4.3 Start-up

4.3.1 Initial start-up/restarting

CAUTION

- Start the pump only if it is fully primed and when there is discharge system pressure.
- Open the sealing and flushing valves.
- If the discharge pipework is empty:
  - Close the delivery isolating valve completely before opening it slightly.
  - Start the pump.
  - Observe the delivery pressure gauge and motor ammeter and gradually open the discharge valve as the system pressure increases. Take care not to open the valve too rapidly as pressure surges may be created in the system.
  - When the system is filled and any high points vented, regulate the discharge valve to create the delivery pressure corresponding to the specified pump generated head (discharge head plus suction lift or discharge head less inlet head). Further observe pressure gauge and motor ammeter.
- **Pumps with gland packing ring:** Adjust the gland gradually with the pump running. The packed gland must not overheat and there should be a constant drip through the packing. Significant initial leaking is not harmful and will be automatically reduced as the packing swells.

4.3.2 Functional check

- Confirm that the readings of the pressure and vacuum gauges and the motor ammeter, together with that of the flow meter (if fitted) correspond to the data specified in the contract documentation.
- Record readings for future reference.
- Check the bearing temperature. A temperature of 50°C above the ambient temperature is acceptable.

4.3.3 Closed valve operation

Never run the pump with the suction and discharge isolating valves closed or with the discharge valve closed at non-return valve installed at suction side. Under such conditions the pump contents will be rapidly vaporised and very high pressures generated. These may exceed the bursting pressure of the pump casing, creating a serious hazard to personnel and property.

4.4 Shut-down

4.4.1 Switching off

- Close the isolating valve in the discharge pipe.
- Switch off the pump.
- If a non-return valve is fitted in the discharge pipe and the upstream pressure is maintained, it is not necessary to close the isolating valve.
- Close the additional valves.

4.4.2 Draining

- If frost is anticipated, drain any pumps or pipework not in use, or take other precautions (lagging, trace heating etc.) to prevent damage from frost.
- After pumping polluted media and to prevent corrosion when not in use the pumps should be drained and, if necessary, flushed.

5. Maintenance/servicing

5.1 General precaution

- Never work on the set until the electricity supply has been disconnected completely. It must be impossible for the set to be started inadvertently.
- Always wear safety gloves when assembling/stripping the pumps or when adjusting glands.
- see para. 4.2

5.2 Maintenance and inspection

5.2.1 Lubricants, filling quantities and lubricating intervals

- **Grade of grease:** Lithium-based grease according to DIN 51825, non-ageing, non-acidic, non-corroding, water-resistant with a working temperature of -30 to +130°C, penetration rate of 2 to 3, working penetration of 265 to 295 and a dripping temperature of approx. 190°C.
- **Recommended commercially-available grades of grease:**
  - OPTIMOL OLISTA LONGTIME or OLIT 2, (OPTIMOL)
  - GLISSANTO 20, (DEA)
  - ENERGREASE MSLS-EP2, (BP)
- **Pump without grease nipple on bearing housing:**
  The bearings are filled with grease in the factory before delivery and this should last for approx. 15,000 working hours or two years. Under unfavourable working conditions such as a hot climate, dampness or overheating, the bearings need to be checked and re-greased before this period.
- **Pump with grease nipple on bearing housing:**
  - Are greased in the factory before delivery.
  - Need to be re-greased with approx. 20 to 30 g per point every six months.
  - Avoid over-greasing as this can lead to a build up of heat.
  - After regreasing several times or if overheating occurs (50°C above ambient) open the bearing cover and remove surplus or used grease.
  - Do not pack new bearings more than half full with clean grease.

5.2.2 Monitoring the pump during operation

For satisfactory operation carry out the following checks as routine:

- Monitor the smooth running of the pump.
- **For pumps with gland packing** confirm the leakage rate of the shaft seal as 5 to 10 l/hr. If gland sealing water is supplied check the flow rate.

Nominal diameter discharge branch	Sealing water required [m³/h] at Δp 0,5 bar
100	0.15
125-200	0.20

Table 2: Sealing water required

- **Pumps with mechanical seals:** If leakage occurs at shaft clean, inspect and if necessary replace the mechanical seal. A leakage of between 0.2 and 5 ml/h is possible depending on running smoothness, pressure, rotational speed and shaft diameter (mechanical seals are wearing parts for which no guarantee can be given).
- Record the readings of pressure gauge, vacuum meter, amperemeter, and if available flow rate gauge and compare them with further readings under the same conditions (same valve positioning, outlet-head, inlet water level etc.) and investigate the reasons for any discrepancies.
- **Pressure gauge with three way cock:** Only open the three-way cock in order to obtain a gauge reading and close it immediately afterwards.
- **If pumping highly corrosive and/or abrasive media,** the components containing pressure should be inspected regularly to avoid unexpected failure. The interval between inspections should be short initially and may be extended as experience is gained.

5.2.3 Renewing the gland packing

- Release the gland.
- Withdraw the old packing with flexible packing pliers.
- Carefully clean the packing area.
- If the protective sleeve displays heavy furrowing then either level them out or replace the sleeve.
- Fit new packing rings individually attending displaced openings. Observe the lantern ring.
- Tighten the gland by hand gently and evenly.
- For restarting procedure see para. 4.3.1.

5.3 Disassembly and assembly instructions

CAUTION

(For V mounting arrangement please refer to the supplementary instructions).

Stripping and assembly should only be carried out by qualified personnel and with reference to the relevant sectional drawings (see para. 7.4). The stripping sequence will be clear from the drawing.

- **When disassembling the pump casing:** secure the pump casing and pipework against falling down.

5.3.1 Securing the stage casing

Observe the required torque moment of the tension rod:

Type	max. permissible pressure [bar]	Tightening torque [Nm]	No. of tension rods	Thread [mm]
49 100	32 50	535 829*	4 4	M 24 M 24
49 125	32 50	807 1250*	4 4	M 30 M 30
49 150	32 50	1316 2037*	4 4	M 36 M 36
49 200	32 50	825 1271*	8 8	M 30 M 30

Table 3: tightening torques of the tension rod.

* Tension rod made from material 1037 (1.7225), nuts from 1017 (10.8)

6. Problems: Causes and Remedies

1) Output low or no output at all
2) Excessive output
3) Motor overload and thermistor stops
4) Pressure surge or water hammer on shut down

1)	2)	3)	4)	Problem	Remedy
■				Excessive draw-down in sump, excessive suction lift or inadequate flooded suction	• Check the system design and pipe sizing • Check the settings and operation of level controls
■				Pump not completely primed	• Vent the pump • Check shaft sealing arrangements for air tightness
■				Air lock in suction pipe	• Prime the suction pipe • Check suction pipework and valves for air tightness
■				Excessive delivery pressure	• Open up restricting valves • Check system design for excessive pressure losses • Modify pump (after consulting the manufacturer)
	■	■		Insufficient delivery pressure	• Check the system design • Restrict discharge valve
■				Wrong rotation	• Correct rotation
■		■		Pipework, fittings or pump clogged	• Remove deposits or obstructions
■		■		Pump internal worn	• Replace worn parts
■				Speed too low	• Check electrical installation
	■	■		Speed too high	• Check electrical installation
		■		Motor two phasing	• Check electrical installation
■		■		Set misaligned	• Check alignment • Eliminate loads from pipework and realign set
		■		Packed gland packing overtightened	• Slacken gland packing
		■		Excessive viscosity/density of pumped medium	• Fit a more powerful motor (after consulting the manufacturer)
			■	System design	• Examine system design

Table 4: Problems

ENGLISH

7. Appendix

7.1 Permissible pump pressure

Arrangement	Maximum admissible final pump pressure* [bar]							
	pump media temperature -20°C to +100°C casing parts made of				pump media temperature +100°C bis +140°C casing parts made of			
	GG	GBz	GGG	GS	GG	GBz	GGG	GS
A,S	40	32	50	50	34	30	45	45
AX	25	20	30	30	20	18	27	27

Table 5: final pressure of pump

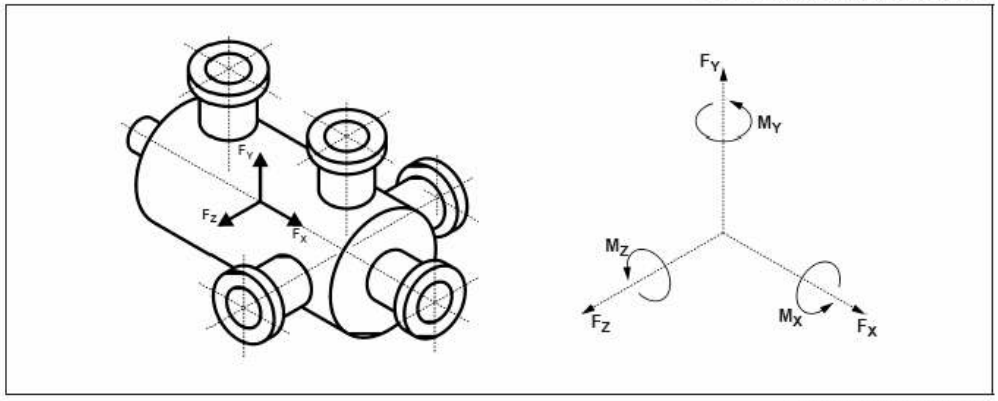
* The maximum permitted final pump pressure [bar] consists of the intake pressure and the pump delivery head at zero capacity.

7.2 Permissible branch loads

- In reference to mounting arrangement E

Nominal width [mm]			100	125	150	200
Vertical branch	Forces [daN]	Fx	90	112	135	175
		Fy	100	125	150	200
		Fz	80	100	120	155
		ΣF	160	200	240	315
	Torque [daNm]	Mx	50	62	75	100
		My	41	47	53	65
		Mz	36	49	62	85
		ΣM	74	92	110	140
Horizontal branch	Forces [daN]	Fx	90	112	135	175
		Fy	80	100	120	155
		Fz	100	125	150	200
		ΣF	160	200	240	315
	Torque [daNm]	Mx	50	62	75	100
		My	41	47	53	65
		Mz	36	49	62	85
		ΣM	74	92	110	140

Table 6: maximum admissible branch loads



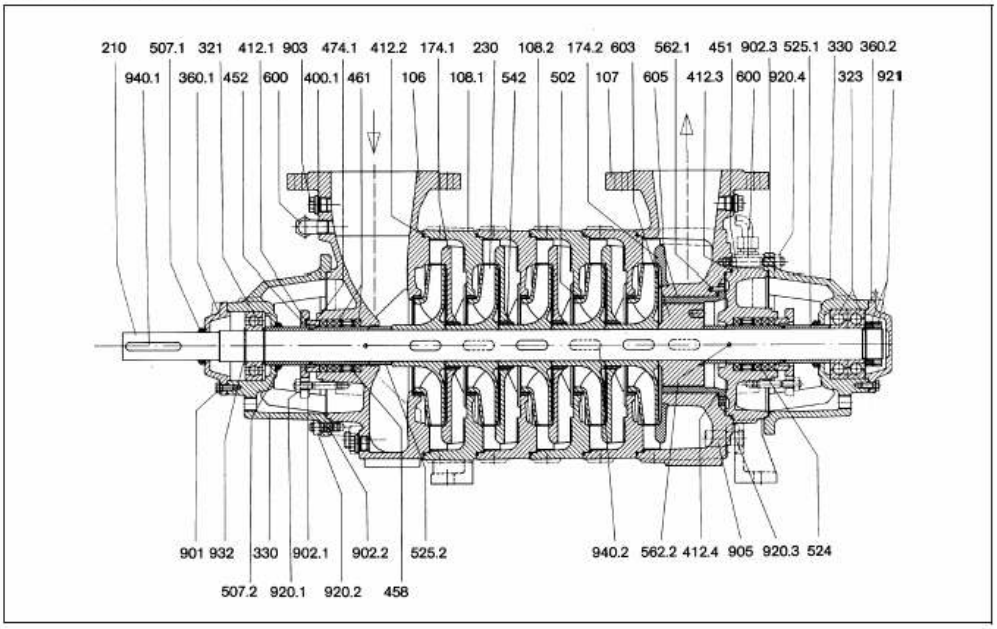
Sketch showing branch loads

7.3 Parts list

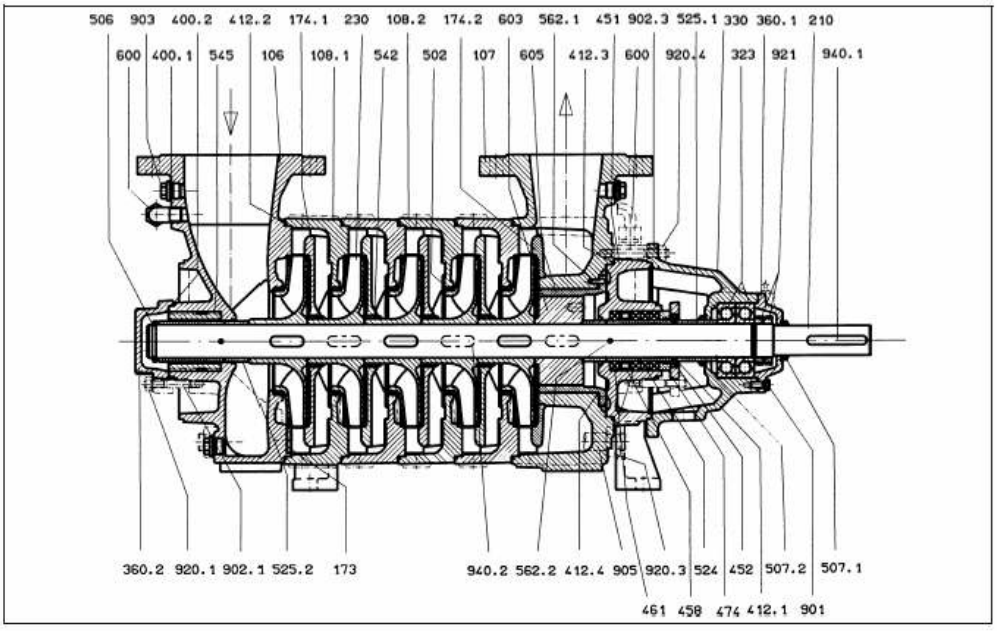
VDMA No.	Description	VDMA No.	Description
106	suction casing	477	spring
107	delivery casing	485	drive collar
108/.2	interstage casing	502	casing wear ring
108.1	interstage casing with pedestal	503	impeller ring
173	diffuser plate (only for 49 200)	506	locating ring
174.1/.2	diffuser insert	507.1/.2/.3	thrower ring
181	pump base	524/.1/.2/.3/.4	shaft sleeve
210	shaft	525.1/.2	distance sleeve
230	impeller	542	neck bush
321	grooved ball bearing	545	bearing bush
323	thrust ball bearing	562.1/.2	dowel pin
330	bearing housing	600	axial balance pipe
341	motor stool	603	axial balance piston
360.1/.2	bearing cover	605	axial balance bush
400/.1/.2	gasket	901	allen key
412.1/.2/.3/.4/.5/.6	o-ring	902.1/.2/.3	stud
451	gland housing	903	plug
452	gland	904	grub screw
458	lantern ring	905	tie bolt
461	gland packing	920.1/.2./.3/.4	hexagon nut
471	seal cover plate	921	shaft locking nut
472	rotating seal face	932	circlip
474/.1/.2	compression ring	940.1/.2	key
475	stationary seal		

7.4 Sectional drawings

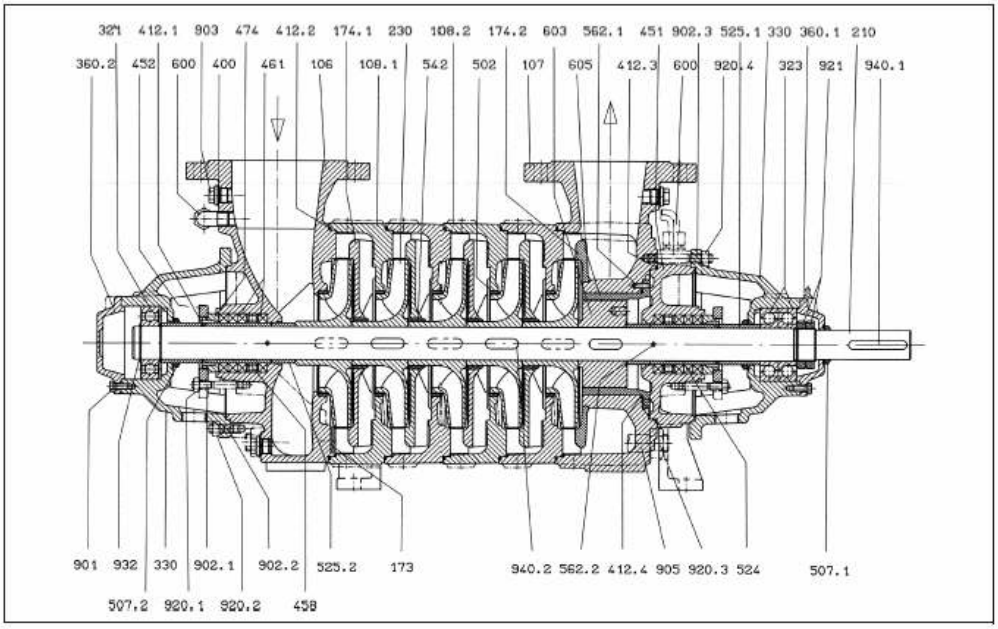
7.4.1 Mounting arrangement A1



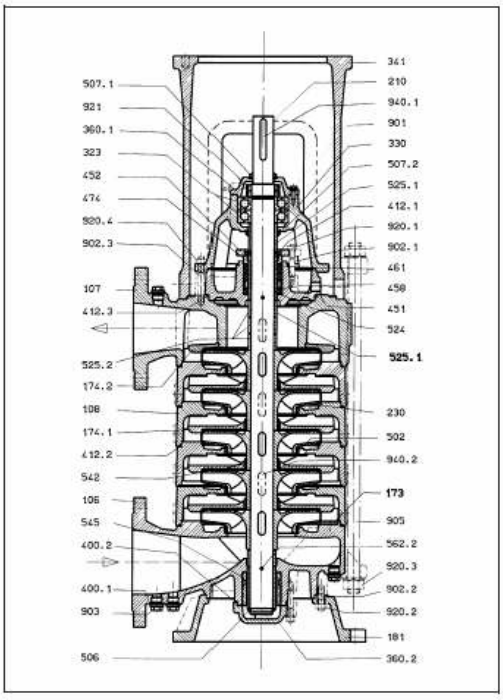
7.4.2 Mounting arrangement A2



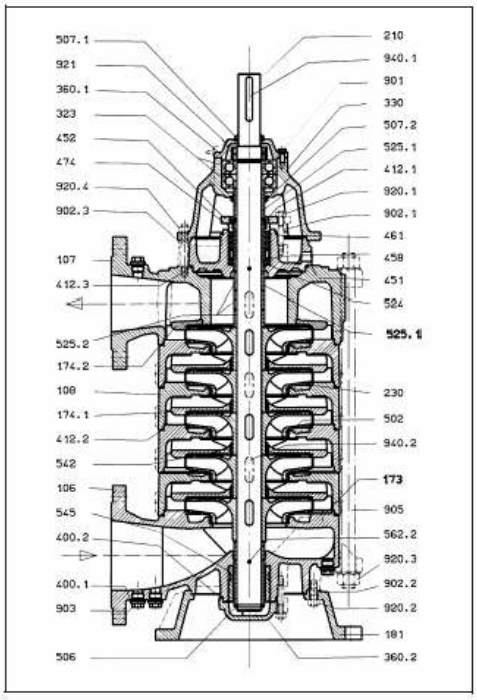
7.4.3 Mounting arrangement A3



7.4.4 Mounting arrangement S

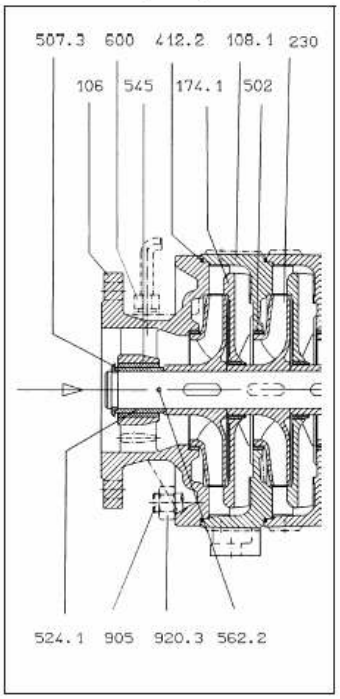


7.4.5 Mounting arrangement SG



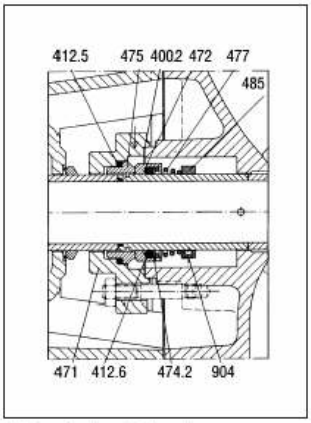
ENGLISH

7.4.6 Mounting arrangement AX

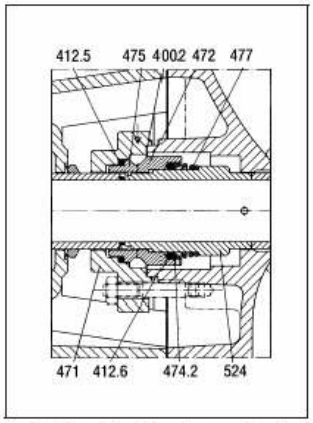


7.4.7 Mechanical seals

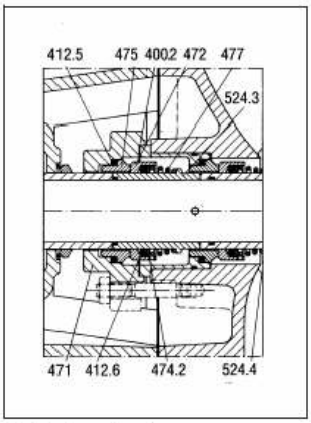
Non balanced mechanical seal



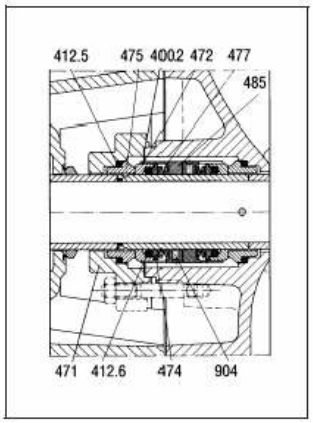
Balanced mechanical seal



Mechanical seal in tandem arrangement



Back-to-back double-acting mechanical seal



7.4.8 Impeller rings