SIHI
Range: ZTND
Volute casing pump for heat transfer oils
PUMP DESCRIPTION _____
SERIAL NUMBER _____

Operating instructions
Translation of the original instructions

Attention: Both the pump and/or the pump set must be installed and commissioned by qualified technical personnel only and these installation, commissioning and operating instructions must be strictly observed. Failure to do so could result in:

- **danger** to you and your colleagues,
- **the pump** or **the pump unit** may be **damaged**,

Note that the manufacturer is not liable for damages resulting from failure to observe these instructions. Please be aware of your responsibility to your colleagues when working on the pump or the pump set!

Safety instructions marked with $\varepsilon\chi$ **included in this Operating Instructions and in the Supplementary Operating Instructions, which must be attached to this Operating Instruction, have to be considered in particular when operating this pump in potentially explosive atmospheres!**

1. Safety

This operating manual gives basic instructions, which must be observed during installation, operation and maintenance of the pump. It is therefore imperative that this manual is read by the responsible personnel/operator(s) prior to assembly and commissioning. It must always be kept available at the site of pump installation.
It is not only the general safety instructions contained in this chapter “Safety” which must be observed, but also the specific information provided in the other chapters.

1.1 Identification of safety symbols in the operating instructions

Safety symbols are given in these operating instructions. Non compliance with these would affect safety and are identified by the following symbol

Danger symbol as per DIN 4844-W9
(ISO 3864 - B.3.1)

Or in case of danger of electric current with:

Danger symbol as per DIN 4844 W-8
(ISO 3864 - B.3.6)

The word

ATTENTION

identifies those safety regulations where non-compliance may pose a danger to the pump and its function. It is imperative that the appropriate safety information is attached to the pump/pump set, for example:

- an arrow indicating the direction of rotation
- symbols indicating fluid connections
- the identification plate

and that these are kept legible.

1.2 Qualification and training of personnel

The personnel responsible for operation, maintenance, inspection and assembly must be adequately qualified. The scope of responsibility and supervision of the personnel must be exactly defined by plant management. If the staff do not have the necessary knowledge, they must be trained and instructed. This task may be performed by the machine manufacturer or supplier on behalf of the plant management. Moreover, plant management must ensure that the contents of the operation instructions are fully understood by plant operators and other relevant personnel such as maintenance staff.

1.3 Hazards in case of non compliance with safety instructions

Non compliance with the safety instructions may result in risk to personnel as well as to the environment and the pump/pump set and result in the loss of any right to claim damages.
For example, non-compliance may result from, or lead to, the following:

- failure of important functions of the pump/pump set/plant
- failure of specified procedures of maintenance and repair
- exposure of people to electrical, mechanical and chemical hazards
- danger to the environment owing to hazardous substances being released.

1.4 Compliance with regulations relating to safety at work

When operating the pump the safety instructions contained in this manual, the relevant national accident prevention regulations and any other service and safety instructions issued by plant management must be observed.

1.5 Safety instructions relating to operation

- If high or low temperature pump/pump set components involve hazards, steps must be taken to avoid accidental contact.
- Guards for moving parts (e.g. couplings) must not be removed from the pump/pump set while in operation.
- Any leakage of hazardous (e.g. explosive, toxic, hot) fluids (e.g. from the shaft seal) must be drained safely so as to prevent any risk to persons or the environment. Statutory regulations are to be complied with.
- Hazards from electricity are to be avoided by the user (see for example the VDE-specifications and the bye-laws of the local power supply utilities).

1.6 Safety instructions relevant for maintenance, inspection and assembly work

It is the plant management's responsibility to ensure that all maintenance, inspection and assembly work is performed by authorized personnel who have adequately familiarised themselves with the subject matter by studying this manual in detail.

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

Pumps and pump sets, which convey hazardous media, must be decontaminated.

On completion of the work all safety and protective guards must be re-installed and made operative again. Prior to re-starting the machine, the instructions listed under "first commissioning" are to be observed.

1.7 Safety instructions for the use in areas with explosion hazard

In this section information is given for operation in areas where an explosion hazard exists.

1.7.1 Complete pump sets

If the pump is combined with other mechanical or electrical components in one set, the category of the complete unit will correspond, based upon the Directive 94/9/EC, only to that category with which all of its components comply.

Note:

These comments are of particular importance when pumps, which conform to a given category of Directive 94/9/EC, are powered by a driver which is not in the same category.

Although the pump may bear the Ex sign, the set should not be used in areas with an explosion hazard when the motor is not classified for this application.

This means that plant management personnel should always check that all elements of the set comply with the Directive 94/9/EC.

1.7.2 Execution of coupling guards

Coupling guards that are to be used in areas with an explosion hazard, have to fulfil one of the following criteria:

- consist of non-sparking material, e.g. brass.
- if they consist of sparking material, e.g. steel sheet, they must be designed in such a way that the rotating parts will not come in contact with any part of the guard if errors, that could be foreseen, are committed by the user, e.g if a person steps on the guard.

1.7.3 Monitoring technical parameters

When using pumps in areas with an explosion risk, the operator must check the following parameters regularly:

- leakage of shaft seals
- bearing temperature
- that the pump is always filled with liquid during operation
- that the pump does not operate against a closed valve for any length of time.

The operator must ensure that pumps, which show evidence of abnormal operation, are switched off and not started again until the cause of the abnormal operation has been eliminated.

1.7.4 Avoiding external damage

In areas with a risk of explosion the operator must ensure that the pumps and or pump set is not subjected to external impacts e.g by heavy objects.

1.8 Unauthorized alterations and production of spare parts

Modifications may be made to the pump/pump set only after consultation with,and written approval from, the manufacturer. Using spare parts and accessories authorized by the manufacturer are in the interests of safety. Use of other parts may exempt the manufacturer from any liability.

1.9 Unauthorized mode of operation

The reliability of the pump/pump set can only be guaranteed if it is used in the manner intended and in accordance with the instructions of this manual. The specified limit values must under no circumstances be exceeded.

1.10 Warranty / guarantee

Sterling Fluid Systems guarantee satisfactory operation if:

- the pump is installed and operated in compliance with these instructions and in operating conditions approved by Sterling Fluid Systems
- modifications are only undertaken with Sterling Fluid Systems' written agreement.

2. Application

The pump is to be used only for the operating conditions stated by the customer and confirmed by the supplier. Guarantee is assumed within the scope of the **Sterling Fluid Systems** conditions of sale.

Appropriate application and operating conditions are contained in the attached data sheets.

2.1 Warning of misuse

- Do not touch hot pumps.
- The pump may only be used for the application(s) stated. Otherwise hazards for people and environment may arise.

ATTENTION

- Never subject the pump to a temperature shock. Never spray off the hot pump with cold liquid.
- Do not exceed fluid density stated. Otherwise, there is a danger of motor overload.
- The pump must not be operated beyond its characteristic curve – otherwise there is a danger of cavitation and motor damage.

2.2 Accessories

The accessories included in the scope of supply are indicated in the delivery note or in the order confirmation. The corresponding operating and installation instructions are also indicated in the Annex relating to accessories.

If it is intended to mount other accessories on the pump or on the pump set, please inform the manufacturer in advance in order that appropriate technical advice can be given.

2.3 Construction and mode of operation

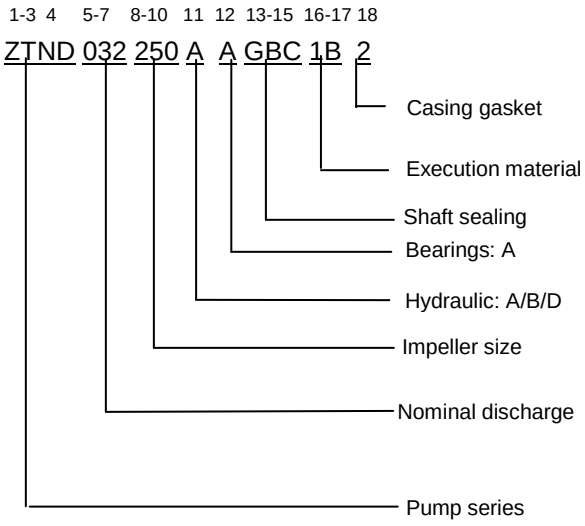
ZTN pumps are volute casing pumps with nominal outputs and flange dimensions acc. to EN 733 / DIN 24255. They have especially been developed for pumping mineral and synthetic heat transfer oils. The pumps are applicable in installations with and without inlet pressure.The back pull out construction allows the disassembly of the complete insert unit without removing the pump out of the pipe system.

Impurities up to a grain size of 0,1 mm can be handled, but shorten the service life.

2.4 Description

Type size	Hydraulic + Bearing	Shaft seal	Material design	Casing gasket
ZTND 032125 to 200500	• A First hydraulic • B Second hydraulic • D Transnorm size with double volute • A one ball bearing respectively two inclined ball bearing grease lubricated and one liquid flushed sleeve bearing	002: radial shaft seal rings (Viton) GBC: unbalanced standard mechanical seal	1B: Spheroidal cast iron GGG40.3, cast iron GG25 impeller 2B: Cast steel	2: confined flat gasket of graphite with A4 insertion
	A All D 200400, 200500 B 32160, 32200 A	Alternatively 002, GBC	1B 032125 to 200315 2B 200400, 200500	2

Example of a pump designation:



2.5 Shaft sealing

Depending on the application, different shaft sealing executions are offered (see 2.4)

- Radial shaft seals (execution 002) or mechanical seals according to DIN 24960 are utilised in the following cases:
  - if the pump draws from a suction line,
  - if the pump is fed by a feed line with a pressure of less than 0.5 bar or
  - if the pumped liquid is at or near its boiling point.

ATTENTION

Section 2.4 does not contain the codes for all variations of mechanical seals. Where the code is not included or replaced by QQQ, consult the relevant data sheet of the mechanical seal supplier (e.g. special execution of the mechanical sealing in a back to back position).

3. Planning the installation

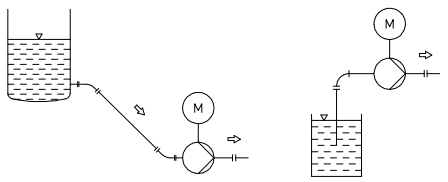
3.1 Piping system

ATTENTION

- Note the arrows on the pump branches indicating the direction of flow.
- Choose nominal widths of the pipelines according to the nominal widths of the pump branches or larger ones with the corresponding reductions.
- Flange sealing must not protrude on the inside.
- Ensure that the pipework is clean before installing of the pump.
- Support the pipework in order to avoid distortions at the pump components (risk of damage to pump components)
- Avoid abrupt changes of cross section and direction.
- Where different diameter pipework is to be used, connection should be by eccentric transition pieces. This will avoid the formation of air pockets in the pipework.
- For difficult pumping on the suction side, to stabilise the flow, a pipe length 15 times the diameter of the suction branch should be installed before the suction branch.
- The flow rate in the suction line or inflow line, must not exceed 2 - 3 m/s.

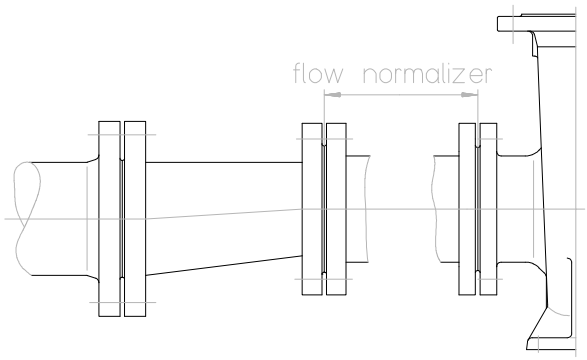
3.1.1 Suction line / inflow line

See the sketches below for the optimum layout of pump installation for flow and suction lift operation.



positive suction head operation suction lift operation

Ensure that air pockets cannot be created. Unequal nominal widths of the suction branch and suction line must be compensated by eccentric transition pieces.



Connection of eccentric pipe transitions

It is recommended that a filter is installed in front of the pump with a filter surface of at least 3 times the pipe cross section (approx.100 meshes/cm²).

A shut-off valve should be installed in the feed line. It must be closed for maintenance work.
It should be installed in order to avoid air pockets forming in the spindle cap, i.e. with the spindle in a horizontal position or pointing vertically downward.

3.1.2 Discharge line

The discharge line is to be laid steeply, a constant cross section should be aimed at.
For flow regulation, a valve must be installed behind the pump. If non-return valves are used, they should close smoothly. Pressure shocks must be avoided.

3.1.3 Leakage line

For the controlled draining of leakage (required by DIN 4754) it is recommended to install a leakage line (see 5.10). For this purpose a connection bore of the size G ¼ is provided.

3.1.4 Inlet and outlet connections

The various connecting points are shows in the drawings. (See Annex, Chapter 10, point 10.1).

3.1.5 Pressure control

For consistent control of pressure, it is advisable to install in the pipework a measuring point in front of, and behind the pump.

3.2 Electrical connections

For the drive motor a mains connection is required which complies with the European Regulations and Directives for the Standards in Industry and with the instructions of the local power supply utilities of the country concerned.

4. Unpacking, storage, handling

4.1 Safety measures

- Never stay below the suspended load.
- Keep a safe distance while the load is being transported.
- Use only approved lifting appliances, which are in good condition.
- Adjust the length of the lifting appliances in such a way that the pump and/ or the pump set, is suspended horizontally.
- Do not use the eyebolts on the pump components for lifting the assembled pump or the complete set.
- Do not remove documents, which are attached to the pump.
- Do not remove the protection covers from the pump suction/discharge. Otherwise, there may be a risk of contamination.

4.2 Unpacking

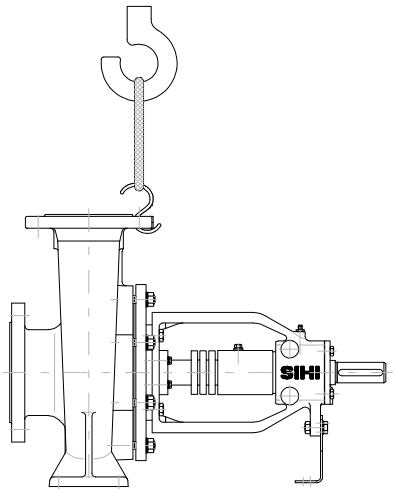
Before unpacking, a visual check of the packing is recommended. If transport damage is visible, the extent should be noted on the receipt or on the delivery note. Potential claims must be lodged immediately with the carriers or the insurance company.

4.3 Interim storage

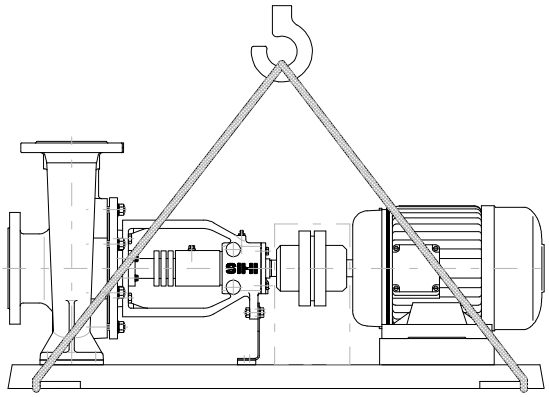
If the pump or the pump unit is not installed immediately after delivery, it must be stored free from vibration in a dry room.

4.4 Handling

The pump or pump set must be lifted and handled as shown in the following sketches.



Pump without motor



Pump set

4.5 Protection against corrosion

In general, a protective coating is applied to the whole pump, internally.

4.5.1 Removal of protection

The protective coating is compatible with normal thermal oils.

The operator must ensure that the pump is completely free of water.

5. Installing the pump

5.1 Requirements

The pump and the pump set, must have been unpacked and handled as described in Chapter 4.

5.2 Use of trained staff

Only appropriately trained staff must undertake the work described in this chapter.

5.3 Safety measures

- Connect the pipework carefully to prevent the pumped liquid escaping during operation and endangering operating personnel.
- Ensure that the suction or inflow line, and the discharge line are closed by valves.
- Ensure that all electrical connections are “dead”. Otherwise, there is a risk of electric shock.
- Pay attention to relevant internal plant regulations.
- Avoid accidental contacts with hot components.

ATTENTION

- The operator must ensure that the pump, internally, is clean, not contaminated and free of water.

5.4 General information

5.4.1 Assembly tools

Special tools are not required for assembly and installation.

5.4.2 Permissible ambient conditions

The ambient temperature can be from -20 ℃ to +60 ℃. The atmospheric humidity should be as low as possible in order to avoid corrosion.

5.4.3 Base, foundation

The pump must be installed on a flat floor or foundation free from vibration. In case of doubt use vibration dampening feet.
The pump set must be correctly mounted on the foundations. To avoid distortion of the pump set and/or the foundation, parallel shims must be used between the base plate and foundation.

Prior to installing, checks should be made with regard to:

- Possible damage to the pump or the pump set that may occur in transit.
- Ease of running (check that the shaft is free to rotate by hand).
- The foundation dimensions.

The following preparatory work must be carried out before to placing the pump:

- Roughen and clean foundation surface.
- Remove shuttering / cores from the anchor holes.
- Blow the anchor holes clean.
- Check the position and dimensions of the anchor holes against the arrangement drawing.

5.4.4 Installation of the set

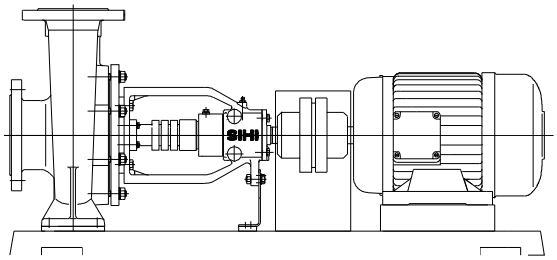
The complete set mounted on the base plate must be placed on the foundation with its foundation (rag) bolts hanging below the baseplate.

5.4.5 Space required

The space required for the pump set is set out in the foundation plan or installation drawing.
Ensure easy access to the shut-off and regulation valves as well as to any measuring instruments.

5.4.6 Position

In principle the ZTN pumps are installed horizontally.



5.5 Motor

Before assembly check the direction of rotation of the motor (indicated by an arrow on the pump casing). If this is not possible the direction of rotation of the complete unit can only be checked only if the pump is filled. Only motors with axial ventilation are permitted.

In any event, the operating instructions of the motor manufacturer must be followed, since the motor is generally incorporated by STERLING FLUID SYSTEMS into the pump set.

5.6 Alignment of the set

Place shims under the base plate on both sides of the foundation bolts, 10 mm from the base plate edge. Use a spirit level to align the set.

If necessary, place shims between the foundation bolts to prevent the base plate from sagging. Care should be taken to minimize distortion of the base plate during installation. The location of the driver must not be higher than that of the pump. The max. deviation from the shaft centre line is ± 0,1 mm.

The foundation bolts should be embedded in concrete using quick-setting grout.

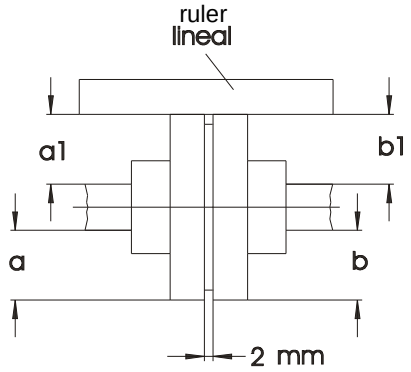
5.7 Coupling

Install the coupling avoiding hard blows, if necessary in warm condition. Arrange the pump and motor on a level base. The shaft ends must be aligned exactly. The distance between each half of the N-EUPEX B (FLENDER) coupling must be 2 - 3 mm (see fig.).

If other manufacturers' couplings are used, follow the manufacturer's instructions. After installation on the foundation and connecting the pipework, the coupling alignment must be checked and re-aligned, if necessary. Moreover, after reaching the operating temperature the alignment of the coupling must be checked again.

The coupling requires a guard that meets DIN 31001 in order to avoid accidental contact during operation.

In any event, the operating instructions of the coupling manufacturer must be followed, since the coupling is a component incorporated by **Sterling Fluid Systems**.

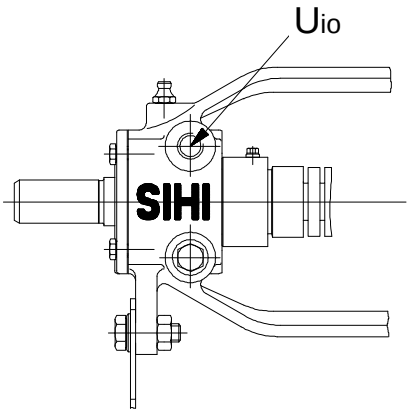


The following is required a = a1 and b = b1

5.8 External cold oil

If the pump is operated in suction lift operation, the pressure has to be measured at the vent bore (see fig. in chapter 6).

In case of underpressure cold oil (e.g. Level-Oiler) has to be admitted onto the shaft seal via the connection U_{IO} (G ¼). The borehole U_{AL} has to be closed. By this measure is ensured that air cannot enter the system and the seal does not run dry. The standard value for the necessity of this measure is an underpressure of abt. 0,5 bar in the inflow line near the pump.



5.9 Checking before installation

Before installing the pump on the plant, the following points must be checked:

1. Is the electrical current to the drive motor switched off?.
2. Are suction and discharge lines emptied and closed by valves?.
3. Is it possible to rotate the pump easily by hand (for this purpose turn the fan of the motor or the coupling)?.
4. Have the latest internal/plant instructions been observed?.

5.10 Mounting the pump and installation into pipework

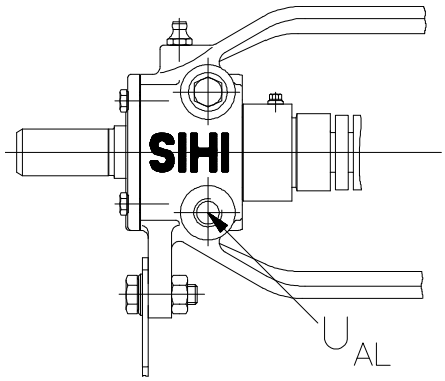
The following instructions must be carried out:

1. Remove the protective covers from the pump flanges and the auxiliary pipework connections.
2. Correctly insert the flange seals.
3. Connect the suction or feed line.
4. Connect the discharge line.

The pump must be aligned with the pipework. The pipework must be supported so that distortion cannot occur when connecting the pump.

5.11 Connection of the leakage line

It is necessary, a tube must be connected to the bore U_{AL} G ¼" for draining off, without any danger, heat transfer liquid which possibly leaves.



5.12 Final work

The following final steps must be undertaken:

1. Check the tightness of the connecting flanges.
2. Check for easy running of the pump (for that purpose turn the motor fan or the coupling).
3. Check the coupling alignment.
4. Install the coupling guard.

5.13 Hydrostatic pressure test

When subjecting the piping system to a hydrostatic pressure test, exclude the pump from the pressure test.

If it is not possible to test the pipework without the pump, ensure that foreign material cannot enter the pump.

- The **max. permmisible** pressure for a pressure test is **1,3 times** the nominal pump pressure.
- The nominal pump pressure is indicated in the tecnical data sheet.
- The medium for the pressure test should be heat transfer oil.
- For reasons of operating safety it is not permitted to subject the pump to a pressure test using water.

6. Start-up and shut-down operations

6.1 Requirements

The pump or the pump set, must be installed acc. to the instructions of Chapter 5.

6.2 Use of trained staff

Only appropriately trained staff must carry out the work described in this chapter.

6.3 Safety measures

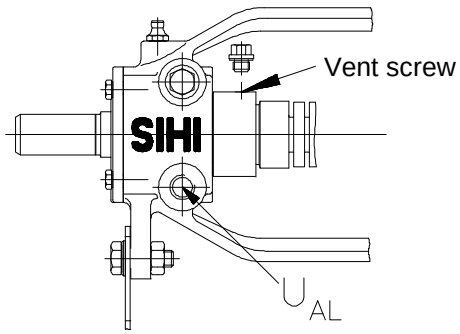
- Electrical connections must be made according to the European Regulations and Directives for the Standards in Industry and in compliance with the instructions of the local power supply utilities of the country concerned.
- Only appropriately authorised personnel may carry out this work.

ATTENTION

- Fill the pump correctly; otherwise the shaft seal could be destroyed.
- Fill the supply lines correctly.
- Check the direction of rotation only when the pump is filled.
- Fill the pump slowly if hot media are being pumped in order to avoid distortions or heat shock.
- When handling explosive, toxic, hot, crystalline or corrosive media, ensure that there is no risk to people or the environment.
- Control the output at constant speed at the discharge side only. The valve at the suction side must always be completely open during operation to avoid the risk of cavitation.
- If there is no bypass line, do not run the pump with the control valve closed for any length of time.
- Safety measures should be taken by the end user to ensure (for example by means of a relief valve) that the permissible pump casing pressure is not exceeded during operation
- Repeat the alignment of the coupling at operating temperature. Re-align the pump or the motor, if necessary.

6.4 Filling / ventilation

Before the first start-up the pump as well as the suction or inflow line, respectively, must be completely filled with pumping medium in order to avoid dry operation of the pump. It can take several minutes to ventilate the pump completely as the heat transfer oil is very viscous when it is cold. For the ventilation of the pump remove the vent screw shown below and rescrew it only when heat transfer oil leaves bubble-free.



ATTENTION

An incomplete ventilation can shorten the service life of the pump.

6.5 Electrical connection

The motor must be connected at set out in the circuit diagram in the terminal box.

6.6 Checks before switching-on

Before switching on the pump unit, the following points should be checked:

1. Is all pipework connected and are the unions tight?
2. Is the pump including the pipework filled properly?
3. Is the shut-off valve in the discharge line closed?
4. Is the shut-off valve in the suction line completely opened?
5. Is the motor ready for operation?
6. Is the direction of rotation of the motor correct?
   (check by running the motor for a short time)
7. Is the coupling aligned exactly?
8. Has the shaft seal been installed?
9. Are the supply lines, if any, to the shaft seal open?
10. In the case of oil lubrication - has the bearing housing been correctly filled with oil?
11. Is the pump completely ventilated?

6.7 Start-up operation

For starting proceed as follows:

1. Open fully the valve on the suction side
2. Close the valve on the discharge side
3. Switch on the motor
4. Check the pressure gauges at the pressure measuring points

If the pumping pressure does not increase consistently with increasing speed, switch off the motor again and vent the pump one more.

5. After reaching operating speed, regulate the operating point of the pump by adjusting the valve in the discharge line (see technical data for permissible range of operation).

Pumping against a closed valve in the discharge line is permitted only if a minimum output via a bypass line is guaranteed.

By means of safety measures at the plant (e.g. overflow valve) it must be ensured that the admissible casing pressure of the pump is not exceeded because of malfunction during operation.

The alignment of the coupling should be repeated at operational temperature. If necessary the pump or the drive motor, respectively, is to be re-aligned.

6.8 Switching frequency

Size	Permissible number of starts equally spaced per hour
032125, 032160, 032200, 032250, 040125, 040160, 040200, 040250, 040315, 050125, 050160, 050200, 050250, 050315, 065125, 065160, 065200, 065250, 065315, 080160, 080200, 080250, 080315, 100160, 100200, 100250, 100315, 125200, 125250, 150200, 150250	8
150315, 150400, 150500, 200250, 200315, 200400, 200500	6

6.9 Special instructions

During operation the following points must be observed:

- Control the speed and the delivery head
- Ensure that the pump runs without vibration
- Control the liquid level in the suction line and/or inflow tank
- Control the bearing temperature (max. temperature 100 ℃)
- Control the cooling flow from the motor to the shaft seal.
- Shaft seal: As a rule leakages of some cm^3/h at shaft seals occur as vapour or fog. Additionally slight drop leakages can occur.

ATTENTION

If the leakage increases considerably after the running-in procedure of the shaft seal, the pump must be switched off as soon as possible, and the shaft seal has to be checked.

6.10 Shutting-down

Before shutting down close the regulating element at the discharge side.

After shutting down all regulating elements can be closed. If there is the risk of freezing, dismount the pump and then drain it by turning it upside down.

In case of handling explosive, toxic, hot, crystalline or corrosive media it must be ensured that persons and environment are not endangered. Even if the pump was turned upside down residues remain in the pump. For transport the pump must be free from any dangerous matters. In case of long standstill periods the pump is to be preserved.

7. Maintenance, dismantling and assembly

7.1 Requirements

The pump or the pump set must have been shut down in the manner described in Chapter 6.

7.2 Use of trained staff

Only appropriately trained and skilled staff should undertake the work described in this chapter.

Only authorised personnel must undertake electrical work associated with maintenance of the pump/pump set.

7.3 Safety measures

- For explosive, toxic, hot, crystalline as well as different pumping media esure that people and the environment are not endangered.
- Flush the pump with clean liquid before dismantling.
- The working place for disassembly or assembly must be clean.
- Before reinstallation, the pump must be free of any dangerous material.

7.4 Maintenance and inspection

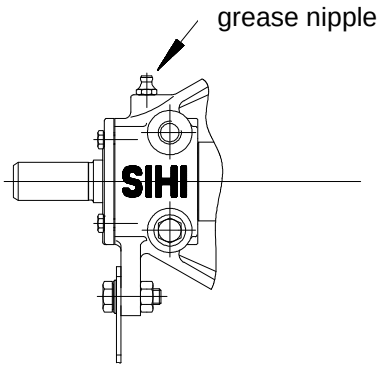
The pump requires only little maintenance.

7.4.1 Bearing with grease lubrication

The antifriction bearing should be lubricated through greese nipples 63.60 at the following intervals:

Pump speed	Lubrication interval
1450 ≤ n ≤ 2900 rpm	2000 operating hours
n ≥ 2900 rpm	700 operating hours

As lubricant should be used lithium-saponified grease which is free from resins and acids and which protects against rust.



Properties:

- Consistency as per DIN 51818, class 1
- Fulling penetration DIN ISO 2137 (0,1 mm) 310-340
- Application temperature 140 ℃
- Dropping point 250°C, DIN ISO 2176

In our works the antifriction bearings are lubricated with the grease Microlube GL 261 (manufacturer Klüber). After approx. 10000 hours of operation in case of permanent operation, or after two years in case of intermittent operation, the antifriction bearing is to be dismounted, washed out and to be provided with a new grease filling.

If another suitable grease shall be applied, the residues of the former grease must be entirely eliminated from the bearing and the bearing chamber.

In case of especially unfavourable conditions of operation (humidity, dust and/or high ambient temperatures) the lubrication intervals must be considerably shorter.

The quantity of grease required is:

Bearing bracket	Grease (g)
25	9
35	15
45	22

7.4.2 Inner sleeve bearing

The inner sleeve bearing does not require any maintenance. Abrasive particles in the pumping medium cause wear and shorten the service life.

7.4.3 Shaft seals

- For shaft seal execution “002”

The radial seal rings should have little or no visible leakage. Where there is considerable leakage, check the radial seal rings.

- For shaft seal execution “CDC” and “GBC”

The mechanical seal should have little or no visible leakage. Where there is considerable leakage, check the mechanical seal.

7.4.4 Drive motor

The drive motor must be maintained according to the instructions of the manufacturer.

7.5 Dismantling

7.5.1 Preparation for the dismantling

Proceed as follows:

- Disconnect power to the motor
- Drain the plant, at least within the pump area, i.e. between the valves on the suction and discharge side
- If necessary, disconnect any measuring probes or control devices and remove them
- The pump casing must not be detached from the pipe union
- Remove motor mounting bolts and move the motor so that there is sufficient space to remove the back pull out unit. When using a spacer coupling repositioning of the motor is not necessary.
- Dismantle guard coupling, pump feet and coupling.

7.5.2 Replacement parts

The item numbers necessary for ordering spare parts are provided in the component parts list in the Annex.

In any case the flat gasket item No. 40.00 is to be replaced when the pump is assembled again.

7.5.3 Dismantling the pump

7.5.3.1 Bearing bracket 25 and 35

1. Mark the position of the parts to each other by a colour pen or by a scribing point.

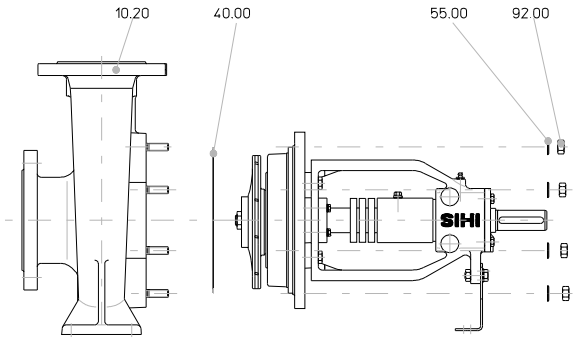


fig. 1

2. Detach the nuts 92.00 and remove the washers 55.00.

Take safety measures for supporting the complete mounting unit and catch oil possibly flowing out.

3. Remove the complete insert unit out of the pump casing 10.20 and take off the gasket 40.00 (fig. 1)

- For shaft seal execution “002”

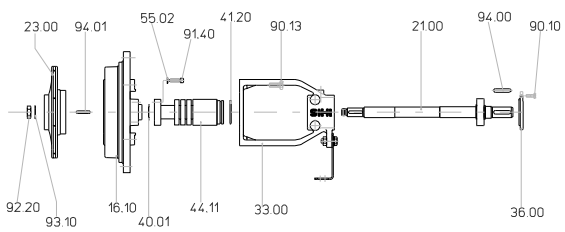


fig. 2

4. Detach the shaft nut 92.20 and take off the safety tab washer 93.10. (fig. 2)
5. Dismount the impeller 23.00 and the key 94.01.
6. Detach the hexagon screws 90.13 of the bearing bracket 33.00 and take off the cover 16.10 incl. shaft seal casing 44.11.
7. If required the shaft seal casing 44.11 is to be dismounted by detaching the screws 91.40 and removal of the disks 55.02.
8. Remove the key 94.00, detach the hexagon screws 90.10 and dismount the bearing cover 36.00.
9. Push the shaft 21.00 together with the antifriction bearing 32.10 out of the bearing bracket 33.00.

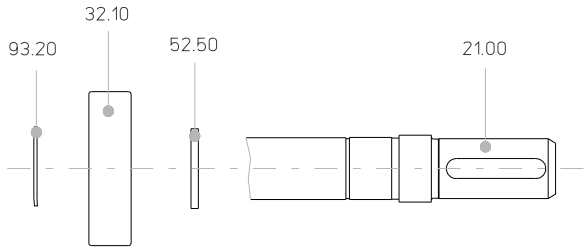


fig. 3

10. Take off the circlip 93.20 by means of a burst-off pliers and pull the antifriction bearing 32.10 and the spacer 52.50 from the shaft 21.00. (fig. 3)

- For shaft seal execution “CDC” and “GBC”

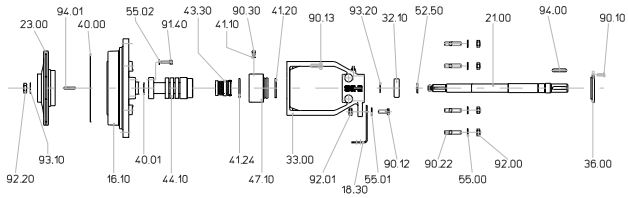


fig. 2

4. Detach the shaft nut 92.20 and take off the safety tab washer 93.10. (fig. 2)
5. Dismount the impeller 23.00 and the key 94.01.
6. Detach the hexagon screws 90.13 of the bearing bracket 33.00 and take off the cover 16.10 incl. shaft seal casing 44.10. The seal cover 47.10 can remain in the bearing bracket.
7. Mark the position of the locating ring 48.50 on the shaft. (fig. 3)

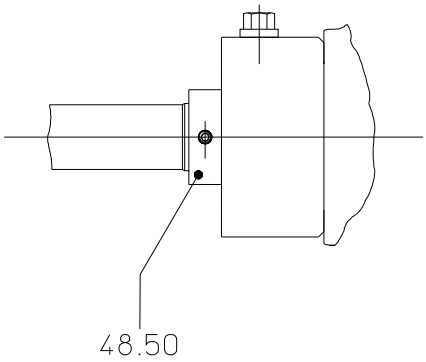


fig. 3

8. Dismount carefully the locating ring and the mechanical seal 43.30.
9. If required the casing of the mechanical seal 44.10 can be dismounted by detaching the screws 91.40 and removal of the disks 55.02. Furthermore the seal cover 47.10 can be removed out of the bearing bracket 33.00 by means of a lever.
10. Remove the key 94.00, detach the hexagon screws 90.10 and dimount the bearing cover 36.00.

11. Push the shaft 21.00 together with antifriction bearing 32.10 out of the bearing bracket 33.00.

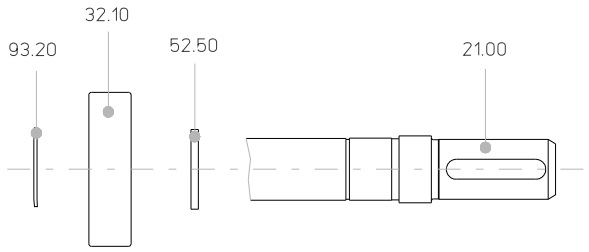


fig. 4

12. Take off the circlip 93.20 by means of a burst-off pliers and pull the antifriction bearing 32.10 and the spacer 52.50 from the shaft 21.00. (fig. 4)

7.5.3.2 Bearing bracket 45

1. Mark the position of the parts to each other by a colour pen or by a scribing point.

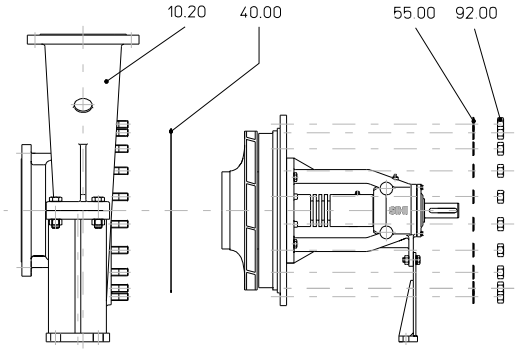


fig. 1

2. Detach the nuts 92.00 and remove the washers 55.00.

Take safety measures for supporting the complete mounting unit and catch oil possibly flowing out.

3. Remove the complete insert unit out of the pump casing 10.20 and take off the gasket 40.00 (fig. 1)

- <u>For shaft seal execution “002”</u>

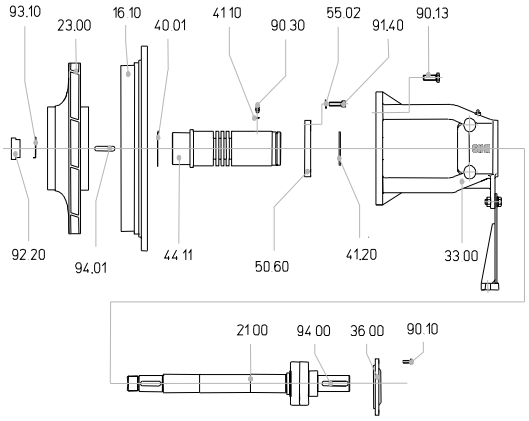


fig. 2

4. Detach the shaft nut 92.20 and take off the safety tab washer 93.10. (fig. 2)
5. Dismount the impeller 23.00 and the key 94.01.
6. Detach the hexagon screws 90.13 of the bearing bracket 33.00 and take off the cover 16.10 incl. shaft seal casing 44.11.
7. If required the shaft seal casing 44.11 is to be dismounted by detaching the screws 91.40 and removal of the disks 55.02. Dismount clamping disc 50.60.
8. Remove the key 94.00, detach the hexagon screws 90.10 and dismount the bearing cover 36.00.
9. Push the shaft 21.00 together with the antifriction bearing 32.11 out of the bearing bracket 33.00.

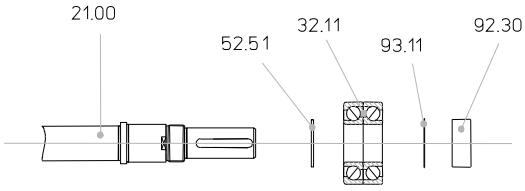


fig. 3

10. Detach the shaft nut 92.30 and take off the safety tab washer 93.11. Then pull the inclined ball bearing 32.11 and the spacer 52.51 from the shaft 21.00. (fig. 3)

- For shaft seal execution “CDC” and “GBC”

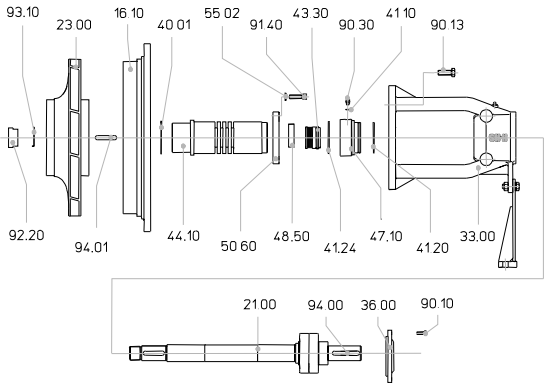


fig. 2

4. Detach the shaft nut 92.20 and take off the safety tab washer 93.10. (fig. 2)
5. Dismount the impeller 23.00 and the key 94.01.
6. Detach the hexagon screws 90.13 of the bearing bracket 33.00 and take off the cover 16.10 incl. shaft seal casing 44.10. The seal cover 47.10 can remain in the bearing bracket.
7. Mark the position of the locating ring 48.50 on the shaft. (fig. 3)

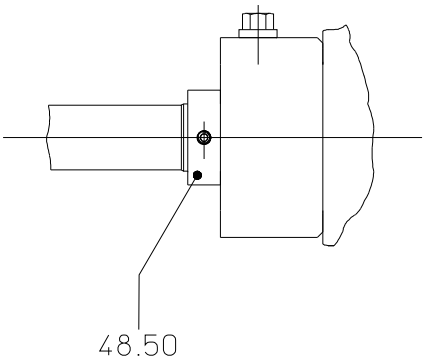


fig. 3

8. Dismount carefully the locating ring and the mechanical seal 43.30.
9. If required the casing of the mechanical seal 44.10 can be dismounted by detaching the screws 91.40 and removal of the disks 55.02. Dismount clamping disc 50.60. Furthermore the seal cover 47.10 can be removed out of the bearing bracket 33.00 by means of a lever.
10. Remove the key 94.00, detach the hexagon screws 90.10 and dimount the bearing cover 36.00.
11. Push the shaft 21.00 together with antifriction bearing 32.11 out of the bearing bracket 33.00.

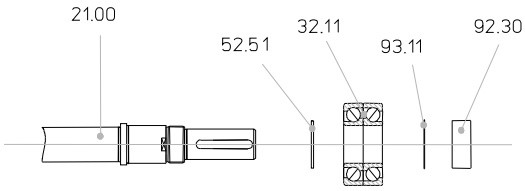


fig. 4

12. Detach the shaft nut 92.30 and take off the safety tab washer 93.11. Then pull the inclined ball bearing 32.11 and the spacer 52.51 from the shaft 21.00. (fig. 4)

7.6 Post dismantling activities

7.6.1 Hints for cleaning.

- Clean all parts.
- Clean the clearances and sealing surfaces with an appropriate liquid.

7.6.2 Points to be checked

The following pump parts are to be checked:

1. Check the shaft seal for damage and wear.
2. Check the wear ring surfaces for damage and wear. The difference in diameter between the wear ring at the impeller and the casing parts shall be 0,3 mm to 0,5 mm. If the wear rings are worn out too much, they have to be replaced.
3. The flat gaskets 40.00 and 40.01 have to be replaced in any case.
4. Check the O-rings 41.20 and 41.24 and replace them, if necessary.

7.6.3 Repair of the shaft seal

- For shaft seal execution “002”

Defective radial seal rings 42.13 must be removed carefully out of the sealing chamber without damaging the wall.

As the sealing rings have a thin metal shell it is recommended to push a sharp tool (e.g. a small sharpened screw driver) between the casing wall and the sealing ring shell. Then deform the ring by bending up it until the ring can be taken out. (see fig. 5)

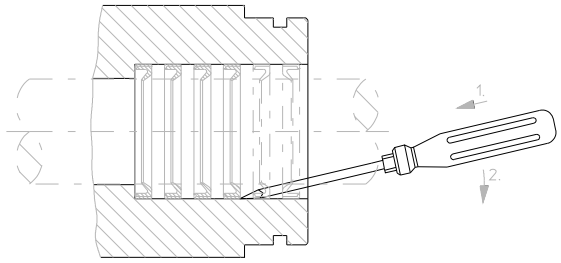
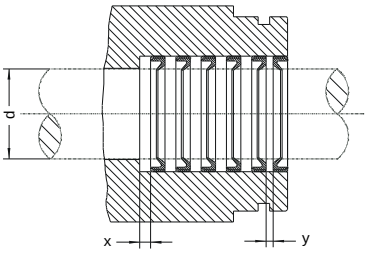


fig. 5

Then clean the sealing chamber and grease it slightly. If the shaft shows grooves in the area of the radial seal rings, the sealing rings are to be mounted acc. to fig. 6.

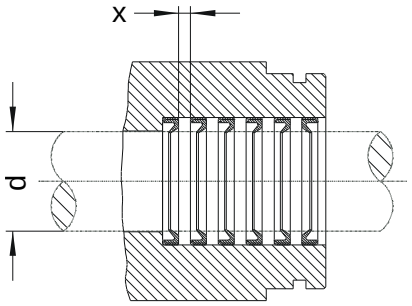
The distances “x” and “y” apply to the corresponding seal diameter “d“.



ø d	x	y
25	3	< 2
35	4	< 2
55	4	2

fig. 6

Fig. 7 shows the original mounting of the radial seal rings.



ø d	x
25	3
35	4
55	5

fig. 7

Use a mounting taper plug (accessory) for the assembly.

The sealing lips must show to the inside and only the last ring points outwards. The spaces between he sealing rings are to be provided with high temperature grease (see 7.4).

7.6.4 Repair of the bearing bush

In case of wear the bearing bush must be replaced completely with the appertaining steel sleeve. It must be pulled out with an inside withdrawal device. After pressing in the new bush ensure that it fits exactly.

ATTENTION

The concentricity tolerance of the bearing bush with regard to the cover centering at the outside diameter must not exceed 0,05 mm.

7.7 Assembly

7.7.1 Tightening torque

When tightening the bolts the following torques must be used:

Thread	M6	M 8	M10	M12	M16	M20
Tightening torque	8,5Nm	12Nm	25Nm	40Nm	90Nm	175Nm
Tightening torque casing nuts 92.00				65Nm	90Nm	

7.7.2 Pump assembly

- For shaft seal execution “002”

Carry out the following steps:

1. Assembly of the shaft unit acc. to fig. 3.

ATTENTION

For bearing bracket 45, mount the inclined ball bearing according to fig 8.

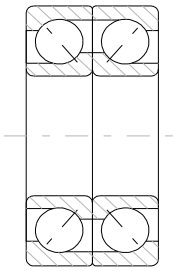


fig. 8

2. Assembly of the insert unit acc. to fig. 2. When assembling pay attention to the position of the vent screw 90.30 with regard to the bearing bracket 33.00.
3. The casing seal is effected by a special flat gasket 40.00. Push the insert unit into the volute casing acc. to fig. 1; tighten with 65 Nm.

- For shaft seal execution “CDC” and “GBC”

Carry out the following steps:

1. Assembly of the shaft unit acc. to fig. 4.

ATTENTION

For bearing bracket 45, mount the inclined ball bearing according to fig 8.

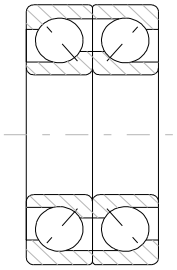


fig. 8

2. Assembly of the insert unit acc. to fig. 2. Under assembly the seal cover 47.10 with the vent screw 90.30, as shown in the fig.9, has to be fitted into the bearing bracket 33.00.

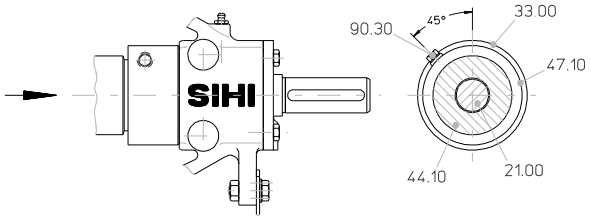


fig. 9

The setting of the mechanical seal can be seen on fig. 10.

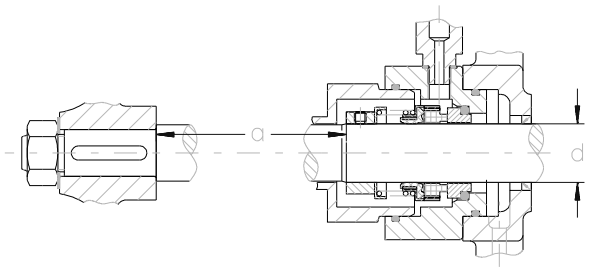


fig. 10

Ød	a
25	175,5
35	237
55	307

3. The casing seal is effected by a special flat gasket 40.00.
4. Push the insert unit into the volute casing acc. to fig. 1; tighten with 65 Nm.

8. Help in case of trouble

8.1 Use of trained staff

Trouble shooting must be undertaken only by appropriately trained personnel.

8.2 Symptoms, causes and remedies

Symptom	Cause	Remedy
Output too low	- Counter pressure too high	Check the plant for contamination. Regulate anew the operating point.
	- Pump or pipeline, resp., not completely filled	vent and fill the pump as well as the suction or inflow line resp.
	- Suction lift too high or positive suction head too low	Check the liquid levels, open the shut-off elements at suction side. Clean the filters and dirt traps installed at suction side.
	- Sealing gap too large because of wear	Replace the worn pump parts.
	- Wrong sense of rotation	Modify the motor connection.
	- Casing or suction line leaky	Replace the casing seal. Check the flange connections.
Pump does not prime or only intermittently	- Casing, shaft seal, foot valve or suction line leaky	Replace the casing seal. Check the shaft seal. Check the flange connections.
	- Suction lift too high or positive suction head too low	Check the liquid levels, open the shut-off elements at suction side. Clean the filters and dirt traps installed at suction side.
	- Loose or jammed parts in the pump.	Open and clean the pump.
Pump leaks	- Casing screws not correctly tightened.	Check the tightening torque of the casing screw.
	- Radial seal rings leaky. (only for 002)	Check the condition of the rings as well as the friction surface of the shaft, if necessary replace the rings.
	- Mechanical seal leaky. (only for CDC, GBC)	Check the sealing surfaces and elastomers of the mechanical seal. In case of damage, replace the mechanical seal.
	- Seals defective	Replace the seals.
Temperature of the pump increases	- Pump or pipeline not completely filled.	Vent and fill the pump as well as the suction line or inflow line, resp.
	- Suction lift too high or positive suction head too low	Check the liquid levels, open the shut-off elements at suction side. Clean the filters and dirt traps installed at suction side.
	- Pump is operated against closed gate.	Open the shut-off element at discharge side.
Pump runs noisily	- Pump or pipeline not completely filled.	Vent and fill the pump as well as the suction line or inflow line, resp.
	- Suction lift too high or positive suction head too low.	Check the liquid levels, open the shut-off elements at suction side. Clean the filters and dirt traps installed at suction side.
	- Pump is not properly leveled or it is distorted.	Check the pump installation.
	- Foreign matters in the pump	Dismount and clean the pump.
	- Antifriction bearing or sleeve bearing defective	Replace parts.
Motor protection switch switches off	- Pump is not properly leveled or it is distorted.	Check the pump installation.
	- The admissible operating conditions were not complied with	Observe the operating conditions stated in the data sheet.
	- Loose or jammed parts in the pump.	Open and clean the pump.

9. Technical Data

For technical information about the pump or pump set, which is not described in this chapter, see the specific data sheet. Note that data relating to a specific order may conflict with information provided here. In any such case, the order specific information will override data provided in the general technical documentation.

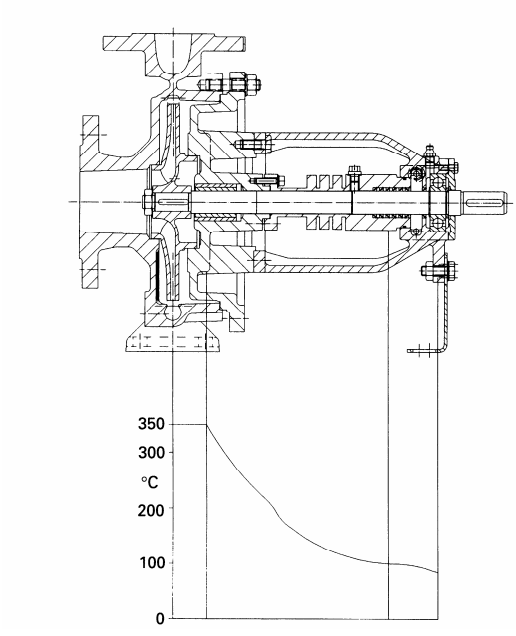
Pressure component operating limits:

Material	Temperature	Pressure	Sizes
1B	0ºC to 120ºC	16 bar	032125 to 200315
	120ºC to 300ºC	13 bar	
	300ºC to 350ºC	10 bar	
2B	0ºC to 120ºC	16 bar	200400 to 200500
	120ºC to 300ºC	13 bar	
	300ºC to 350ºC	10 bar	

Shaft sealing operating limits:

Shaft sealing execution	Temperature range
002	-25℃ to +200℃
GBC	-40℃ to +150℃

Heat barrier / shaft sealing / bearing tempeture trend in normal operation:



ATTENTION

- All indicated operating limits are not valid for all liquids which can be pumped. See technical data or delivery note.

Flange locations:

Axial suction flange, discharge flange radially upwards.

Flanges:

Material design 1B and 2B: Complies with DIN 2533 PN16.

Direction of rotation:

Clockwise seen from the drive end of the pump.

Materials of construction, and of shaft seals:

See Chapter 2.4.

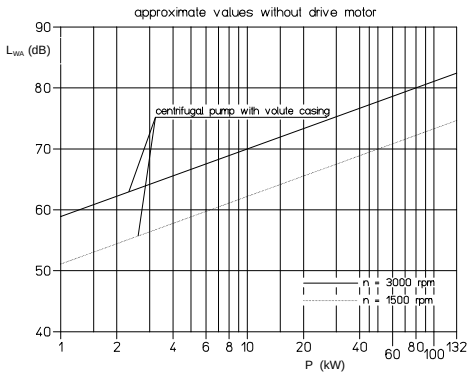
Vibrations:

ZTN range pumps comply with VDI 2056 and ISO 5199 Class K for pumps with a driving power of up to 15 kW and Class M with a driving power of more than 15 kW

Noise levels:

The noise levels of the pump comply with the Directive 001/30 - 1992 of the EUROPUMP Commission.

The following table provides approximate values:



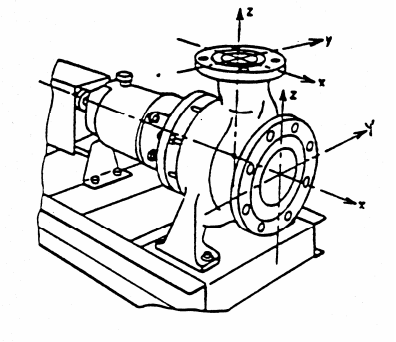
pump without motor

Note that additional noise can be generated by:

- The driver.
- A possible misalignment of the coupling.
- Pipework (note: the larger the pipe diameter, the lower the pipe noise).

Permissible branch forces and moments:

Permissible forces and moments for 1B and 2B executions. According to ISO/DIN 5199 Class II (1997) Annex B.

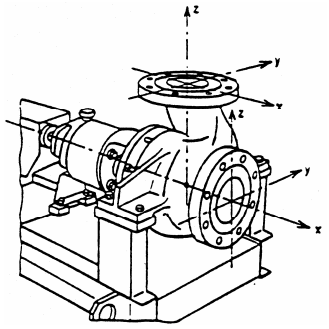


- Material execution 1B:

	DN flanges	Fy (N)	Fz (N)	Fx (N)	ΣF (N)	My (Nm)	Mz (Nm)	Mx (Nm)	ΣM (Nm)
Top branch z-Axis	32	580	725	638	1131	522	609	754	1102
	40	580	725	638	1131	522	609	754	1102
	50	783	957	870	1508	580	667	812	1189
	65	1189	1450	1305	2291	667	754	928	1363
	80	1189	1450	1305	2291	667	754	928	1363
	100	1566	1943	1740	3045	725	841	1015	1508
	125	2349	2900	2610	4553	1015	1189	1450	2117
	150	2349	2900	2610	4553	1015	1189	1450	2117
	200	3132	3886	3480	6061	1334	1537	1885	2784
End branch x-Axis	50	870	783	957	1508	580	667	812	1189
	65	1305	1189	1450	2291	667	754	928	1363
	80	1305	1189	1450	2291	667	754	928	1363
	100	1740	1566	1943	3045	725	841	1015	1508
	125	2610	2349	2900	4553	1015	1189	1450	2117
	150	2610	2349	2900	4553	1015	1189	1450	2117
	200	3480	3132	3886	6061	1334	1537	1885	2784
	250	3457	3132	3874	6055	1462	1694	2065	3799

- Material execution 2B: (Only for 200400 to 200500 pump sizes)

Multiply by f = 1,276; which is the relationship of E – modules between GS-C25 and GGG 40.3



	DN flanges	Fy (N)	Fz (N)	Fx (N)	ΣF (N)	My (Nm)	Mz (Nm)	Mx (Nm)	ΣM (Nm)
Top branch z-axis	150	5638	6960	6264	10927	2436	2854	3480	5081
	200	7517	9326	8352	14546	3202	3689	4524	6682
End branch x-axis	200	8352	7517	9326	14546	3202	3689	4524	6682
	250	8352	7517	9326	14546	3202	3689	4524	6682

Maximum permissible speeds:

max. speed n = 3600 rpm	size	max. speed n = 3000 rpm	size	max. speed n = 1800 rpm	size	max. speed n = 1500 rpm	size
t = 120 ℃	032125 050200 032160 065125 032200 065160 040125 065200 040160 080160 040200 080200 050125 100160 050160 100200	t = 120 ℃	032250 040250 050250 065250 080250 100250 125200	t = 120 ℃	040315 150315 050315 150400 065315 200250 080315 100315 125250 150200 150250	t = 120 ℃	150500 200315 200400
t = 350 ℃	032125 050200 032160 065125 032200 065160 040125 080200 040160 100160 040200 050125 050160	t = 350 ℃	040250 050250 065200 065250 080160 080250 100200 100250	t = 350 ℃	040315 150250 050315 065315 080315 100315 125200 125250 150200	t = 350 ℃	150315 150400 150500 200250 200315 200400 200500

The maximum speeds result from the permissible peripheral speeds of the impellers or from the shaft load admissible at higher temperatures, respectively.

Operating range:

(Continuous operation)

	Sizes
0,3 Q_{opt} < Q < 1,1 Q_{opt}	032125 to 080315 100315 150250 to 150500
0,5 Q_{opt} < Q < 1,1 Q_{opt}	100160 to 100250 125200 to 125250 150200 200500
0,7 Q_{opt} < Q < 1,2 Q_{opt}	200250 to 200400

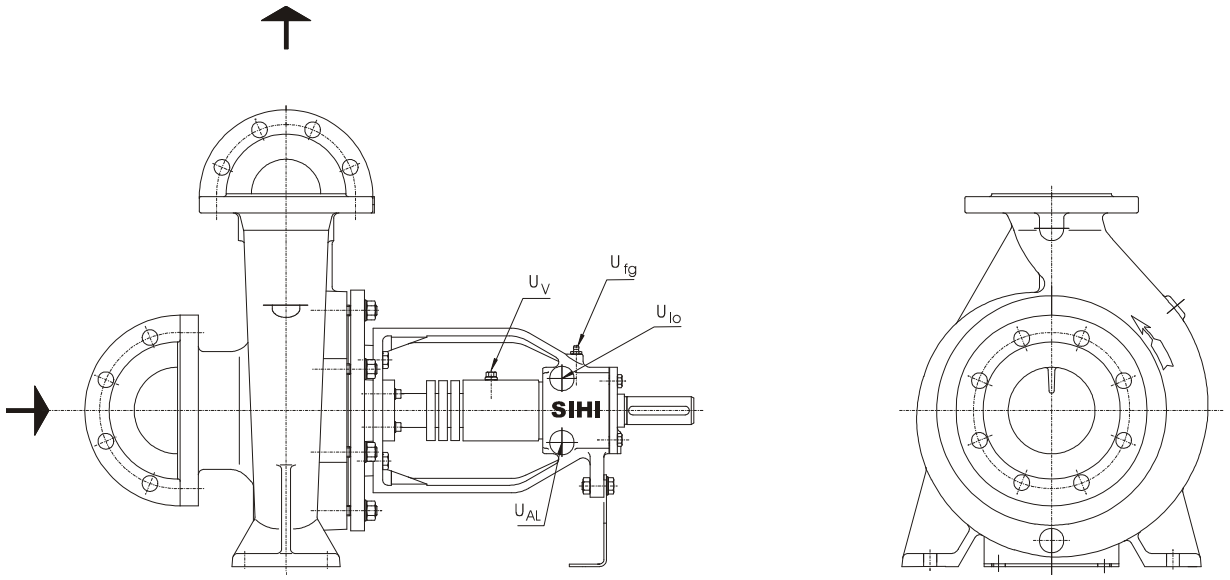
This operating range is applicable if waterlike liquids are pumped. If liquids having distinctly different physical properties are handled, it may be necessary to narrow the permissible operating range.

See the specific performance curve for more details.

10. Connections, dimensions, sectional drawing

10.1 Connections

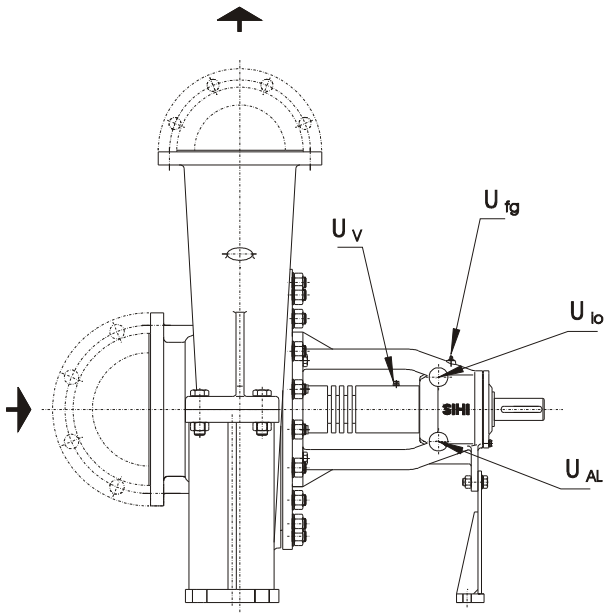
Connections for bearing brackets 25, 35

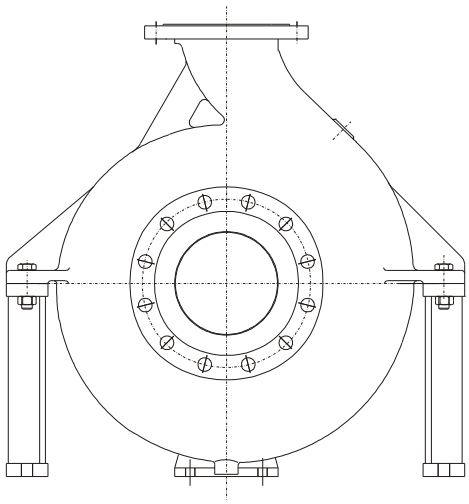


u_{fg} : Grease filling connection. u_{io} : Sealing liquid connection. u_{AL} : Drainage for leakage. u_v : Vent connection

Size	u_{fg}	u_v	u_{io}	u_{AL}
032125	G 1/8	G 1/8	G 1/4	G 1/4
032160				
032200				
032250				
040125				
040160				
040200				
040250				
040315				
050125				
050160				
050200				
050250				
050315				
065125				
065160				
065200				
065250				
065315				
080160				
080200				
080250				
080315				
100160				
100200				
100250				
100315				
125200				
125250				
150200				
150250				

Connections for bearing brackets 45



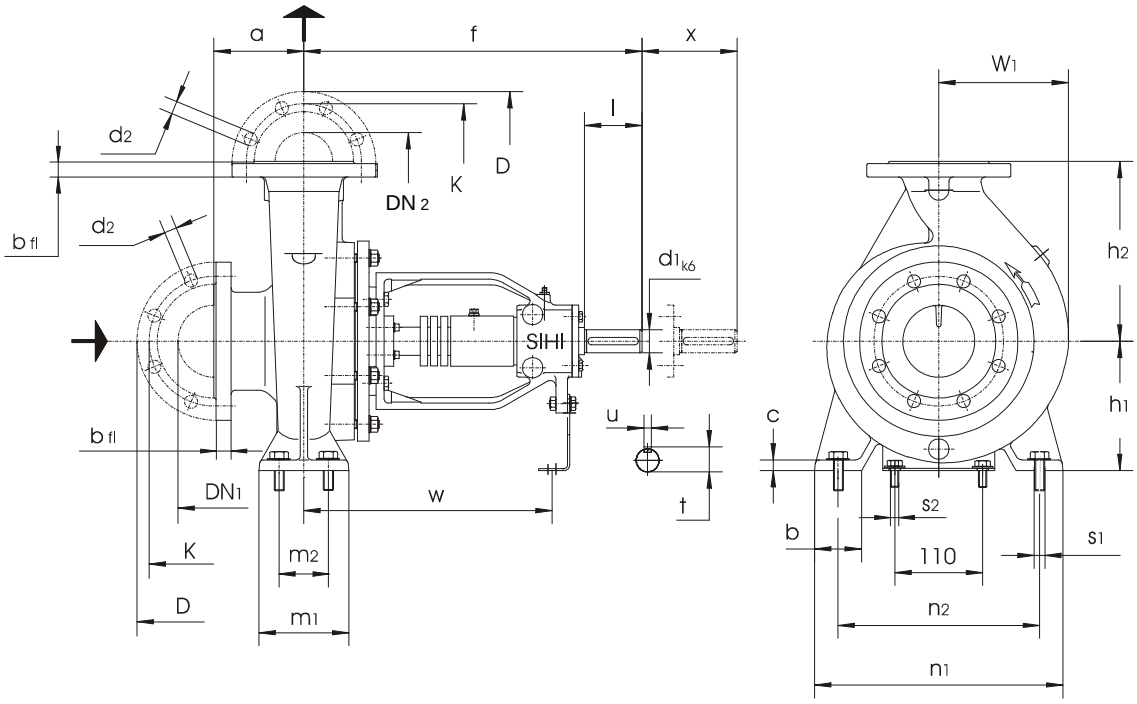


u_{fg} : Grease filling connection. u_{io} : Sealing liquid connection. u_{AL} : Drainage for leakage. u_v : Vent connection

Size	u_{fg}	u_v	u_{io}	u_{AL}
150315	G 1/8	G 1/8	G 1/4	G 1/4
150400				
150500				
200250				
200315				
200400				
200500				

10.2 Table of Dimensions

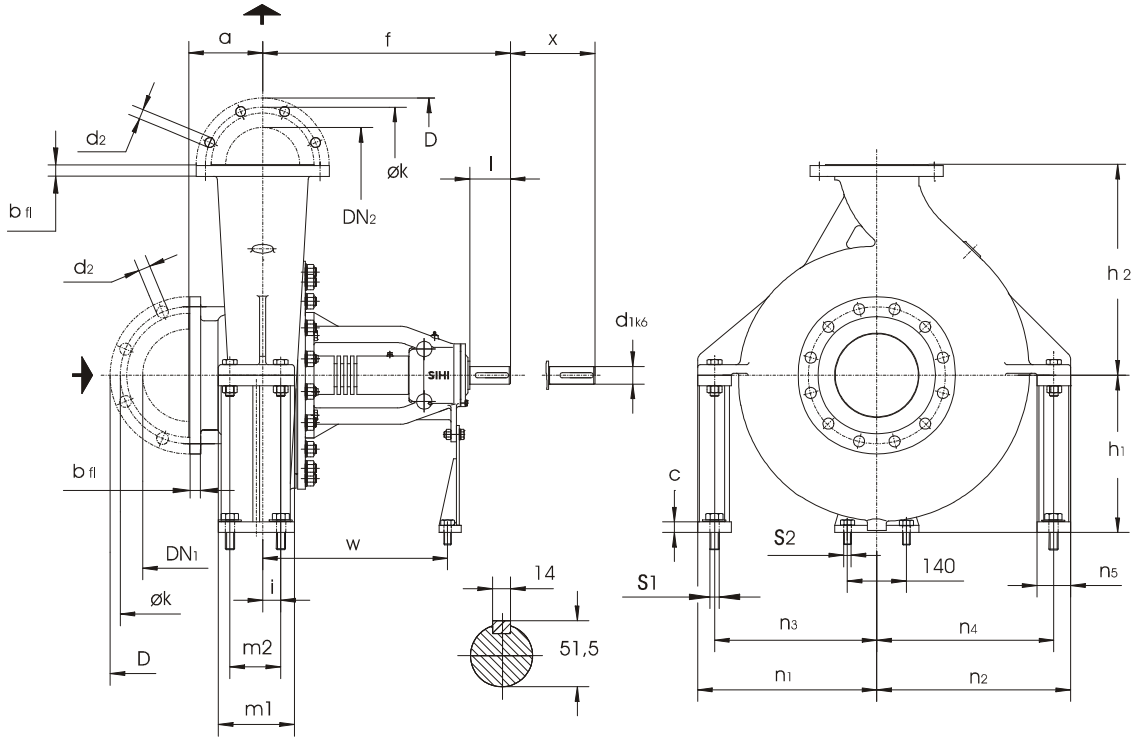
ZTN 032-125 ... 150-250



size	DN_2	DN_1	a	b	c	f	h_1	h_2	m_1	m_2	n_1	n_2	s_1	s_2	w	w_1	x	d_1	l	t	u
032125	32	50	80	50	15	360	112	140	100	70	190	140	M12	M12	267	105	80	24	50	27	8
032160							132	160			240	190				120					
032200							160	180								137					
032250[1)]			100	65			180	225	125	95	320	250				164					
040125	40	65	80	50			112	140	100	70	210	160				105					
040160							132	160			240	190				120					
040200			100				160	180			265	212				140					
040250				65			180	225	125	95	320	250				164					
040315[1)]			125		18	470	225	250			345	280			340	204	100	32	80	35	10
050125	50		100	50	15	360	132	160	100	70	240	190			267	105	80	24	50	27	8
050160							160	180			265	212				130					
050200								200								150					
050250				65			180	225	125	95	320	250				164					
050315[1)]			125		18	470	225	280			345	280			340	210	100	32	80	35	10
065125	65	80	100	65	15	360	160	180	125	95	280	212			267	140	80	24	50	27	8
065160								200								147					
065200							180	225			320	250				165	100				
065250				80		470	200	250	160	120	360	280	M16		340	185		32	80	35	10
065315			125		18		225	280			400	315				220					
080160	80	100		65	15	360	180	225	125	95	320	250	M12		267	163		24	50	27	8
080200						470		250			345	280			340	180		32	80	35	10
080250				80	18		200	280	160	120	400	315	M16			200					
080315							250	315								235					
100160[1)]	100	125					200	280			360	280				200	140				
100200																202	120				
100250			140				225				400	315				212					
100315							250	315								242					
125200[1)]	125	150															140				
125250								355								236	120				
150200	150	200	160	100	20		280	400	200	150	550	450	M20			271	190				
150250[1)]											500	400				273	170				

[1)]Transnorm pump sizes, not included in DIN 24255/ EN 733. Flanges drilled according to ANSI 150 can be suplied.

Dimension table **ZTN 150-315 ... 200-500**



size	DN_2	DN_1	a	f	h_1	h_2	m_1	m_2	i	l	x	d1	w	c	s_1	s_2	n1	n2	n3	n4	n5
150315[1)]	150	200	180	670	315	400	160	100	35	110	180	48	500	23	M20	M12	320	360	290	330	60
150400[1)]					355	450	180	120									380	420	340	380	80
150500[1)]					400	500			45							M16	425	460	385	420	
200250[1)]	200	250	250		335	425										M12	340	410	300	370	
200315[1)]			200		355	450										M16	360	420	320	380	
200400[1)]					375	500			35								400	460	360	420	
200500[1)]					425	560	220	160	50								475	575	425	525	100

[1)]Transnorm pump sizes, not included in DIN 24255/ EN 733. Flanges drilled according to ANSI 150 can be suplied.

Flange connection size acc. to DIN EN 1092-2 PN 16										*Flange connection size acc. to DIN EN 1092-2 PN 25		
DN_2/DN_1	32	40	50	65	80	100	125	150	200	150	200	250
D	140	150	165	185	200	220	250	285	340	300	360	425
k	100	110	125	145	160	180	210	240	295	250	310	370
b_{fl}	18	18	20	20	22	24	26	26	30	34	34	36
Tolerances	+4 -3									+4,5 -4		
d_2 x	19x4	19x4	19x4	19x4	19x8	19x8	19x8	23x8	23x1	28x8	28x12	31x12

10.3 Parts list

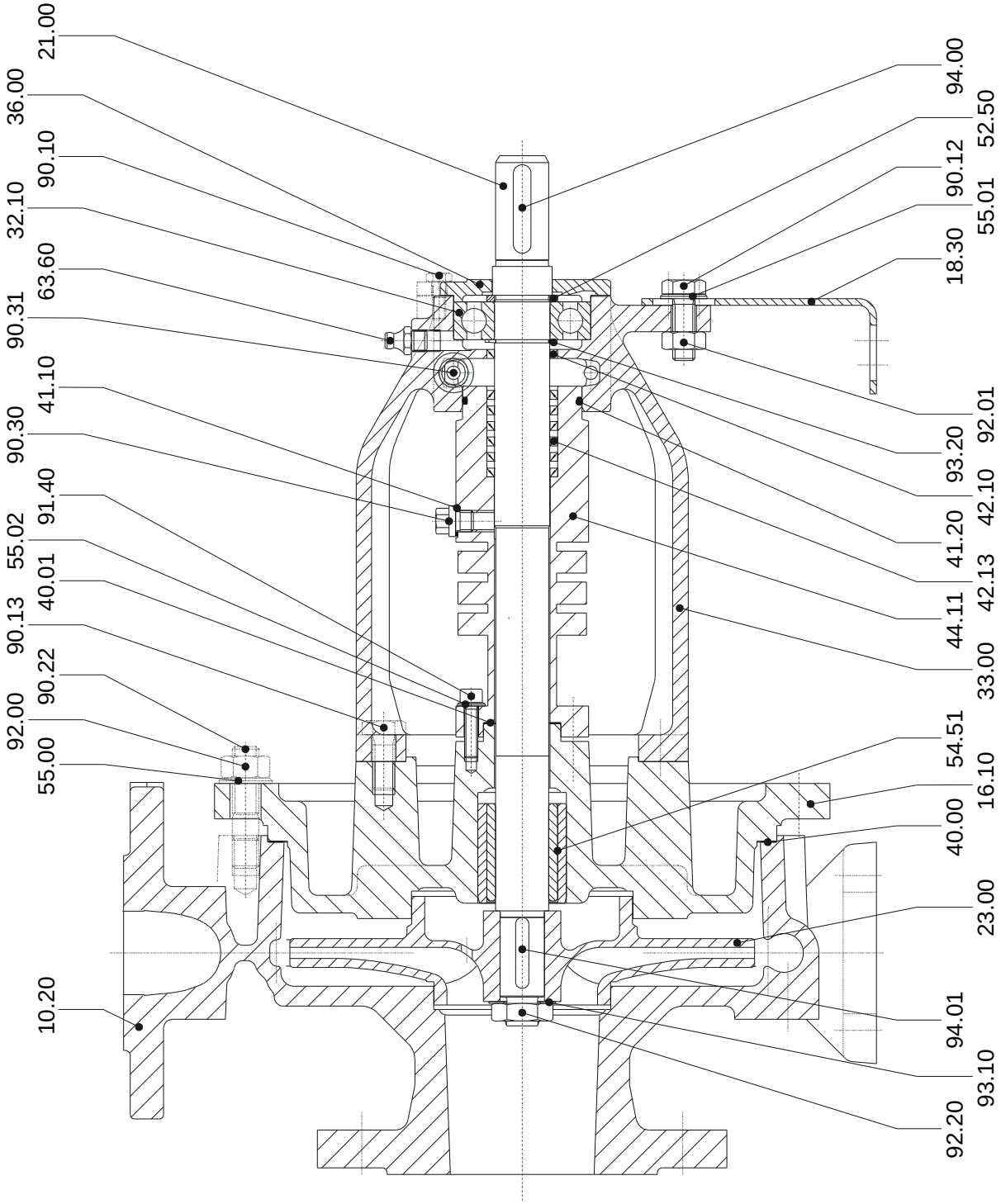
When ordering spare parts give the following information: position number, the complete pump designation and the serial number, which can be found on the nameplate fixed to the pump.

Pos. Nr.	Description
10.20	Volute casing
16.10	Cover
18.30	Support foot
18.31	Support foot
21.00*	Shaft
23.00*	Impeller
32.10*	Grooved ball bearing
32.11*	Inclined ball bearing
33.00	Bearing bracket
36.00	Bearing cover
40.00*	Gasket
40.01*	Gasket
41.10	Joint
41.20*	O-ring
41.24*	O-ring
42.10*	Radial shaft seal ring
42.13*	Radial shaft seal ring
43.30*	Mechanical seal
44.10	Shaft seal casing
44.11	Shaft seal casing
47.10	Sealing cover
48.50	Locating ring
50.20	Wear ring
50.60	Clamping disc

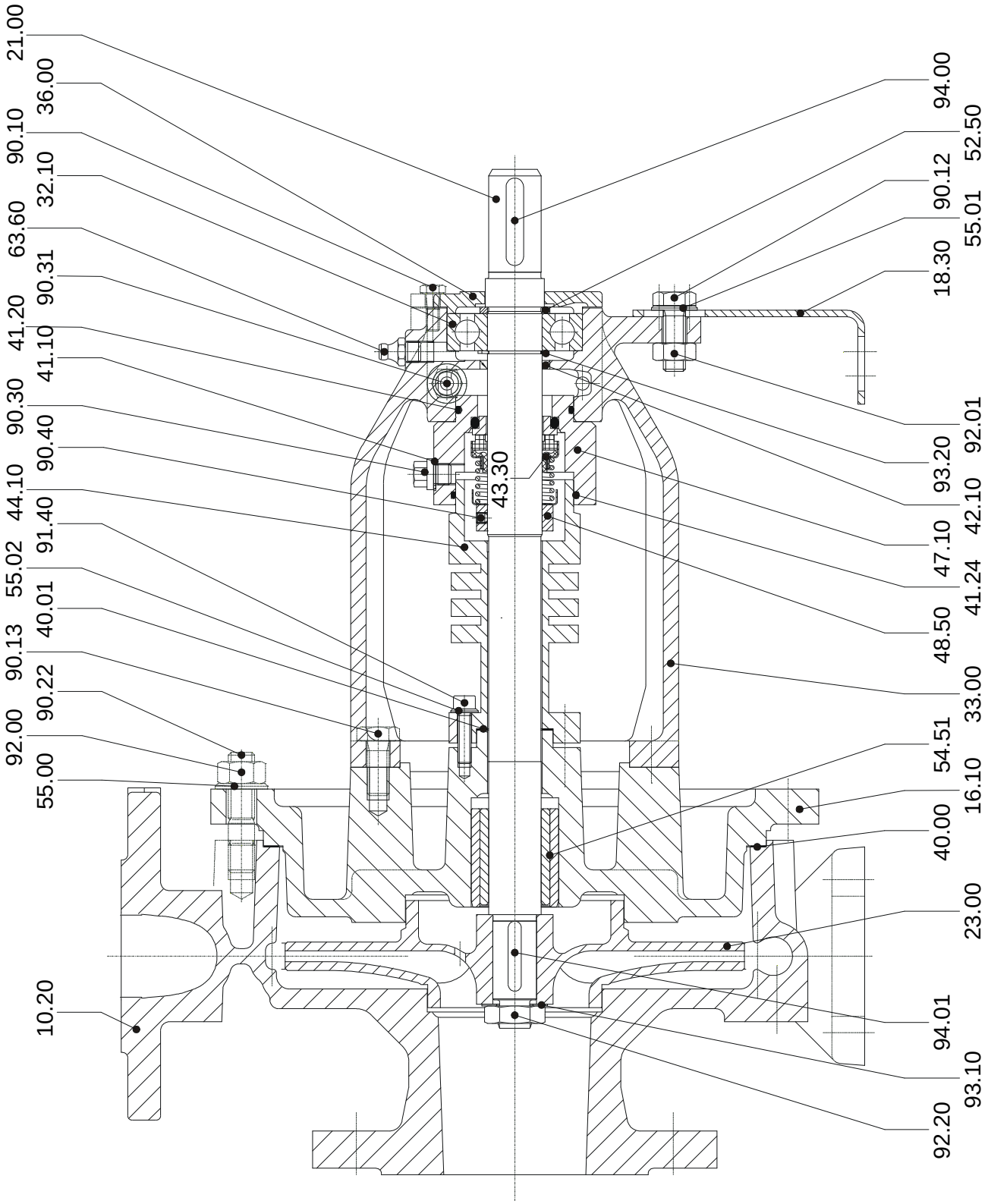
Pos. Nr.	Description
52.50*	Spacer
52.51*	Spacer
54.51*	Bush
55.00	Disc
55.01	Disc
55.02	Disc
56.00	Grub screw
63.60	Grease nipple
90.10	Hexagon screw
90.11	Hexagon screw
90.12	Hexagon screw
90.13	Hexagon screw
90.22	Stud
90.30	Screwed plug
90.31	Screwed plug
90.40	Grub screw
91.40	Allen head screw
92.00	Hexagon nut
92.01	Hexagon nut
92.02	Hexagon nut
92.20*	Shaft nut
92.30*	Shaft nut
93.10*	Lock washer
93.11*	Lock washer
93.20*	Circlip
94.00*	Key
94.01*	Key

* Recommended spare parts

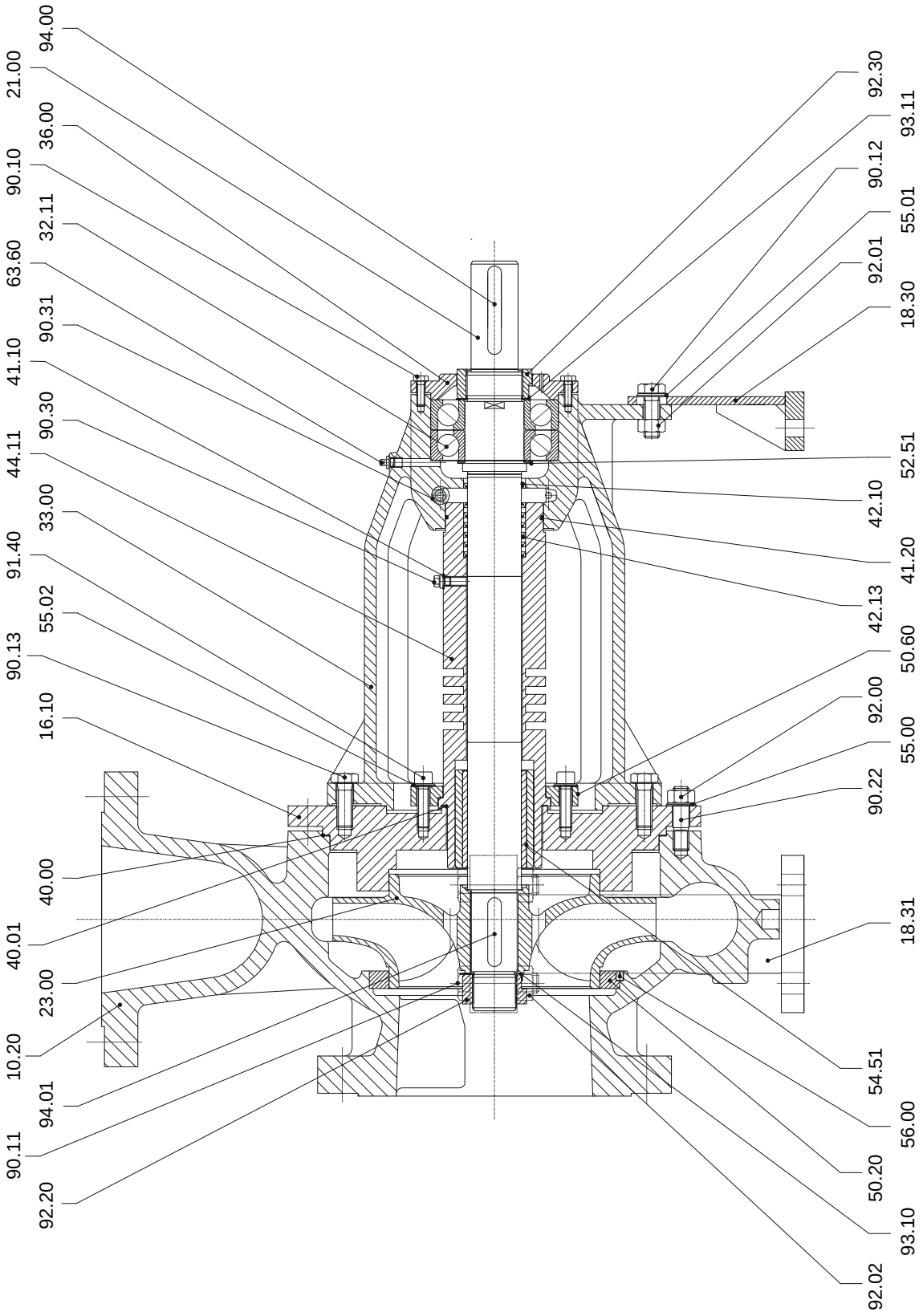
ZTN 032125 to 150250
SHAFT SEAL EXECUTION “002”



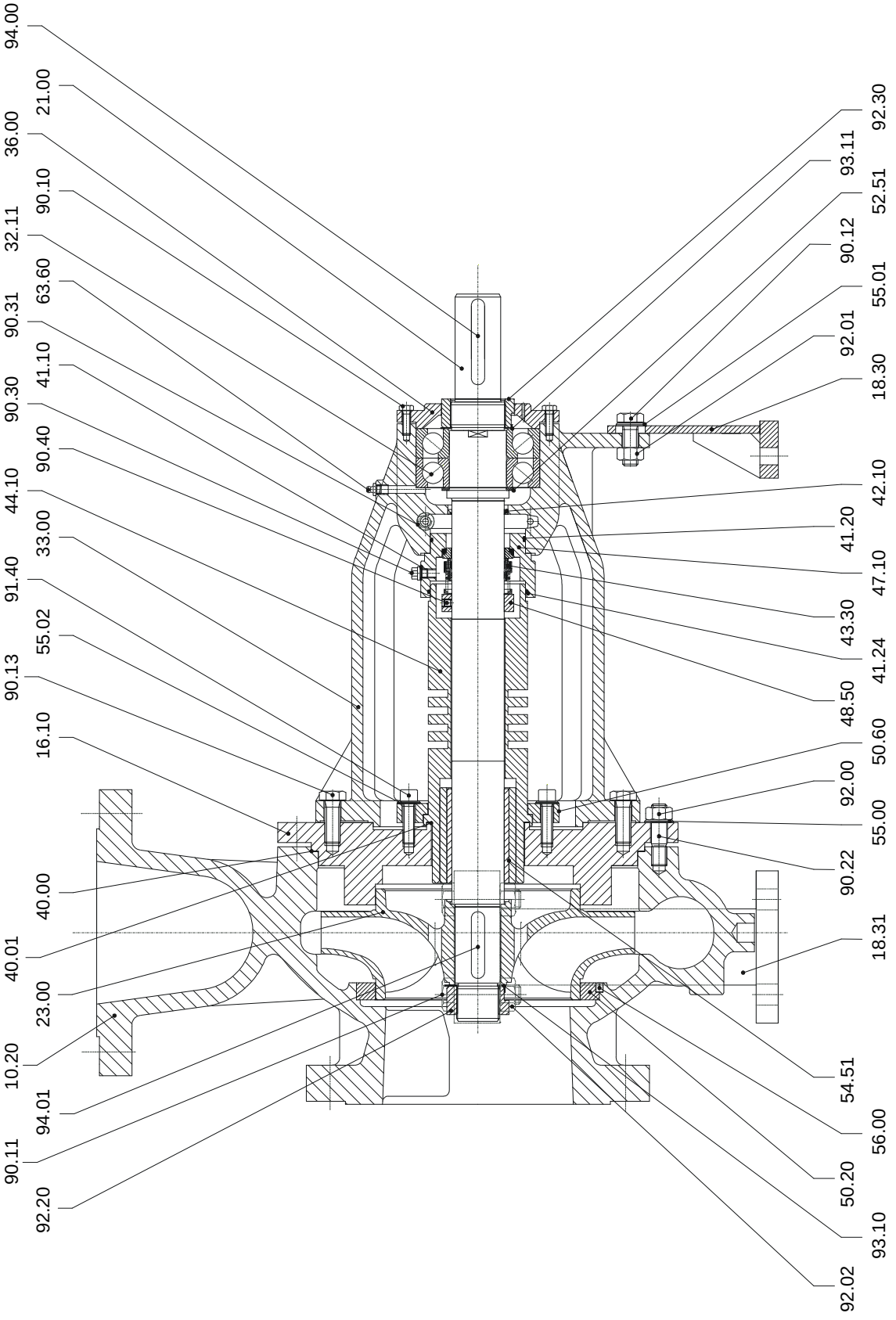
ZTN 032125 to 150250
SHAFT SEAL EXECUTION “GBC”



ZTN 150315 to 200500
SHAFT SEAL EXECUTION “002”



ZTN 150315 to 200500
SHAFT SEAL EXECUTION ”GBC”



CE EC Declaration of Conformity STERLING

The manufacturer:

Sterling Fluid Systems (Spain), S.A.
Vereda de los Zapateros, s/n
E-28223 Pozuelo de Alarcón

declares herewith that the product

Pump: ZTND

Serial number: XXX

fulfils all relevant provisions of the Directive Machinery 2006/42/EC.

Furthermore the aforementioned product complies with the provisions of the EC Directives:

- Explosion Protection 94/9/EC (ATEX) as follows:

Pump:  II 2G c T1-T5

Harmonised standards used:

EN 809
DIN EN ISO 12100-1
DIN EN ISO 12100-2
EN 1127-1
EN 13463-1
EN 13463-5

Other technical standards and specifications used:

Person authorised to compile the technical file:

Joaquin Holgado
Sterling Fluid Systems (Spain), S.A.
Vereda de los Zapateros, s/n
E-28223 Pozuelo de Alarcón

Place, date:

XXX, XX.XX.XXXX

Person empowered to draw up this declaration:

Product Line Manager — Operation Manager

J.A.Cobo — Thomas Plingen

Supplementary operating instructions in accordance to EC directive 94/9/CE (ATEX) for the use in potentially explosive atmospheres of the following pumps types, manufactured by Sterling Fluid Systems (Spain), S.A. type:

ZLN, ZLK and ZLI (Industrial pumps)
ULN (Self Priming Pumps)
ZTN, ZTK and ZTI (Thermal Oil Pumps)
ZHN, ZDN, ZEN and ZLI (Hot Water Pumps)

These supplementary operating instructions give only general instructions for the use of pumps in conditions that need explosion protection. The operating instructions of the specific pump must be taken into consideration as well.

Contents Page

1 General Objective

Pumping systems can be operated in hazardous areas. It is the obligation of the operator to define the zone and to select the pump with the correct category for this zone.
The pump installation and operation must take into account the Operating Instructions that are described in these supplementary operating instructions. They contain important information for safe and reliable pump operation in hazardous areas. This information plus all information given for all components of the system (e.g. the operating instructions for the pump) are of vital importance to avoid risks.
These supplementary operating instructions do not take into account national or local regulations; the operator must ensure that such regulations are strictly observed by all, including the personnel in charge of the installation.
For any further information or instructions exceeding the scope of this manual or in case of damage, please contact Sterling Fluid Systems nearest customer service.

2 Safety issues

These supplementary operating instructions contain fundamental information concerning all actions with pumping systems, when operated in hazardous areas like: installation, inspection, operation, monitoring and maintenance. Therefore these and all other instructions related to safety must be known and available with easy access to all personnel involved in the above stated actions.
Not only must the general safety instructions established in this chapter on “Safety issues” be complied with, but also the safety instructions outlined under specific headings as well as the safety instructions contained in the specific operating manual of the specific pump.

2.1 Identification of safety symbols in these instructions

In these supplementary operating instructions, the safety instructions related to explosion protection are marked with:

The sign

is used to highlight safety instructions where non-compliance may pose a damage to the pump and its functions.

2.2 Compliance with regulations

It is imperative to comply with the safety instructions contained in these supplementary operating instructions, the operating instructions of the pump type concerned, the relevant national and international explosion protection regulations, health and safety regulations and the operator’s own internal work, operation and safety regulations.

 Ex symbol relates to additional requirements, which must be complied with when the pump is operated in hazardous areas.

In addition the following must be observed:

 If pumps / units are located in hazardous areas, it is imperative to make sure that the correct category of pump and equipment is selected and that unauthorised modes of operation are prevented. Non-compliance may result in first: increased risk of explosion and second: the specified temperature limits might be exceeded.

Non-compliance with these safety instructions may also result in the loss of any rights to claim damages.

Non-compliance may also result in hazards to persons by explosion.

2.3 Qualification and training of personnel
The personnel responsible for or involved in the installation, the operation, maintenance and inspection of the pump and the unit must be adequately qualified to carry out these works in hazardous areas.
The scope of responsibility and supervision of the personnel must be exactly defined by plant management. If the staff does not have the necessary knowledge, they must be trained and instructed. The pump manufacturer or supplier on behalf of the plant management may perform this task. Moreover, plant management must ensure that the contents of the operation instructions are fully understood by plant operators and other relevant personnel such as maintenance staff.

2.4 Safety instructions for maintenance, inspection and installation work
The operator is responsible to assure that all installation work, inspection, operation and maintenance must be carried out by authorized and qualified specialist personnel, which is thoroughly familiarized with the pump operating instructions and these supplementary operating instructions.

 If necessary, additional explosion protection regulations must be considered.

3 Instructions concerning pump and accesories

3.1 General
Pumps and accessories for installations in hazardous areas must comply with the relevant category of mechanical and electrical equipment.

Some details are pointed out below:

3.2 Pump pressure containment components

 For handling inflammable fluids, the pump pressure containment components must be made of ductile material.

3.3 Coupling and coupling guard
The accident prevention regulations require, that pump drive must not be operated without a coupling guard. If a customer specifically decides, not to include a coupling guard in our delivery, then the operator must provide such coupling guard himself. The coupling must be selected and sized in accordance with the instructions of the coupling manufacturer. It is important to make sure that the materials selected for coupling and coupling guard are non-sparking in the event of mechanical contact. Sterling Fluid Systems scope of supply meets this requirement.

 In hazardous areas coupling guards must be of non-sparking material, whereby the coupling material must be considered.

3.4 Belt drive
Belts must include some electrically conductive material.

4 Instructions concerning installation and start-up of pump sets

In addition to the normal installation instructions, the specific criteria for explosion protection are listed below:

4.1 Coupling

 The coupling must be installed, started-up and operated in accordance with the operating instructions of the coupling manufacturer. Misalignment of the coupling may result in inadmissible temperatures at the coupling and motor bearings. It has to be ensured that the coupling halves are correctly aligned at all times.

4.2 Connection to power supply

 Only a properly trained electrician must effect connection to the power supply. The available main voltage must be checked against the data on the motor rating plate and an appropriate start-up method must be selected.

Sterling Fluid Systems strongly recommends using a motor protection device (motor protection switch)

In hazardous areas, compliance with national and local regulations form and additional requirement for electrical connections.

4.3 Earthing

To eliminate risks due to electrostatic charging, pump set must be earthed directly or through an earthing line.

4.4 Belt drive

Belt-driven pump sets must always be earthed. The condition of the belts must be checked regularly.

5 Instructions concerning operation and maintenance

5.1 Unauthorized modes of operation

The warranty related to the operating reliability and safety of the unit supplied is only valid if the equipment is used in accordance to its designated use as described in the following sections of this supplementary operating manual and the specific pump operating manual. The limits stated in the data sheet must not be exceeded under any circumstances.

Any operation of the pump outside the permissible operating range and any unauthorized modes of operation may result in the specific temperature limits being exceeded (see section 5.8).

5.2 Explosion protection

If pumps / units are installed in hazardous areas where compliance with EC directive 94/9/EC is required, the measures and instructions given in the following sections 5.3 to 5.9 must be carried out with no excuse, to ensure explosion protection.

5.3 Pump filled and vented

Especially dry running of a pump results in friction and non-allowed temperature rise. Therefore precautions have to be taken to prevent dry running.

It is necessary that the system of suction and discharge lines and thus the wetted pump parts including seal chamber and auxiliary systems are completely filled with fluid to be handled at all time during pump operation, so that and explosive atmosphere is prevented.

If the operator cannot warrant this condition, appropriate monitoring devices must be used.

Improper installation (e.g. vertical installation) may impair the self-venting properties of the seal chamber, so that gas bubbles may be collected in the pump and cause the mechanical seal to run dry.

High negative pressure on the suction side (e.g. due to clogged suction-side strainers or low system pressure) may result in air intake at the shaft seal forming gas bubbles in the pump. This may also cause the mechanical seal to run dry. Suitable monitoring facilities shall be installed, if necessary.

For design inherent reasons, however, it is not always possible to exclude the existence of a certain residual volume not filled with liquid after the pump has been filled prior to start of operation. However, once the motor is started up the pumping effect will immediately fill this volume with pumped fluid.

It is imperative to make sure that seal chambers and auxiliary seal systems are properly vented from air and filled with liquid.

5.4 Marking

The Ex marking on the pump only refers to the pump part, i.e. the coupling and motor must be considered separately. The coupling must have an EC Declaration of Conformity and the EC marking. The driver must be treated separately

Example of marking on the pump part: CE Ex II 2 G c T1 - T5

The safety instructions published in section 5.8 must be complied with.

5.5 Fluid pumped

Abrasive particles in the fluid handled may erode the casing walls to such and extent that fluid may escape. When handling inflammable media, it has to be ensured that the fluid does not contain any abrasive particles, or that the pump is regularly checked with respect to erosion.

5.6 Checking of direction of rotation (see also pump specific operating manual)

If the explosion hazard also exists during the installation phase, the direction of rotation must never be checked by starting up the unfilled pump unit, even for a short period, to prevent temperature increases resulting form contact between rotating and stationary components. If it is possible to fill the pump, the direction of rotation must be checked with the pump / motor coupling removed.

5.7 Pump operating mode

Make sure that the pump is always started up with the suction-side shut-off valve fully open and the discharge-side shut-off valve slightly open. However, the pump can also be started up against a closed swing check valve. Only after the pump has reached full rotational speed shall the discharge-side shut-off valve be adjusted to comply with the duty point.

Pump operation with closed shut-off valves in the suction and / or discharge pipes is not permitted. In this case, there is a risk of the pump casing reaching a high surface temperature after a very short time, due to a rapid temperature rise in the pumped fluid inside the pump. Additionally, the resulting rapid pressure build-up inside the pump may cause excessive stresses on the pump materials and even cause it to burst.
The minimum flows indicated in the relevant pump operating manuals refer to water and water-like liquids. Longer operation periods with these liquids and at the flow rates indicated will not cause and additional increase in the temperature on the pump surface. However, if the physical properties of the fluids handled are different from water, it is essential to check if and additional heat build-up may occur and if the minimum flow rate must therefore be increased.
The calculation formula below can be used to check if an additional heat build-up may lead to a dangerous temperature increase at the pump surface.

$T_o = T_f + \Delta\vartheta$

$\Delta\vartheta = ((g * H) / (c * \eta))*(1 - \eta)$

c	Specific heat of liquid [J / kg K]
g	Acceleration due to gravity [m2/s]
H	Pump head [m]
T_f	Temperature of pumped fluid [º C]
T_o	Temperature of casing surface [º C]
η	Pump efficiency [-]
$\Delta\vartheta$	Temperature difference [º C]

5.8 Temperature limits

In normal pump operation, the highest temperature is to be expected on the surface of the pump casing, at the shaft seal, at the bearing areas and at the pump shaft end in close coupled executions.
Unless the pump is equipped with an additional heating facility, the surface temperature at the pump casing will correspond to the temperature of the fluid handled, assuming that the pump surface is freely exposed to the atmosphere.

In any case, responsibility for compliance with the specified fluid temperature (operating temperature) lies with the plan operator. The maximum permissible fluid temperature depends on the temperature class to be complied with.
The following limits for the maximum permissible temperature must be observed for the individual temperature classes as per EN 13463-1 given below (temperature increase in the shaft seal area, if any, has been taken into consideration):

Temperature class as per EN 13463-1:	Permissible surface temperature	Max. Permissible fluid temperature for compliance with temperature class
T5	100 º C	80 º C
T4	135 º C	115 º C
T3	200 º C	180 º C
T2	300 º C	280 º C
T1	450 º C	Temperature limit of the pump

The permissible operating temperature of the pump in question is indicated in the technical data. If the pump is to be operated at a higher temperature, the technical data are missing or if the pump is part of a pool of pumps, the maximum permissible operating temperature must be requested from the pump manufacturer.

Because of the very close contact between pumps and motors in close coupled design (ZLK and ZLI Industrial pumps; ZTK and ZTI, Thermal Oil Pumps; and ZLI, Hot Water Pumps), there is a thermal influence between pump and motor.
Especially for motors with protection type EExe (increased safety) the possibility that the declaration of conformity losses its validity exits, as for the EC type examination an ambient temperature of 40 ºC is taken as a basis. This admissible ambient temperature could be exceeded in the area of the motor flange when pumping hot liquids.
In the event of fluid temperature above 80 ºC, the temperature category of the unit / set is determined by the pump not by the motor.

The motor is usually rated for continuous operation at the data indicated in the technical data. Frequent motor start-ups may result in increased surface temperature at the motor. Contact motor manufacturer, if necessary.
Based on ambient temperature of max. 40 ºC and assuming that the pump unit is properly serviced and operated and that the surfaces in the bearing area are freely exposed to the atmosphere, compliance with temperature class T4 is warranted for surfaces in the area of rolling element bearings.
If temperature class T5 (100 ºC) and T6 (85 ºC) have to be compliance with, special measures may have to be taken with regard to bearing temperature. In such cases and if ambient temperatures are higher, contact the manufacturer.
Operator's errors or malfunctions may result in substantially higher temperatures. Please refer to section 5.1 in this context.

Mechanical seals may exceed the specified temperature limits if run dry. Dry running may not only result from an inadequately filled seal chamber, but also from excessive gas content in the fluid pumped.
Pump operation outside the specified operating range may also result in dry running. Shaft seals shall be regularly checked for leakage.

The above stated and also stated in other paragraphs related to the mechanical seal, is also applicable for any shaft sealing execution (i.e. packing rings, lip seal rings,…)

It has to be verified, that V-rings are properly fitted to the shaft. Only proper contact should exist between the sealing lip and the shaft.

5.9 Maintenance

Only a pump set, which is properly operated and maintained in perfect technical conditions, will give safe and reliable operation. This also applies to the reliable function of the rolling element bearings whose actual lifetime largely depends on the operating mode and operating conditions.
Regular checks of the lubricant and the running noises will prevent the risk of excessive temperatures as a result of bearings running hot or defective bearing seals.
The correct function of the shat seal must be checked regularly.
Any auxiliary systems installed must be monitored, if necessary, to make sure they function correctly.
Static sealing elements shall be regularly checked for leakage.
The coupling guard and any other guards of fast rotating components must be regularly checked for deformation and sufficient distance from rotating elements.
Regularly verify the correct position and the status of plastic components exposed to the atmosphere.

It is strongly recommended to draw up a maintenance schedule, which includes the above-mentioned points.

In case of repair, only original Sterling Fluid Systems spare parts must be used, which comply with the corresponding EC Directives.

6 Additional instructions for couplings in ATEX pump sets

The following instructions for couplings need especially to be followed for pump sets which are manufactured in conformity with Directive 94/9/EC for operations as category 2G equipment in hazardous areas.

6.1 Limitations
Only the coupling type BDS and HDS are released for pump sets in conformity with 94/9/EC.

These couplings are designed to be operated according to the following parameters:
- Max. 25 starts per hour.
- Daily operating cycle up to 24 h.
- Operation within the specified alignment.
- Temperature range -30ºC a +80ºC in the immediate vicinity of the coupling.

6.2 Storage
If coupling parts are stored as spare parts, the storage area must be dry and free from dust. The flexible elements must not be stored with chemicals, solvents, motor fuels, acids, etc… Furthermore they should be protected against light, in particular sunlight and bright artificial light with high ultraviolet content.

The storage area must not contain any ozone-generating equipment, e.g. fluorescent light sources, mercury vapour lamps, high voltage electrical equipment. Damp storage areas are unsuitable. Ensure that no condensation occurs. The most favourable atmospheric humidity is below 65%.

6.3 Installation
Type B and H couplings shall never be operated in pump sets category 2G.

The flexible elements are delivered in different materials and are then differently coloured or marked with stripes in different colours. Only elements of one type must be used in one coupling.

When assembling a pump set with a coupling, the fits of the bores and shafts must be checked. See table 6.C.1

Table 6.C.1 Tolerances for coupling fit

Fit	Nominal diamenter	Shaft tolerance	Coupling bore tolerante
Shaft tolerance according to DIN 748/1	≤ 50 mm	k6	H7
	> 50 mm	m6	

Failure to observe these instructions may result in breakage of the coupling. Danger from flying fragments! The coupling then becomes and explosion hazard.

6.4 Mounting coupling parts

Before beginning installation, shaft ends and coupling part must be carefully cleaned. Before cleaning the coupling parts with solvent the flexible elements must be removed.
If necessary, heating the coupling parts (to max 150 ºC) will facilitate fitting. With temperatures over 80 ºC the flexible elements must be removed form the coupling parts before heating.

Coupling parts must be fitted with the aid of suitable equipment to avoid damaging the shaft bearings through axial joining forces. Always use suitable lifting equipment.
Shaft ends must not project from the inner sides of the hub. Axial security is effected by means of the set screw.

Tighten the set screws with a tightening torque in accordance with the table 6.C.3.

Failure to observe these instructions may result in breakage of the coupling. Danger from flying fragments! The coupling then becomes and explosion hazard.

After fitting the coupling parts onto the shafts the flexible elements, if previously removed must be fitted. Previously heated coupling parts must make cooled down again to a temperature below +80 ºC. It must be ensured that the flexible elements are of identical size and colour or have identical marking.

Move together the pump set components to be coupled.

Danger of squeezing!

6.5 Alignment

Couplings connect shaft ends of the driver and the pump. The alignment of shaft ends needs to be adjusted within the following tolerances.

The errors of alignment are differentiated into:

- Axial misalignment: the allowable difference between maximum and minimum axial gap S between maximum and minimum axial gap S between the two coupling halves is given Table 6.C.2.
- Angular misalignment: this can usefully be measured as the difference in the gap dimensions $\Delta S = S_{max} - S_{min}$. The allowable values are given in Table 6.C.2, depending on coupling size and speed.

- Radial misalignment is the radial offset between the shaft centres. The allowable values are the same ΔS values like for the angular misalignment given in Table 6.C.2.

The method to adjust the alignment is:

- First correct the angular misalignment.
- Then correct the axial gap.
- Then correct the radial misalignment.

The useful tools are a feeler gauge and a ruler as shown in figure 6.C.2.

Table 6.C.2 Alignment dimensions

Coup. type BDS	Axial gap S mm	Angular and radial misalignment ΔS_{max}. in mm at speed				
		750 1/min	1000 1/min	1500 1/min	2000 1/min	3000 1/min
76	2 – 4	0,25	0,2	0,2	0,15	0,15
88	2 – 4	0,25	0,2	0,2	0,15	0,15
103	2 – 4	0,25	0,25	0,2	0,2	0,15
118	2 – 4	0,3	0,25	0,2	0,2	0,15
135	2 – 4	0,3	0,25	0,25	0,2	0,15
152	2 – 4	0,35	0,3	0,25	0,2	0,2
172	2 – 6	0,4	0,35	0,3	0,25	0,2
194	2 – 6	0,4	0,35	0,3	0,25	0,2
218	2 – 6	0,45	0,4	0,3	0,3	0,2
245	2 – 6	0,5	0,4	0,35	0,3	0,25

6.6 Fixing the coupling on the shaft

For fixing the coupling parts on the shaft there are set screws, which need to be locked with the following torque depending on coupling size:

Table 6.C.3 Torque for set screws

Size	76	88	103	118	135	152
Torque Nm	4	4	4	4	8	8
Size	172	194	218	245		
Torque Nm	15	25	25	25		

6.7 Operation

If any irregularities are registered during operation (vibrations of noise) the pump set is to be switched off immediately. Determine the cause of the fault using the fault list in Chapter 8. This list contains possible faults, their reasons and successful actions.

If the analysis is not possible then contact the Sterling Service.

6.8 Maintenance

Regular control of the torsional backlash is necessary to prevent.

The torsional backlash has to be measured in the following way: One coupling part is rotated against the other with no torque to a stop. Then this position of the two coupling halves is marked (se figure 6.C.3). Then the coupling parts are rotated into the other direction as far as possible without torque. The distance between both marks is the backlash measure ΔS_b. The maximum values for this measure are given in Table 6.C.4 by coupling size. If this measure is exceeded, then the flexible elements need to be exchanged.

The flexible elements must be replaced in sets (all elements of one coupling at once, independent of the individual wear). Only identically marked flexible elements must be used. Only spare parts from the original equipment manufacturer are allowed for replacement

Table 6.C.4 Torsional backlash measure

Size	76	88	103	118	135	152	172
ΔS_b mm	7,0	5,0	7,0	9,0	10,5	11,5	9,0
Size	194	218	245				
ΔS_b mm	8,0	7,0	6,5				

6.9 Figures:

Figure 6.C.1 Measures for checking alignment

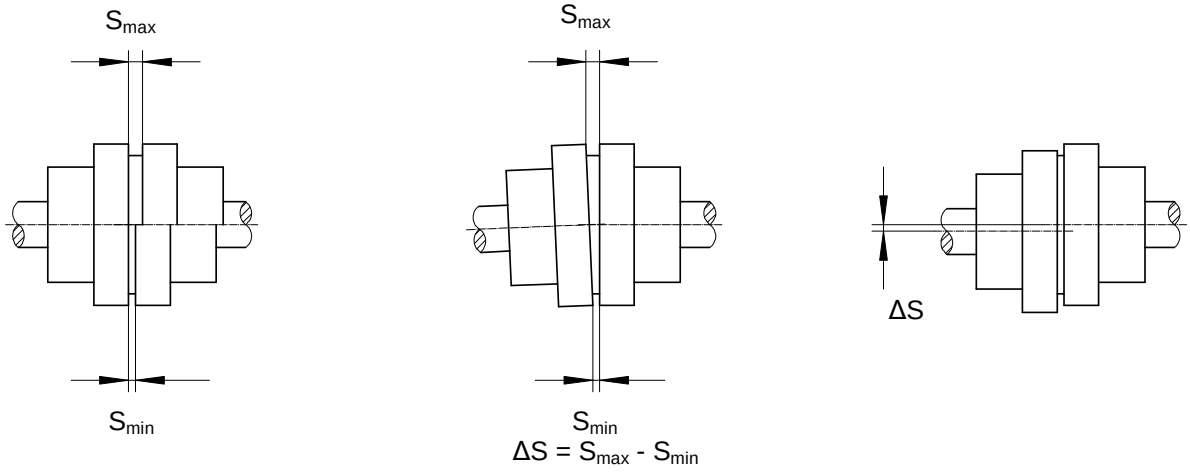


Figure 6.C.2 Checking of alignment

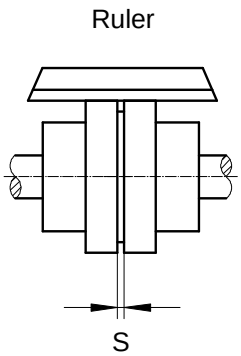


Figure 6.C.3 Measurement of torsional backlash