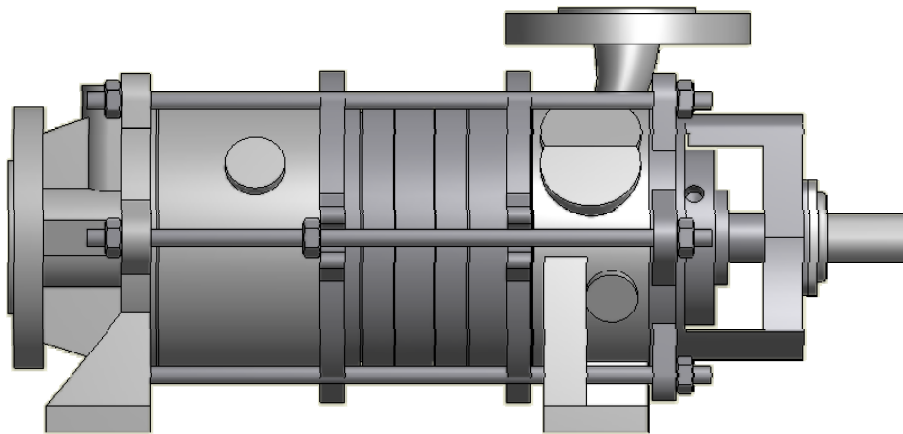


# Operation / Installation Instructions

SC

No. 44.SC.E2.06/11



Original Manual



**DICKOW PUMPEN KG**





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# 1. General

This instruction manual describes the proper and safe usage of the pump during all operating phases.

The instruction manual does not consider local regulations. Adherence to those is the responsibility of the owner.

The name tag states pump type and size, the most important operating data as well as the pump serial number. The serial number is a precise description of the pump unit and serves as identification for all following procedures.

In the event of damage the Customer Service of Dickow Pumpen must immediately be informed in order to maintain guarantee claims.

For installation of supplied interchangeable units, the respective subchapters of "Maintenance, Servicing, Inspection" must be observed.

Applicable documents:

- Pump data sheet
- Dimensional drawing
- Sectional drawing
- Parts lists
- Sub-supplier documentation



## 2. Safety

The manual includes basic instructions for installation, operation and maintenance. Only if these instructions are strictly observed, a safe handling of pump or pump unit is guaranteed and personal injury and material damage is avoided.



All the safety instructions in this manual must be considered.

This manual must be thoroughly reviewed and completely understood by the qualified personnel / operator before attempting assembly and start-up.  
The manual must consistently be available on site.

Indications and plates attached to the pump must be followed and kept in legible condition.




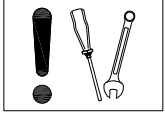

### 2.1 Designation of Warning Notices

Signal word	Explanation
<b>DANGER</b>	signifies an imminent danger. If it will not be avoided, death or severe injury are the consequence.
<b>WARNING</b>	signifies a possibly dangerous situation. If it will not be avoided, death or severe injury may be the consequence.
<b>CAUTION</b>	signifies a possibly dangerous situation. If it will not be avoided, slight or minor injury may be the consequence.
<b>ATTENTION</b>	signifies a possibly harmful situation. If it will not be avoided, danger for the pump and its function may be the consequence.

Symbol	Explanation
	General danger sign Together with a signal word, it signifies dangers in connection with death or injury.
	Dangerous voltage Together with a signal word, it signifies dangers in connection with voltage.



## 2. Safety

	<p>Warning from magnetic field Together with a signal word, it signifies dangers in connection with magnetic fields.</p>
	<p>Hot surface Together with a signal word, it signifies dangers in connection with hot surfaces.</p>
	<p>Explosion protection Gives information on protection from explosion development in hazardous area according to EC-Directive 94/9/EG.</p>
	<p>Mechanical breakdown Together with the signal word ATTENTION, it signifies dangers for the pump and its function.</p>
	<p>Notice Provides recommendation and useful information for handling the product.</p>

## 2.2 Intended use

The pump / pump unit may only be operated in the application area which is described in the relevant pump data sheet. This applies for instance to pumped liquid, flow, speed, pressure, temperature and motor power. Further points to be observed:

- Operate pump in technically faultless condition only.
- Never operate pump if not completely assembled.
- Never operate pump without liquid.
- Observe the pump data sheet / operating manual regarding the minimum flow.
- Observe the pump data sheet / operating manual regarding the maximum flow.
- Never throttle pump on suction side.
- Maximum speed is 1450 rpm (+10%) at 50 cycles and 1750 rpm (+10%) at 60 cycles. Consider deviations mentioned in the pump data sheet

## 2.3 Avoidance of foreseeable operating errors

- Never open shut-off valves in excess of the allowable range. This would cause exceedance of the maximum flow and possible cavitation damage.
- Never exceed the allowable application limits regarding pressure and temperature which are specified in the pump data sheet.
- Consider and adhere to all safety instructions and other notices mentioned in the operating manual.



### 2.4 Qualification of personnel

The personnel must possess the relevant qualification for assembly, operation, maintenance and inspection of the pump unit.

Responsibility, competence and supervision must be strictly regulated by the owner.

Skill of the personnel shall be improved by training. Training course can be held by the technical staff of Dickow Pumpen.

### 2.5 Additional safety regulations

Besides the safety instructions mentioned in this manual, the following additional regulations apply:

- Accident prevention regulations
- Explosion proof regulations
- Safety regulations for handling hazardous materials
- Applicable standards and laws

### 2.6 Safety instructions for the operator / user

- Protection against contact with hot and cold components must be provided by customer.
- Coupling guard and hand guard on the pump / pump unit must not be removed during operation.
- Pump must always be earth connected / grounded.
- Protective equipment for personnel must be provided and used.
- Toxic liquid leakage must be drained off safely, without endangering individuals and environment. Legal requirements must be observed.
- Danger through electric energy must be excluded.



### 2.7 Safety instructions for maintenance, inspection and assembly

- Alteration works or modifications on the pump are only allowed after consulting Dickow Pumpen.
- Only original parts or parts approved by Dickow shall be used.
- Repairs on the pump / pump unit may only be done during shutdown.
- The pump casing must have cooled down to ambient temperature.
- The pump must be depressurized and drained.
- Consider the procedure for decommissioning according to chapter 6.6.
- Pumps handling products dangerous to health must be decontaminated according to chapter 4.4
- Coupling guard and hand guard must be mounted again after completion of the works.
- Works on the pump unit may be done only with disconnected electricity.
- Secure the pump unit against unintentional switch-on.

### 2.8 Non-observance of the instruction manual

Non-observance of this manual leads to loss of warranty and damage claims. Non-observance will involve the following risks:

- Endangering of individuals through electrical, thermal, mechanical and chemical impacts.
- Danger through explosions.
- Danger through breakdown of essential functions.
- Endangering of environment through leakage of toxic liquids.

### 2.9 Notices on explosion protection

**DANGER**

**Operation in explosive areas requires stringent attention to this chapter.**



- Only pumps with “Ex”-identification are allowed to be used in explosive areas.
- Pumps must be designated for this service in the pump data sheet.
- Intended use must be guaranteed.
- Inadmissible operating conditions must be avoided in any case.
- Special conditions apply for operation in compliance with EC-Directive 94/9/EC (ATEX). The “Ex”-symbol shown here marks the chapters in this manual which require special attention.





## 2. Safety

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### 2.9.1 Surface temperature

The highest surface temperatures are to be expected at the pump casing, the atmosphere sided seal ring of the mechanical seal and in the area of antifriction bearings. The surface temperature at the pump casing is equal to the temperature of pumped liquid.

The expected temperature of atmosphere sided seal ring, respectively the allowable temperature of pumped liquid or operating temperature of supply fluid can be determined with the operating instructions of the seal manufacturer.

### 2.9.2 Monitoring devices

The pump may only be operated within the limits given in the pump data sheet and on the name tag. In case the owner cannot maintain the operating limits, monitoring devices are required.

More information on monitoring devices can be inquired at DICKOW Pumpen.



# 3. Description

## 3.1 General description

This pump is used where ever aggressive but clean liquids without solid particles are handled in the chemical, petrochemical and general industry and where pump must be selfpriming.

The pumps are not suitable for handling solid containing liquids.

## 3.2 Design code

Example: SC h 3562 A Ge

	<b>Pump code</b>
SC	Pump type
h	Material execution; e.g. h = 1.4408 / 1.4571
35	Nominal width discharge flange = 32 mm
6	Design; e.g. 6 = end suction flange
2	Number of stages
A	Scope of supply; e.g. A = bare shaft pump
Ge	Shaft sealing; e.g. Ge = standard mechanical seal, balanced

## 3.3 Pump sizes

<b>Pump size</b>
- 25
- 35
- 40
- 45
- 50
- 65



## 3.4 Identification

### 3.4.1 Name tag

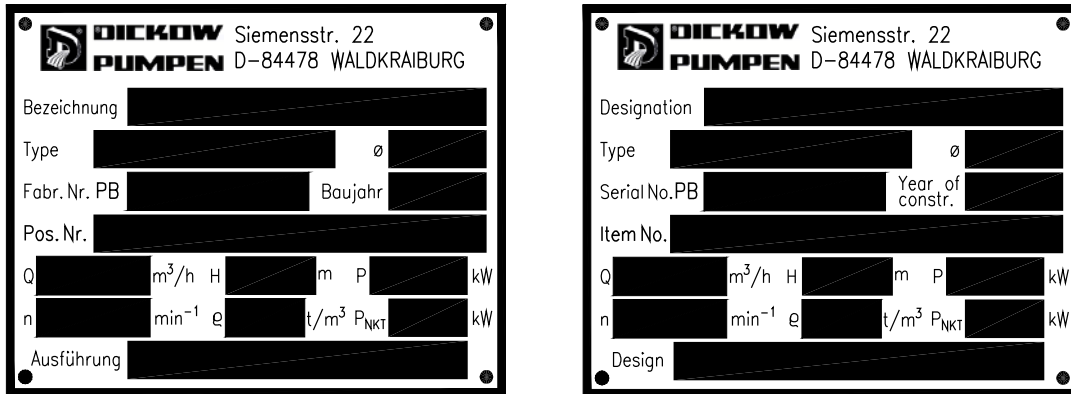


Fig. 1: Name tag German and English

### 3.4.2 Identification acc. to EC-Explosion Proof Directive

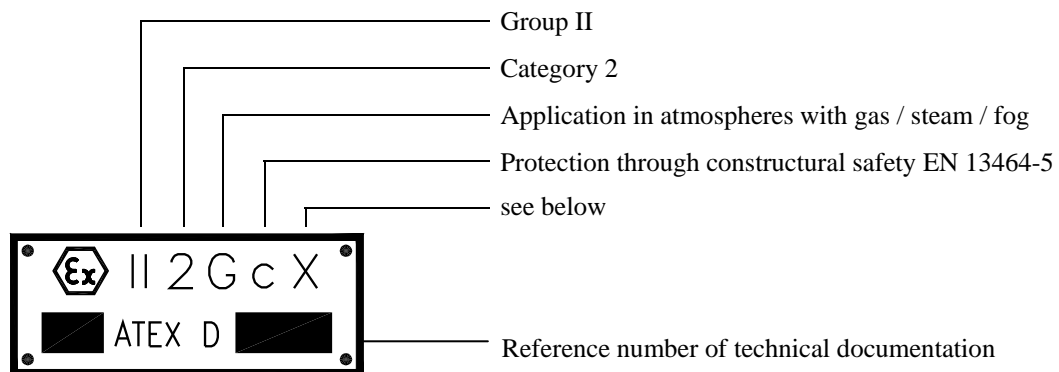


Fig. 2: ATEX-Name tag

The surface temperature does not depend on the ignition source, but on the temperature of the pumped liquid. There is no identification with a temperature class or a temperature. The symbol "X" is integrated in the identification. Chapter 2.9.1 refers to the arising surface temperatures. (Consider the notes on the pump data sheet)



## 3. Description

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### 3.5 Design

#### Design

- side channel pump
- horizontal installation
- multistage
- selfpriming

#### Pump casing

- end suction flange (vertical suction flange on request)
- vertical discharge flange
- cast-on feet

#### Impeller

- suction impeller
- star-shaped side channel impellers

#### Bearing

- motor end: radial ball bearings with permanent grease filling
- pump end: product lubricated sleeve bearings

#### Shaft sealing

- gland packing
- single or double mechanical seal
- cartridge seal

### 3.6 Scope of supply

Depending on the pump execution, the following items belong to the scope of supply:

- Pump
- Elastic coupling with or without spacer
- Coupling guard
- Casted baseplate respectively welded baseframe of stiff design
- Drive motor
- Special accessories if required

### 3.7 Dimensions and Weights

Dimensions and weights can be taken from the foundation plan / dimensional drawing.



## 4. Handling / Storage / Disposal

### 4.1 Handling

**DANGER**

**Slipping of pump / pump unit from its suspension**

Danger of life through components falling down !



- Lift the pump / pump unit only in horizontal position.
- Never hook the pump on its bare shaft.
- Never hang up the pump unit on the ring screw of the motor.
- Do not stay underneath floating loads.
- Consider weight indications in the dimensional drawing.
- Observe the local accident prevention regulations.
- Use suitable and approved lifting accessories.

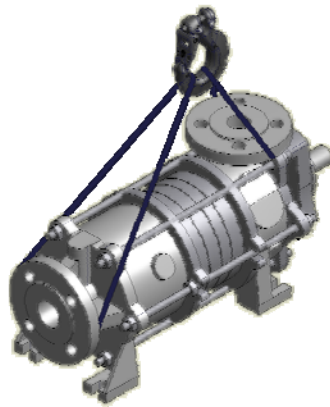


Fig. 3: lifting the pump

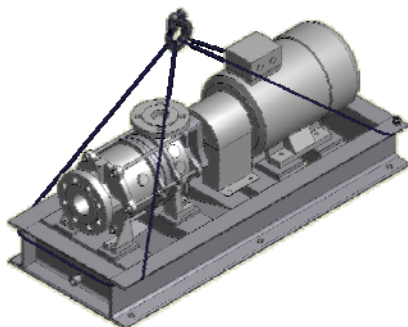


Fig. 4: lifting the complete pump unit

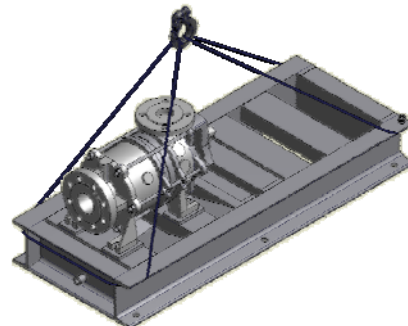
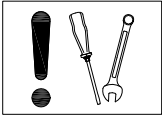


Fig. 5: lifting the pump mounted on baseplate



### 4.2 Storage / Preservation

#### ATTENTION

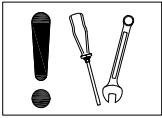


**Damage during storage through moisture or dirt.**

Corrosion and / or contamination of the pump !

- Outside storage requires a watertight cover over pump or over packed pump and accessories.

#### ATTENTION



**Wetted, contaminated or damaged openings and joints.**

Leakage or damage of the pump !

- Plugged openings should be uncovered only during installation.

The following measures are recommended for storage of the pump / pump unit:

- Store the pump in a sheltered dry place with constant air humidity.
- Turn the shaft manually once a month.

New pumps of material GGG (ductile iron) and ferritic cast steel are covered inside with anti-corrosive agent and dewatering-fluid. The maximum dry storage period is 12 months.

For storing a pump that has been in operation already, consider chapter 6.6.

### 4.3 Return of pump

- Drain the pump properly considering chapter 7.3.
- Rinse and clean the pump in general, especially when handling dangerous, explosive, hot or other risky liquids.
- A Document of Compliance completely filled in must always be attached to the pump. Refer to chapter 11.2.

#### NOTE



If required, a Document of Compliance can be downloaded under [www.dickow.de](http://www.dickow.de).

<http://www.dickow.de/unbedenk-en.pdf>



### 4.4 Disposal

**WARNING****Liquids dangerous to health**

Danger for individuals and environment !

- Collect and dispose rinsing water and residual liquid.
- Wear protective clothing and face mask.
- Consider the legal regulations for disposal of liquids dangerous to health.

1. Disassemble pump / pump unit.
2. Collect grease and oil.
3. Separate pump materials
4. Dispose according to the local regulations.



# 5. Installation / Mounting

## 5.1 Safety Instructions

**DANGER**



### Improper installation in explosive area

Danger of explosion !

- Consider the local applicable explosion proof regulations.
- Consider indications on the pump data sheet and on the name tag of pump and motor.

## 5.2 Foundation

**WARNING**



### Installation on weak and unstable foundations

Personal injury and material damage !

- Consider sufficient concrete strength (minimum class XO) of the foundation acc. to DIN 1045.
- Place the pump unit on hardened foundation only.
- Place the pump unit on level and even surfaces only.
- Consider weight indications of dimensional drawing.

## 5.3 Installation of pump unit

### 5.3.1 Installation on foundation

1. Place the pump unit on the foundation and align it with a water-level.  
Allowable deviation: 0,2 mm/m
2. Insert shims for height compensation. Always insert them both-sided near the foundation bolts between baseplate and foundation.
3. If the space between the foundation bolts is > 600 mm, insert additional shims in the middle between the foundation bolts.
4. All shims must seat solidly.
5. Hook the foundation bolts into the provided bore.
6. Concrete the foundation bolts.
7. Align the base plate after concrete has hardened.
8. Tighten the foundation bolts evenly.
9. Pour the base plate with vibration-free concrete of normal graining with a water-cement-value (W/Z-value)  $\leq 0,5$ . Provide a pourable consistency by using a mobile solvent. Cure of concrete according to DIN 1045.





## 5. Installation / Mounting

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### 5.3.2 Installation without foundation

Installation without foundation requires a solid and even ground.

1. Place the pump unit on stilts and align it with a water-level.
2. For height compensation, loosen screws and counter nuts of stilts.
3. Adjust the nut until available height differences are compensated.
4. Fasten the counter nuts of the stilts.

## 5.4 Piping

**DANGER**



### Exceedance of the allowable loads at the pump flanges

Danger to life from leaking hot, toxic, caustic or flammable liquids.

- Do not use the pump as an anchor point for piping.
- Support piping before the pump and connect it stress-free.
- Consider allowable flange forces and moments according to chapter 5.4.2.
- Compensate expansion of the piping in case of high temperatures.



## 5. Installation / Mounting

### 5.4.1 Suction pipe

Layout of suction pipe requires special attention. NPSH Available and NPSH Required must be clearly defined. Pay attention to the following:

- Mounting of elbows close to the pump suction must be avoided. Provide a straight pipe of minimum two suction pipe diameters
- Never connect a larger suction pipe direct to the pump. Flow eddies reduce the free flow area of the pump. Use an eccentric reducer. Consider Figure 8 + 9.

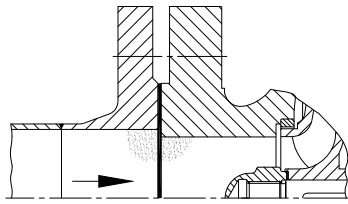


Fig. 6: Flow eddies

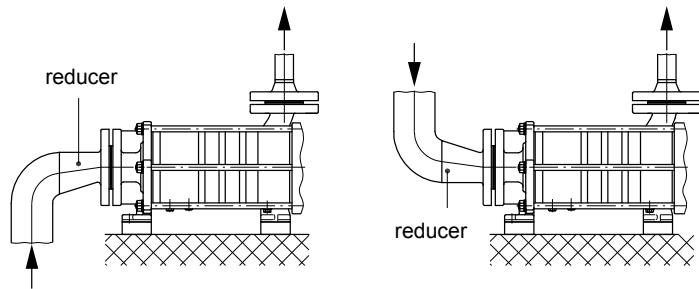
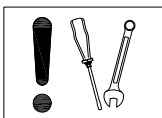


Fig. 7: Reducer connection

- At suction lift conditions, the suction pipe must continuously slope upwards towards pump suction. Eliminate air pockets.
- At flooded suction conditions, the suction pipe must slope gradually downwards to the suction flange. Avoid air pockets to ensure a complete venting.
- Maximum flow speed of 2 m/s must not be exceeded.

#### ATTENTION



#### Welding beads, scale and other impurities in the piping.

Damage of the pump !

- Piping must be thoroughly cleaned before connecting the pump.
- Remove impurities from the pipes.
- If required, insert a filter.

#### NOTE

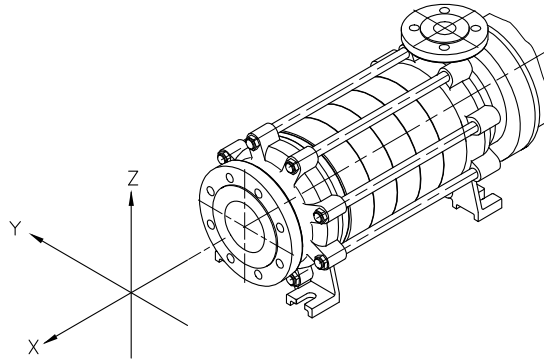
- Use a filter with a mesh width of 0,2 mm.
- Insert filter with a surface of minimum triple the pipe section.





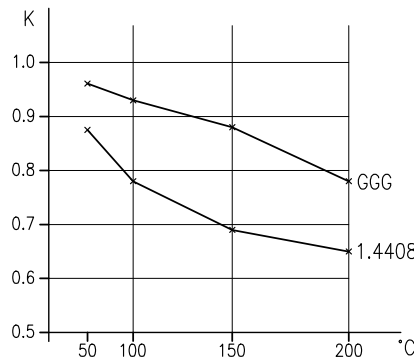
## 5. Installation / Mounting

### 5.4.2 Allowable flange forces and moments



Pump size	Suction flange											Discharge flange										
	DN	F <sub>x</sub> [N]		F <sub>y</sub> [N]		F <sub>z</sub> [N]		Σ F [N]		Σ M [Nm]		DN	F <sub>x</sub> [N]		F <sub>y</sub> [N]		F <sub>z</sub> [N]		Σ F [N]		Σ M [Nm]	
		GGG	GS	GGG	GS	GGG	GS	GGG	GS	GGG	GS		GGG	GS	GGG	GS	GGG	GS	GGG	GS	GGG	GS
25	40	375	750	330	660	300	600	585	1170	490	980	25	225	450	210	420	255	510	390	780	280	560
35	40	375	750	330	660	300	600	585	1170	490	980	32	270	540	255	510	315	630	495	990	385	770
40	40	375	750	330	660	300	600	585	1170	490	980	32	270	540	255	510	315	630	495	990	385	770
45	65	630	1260	555	1110	510	1020	990	1980	595	1190	50	450	900	405	810	495	990	780	1560	543	1085
50	65	630	1260	555	1110	510	1020	990	1980	595	1190	50	450	900	405	810	495	990	780	1560	543	1085
65	80	750	1500	675	1350	615	1230	1185	2370	648	1295	65	555	1110	510	1020	630	1260	990	1980	595	1190

Forces and moments are based on 20°C. Temperature dependent correction values are given in the figure below.



In case that not all acting loads reach the maximum allowable values, one of these loads may exceed the limit value under the following provisions:

- Exceedance is limited to 1,4 times the allowable value.
- For the actual forces and moments acting on the flange shall apply:

$$\left( \frac{\Sigma F /_{actual}}{\Sigma F /_{max. allowable}} \right)^2 + \left( \frac{\Sigma M /_{actual}}{\Sigma M /_{max. allowable}} \right)^2 \leq 2$$



## 5. Installation / Mounting

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### 5.5 Insulation

#### WARNING

**Wetted casing parts adopt the temperature of the pumped liquid.**

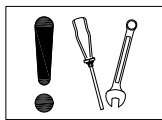


Risk of burns !

- Insulate casing parts
- Attach protective device

#### ATTENTION

**Heat accumulation in the bearing bracket**



Bearing damage !

- Do not insulate the bearing bracket

### 5.6 Coupling alignment

#### DANGER

**Inadmissible temperatures on coupling or antifriction bearings due to misalignment of the coupling**



Danger of explosion !

- Proper alignment of coupling must anytime be ensured.

#### WARNING

**Unintentional switch-on of the pump unit**

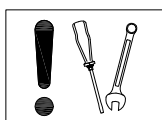


Risk of injury through moving components !

- Works on the pump unit may be done only with disconnected electricity.
- Secure the pump unit against unintentional switch-on.

#### ATTENTION

**Offset of pump shaft and motor shaft**



Damage of pump, motor and coupling !

- Coupling check has always to be performed after pipe connection.
- Coupling check has also to be performed at pump units supplied on common base plate.



## 5. Installation / Mounting

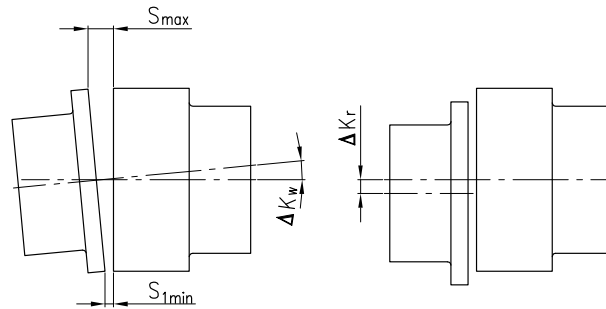


Fig. 8: Angular and radial misalignment of couplings

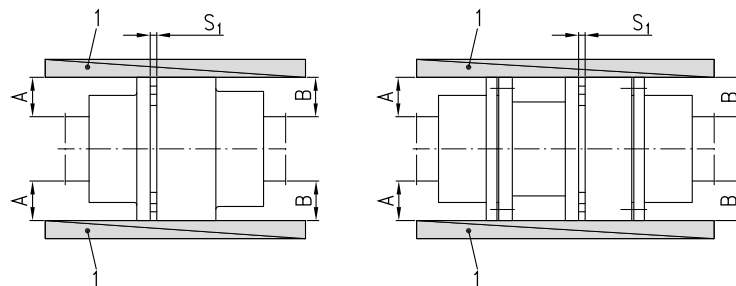


Fig. 9: Coupling alignment

1. Dismantle coupling guard.
2. Loosen support foot.
3. Place a straight edge (1) axially across the coupling half.
4. Possible radial displacement  $\Delta K_r$  becomes visible as a light gap.  
Better: Determine the radial misalignment by measuring the distances A and B at three points staggered by  $120^\circ$ .  
The coupling is aligned correctly if the distance to the shaft is identical at all points.
5. Check the distance  $s_1$  circularly between the coupling halves. The coupling is aligned correctly if the distance is circularly identical.
6. Concerning the allowable deviation  $\Delta s_1$  and  $\Delta K_r$  of both coupling halves, refer to the instruction manual of the coupling manufacturer !
7. Mount the support foot.
8. Mount the coupling guard.



## 5. Installation / Mounting

---

### 5.7 Alignment of pump and motor

#### WARNING



##### Exposed rotating coupling

Risk of injury through rotating shaft !

- Operate the pump unit only with coupling guard.
- Select the coupling guard according to corresponding standards.

#### DANGER



##### Ignition hazard through friction sparks

Danger of explosion !

- Use non-sparking material for coupling guard only to exclude flying sparks in case of contact.
- Consider EN 13463-1.

After the pump unit is installed and piping is connected, check the coupling alignment and realign motor if necessary.

Use shims for height compensation.

1. Dismantle coupling guard.
2. Check coupling alignment. Consider chapter 5.6.
3. Loosen hold down bolts of motor.
4. Place shims under the motor feet for height compensation.
5. Tighten hold down bolts of motor.
6. Check function of coupling / shaft. The coupling must easily be turnable by hand.
7. Mount the coupling guard.
8. Check the space between coupling and coupling guard.

### 5.8 Electrical connection of the pump unit

#### DANGER



##### Improper electrical installation

Danger of explosion !

- Electrical installation requires additionally observance of IEC 60079-14.
- Explosion proof motors shall be connected through motor protection switch only

#### DANGER



##### Working on the pump unit by unqualified personnel

Danger to life through electric shock !

- Electrical connection must be performed by qualified electrician only.
- Regulations IEC 30364 and IEC 60079 must be considered.



## 5. Installation / Mounting

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### WARNING



#### Incorrect power connection

Short circuit !

- Adhere to connection conditions of local energy supply companies.

Proceedings:

1. Check for compliance of the available supply voltage with the indications on the motor name tag.
2. Select suitable connection method.
3. Check for identical rotating direction of motor and pump. Consider the rotating direction arrow of the pump !

### NOTE



Observe the instruction manual of the motor !

### 5.8.1 Checking rotating direction

### DANGER

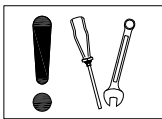


#### Temperature rise through parts touching each other

Danger of explosion !

- Never check rotating direction with dry pump.
- Disconnect the pump for checking rotating direction.

### ATTENTION



#### Wrong rotating direction of motor and pump

Damage of the pump !

- Consider the rotating direction arrow on the pump.

1. Start motor briefly. Note rotating direction of the motor.
2. Rotating direction of the motor must comply with the rotating direction arrow on the pump.
3. In case of wrong rotating direction, change the cables in the motor terminal box.



# 6. Commissioning / Decommissioning

## 6.1 Commissioning

The following points must be checked prior to start-up;

- The pump unit is correctly electronically connected to all relevant protective devices.
- The pump is filled with liquid.
- Rotating direction has been checked.
- All additional connections are connected and fully functional.
- Lubricants are checked.
- After a longer standstill period, the measures mentioned in chapter 7 "Maintenance/Service/Inspection" must be considered and performed.

### 6.1.1 Filling the pump

**DANGER**

**Formation of explosive atmosphere inside the pump**



Danger of explosion !

- The pump must permanently be filled with liquid.
- Appropriate monitoring measures must be provided.

1. Fill the pump with liquid.
2. Open shut-off valve in suction pipe completely.
3. Open all additional connections completely (e.g. external circulation, external flush)

### 6.1.2 Shaft sealing

The pump is supplied with shaft sealing. If a fluid reservoir is foreseen, it must be filled according to the reservoir manual.

If double mechanical seals are provided, a barrier pressure supply must be connected prior to starting the pump, following the instruction manual of reservoir respectively mechanical seal.

In case of external flush, the pump must be flushed with the quantities and pressures as stated in the pump data sheet respectively in the dimensional drawing.





## 6. Commissioning / Decommissioning

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### 6.1.3 Starting the pump

**DANGER**



#### Exceedance of allowable pressure- and temperature limits

Danger of explosion ! Leakage of hot or toxic liquid

- Never operate pump with closed shut-off valves in suction and/or discharge pipe.
- Start-up pump unit only against partially opened shut-off valve on discharge side.

**DANGER**



#### Elevated temperature through dry run

Danger of explosion !

- Never operate pump in empty condition.
- Always fill up pump properly.
- Operate pump only within the allowable operating range.

1. Open shut-off valve completely in suction pipe
2. Open shut-off valve partially in discharge pipe
3. Switch on the motor.
4. When pressure gauge indicates pressure, open shut-off valve on discharge side until the duty point is reached.
5. When the operating temperature is reached, check coupling alignment and realign if necessary.

### 6.1.4 Inspection of shaft sealing

A mechanical seal is a dynamical seal and – due to physical and technical reasons – never leakage free. Design, tolerances, operating conditions, smoothness etc. determine the quantity of leakage.

Leakage may increase during normal running-in of the sliding faces but will return to normal value after sufficient running time. If this should not be the case, the mechanical seal must be shut down, dismantled and inspected.

A gland packing must slightly drip during operation.

**DANGER**



#### Elevated temperature at gland packings

Danger of explosion !

- Gland packings are not suitable for use in explosive areas.



## 6. Commissioning / Decommissioning

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Leakage on the gland packing is adjusted as follows:

1. Tighten the gland nuts only slightly by hand.
2. Check rectangular and centric seat by using a packing gauge.
3. After the pump is filled up, leakage must be available.
4. Tighten the gland nuts so far that the appearing leakage is reduced to 60-120 drops per minute.
5. Start the pump.
6. After a running time of 5 minutes, reduce the leakage by fastening the gland nuts for 1/6 turn.
7. Watch the leakage.

Leakage too high → Repeat step 6 and 7.

Leakage too low → Loosen the gland nuts slightly.

No leakage → Switch off the pump unit immediately!  
Loosen the gland and repeat the procedure.

### 6.2 Operating the pump

#### **WARNING**

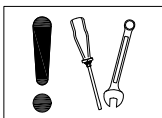


#### **High surface temperatures through hot liquids**

Risk of burns !

- Avoid touching the pump surface.
- Wear protective clothing.

#### **ATTENTION**



#### **Abnormal noises, vibrations, temperatures or leakage**

Damage of the pump !

- Switch off the pump immediately.
- Only restart the pump unit after cause of trouble has been eliminated.

### 6.3 Impeller trimming

Impeller trimming is not possible for this pump type.



### 6.4 Operating limits

**DANGER**



**Exceedance of operating limits regarding pressure, temperature and speed**

Danger of explosion ! Leaking hot or toxic liquid !

- Maintain the allowable service conditions specified in the pump data sheet.
- Avoid operation against closed shut-off valve.
- Never operate pump at a temperature higher than specified in the pump data sheet.

#### 6.4.1 Flow rate

If not stated otherwise in the pump data sheet, the following applies:

$$Q_{\min} = 0,25 \times Q_{\text{opt}}$$

$$Q_{\max} = 1,2 \times Q_{\text{opt}}$$

#### 6.4.2 Switching frequencies

**DANGER**



**Elevated surface temperature of the motor**

Danger of explosion !

- When using explosion proof motors, consider the information in the motor manual regarding switching frequencies.

The switching frequencies are defined by the maximum temperature rise of the motor and depend on the power reserve of the motor during operation and on the starting conditions.

**NOTE**



Read instruction manual of motor manufacturer !



### 6.5 Switching off the pump

1. Keep shut-off valve in suction pipe open.
2. Close shut-off valve in discharge pipe.
3. Switch off the motor and watch for steady run down.

#### NOTE



In case a non-return valve is installed in the discharge pipe, the shut-off valve can remain open. A counter pressure must be available.

For a longer standstill period, the following must be observed:

- Liquids which tend to polymerization, crystallization or solidification, must be drained completely.
- If required, rinse the pump with a suitable liquid.
- Close shut-off valve in the suction pipe.
- Flush connections must be closed.

### 6.6 Decommissioning

The pump unit remains in the piping:

- Provide sufficient amount of liquid for the test runs.
- Switch on the pump unit regularly monthly or quarterly.

The pump unit will be dismantled and stored:

- Empty the pump properly.
- Observe the safety instructions acc. to chapter 7.1 / 7.3.
- Spray the inside of the pump casing with preservation agent. Not required for stainless steel pumps.
- Spray preservation agent through suction and discharge flange.
- Plug suction and discharge flanges, e.g. with plastic caps.
- Lubricate all unpainted outside surfaces of the pump with oil and grease free of silicone. Not required for stainless steel pumps.
- Pay attention to additional notes in chapter 4.2.



# 7. Maintenance / Servicing / Inspection

## 7.1 Safety regulations

**DANGER**



### Improper maintained pump unit

Danger of explosion !

- Maintain the pump unit regularly
- Establish a maintenance schedule

**WARNING**



### Unintentional switching-on of the pump unit

Risk of injury through moving components !

- Works on the pump unit may be done only at disconnected electricity.
- Secure the pump unit against unintentional switch-on.

**WARNING**



### Hot liquids

Risk of injury!

- Let the pump unit cool down to ambient temperature.

**WARNING**



### Liquids dangerous to health

Risk of injury !

- Consider legal requirements.
- Take safety measures for individuals and environment when draining the pumped liquid.
- Decontaminate the pumps.

The user must assure that maintenance, inspection and assembly is performed by qualified personnel. These persons must have studied this operating manual comprehensively.

A maintenance schedule needs a minimum of effort and may avoid expensive repairs.

Any use of force on the pump unit must be avoided.



### 7.2 Operating surveillance

#### DANGER

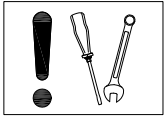


#### Elevated surface temperature through hot running antifriction bearings

Danger of explosion ! Fire hazard !

- Check antifriction bearings regularly for running noise.

#### ATTENTION

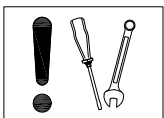


#### Wear caused by dry run

Damage of the pump !

- Never operate an empty pump.
- Never close the shut-off valve in suction pipe during operation.

#### ATTENTION



#### Exceedance of the allowable liquid temperature

Damage of the pump !

- Operation against closed discharge valve is not allowed.
- Consider the temperature indications in the pump data sheet.

The following requires regular checking during operation:

- The pump must always run steady and vibration-free.
- Check antifriction bearings for running noise. Vibrations, noises and increased power consumption are signs of wear.
- Check the elastic elements of the coupling.
- Clean the filter in the suction pipe regularly.

#### 7.2.1 Lubrication / Lifetime of antifriction bearings

Lubrication of antifriction bearings is not required. Permanent grease-lubricated ball bearings are installed.

	T <sub>amb</sub> = 25°C		T <sub>amb</sub> = 40°C	
	1500	1750	1500	1750
Speed 1/min	1500	1750	1500	1750
nominal lifetime h	35000	30000	18000	15000

Antifriction bearings should be replaced at the latest when the running time has reached 90% of the life time mentioned in this table.



## 7. Maintenance / Servicing / Inspection

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### 7.2.2 Lubrication of sleeve bearings

Sleeve bearings require a stable liquid film. Checking on wear must be done

- after dry run or cavitation.
- when vibrations, noises and power consumption are increasing.

## 7.3 Drainage and Disposal

### **WARNING**



#### **Pumped liquids dangerous to life**

Endangering for individuals and environment !

- Collect flushing liquid and possible residual liquid and dispose it.
- Wear protective clothing and face masks.
- Consider legal requirements concerning disposal of liquids.

Drainage of pumped liquids through the drain plugs at the casing, through a connected shut-off valve or through a flange.

Mode of drainage and position can be taken from the dimensional drawing !

## 7.4 Disassembly of pump unit

### 7.4.1 General instructions

- Pay attention to safety instructions of chapter 7.1.
- Working on the motor requires observance of the documentation provided by the motor manufacturer.
- Consider the sectional drawings when disassembling.
- In case of damage, our service department can be contacted.

### **DANGER**



#### **Working on the pump unit without sufficient preparation**

Risk of injury !

- Switch off the pump unit properly.
- Close shut-off valves on suction and discharge side.
- Drain and depressurize the pump.
- Flush connections must be closed.
- Let the pump unit cool down to ambient temperature.



## 7. Maintenance / Servicing / Inspection

### 7.4.2 Removal of driver

1. Disconnect the motor.
2. Remove coupling guard.
3. Remove the hold down bolts of the motor from the baseplate.
4. Decouple pump and motor by displacing the motor.

#### **WARNING**



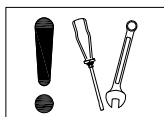
#### **Tilting the motor**

Squeezing of hands and feet !

- Secure the motor by lifting or bracing.

### 7.4.3 Tools

#### **ATTENTION**



#### **Wrong disassembly and assembly tools**

Damage of components!

- Use special tools.

In order to facilitate disassembly and assembly as well as to improve protection of sensitive components, the following special tools shall be used:

designation	dimensions / size / dwg.No.	for part
Disassembling sleeve	60.1903	524
Knipex-plier wrench	46 mm / 1 3/4"	940
Spezial pliers	60.1427	932.2
Assembling sleeve	60.668	524

### 7.4.4 Disassembly of antifriction bearings

1. Pull off the pump sided coupling half from pump shaft 211, remove key 940.1.
2. Remove hexagon head bolt 901.2.
3. Remove bearing cover 360.1.
4. Remove circlip 932, pull off spacer disk 551.
5. Remove hexagon nuts 920.1 from bearing bracket housing 355.
6. Pull off bearing bracket housing 355 together with radial ball bearing 321 from pump shaft 211.
7. Loosen grub screw 904.1 and remove deflector 507.
8. Press the radial ball bearing out off the bearing bracket housing.





## 7. Maintenance / Servicing / Inspection

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### 7.4.5 Replacement of antifriction bearings

Pump size	321
25 - 40	6304 2ZR
45 + 50	6305 2ZR
65	6306 2ZR

### 7.4.6 Disassembly of shaft sealing

The works according to chapter 7.4.4 are completed.

#### **Standard Mechanical seal according to EN 12756**

1. Remove hexagon nut 920.2 from seal end plate 471.
2. Pull off seal end plate 471 together with seal ring 475.
3. Pull off the discharge casing 107.
4. Loosen grub screws 904.3 and pull off mechanical seal 433 together with shaft sleeve 527.
5. Pull off packing ring 457.

#### **Tandem-Standard Mechanical seal according to EN 12756 (API-Plan 52)**

1. Remove hexagon nuts 920.2 from seal end plate 471.
2. Pull off seal end plate 471 together with seal ring 475.2.
3. Loosen grub screws from mechanical seal 433.2 and pull the mechanical seal off.
4. Pull off discharge casing 107 together with seal ring 475.1.
5. Loosen grub screws 904.3 and pull off mechanical seal 433.1 together with shaft sleeve 527.

#### **Double Standard Mechanical seal according to EN 12756 (API-Plan 53)**

1. Remove hexagon nuts 920.2 from seal end plate 471.
2. Pull off seal end plate 471 together with seal ring 475.2.
3. Pull off discharge casing 107.
4. Loosen grub screws 904.3, pull off mechanical seals 433.2 and 433.1 together with shaft sleeve 527.1 and 527.2, O-ring 412.4 and insert ring 513.
5. Pull off seal ring support 476 together with seal ring 475.1.

#### **Cartridge-Mechanical seal**

1. Remove hexagon nuts 920.2.
2. Attach assembly gauges to the mechanical seal.
3. Loosen grub screws and pull off the complete seal unit 433 from pump shaft.



## 7. Maintenance / Servicing / Inspection

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### 7.4.7 Disassembly of impeller

#### **WARNING**

#### **Possibly available residues of pumped liquid**



Danger for individuals and environment!

- Wear protective clothing.

1. Clamp the pump at the shaft end in vertical position in a three-jaw juck. Protect the shaft end by braces.
2. Loosen hexagon nut 920.1.
3. Pull off suction casing 106.
4. Loosen inner hexagon cap screw 914.6 respectively impeller nut 922 (left hand thread).
5. Pull off suction impeller 231.
6. Remove key 940.3 and intermediate ring 509.1.
7. Pull off diffuser 170 together with sleeve bearing 310.1.
8. Fit disassembling sleeve – see chapter 7.4.3 – to the shaft sleeve 524 and fasten it.
9. Fit the puller and take off the shaft sleeve.
10. Remove tolerance rings 500.4 and intermediate ring 509.3.
11. Loosen hexagon nut 920.1 from assembling ring 552.
12. Pull off assembling ring 552.
13. Remove side channel stages as follows:
  - Pull off suction disk 558.1/2.
  - Pull off side channel impeller 235.
  - Remove key 940.1.
  - Pull off pressure disk 557.2/1 with sleeve bearing 310.3.

## 7.5 Inspection

### 7.5.1 Impeller, suction and pressure disk

Suction capability is highly dependent on the axial clearance between impellers and suction and pressure disks. The manufacturing tolerances are calculated such that the total axial clearance is 0,18 mm. Natural wear will enlarge the clearance and reduce the selfpriming capability. Wear is very much depending on the nature of the pumped liquid.

Reliable statements about lifetime are therefore not possible. Replacement of the components is generally recommended if traces of wear are distinctly visible.



## 7. Maintenance / Servicing / Inspection

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### 7.5.2 SiC-Sleeve bearing / shaft sleeves

Measure the diameters of the sliding surfaces. The total clearance in new condition is as follows:

Pump size 25 – 50 = 0,194 mm

Pump size 65 = 0,176 mm

Replace sleeve bearings if the mentioned clearances are exceeded.

### 7.5.3 Bearing bracket housing

Measure the inner diameters of ball bearing seats. Replace the bearing bracket housing if the following values are exceeded.

Pump size 25 – 40 → 52,009 mm

Pump size 45 + 50 → 62,009 mm

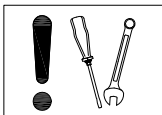
Pump size 65 → 72,009 mm

## 7.6 Assembly of pump unit

### 7.6.1 General instructions

- Consider the safety instructions of chapter 7.1.
- Consider the sectional drawings for assembly.
- Use new gaskets and O-rings only.
- Mount gaskets without lubricants.
- Do not use assembling aid when mounting the gaskets. If necessary, use customary contact adhesive. Never use superglue.
- Lubricate fittings and screw joints with graphite or similar lubricant. Lubricants must be compatible with the pumped liquid.
- Tighten all screws properly. Consider chapter 7.7.
- When mounting the shaft sleeve, use new tolerance rings only.

#### **ATTENTION**



#### **Unprofessional assembly**

Damage of the pump!

- Assemble pumps / pump units under consideration of the general rules of engineering.
- Only use original spare parts.

The following must be checked prior to assembly:

- All dismantled parts shall be cleaned and checked for wear.
- Damaged or worn out parts must be replaced by original spare parts.
- All sealing surfaces shall be cleaned.



### 7.6.2 Assembly of mechanical seal

Installation requires attention of the following:

- Consider the seal drawing.
- Works must be performed proper and thoroughly.
- Remove protective agent completely.
- Never apply lubricants to sliding surfaces.
- Check parallelism with the casing part after assembly.
- Surface of shaft sleeve must be clean and smooth. The edge has a chamfer.

#### Standard Mechanical seal according to EN 12756

1. Slide the packing ring 457 onto the pump shaft 211.
2. Take the setting dimension L (1) from the table below and mark it on the pump shaft.

Pump size	L [mm]
25 – 40	115,9
45 + 50	121,9
65	191,9

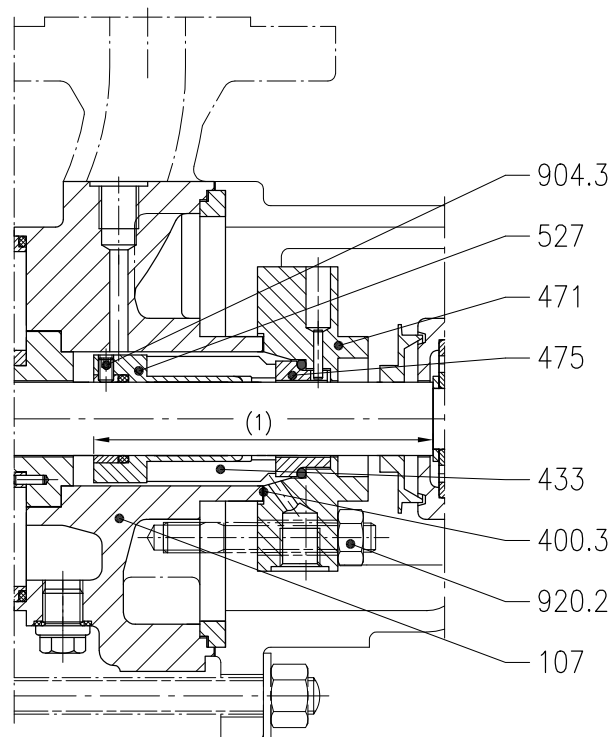


Fig. 10: Setting dimension L (1)

3. Slide the mechanical seal 433 together with shaft sleeve 527 onto the pump shaft up to dimension “L”.
4. Tighten grub screws 904.3.
5. Slide on the discharge casing 107.
6. Slide on the seal end plate 471 together with the seal ring 475.
7. Do not forget the gasket 400.3.
8. Tighten hexagon nut 920.2.



## 7. Maintenance / Servicing / Inspection

### Tandem-Standard-Mechanical seal acc. to EN 12756 (API-Plan 52)

1. Take the setting dimensions  $L_1$  (1) and  $L_2$  (2) from the table below and mark it on the pump shaft.

Pump size	$L_1$ [mm]	$L_2$ [mm]
25 – 40	84,6	162,6
45 + 50	80,7	161
65		

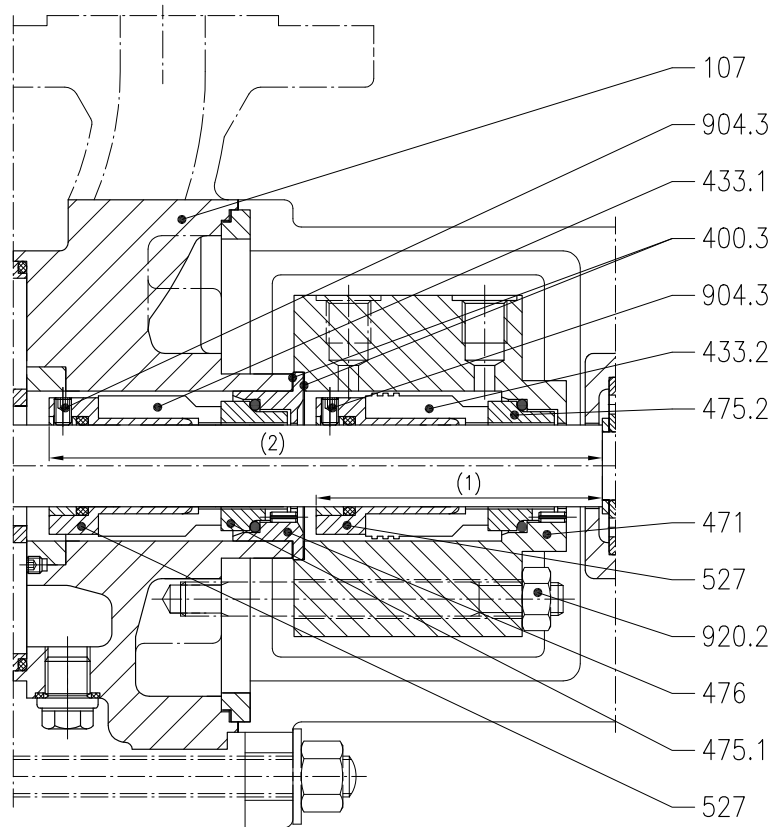


Fig. 11: Setting dimensions  $L_1$  (1) and  $L_2$  (L2)

### NOTE



The setting dimensions listed in the table apply only to the seal design „Te“ (= balanced both-sided).  
For design “balanced/unbalanced” and “unbalanced/unbalanced” consult Dickow Pumpen.

2. Slide the mechanical seal 433.1 together with shaft sleeve 527 onto the pump shaft up to dimension „ $L_2$ “.
3. Tighten grub screws 904.3.
4. Slide on the discharge casing 107.
5. Slide on the seal ring support 476 together with seal ring 475.1. Do not forget gasket 400.3.
6. Slide the mechanical seal 433.2 together with shaft sleeve 527 onto the pump shaft up to dimension „ $L_1$ “.
7. Tighten grub screws 904.3.
8. Slide on the seal end plate 471 together with seal ring 475.2. Do not forget gasket 400.3.
9. Tighten hexagon nuts 920.2.



## 7. Maintenance / Servicing / Inspection

### Double Standard Mechanical seal acc. to EN 12756 (API-Plan 53)

1. Slide the seal ring support 476 together with seal ring 475.1 onto the pump shaft 211. Do not forget O-ring 412.5.
2. Take the setting dimension L (1) from the table below and mark it on the pump shaft.

Pump size	L [mm]
25 – 40	115,9
45 + 50	121,9
65	191,9

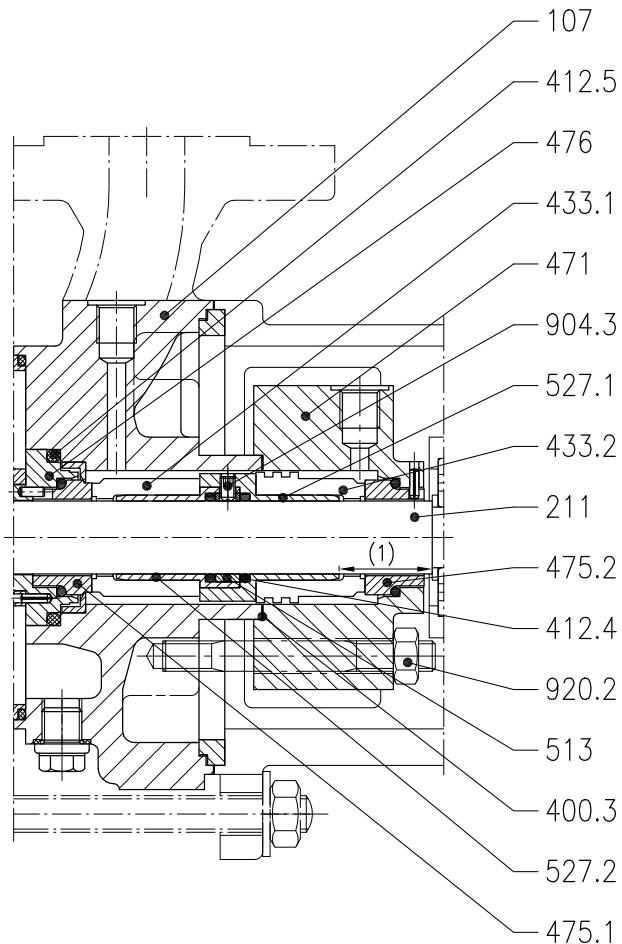


Fig. 12: Setting dimension L (1)

3. Slide mechanical seals 433.2 and 433.1 together with shaft sleeves 527.1, 527.2, O-ring 412.4 and insert ring 513 onto the pump shaft up to dimension “L”.
4. Tighten grub screws 904.3.
5. Slide on the discharge casing 107.
6. Slide on the seal end plate 471 together with seal ring 475.2. Do not forget gasket 400.3.
7. Tighten hexagon nut 920.2.



### 7.6.3 Assembly of antifriction bearings

1. Press the radial ball bearing 321 into the bearing bracket housing 355.
2. Heat up the bearing bracket housing with ball bearing to 80 – 100°C.
3. Push the deflector 507 with grub screw 904.1 onto the pump shaft.
4. Slide the spacer disk 551 onto the pump shaft.
5. Fit the centring ring 511.1 in the discharge casing 107.
6. Slide the bearing bracket housing together with ball bearing onto the pump shaft 211 until limit.
7. Slide on the spacer disk 551 and secure it with circlip 932.
8. Fit the bearing cover 360.1 and tighten hexagon head bolts 901.2.

### 7.6.4 Assembly of impellers

The works according to chapter 7.6.2 and 7.6.3 are completed.

#### NOTE



Suction (1) and pressure disks (2) are oppositely arranged and both provided with one thin and one thick marking (4). The pressure disk 557.1 (5) must be mounted to the discharge casing (6) with the thin marking upwards. The matching suction disk must also be installed with the thin marking upwards. The thick marking follows next and then thin and thick markings in turn.

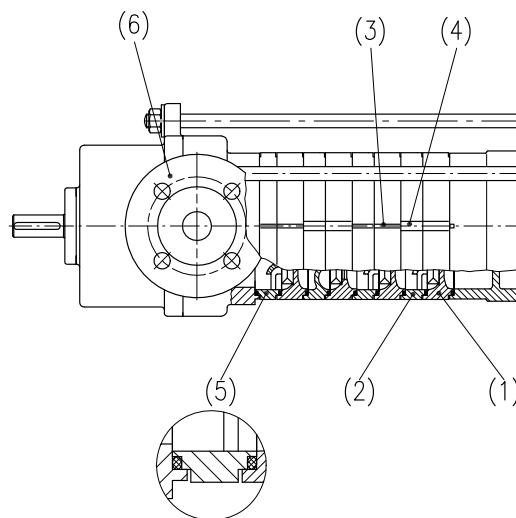


Fig. 13: assembly of suction and pressure disks

1. Clamp the pump at the shaft end in vertical position in a three-jaw chuck. Protect the shaft end by braces.
2. Insert the O-ring 412.2 into the discharge casing 107.
3. Slide the pressure disk 557.1 together with assembling ring 552 onto the pump shaft.
4. Fit the grooved dowel pin 561.3 to the packing ring 457.



## 7. Maintenance / Servicing / Inspection

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5. Assemble the side channel stages as follows: (don't forget O-rings 412.2!)
  - Insert key 940.2 and press it in by Knipex-plier wrench.
  - Slide on the suction disks 558.1/2.
  - Insert the sleeve bearing 310.3.
  - Slide on the pressure disk 557.2.
6. Slide the assembling ring 552 onto the suction disk 558.1.
7. Mount the casing screws 915 and tighten hexagon nuts 920.1 slightly.
8. Slide intermediate ring 509.3 and spacer ring 504 onto the pump shaft until limit.
9. Insert new tolerance rings 500.4 into the shaft grooves.
10. Fit disassembling sleeve – see chapter 7.4.3 – to the shaft sleeve and tighten it.
11. Spray the pump shaft in the area of tolerance rings with graphite.
12. Fit the shaft sleeve and press it over the tolerance rings using the assembling sleeve – see chapter 7.4.3.
13. Slide on diffuser 170 with sleeve bearing 310.1.
14. Slide on intermediate ring 509.1 together with distance ring 504.
15. Insert key 940.3.
16. Slide on suction impeller 231 and fasten it with inner hexagon cap screw 914.4 respectively impeller nut 922 (left hand thread).
17. Fit the suction casing 106.
18. Tighten hexagon nuts 920.1 slightly.
19. Unclamp the pump, place it on a even bench and align the feet.
20. Tighten hexagon nuts 920.1 by torque wrench.

### 7.6.5 Motor assembly

<b>NOTE</b>
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The first two steps do not apply for pumps with spacer type coupling.

1. Couple pump and motor by displacing the motor.
2. Fix the motor to the baseplate.
3. Align pump and motor. Consider chapter 5.7.
4. Align coupling. Consider chapter 5.6.





### 7.7 Bolt torques

	Bolt torque [Nm]	
	8.8 standard bolts	A4-70 standard bolts
M5	5	4
M6	9	6
M8	22	16
M10	45	30
M12	80	55
M16	195	135

	Bolt torque [Nm] for casing screws 915/920.1	
Pump size	C45	1.4122
25 - 40	60	70
45 - 65	150	170

Calculation basis:

- 80% Yield strength utilisation of screw material.
- Friction coefficient  $\mu = 0,14$  ; use screw lubricant for threads and head- / nut contact surface.  
Recommended: Klüber-paste HEL 46-450.
- Torque controlled tightening by torque wrench.

#### NOTE



Deviating bolt torques are indicated in the pump data sheet.

Bolt torque for screwed plugs (independent of material):

- G 1/4 = 25 Nm
- G 3/8 = 45 Nm
- G 1/2 = 75 Nm

Bolt torques for impeller nut 922 respectively inner hexagon cap screw 914.6 (independent of material):

Pump size	922 resp. 914.6	
	Bolt torque [Nm]	Wrench size
25 - 50	30	13
65	120	41



# 8. Troubleshooting

Failure	Number
Pump delivers no or not enough liquid	1
Motor is overloaded	2
Bearing temperature too high	3
Pump is leaking	4
Increased noises and vibrations	5
Inadmissible temperature increase	6
Sleeve bearing damage	7
Suction capacity too low	8
Increased seal leakage	9

Failure number									Problem	Elimination
1	2	3	4	5	6	7	8	9		
X				X	X		X		Pump not completely vented or filled	Venting respectively filling
X							X		Shut-off valve in suction line not completely opened	Open shut-off valve
X							X		Wrong rotating direction	Exchange 2 phases of power supply
X	X								Counter pressure of the pump is higher than specified	Readjust the duty point by discharge valve Increase speed
X	X				X		X		Viscosity of pumped liquid is higher than specified	Consult the factory
X				X					Counter pressure of the pump is lower than specified	Readjust the duty point by discharge valve
X				X	X	X		X	NPSHA too low	Check liquid level in suction tank Reduce resistances in suction line Open shut-off valve in suction line completely
	X								Wrong speed	Check speed
		X		X				X	Pump unit is not correctly aligned	Check coupling alignment and correct if necessary
		X		X					Pump stressed by piping	Check piping connections and pump mounting
		X		X					Ball bearing damage	Renew antifriction bearings
				X		X		X	Unbalance of rotating parts	Balance the parts
			X						Casing screws and screwed plugs loose	Tighten screws and plugs Renew gaskets

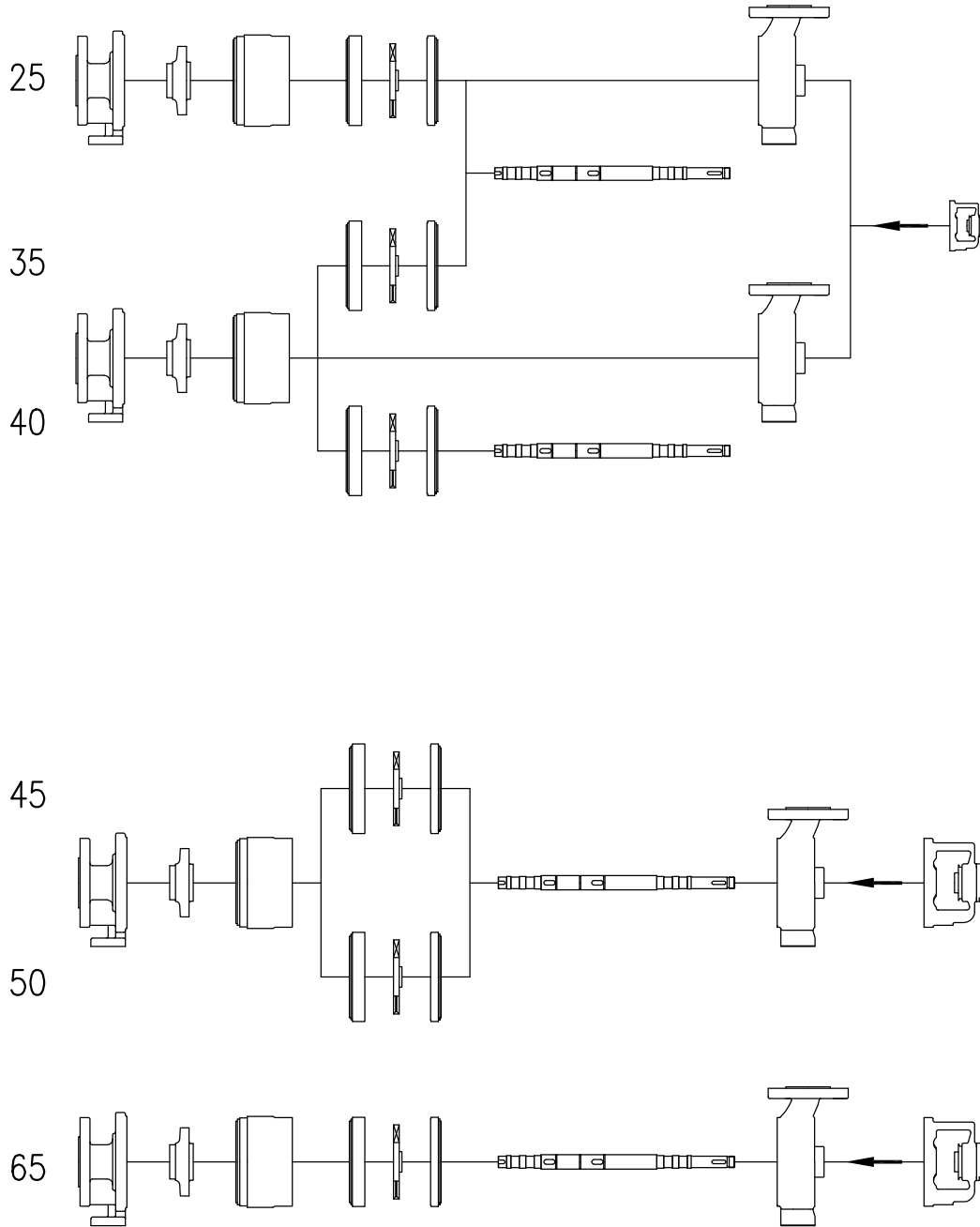


## 8. Troubleshooting

Failure number									Problem	Elimination
1	2	3	4	5	6	7	8	9		
		X							Coupling gap not correct	Correct coupling guard
		X							No cooling flow available from motor to antifriction bearing	Check the installation Install a cooling fan
				X	X	X			Rated flow too low	Increase rated flow
						X	X	X	Abrasive solids	Abrasive solids are not allowed Consult the factory
X							X		Axial clearance of impellers too big	Replace parts
							X		Suction height too high	Check liquid level
								X	Shaft sealing worn out	Renew shaft sealing Check flushing/barrier fluid
								X	Shaft sleeve grooved or rough	Renew shaft sleeve
								X	Failure in circulation pipe	Enlarge cross section
								X	Damaged elastomeres on mechanical seal	Replace elastomeres Check material consistency
								X	Boiling point of pumped liquid at atmospheric pressure is below the operating temperature	Use double mechanical seal Use seal with steam quench



# 9. Interchangeability





# 10. Sectional drawings

## 10.1 Pump

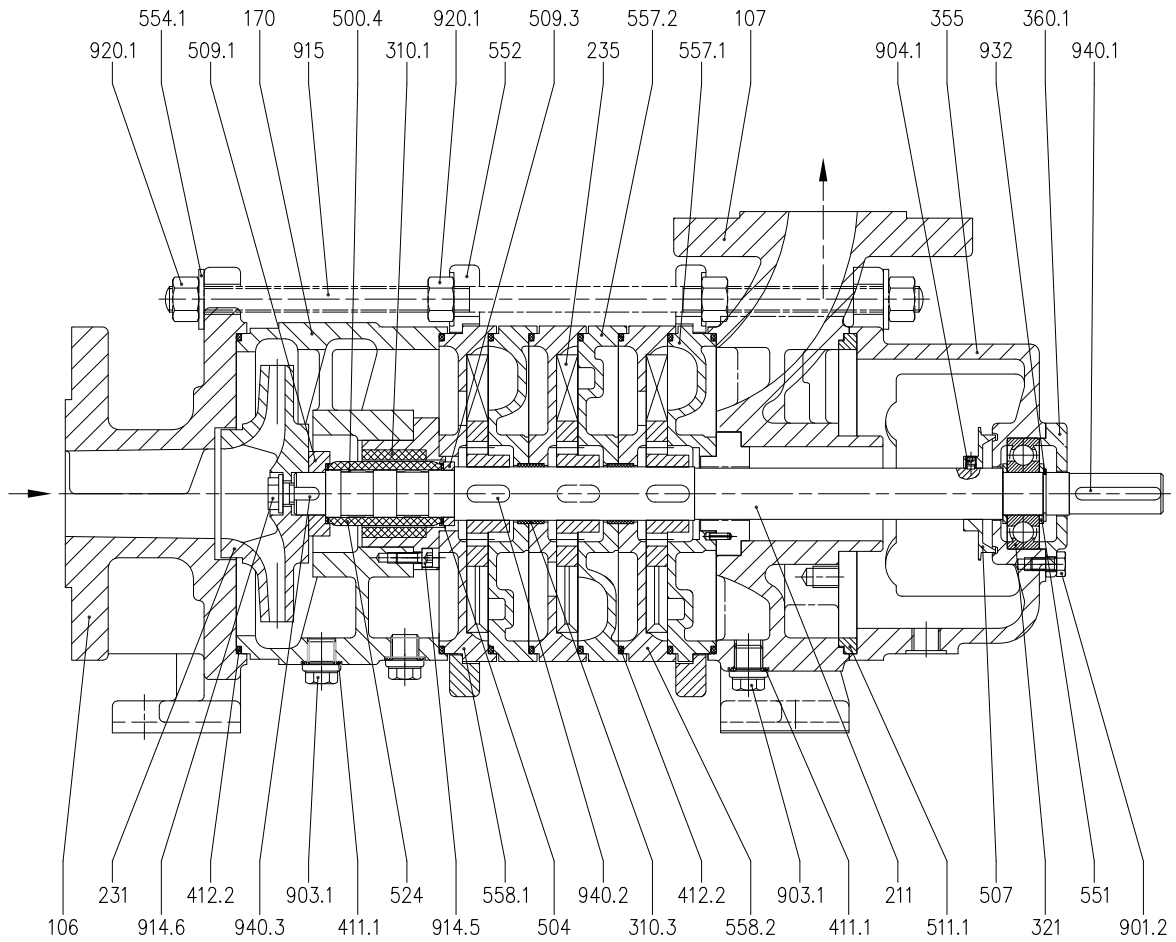


Fig. 14: Sectional drawing – standard design SC

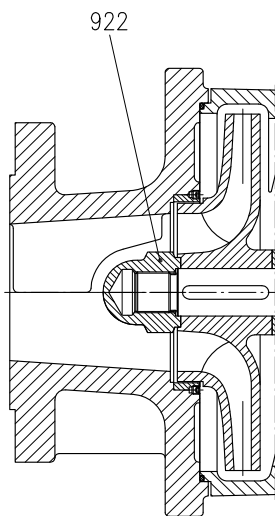


Fig. 15: Impeller screwing SC 65

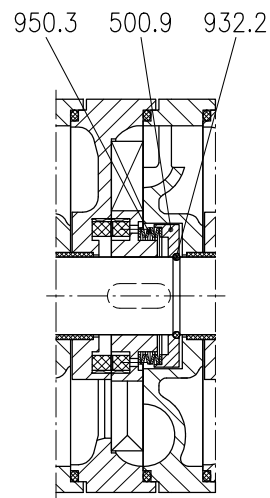


Fig. 16: wear resistant design



## 10.2 Mechanical seals

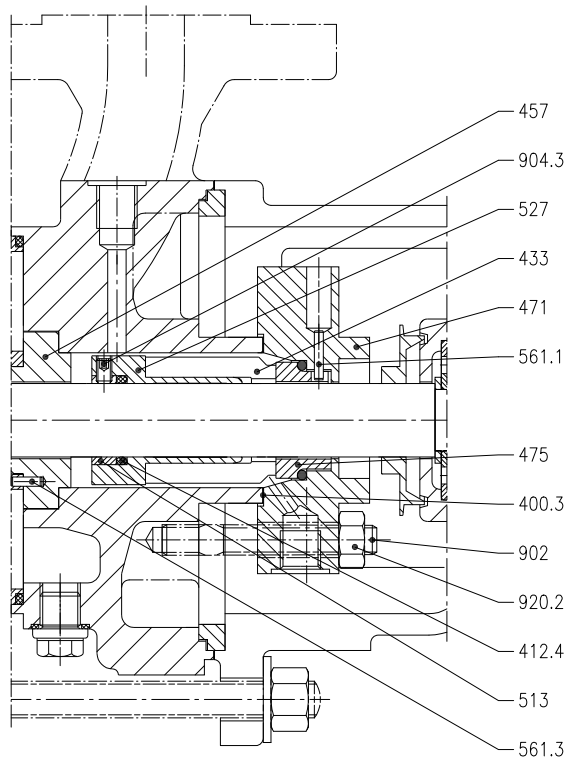


Fig. 17: single acting DIN Standard Mechanical seal, design „Ge“

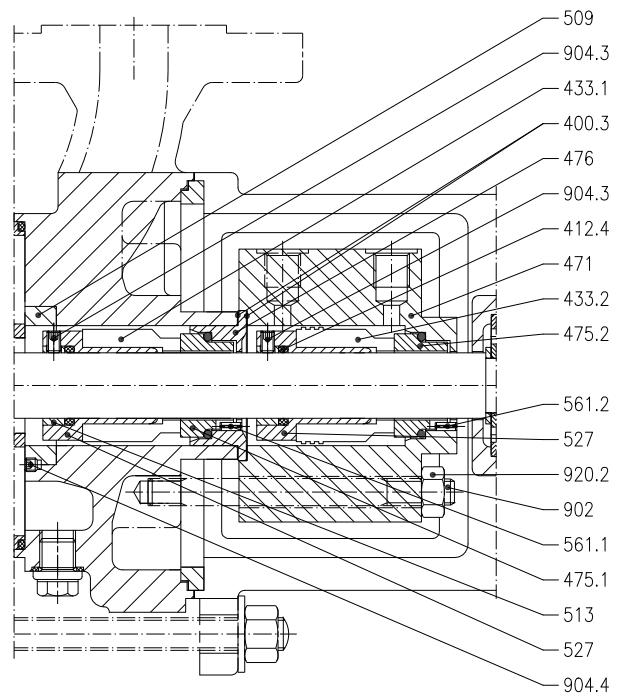


Fig. 18: Tandem-DIN Standard Mechanical seal, design „Te“

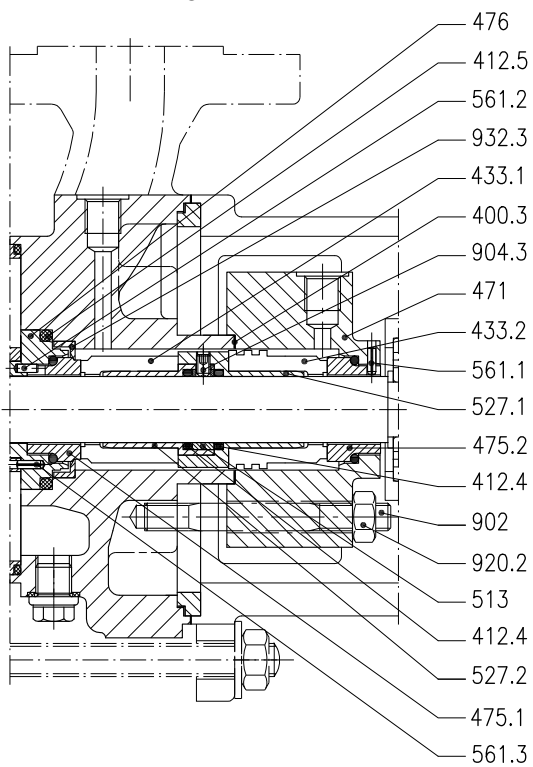


Fig. 19: double acting DIN Standard Mechanical seal, design „Gde“

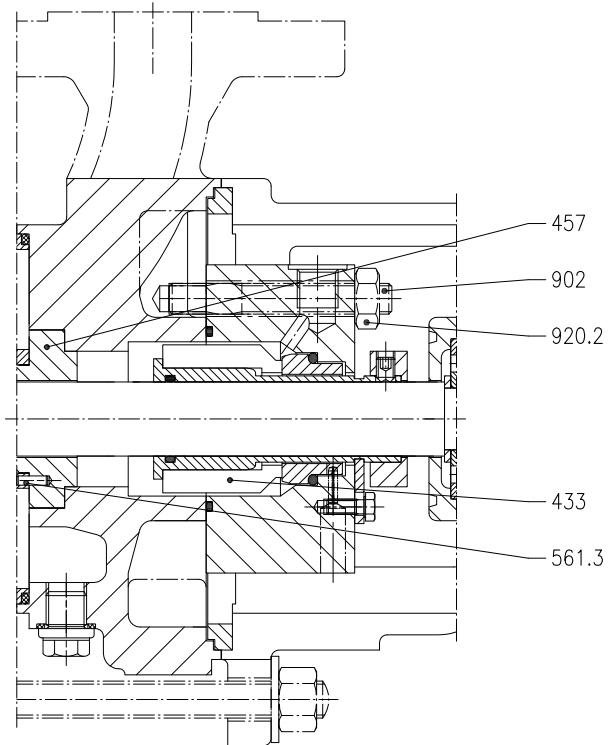


Fig. 20: Cartridge-Mechanical seal, design „Cart“



# 11. CERTIFICATES

## 11.1 EC-Declaration of Conformity

### EC-Declaration of Conformity

according to EC-Machinery Directive 2006/42/EG, Annex II, No. 1A

DICKOW PUMPEN KG  
Siemensstraße 22  
D-84478 Waldkraiburg

Herewith we declare that the pump unit described in the data sheet

**Designation** : Side channel pump  
**Type:** SC  
**Size** :  
**Design:**  
**Serial No.:**

is in compliance with all relevant provisions of the EC-Machinery Directive 2006/42/EG.

Applied harmonized standards:

EN 809:1998+A1:2009+AC:2010	EN ISO 12732-1:2008
EN ISO 12100:2010	EN ISO 12732-3:2008
EN 12162:2001+A1:2009	EN ISO 20361:2009

Additionally applied standards and technical specifications:

EN ISO 5199:2002	VDMA 24276:2001
EN ISO 9906:1999	
EN 12723:2000	
EN 22858:1993	


Waldkraiburg,

(Jürgen Konrad, Head of Technical Dept. at DICKOW)

Jürgen Konrad is authorized to compile the technical documentation



## 11.2 Document of Compliance

 <b>DICKOW PUMPEN</b>	<b>Document of Compliance</b>	
<p>Please fill in this statement for health innocuousness completely and attach it to the pump to be returned to the factory.</p>		
<p><b><u>Pump data</u></b></p>		
<p>Type:</p>	<p>Serial No.: PB</p>	
<p><b><u>Reason for shipment</u></b></p>		
<p><b><u>Contamination of the pump</u></b></p>		
<p><input type="checkbox"/> Hazardous liquids were <b>not</b> handled  <input type="checkbox"/> Hazardous liquids were handled</p>		
<p>Pumped liquid:</p>		
<p>The pump has been</p>		
<p><input type="checkbox"/> cleaned</p>	<p><input type="checkbox"/> flushed</p>	<p><input type="checkbox"/> breamed</p>
<p>The following safety measures must be taken before opening/repairing the pump:</p>		
<p><b><u>Customer data</u></b></p>		
<p>Company:</p>	<p>Phone:</p>	
<p>Address:</p>	<p>Fax:</p>	
<p>Name: (Block Letters)</p>	<p>E-Mail:</p>	
<p>Position:</p>		
<p>This is to certify that the above mentioned pump has been proper cleaned/flushed/breamed and repair can be performed without risk.</p>		
<p>Date:</p>	<p>Signature:</p>	