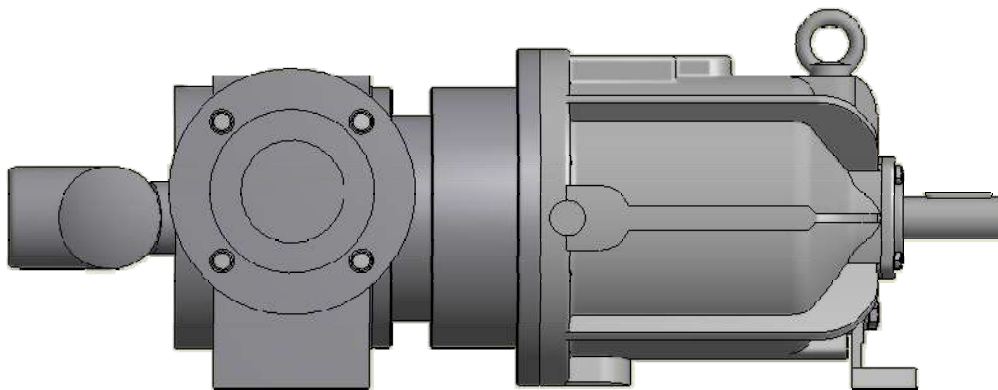


Operating / Installation Instructions

GML

No. 44.GML.E1.09/ 16



Original Manual





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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.




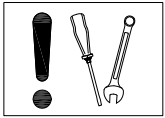

Indications and plates attached to the pump must be followed and kept in legible condition.

2.1 Designation of Warning Notices

Signal word	Explanation
DANGER	signifies an imminent danger. If it will not be avoided, death or severe injury are the consequence.
WARNING	signifies a possibly dangerous situation. If it will not be avoided, death or severe injury may be the consequence.
CAUTION	signifies a possibly dangerous situation. If it will not be avoided, slight or minor injury may be the consequence.
ATTENTION	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.



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

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.

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 Explosion Proof Directive. The ”Ex”- symbol shown here marks the chapters in this manual which require special attention.

2.9.1 Surface temperature

The highest surface temperatures are to be expected at the pump casing, the containment shell and in the area of antifriction bearings. The surface temperature at the pump casing is equal to the temperature of the pumped liquid.

The surface of the bearing bracket must be uncovered. Insulation of the bearing bracket is not allowed. The containment shell temperature can be determined with Figure 1 and the following formula.

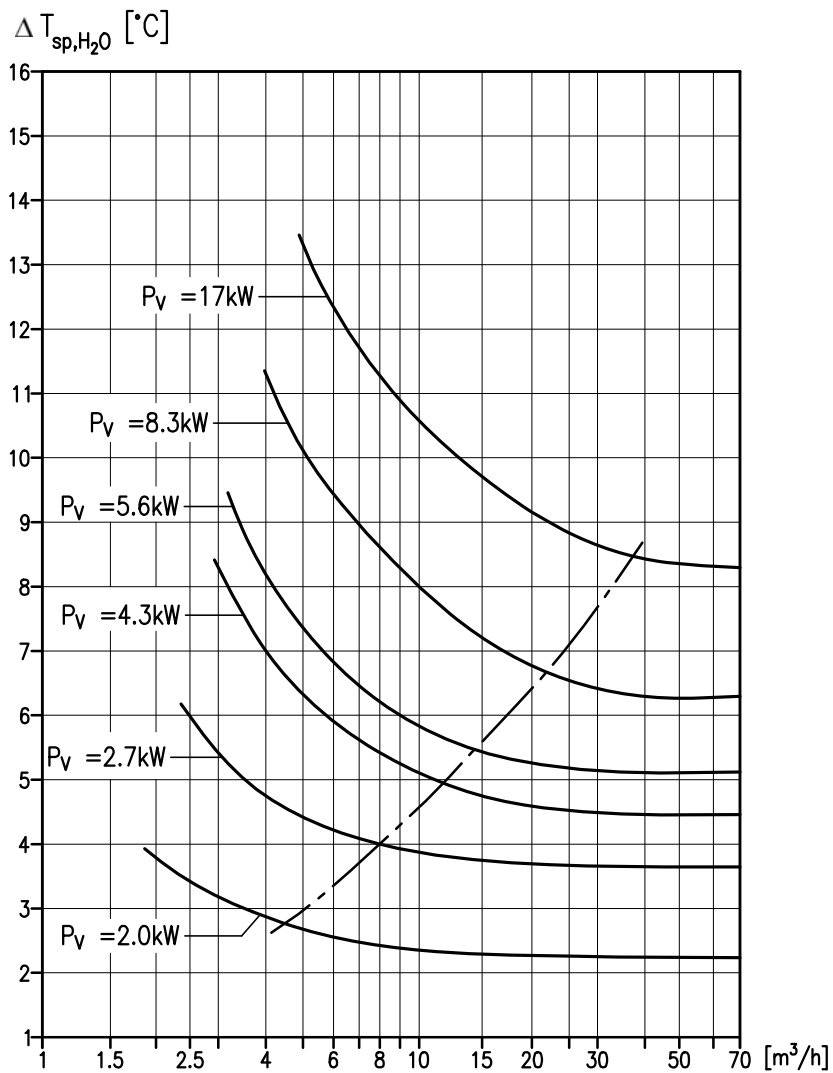


Fig. 1: Containment shell temperature as a function of magnet losses P_v based on water.

$$T_{sp,medium} = T_E + \Delta T_{sp,H_2O} \times \frac{C_{H_2O}}{C_{medium}} \times \frac{\rho_{H_2O}}{\rho_{medium}}$$

T_E = Inlet temperature of product at suction flange

$\Delta T_{sp,H_2O}$ = Refer to Figure 1

C_{H_2O} = Specific heat capacity of water = 4,187 kJ / kgK

C_{medium} = Specific heat capacity of handled liquid [kJ / kgK]

ρ_{H_2O} = Density of water = 1 kg / dm³

ρ_{medium} = Density of handled liquid [kg / dm³]



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. The following risks must be considered:

- **Plugging of internal circulation channels**
The inner liquid filled area of the magnet coupling is cooled by an internal circulation. Interruption of this internal circulation through certain properties of the product (e.g. polymerization) can cause an inadmissible temperature rise.
- **Desynchronisation of the magnet coupling**
Overstressing, overheating or non-observance of the design data may result in desynchronisation of the magnet coupling. The generated heat energy may cause temperature rise of the containment shell.
- **Solids between inner magnet and containment shell**
Large solids may become wedged between inner magnet and containment shell and cause inadmissible temperature rise at the containment shell through friction.
- **Product leakage**
If a containment shell is damaged (= rare failure) and leaking product can endanger the environment, a leakage monitor should be provided.
Interaction with adjoining materials must be considered.
- **Operation below the minimum flow**
- **Operation above the maximum flow**

The following monitoring devices can be supplied:

- Level switch to avoid dry running.
- Temperature monitoring of the containment shell for controlling elevated temperatures in the containment shell.
- Power monitor for controlling minimum flow and/or maximum flow and detection of dry run and desynchronisation of the magnet coupling.
- Monitoring of the inner area of the bearing bracket to detect leakage due to containment shell damage.



2.10 Magnet coupling

DANGER

Strong magnetic field from the area of the magnet coupling or from single magnets.



Danger to life for individuals with pace maker!
Disturbance of magnetic data media, electronic devices, components and instruments!
Uncontrolled attractive force between magnetic components, tools etc.!

- A safe distance of 0,3 m minimum must be maintained.

The safe distance refers to inner and outer magnets which are not yet installed in the pump.

In mounted condition, the magnetic field is completely shielded. There is no danger through magnetic fields from an assembled pump. This refers also to pace makers.



3. Description

3.1 General description

These gear pumps operate according to the internal gear principle in order to generate the desired displacing process. The pump has only two moving parts, the impeller and the rotor, whereas the impeller is carried by the driven rotor. The pumped liquid is sucked into the free space between the tooth flanks of impeller and rotor. The crescent-shaped sickle closes the gaps between impeller and rotor, while the pumped liquid is displaced towards discharge side and pumped from there into the discharge flange. This results in a constant pumping capacity without pulsation.

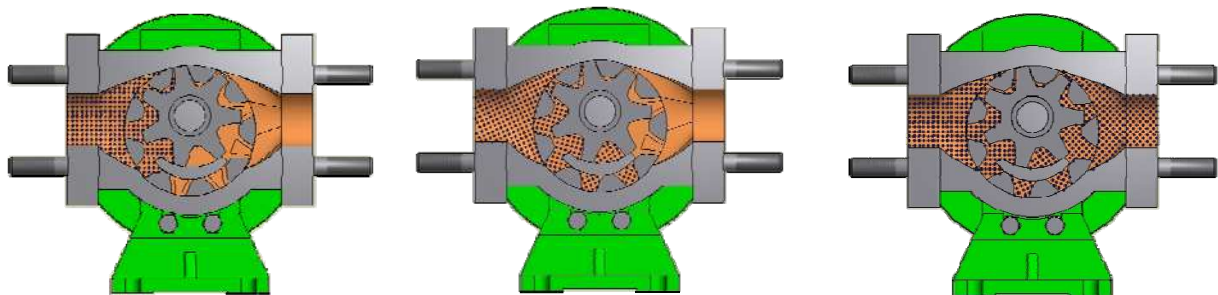


Fig. 2: Pumping principle of internal gear pump

3.2 Design code

Example: GML s 030 A 11 / 1,0 / 72 / 1 / 2

	Pump code
GML	Pump type
s	Material execution; e.g. s = EN-GJL / St
030	Pump size
A	Scope of supply; e.g. A = bare shaft pump
Magnet code	
11	Material; e.g. 11 = rotor 1.4571 + containment shell 1.4571
1,0	Wall thickness containment shell [mm]
72	Magnet length [mm]
1	Circulation; e.g. 1 = internal
2	Sleeve bearing design; e.g. 2 = shrink fitted



3. Description

3.3 Application limits

Pump size	Steel			Stainless steel		
	Max. speed [min ⁻¹]	Max. capacity [m ³ /h]	Nominal flow	Max. speed [min ⁻¹]	Max. capacity [m ³ /h]	Nominal flow
030	1800	7	5,7 m ³ /h @ 1450 min ⁻¹	1200	5	3,7 m ³ /h @ 920 min ⁻¹
080	1500	18	10,9 m ³ /h @ 920 min ⁻¹	1000	12	9,1 m ³ /h @ 780 min ⁻¹
130	1000	30	27 m ³ /h @ 920 min ⁻¹	640	19	14,8 m ³ /h @ 520 min ⁻¹
210	800	48	32 m ³ /h @ 520 min ⁻¹	520	31	25 m ³ /h @ 420 min ⁻¹

3.4 Identification

3.4.1 Name tag

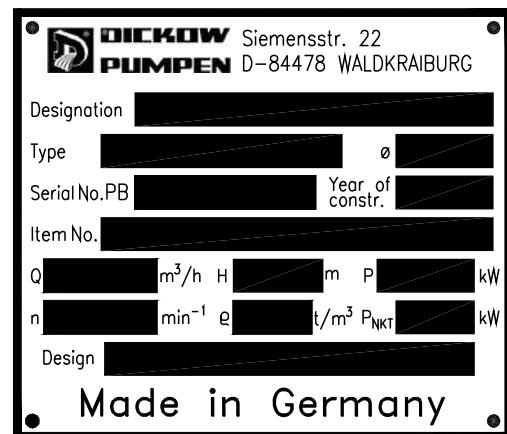


Fig. 3: Name tag German and English

3.4.2 Identification acc. to EC-Explosion Proof Directive

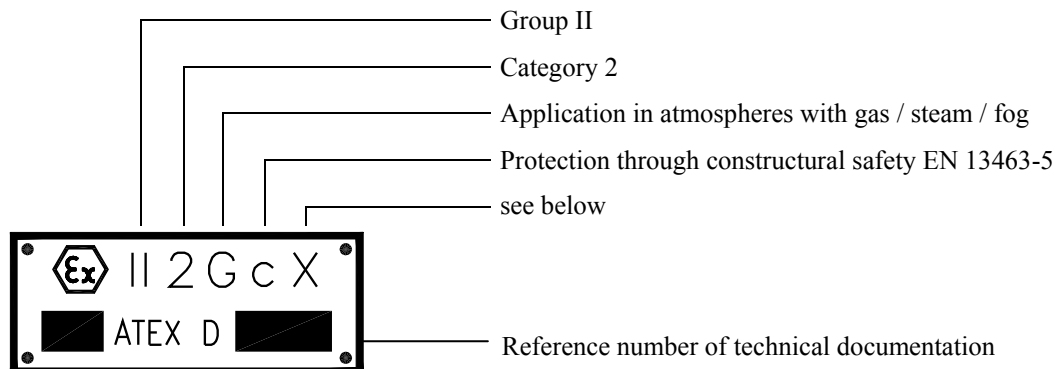


Fig. 4: ATEX-Name tag



3. Description

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.

3.5 Design

Design

- Internal gear pump
- Horizontal installation
- Single stage

Pump casing

- radially split
- cast-on feet

Bearing

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

Shaft sealing

- Magnet coupling

3.5.1 Magnet coupling

The drive power is transmitted by the motor - through the magnetic field lines - via the outer magnets to the inner magnet coupling. The inner and outer magnets are tied together through magnetic field lines and are therefore synchronized. No slip exists, the motor speed complies with the coupling speed.

The pump shaft with impeller and driven inner magnet is carried by wetted sleeve bearings. The SiC components have an almost unlimited service life as long as a stable fluid film is available between the sliding surfaces.

The heat in the metallic containment shells, generated through eddy currents, is dissipated through an internal circulation flow. The internal circulation is an additional safety against exceedance of boiling point in the magnet chamber and serves as a lubrication of the sleeve bearings.

3.5.2 Safety valve

These internal gear pumps are typically supplied with a safety valve which operates as an internal by-pass. Displacement pumps maintain a constant flow rate, also if pressure changes. With closed discharge pipe and without safety valve (by-pass), the pressure may increase until blocking of the motor. If the limit of the motor power is very high, the pressure can increase excessively and cause bursting of piping or damage of the pump.

The adjusting screw of safety valve must always point in direction of the suction pipe.



3. Description

3.5.3 Flange orientation / Rotation direction

The following Figure shows the possible flange orientations of the connection flanges at angular and horizontal arrangement! Front view to the safety valve.

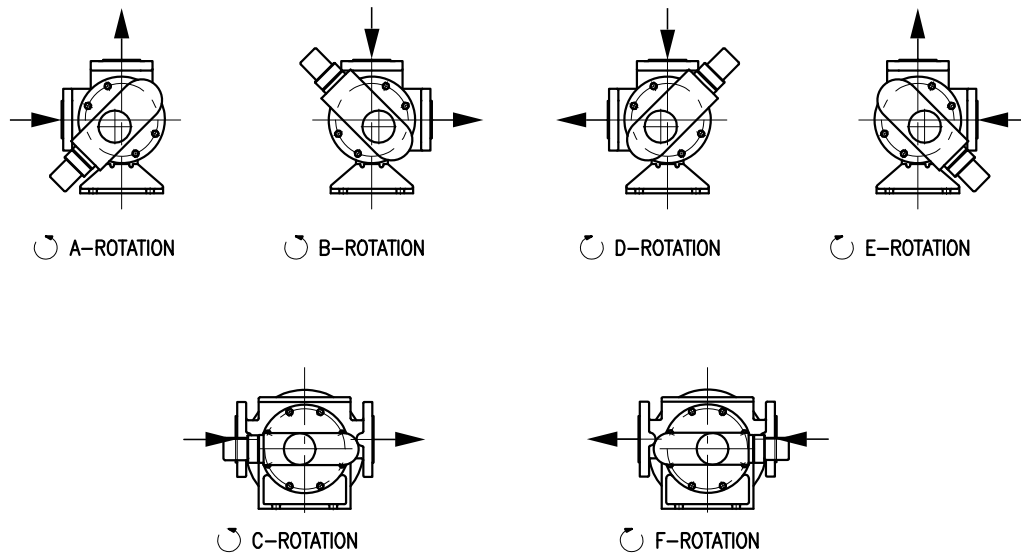


Fig. 5: flange orientation / rotation direction

Both rotation directions are possible without requiring change in design or replacing any components.

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 sturdy 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 up the pump on its bare shaft.
- Never hang up the pump on the ring screw of the motor.
- Do not stay underneath floating loads.
- Observe the local accident prevention regulations.
- Use suitable and approved lifting accessories.



Fig. 6: lifting the pump

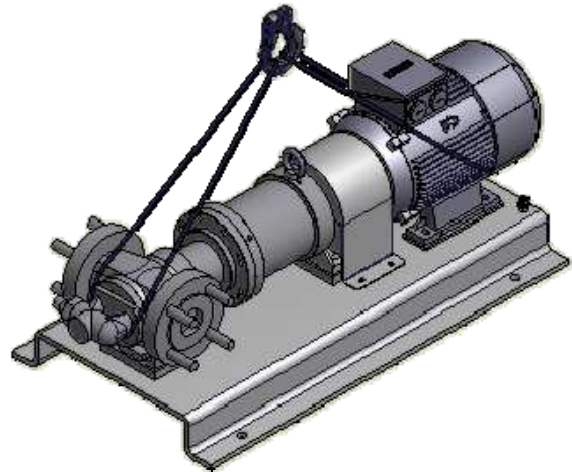


Fig. 7: lifting the complete pump unit

NOTE



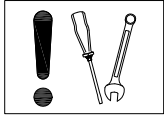
The ring screw 919 shall be used as lifting device when handling the pump.



4.2 Storage / Preservation

ATTENTION

Damage during storage through moisture or dirt.

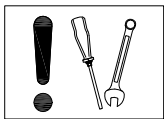


Corrosion and / or contamination of the pump!

- 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 at normal air humidity of 60%.
- Pump and motor must be decoupled.
- 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 inside storage period is 12 months.

If the storage period will be longer than 12 months, Dickow Pumpen must be informed. The pumps need to be treated with a long-term preservation, e.g. nitrogen-preservation.

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/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.

DANGER

Strong magnetic field from the area of the magnet coupling or from single magnets



Danger to life for individuals with pace maker!

Disturbance on magnetic data media, electronic devices, components and instruments!

Uncontrolled attractive force between magnetic components, tools etc.!

- A safe distance of 0,3 m minimum must be maintained.
- Consider additional notes in chapter 2.10.

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.



5. Installation / Mounting

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.

5.3.2 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

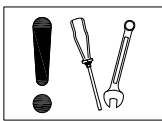


Exceedance of the allowable loads at the pump flanges

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.
- Compensate expansion of the piping in case of high temperatures.

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

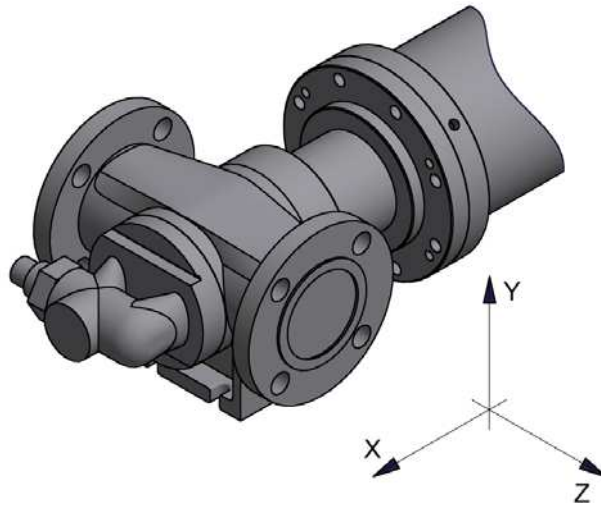


- Use a filter with a mesh width of 0,1 mm (pump size 30) or 0,2 mm.
- Insert filter with a surface of triple the pipe section.



5. Installation / Mounting

5.4.1 Allowable flange forces and moments



Pump size	DN	Fx, Fy + Fz [N]	Mx, My + Mz [Nm]
30	50 / 2"	667	339
80	50 / 2"	667	339
130	80 / 3"	1001	508
210	100 / 4"	1334	678

For casing designs of material EN-GJL, the above mentioned values must be multiplied by the factor 0,35.

5.5 Insulation

WARNING

Wetted casing parts adopt the temperature of the pumped liquid.

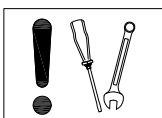


Risk of burns!

- 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

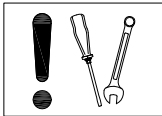


Risk of injury through moving components!

- 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.
- For higher operating temperatures a second alignment at operating temperature is absolutely necessary.

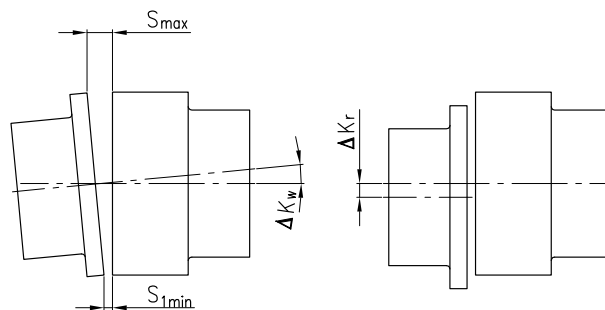


Fig. 8: Angular and radial misalignment of couplings

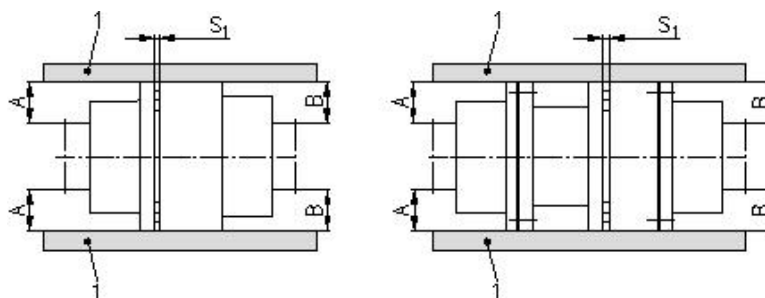


Fig. 9: Coupling alignment



5. Installation / Mounting

1. Dismantle coupling guard.
2. Loosen support foot.
3. Place a straight edge (1) axially across the coupling half.
4. Possible radial displacement ΔK_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° .
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 Δs_1 and ΔK_r of both coupling halves, refer to the instruction manual of the coupling manufacturer!
7. Mount the support foot.
8. Mount the coupling guard.

5.7 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 or NEC 505.

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

Use shims for height compensation.

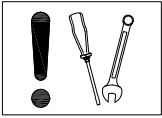
1. Dismantle coupling guard.
2. Check coupling alignment. Consider chapter 5.6.
3. Loosen hold down bolts of motor.
4. Place shims under the motor feet for height compensation.
5. Tighten hold down bolts of motor.
6. Check function of coupling / shaft. The coupling must easily be turnable by hand.
7.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



5. Installation / Mounting

ATTENTION

Offset of pump and motor



Damage of pump, motor and coupling!

- For higher operating temperatures a second alignment at operating temperature is absolutely necessary.

5.8 Electrical connection of the pump unit

DANGER

Improper electrical installation



Danger of explosion!

- Electrical installation requires additionally observance of IEC 60079-14 or NEC 505.
- 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 or NEC must be considered.

WARNING

Incorrect power connection



Short circuit

- Adhere to connection conditions of local energy supply companies.

NOTE



Star-Delta starting leads to a high torque increase when switching from star to delta, this can cause decoupling of the magnets. Therefore, star-delta starting is not suitable for magnetic coupled pumps. In order to reduce the starting current, a soft-starter is recommended.

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

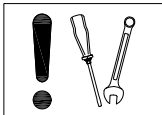


Danger of explosion!

- 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.
- The adjusting screw of the safety valve must always show towards the suction pipe.

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/Servicing/Inspection" must be considered and performed.

6.1.1 Filling and venting 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. Vent and fill up pump and suction pipe with liquid.
Pump is selfventing.
2. Open shut-off valve in suction pipe completely.
3. Open all additional connections completely (e.g. external circulation, external flush).

6.1.2 Adjusting the safety valve

The factory setting for all safety valves is 7 bar at full by-pass. Other settings are documented in the pump data sheet.

The factory setting will vary depending on the viscosity of the pumped liquid and the pump speed.

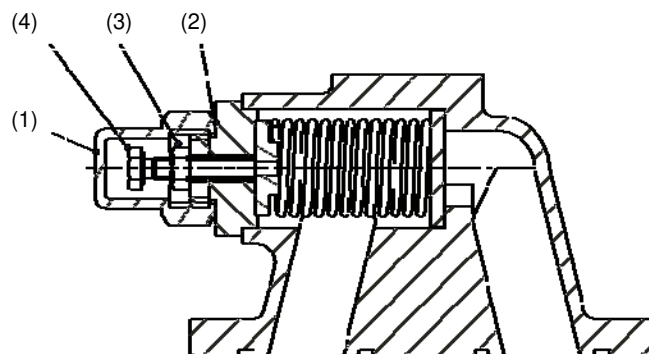


Fig. 10: safety valve



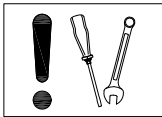
6. Commissioning / Decommissioning

If the factory setting needs to be changed, proceed as follows:

1. Mount the gauge in the discharge pipe as near as possible to the pump.
2. Remove cover (1) and cover seal (2).
3. Loosen the safety nut (3).
4. Start the pump.
5. Close the valve in discharge pipe slowly. Watch the pressure gauge. Stop immediately if the pressure exceeds the safety area.
6. If the valve is closed, the pressure gauge displays the total by-pass pressure setting for the existing speed and viscosity.

ATTENTION

High liquid temperature



Damage of the pump!

- Do not keep the valve closed in discharge pipe for a longer period.

7. Adjust the adjusting screw (4) for setting the by-pass as required.
Tighten the screw for increasing the setting; loosen the screw for reducing the setting.
8. Open the valve in discharge pipe again.
9. The setting shall be 15-25% above the normal operating pressure of the system.

DANGER

High surface temperature; evaporation of pump fluid



Danger of explosion!

- Never have the safety valve working in continuous operation.

NOTE



If other flow control devices are available in the system, adjust the safety valve according to this pressure.

NOTE



The safety valve on the pump shall only be used as a protection against overpressure. It must not be misused for flow control or other purposes.

10. Retighten the safety nut (3).
11. Install cover (1) and cover seal (2).



6.1.3 Design with heating jacket

Pump casing and containment shell with heating jacket.

Permissible heating agent:

- Hot water
- Steam
- Heat transfer oil

Pressure- and temperature limits for containment shell heating:

- $t_{\max} = 200^{\circ}\text{C}$
- $p_{\max} = 25 \text{ bar}$

ATTENTION

Elevated surface temperature

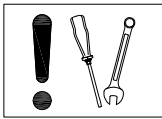


Danger of explosion!

- Consider the allowable temperature class.

ATTENTION

Lack of heating fluid

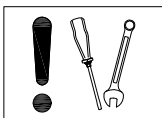


Damage of the pump!

- Provide sufficient amount of heating fluid.

ATTENTION

Heating period too short

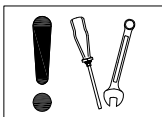


Damage of the pump!

- Consider a sufficient heating period of the pump (approx. 2 hours).
- Check free rotation of the pump shaft.

ATTENTION

Exceedance of the allowable heating fluid temperature



Leak of pumped liquid or heating agent!

- Consider the application limits for pressure and temperature.

6.1.4 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. Pay attention to the synchronicity of pump and motor. Decoupling leads to low differential head and noise in the magnetic coupling.
4. When the 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.

DANGER

Elevated temperature through decoupling of the magnet coupling



Danger of explosion!

- Switch off pump unit immediately.
- Eliminate cause of malfunction.

6.2 Operating the pump

WARNING

High surface temperatures through hot liquids

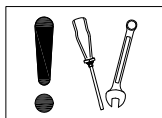


Risk of burns !

- 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 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.

6.3.1 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

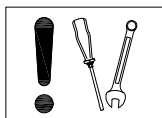


Read instruction manual of motor manufacturer!

6.3.2 Abrasive liquids or solids

If products containing abrasive solids are handled, increased wear is expected. The inspection intervals in this regard must be shorter than the usual ones.

ATTENTION



Magnetic particles in the pumped liquid

Damage of the magnet coupling!

- Take appropriate measures to keep the containment shell area free of magnetic particles.
- If magnet filter is used, provide differential pressure measurement.



6.4 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.

6.5 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.

DANGER



Strong magnetic field in the area of magnet coupling or single magnets

Danger to life for individuals with cardiac pacemakers!

Disruption of magnetic data medium, electric devices, components and instruments!

Uncontrolled attractive force between magnetic components, tools etc.!

- A safe distance of minimum 0,3 m must be maintained..

WARNING



Unintentional switching-on of the pump unit

Risk of injury through moving components !

- Works on the pump unit may only be done 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

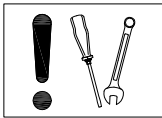


Danger of explosion! Fire hazard!

- Check antifriction bearings regularly for running noise.
- Check the lubricant level regularly.

ATTENTION

Wear caused by dry run

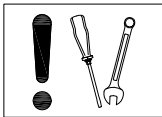


Damage of the pump!

- 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. The calculated lifetime of antifriction bearings is – also under critical service conditions – more than 25000 operating hours.

7.2.2 Lubrication of sleeve bearings

Sleeve bearings require a stable liquid film. Checking of 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.

7.4.2 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!

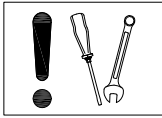
- Secure the motor by lifting or bracing.



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 No.
	030	080	130 + 210	
Socket wrench / adapter unit	60.807			921.2
Socket wrench	60.2336	60.863	60.670	921.1
Assembly tool	60.1885			321.2/213
Knipex-plier wrench	46 mm / 1 3/4 "			940

7.4.4 Disassembly of bearing bracket

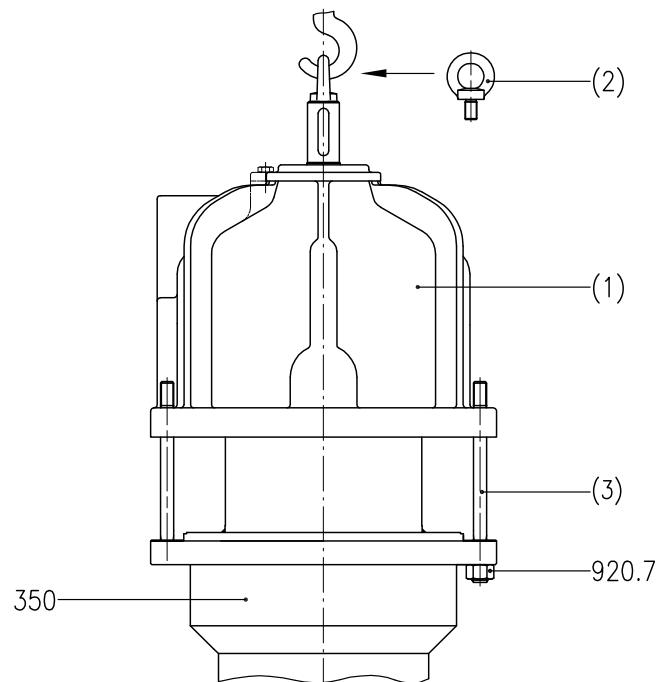


Fig. 11: Disassembly of bearing bracket

1. Remove the motor, consider chapter 7.4.2.
2. Remove the pumps from the piping.
3. Place the pump on a clean and even bench.
4. Remove hexagon nut 920.7 from the bearing housing 350.
5. Pull off the complete drive unit (1) by crane. Use of a ring screw (2) is recommended.
6. Place the drive unit in vertical position on a clean and even bench.



WARNING

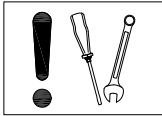


Tilting the pump

Squeezing of hands and feet!

- Secure the pump by lifting or bracing.

ATTENTION



Outer magnet is touching the containment shell

Damage of containment shell or outer magnet!

- Use guide rods (3).

7.4.5 Disassembly of antifriction bearing

The works according to chapter 7.4.5 are completed.

1. Fix the drive unit to the bench and secure it against twisting.
2. Remove ring screw and key.
3. Loosen hexagon nut 901.2 and remove it together with bearing cover 360 and radial seal ring 421.
4. Reinsert the key 940.2 and press it in by a Knipex-plier wrench.

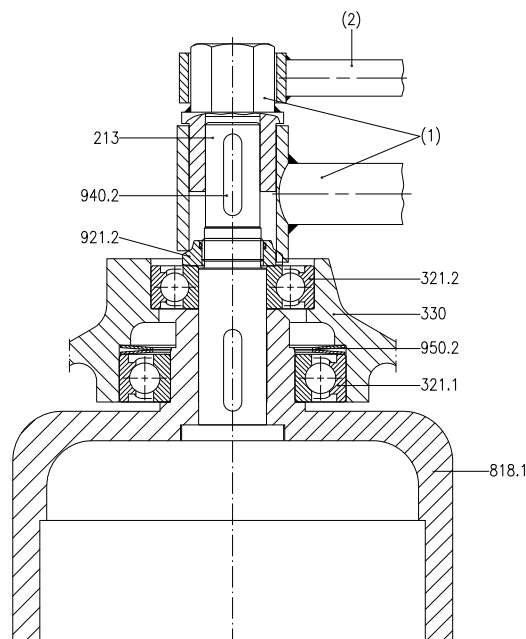


Fig. 12: Disassembly of shaft nut

5. Fit the socket wrench / adapter unit (1) – see chapter 7.4.3 – to the shaft nut 921.2 and loosen it by a ring spanner (2) (left hand thread).
6. Remove key 940.2.
7. Press the drive shaft 213 with a press- or drilling spindle down and out off the bearing 321.2.
8. Remove the bearing 321.2 from the bearing bracket 330 using a puller.
9. Take care of the cap springs 950.2.
10. Pull off the bearing 321.1 from drive rotor 818.1 using a puller.



7.4.6 Replacing antifriction bearings

Pump size	321.1	321.2
030 + 080	6211.2ZR.C3.L100	6306.2ZR.C3
130 + 210	6212.2ZR.C3.L100	6307.2ZR.C3

7.4.7 Disassembly of rotor, sleeve bearing and shaft sleeve

The works according to chapter 7.4.5 are completed.

WARNING

Possibly available residues of pumped liquid



Danger for individuals and environment!

- Wear protective clothing.

1. Loosen and remove inner hexagon cap screws 914.7.
2. Loosen containment shell 817 by jack screws.
3. Loosen hexagon nut 920.2.
4. Detach pump casing 101 from bearing housing 350 by using jack screws.
5. Loosen the shaft nut 921.1 by socket wrench – see chapter 7.4.3 (left hand thread).
6. Pull off the rotor 818.2.

WARNING

Axial magnetic forces



Danger of squeezing fingers and hands!

- Use non-magnetic tools only.
- Never place the rotor 818.2 near magnetic components.

7. Remove key 940.4.
8. Loosen inner hexagon cap screws 914.11.
9. Remove stationary sleeve bearing 310.2.
10. Pull off shaft sleeve 524 and intermediate ring 509.1 as well as start-up ring 500.1 from pump shaft.
11. Pull the pump shaft unit out off the bearing housing unit.
12. Loosen inner hexagon cap screw 914.10.
13. Remove stationary sleeve bearing 310.1.
14. Remove key 940.5.
15. Pull off shaft sleeve 524 and start-up ring 500.5 from pump shaft.



7.5 Inspection

7.5.1 Magnet assembly

Driven rotor 818.2

Surface must be free of cracks and bulges. Check parallelism by a bevelled steel edge.

Drive rotor 818.1

Replace outer magnets if mechanical or chemical damage is visible.

Ball bearing seats must be measured, the rotor must be replaced if values fall below the following:

Pump size 030 + 080 → 55,002 mm
Pump size 130 + 210 → 60,002 mm

Torque capacity

Torques of new magnets are stated in the table below. Magnet length according to pump data sheet or name tag. For magnets in operation a devaluation of 10% is allowed. Bigger devaluation requires exchange of magnet coupling.

Pump size	Magnet length [mm]	Torque [Nm]
030	36	20
	54	29
	72	40
080	90	95
	108	114
130 + 210	70	165
	80	190
	90	210
	100	235
	110	260
	120	280

7.5.2 Bearing bracket

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

Pump size 030 + 080 → 100,022 mm + 72,018 mm
Pump size 130 + 210 → 110,022 mm + 80,018 mm

7.5.3 Rotor and impeller

For highly viscous liquids (> 1650 cSt) and/or high temperature applications (> 100°C), the components rotor 818.3 and impeller 237 have no standard dimensions. In this case please contact Dickow Pumpen.



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 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.

WARNING

Hitting of rotor against containment shell or of containment shell against coupling half through magnetic forces

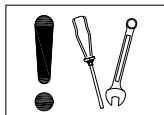


Damage of magnets and bearing! Risk of injury!

- Strictly follow the assembling instructions.

ATTENTION

Unprofessional assembly

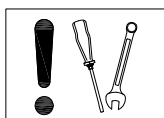


Damage of the pump!

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

ATTENTION

Improper mounting



Damage of outer magnet coupling!

- Use guide rods.

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 rotor, sleeve bearing and shaft sleeve

1. Slide start-up ring 500.5 and shaft sleeve 524 onto the pump shaft and insert key 940.5.
2. Secure the stationary sleeve bearings 310.1 with inner hexagon cap screws 914.10 to the bearing housing 350.
3. Push the pump shaft unit into the bearing housing unit.
4. Slide start-up ring 500.1, intermediate ring 509.1 as well as the second shaft sleeve 524 onto the pump shaft.
5. Mount the stationary sleeve bearing 310.2 with inner hexagon cap screws 914.11 to the bearing housing 350.
6. Insert key 940.4 into the pump shaft and press it in.
7. Place the rotor 818.2.

WARNING



Axial magnetic forces

Danger of squeezing fingers and hands!

- Use non-magnetic tools.
- Never place the rotor 818.2 near magnetic components.

8. Tighten the shaft nut 921.1 by a socket wrench – see chapter 7.4.3 – (left hand thread).
9. Fit the containment shell 817, use a new O-ring 412.3.
10. Tighten the inner hexagon cap screws 914.7 at the containment shell by a torque wrench.
11. Insert the bearing housing unit into the pump casing 101. Use a new O-ring 412.2.
12. Tighten the hexagon nut 920.2 by a torque wrench.

7.6.3 Assembly of antifriction bearings

1. Heat up the antifriction bearing 321.1 to 80-100°C.
2. Push the bearing onto the drive rotor 818.1 until limit.
3. Press the bearing 321.2 into the bearing bracket 330, using assembling tool (1) – see chapter 7.4.3 – and a press or drilling spindle.

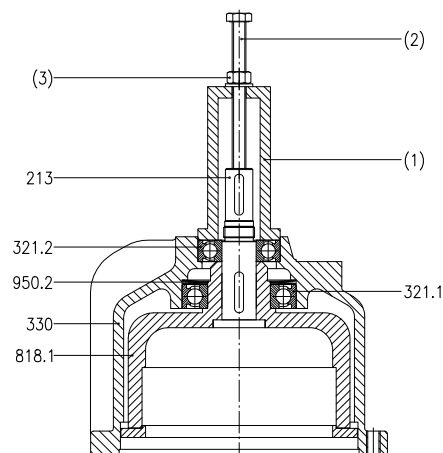


Fig. 13: Mounting antifriction bearings



4. Clamp the assembling tool (1) in a jaw chuck and fit the bearing bracket 330 with the bearing 321.2.
5. Insert the cap springs 950.2 (X-arrangement).
6. Press the drive rotor 818.1 into the bearing bracket 330.
7. Insert the drive shaft 213 into the drive rotor 818.1.
8. Screw the spindle (2) into the drive shaft.
9. Place the bearing bracket unit on the bench.
10. Draw the drive shaft into the hub of the drive rotor by turning the hexagon nut (3).
11. Insert the key 940.2 and press it in by using a Knipex-plier wrench.
12. Fit the shaft nut 921.2 and tighten it by socket wrench / adapter unit (see Fig. 17) – (left hand thread).
13. Remove key 940.2.
14. Fit the bearing cover 360 with a new radial seal ring 421 and tighten it by hexagon cap screw 901.2.
15. Reinsert the key 940.2 and press it in by using Knipex-plier wrench.

7.6.4 Assembly of bearing bracket

WARNING

Tilting the pump

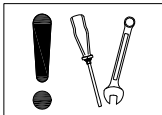


Danger of squeezing hands and feet!

- Secure the pump by lifting or bracing.

ATTENTION

Outer magnet is touching the containment shell



Damage of containment shell or outer magnets!

- Use guide rods.

1. Screw the ring screw into the thread of the drive shaft 213.
2. Lift the bearing bracket by crane.
3. Insert new gasket 400.15.
4. Lower the bearing bracket via the guide rods to the bearing housing 350.
5. Tighten the hexagon nut 920.7 by torque wrench.

7.6.5 Motor assembly

1. Fit the motor to the baseplate and couple it.
2. Align pump and motor. Consider chapter 5.7.
3. Align coupling. Consider chapter 5.6.
4. Fix the motor to the baseplate.



7.7 Bolt torques

	Bolt torque [Nm]	
	8.8 Standard bolt	A4-70 Standard bolt
M5	5	4
M6	9	6
M8	22	16
M10	45	30
M12	80	55
M16	195	135
M20	370	260

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 torque for containment shell screws 914.7 = 40 Nm.

Bolt torque for shaft nut 921 (independent of material):

Pump size	921 – Bolt torque [Nm]		
	M20 x 1,5	M27 x 1,5	M35 x 1,5
030 + 080	80	90	---
130 + 210	---	90	120



8. Troubleshooting

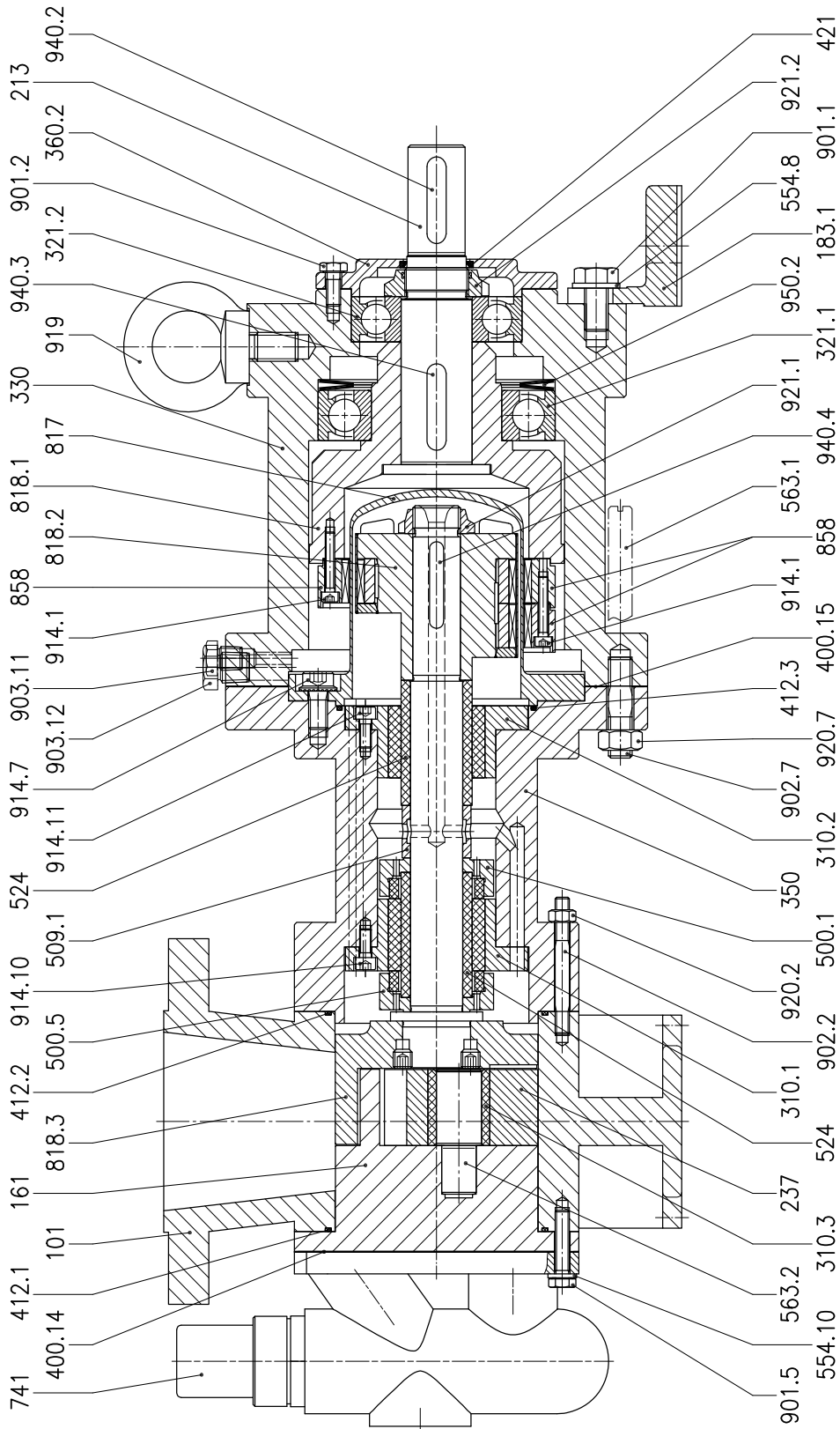
Failure	Number
Pump delivers no or not enough liquid	1
Motor is overloaded	2
Bearing temperature too high	3
Pump is leaking	4
Increased noises and vibrations	5
Inadmissible temperature increase	6
Sleeve bearing damage	7

Failure number							Problem	Elimination
1	2	3	4	5	6	7		
X				X	X		Pump or piping not completely vented or filled	Venting respectively filling
X							Shut-off valve in suction line not completely opened	Open shut-off valve
X							Air pockets in piping system	Correct piping layout Install vent valve
X							Wrong rotating direction	Exchange 2 phases of power supply
X	X				X		Viscosity of pumped liquid is higher than specified	Consult the factory
	X						Wrong speed	Check speed
		X		X			Pump 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				Casing screws and screwed plugs loose	Tighten the screws and plugs Renew gaskets
		X					Coupling gap not correct	Correct coupling gap
X					X	X	Torque of magnet coupling reduced	Check torque
				X	X	X	Rated flow too low	Increase rated flow
X				X	X		Magnet coupling decoupled	Shut down the motor and restart Check start-up safety Consult the factory
					X	X	Boiling point exceedance in containment shell area	Temperature monitor on containment shell Increase pressure in containment shell Increase minimum capacity



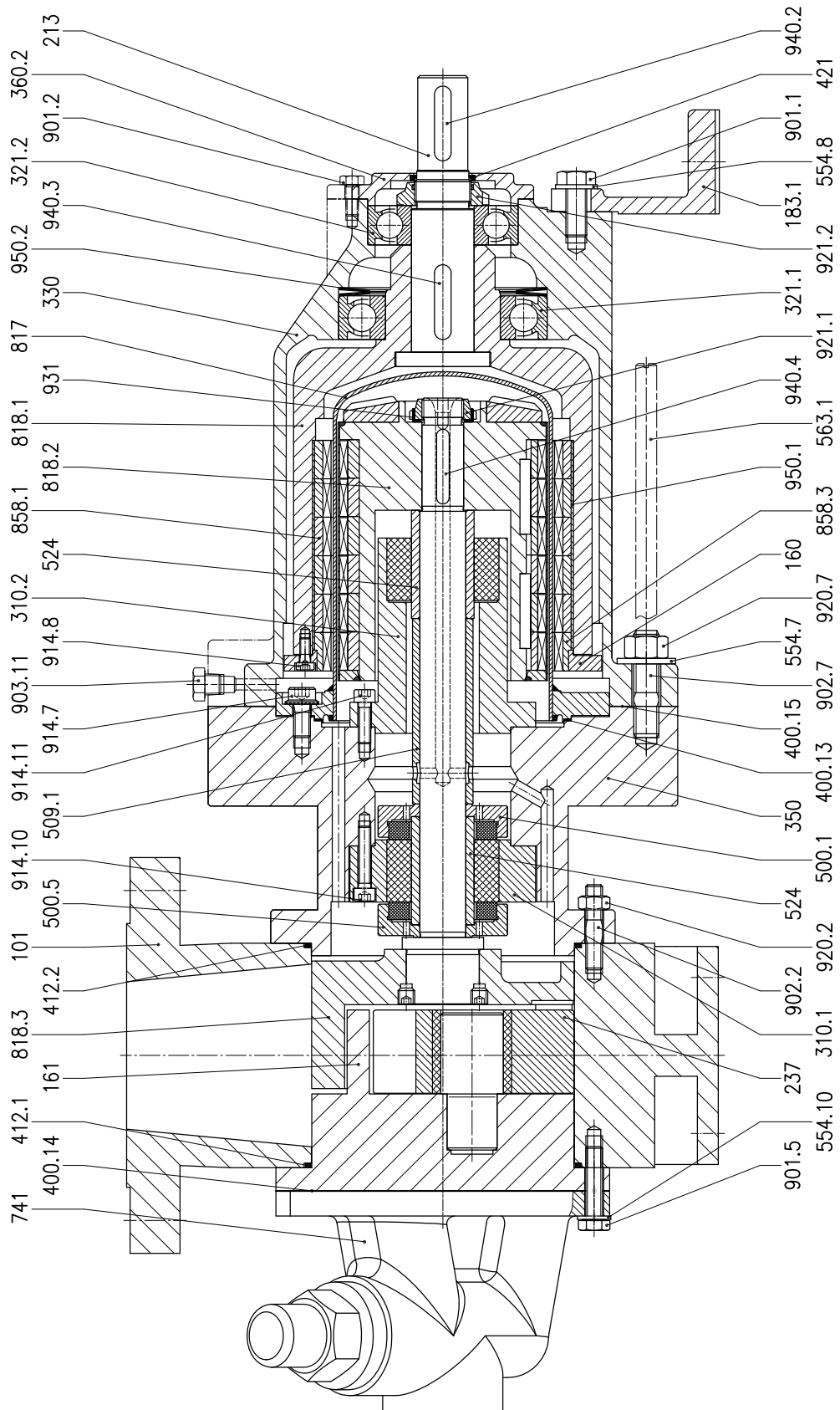
9. Sectional drawings

9.1 GML 030



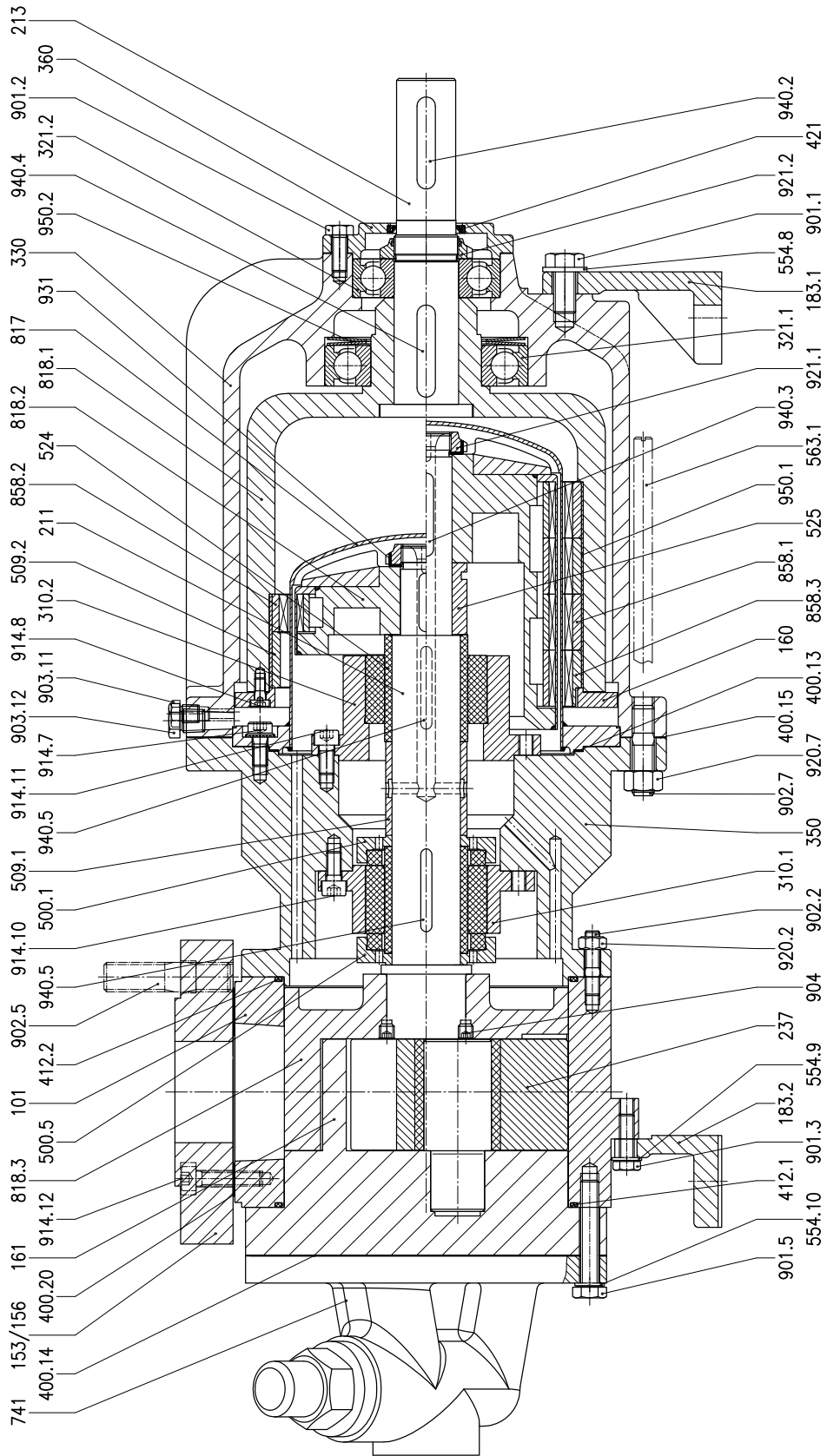


9.2 GML 080





9.3 GML 130/210





10. Certificates

10.1 EC-Declaration of Conformity

EC-Declaration of Conformity

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

DICKOW PUMPEN GmbH & Co. KG
Siemensstraße 22
D-84478 Waldkraiburg

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

Designation: Gear pump
Type: GML
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
EN 953:1997+A1:2009	


Waldkraiburg,

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

Jürgen Konrad is authorized to compile the technical documentation.



10.2 Document of Compliance

 DICKOW PUMPEN	Document of Compliance	
<p>Please fill in this statement for health innocuousness completely and attach it to the pump to be returned to the factory.</p>		
<p><u>Pump data</u></p>		
<p>Type:</p>	<p>Serial No.: PB</p>	
<p><u>Reason for shipment</u></p>		
<p><u>Contamination of the pump</u></p>		
<p><input type="checkbox"/> Hazardous liquids were not 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><u>Customer data</u></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>	