

In-line Twin Pump

Installation/Operating Manual
Omega DS



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Original operating manual Omega DS

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Glossary

Back pull-out unit

Pump without pump casing; partly completed machinery

Certificate of decontamination

A certificate of decontamination is enclosed by the customer when returning the product to the manufacturer to certify that the product has been properly drained to eliminate any environmental and health hazards arising from components in contact with the fluid handled.

Close-coupled design

Motor directly fitted to the pump via a flange or a drive lantern

Discharge line

The pipeline which is connected to the discharge nozzle

Hydraulic system

The part of the pump in which the kinetic energy is converted into pressure energy

IE3

Efficiency class to IEC 60034-30: 3 = Premium Efficiency (IE = International Efficiency)

In-line design

Suction and discharge nozzle are arranged opposite each other on the same axis

Pool of pumps

Customers/operators' pumps which are purchased and stored regardless of their later use.

Pump

Machine without drive, additional components or accessories

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Pump set

Complete pump set consisting of pump, drive, additional components and accessories

Suction lift line/suction head line

The pipeline which is connected to the suction nozzle

1 General

1.1 Principles

This operating manual is supplied as an integral part of the type series and variants indicated on the front cover. The manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series and size, the main operating data, the order number and the order item number. The order number and order item number uniquely identify the pump (set) and serve as identification for all further business processes.

In the event of damage, immediately contact your nearest KSB service centre to maintain the right to claim under warranty.

Noise characteristics see

1.2 Installation of partly completed machinery

To install partly completed machinery supplied by KSB refer to the sub-sections under Servicing/Maintenance.

1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. [⇒ Section 2.4, Page 10]

1.4 Other applicable documents

Table 1: Overview of other applicable documents


| Document | Contents |
|---|--|
| Data sheet | Description of the technical data of the pump (set) |
| General arrangement drawing/outline drawing | Description of mating and installation dimensions for the pump (set), weights |
| Drawing of auxiliary connections | Description of auxiliary connections |
| Hydraulic characteristic curve | Characteristic curves showing head, NPSH required, efficiency and power input |
| General assembly drawing ¹⁾ | Sectional drawing of the pump |
| Sub-supplier product literature ¹⁾ | Operating manuals and other documentation for accessories and integrated machine parts |
| Spare parts lists ¹⁾ | Description of spare parts |
| Piping layout ¹⁾ | Description of auxiliary piping |
| List of components ¹⁾ | Description of all pump components |
| Drawing for assembly ¹⁾ | Sectional drawing of the installed shaft seal |

For accessories and/or integrated machinery components observe the relevant manufacturer's product literature.

¹⁾ If agreed upon in scope of supply

1.5 Symbols

Table 2: Symbols used in this manual

| Symbol | Description |
|---|--|
| ✓ | Conditions which need to be fulfilled before proceeding with the step-by-step instructions |
| ▷ | Safety instructions |
| ⇒ | Result of an action |
| ⇔ | Cross-references |
| 1. 2. | Step-by-step instructions |
|  | Note Recommendations and important information on how to handle the product |








2 Safety



All the information contained in this section refers to hazardous situations.

2.1 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

| Symbol | Description |
|--|---|
|  DANGER | DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury. |
|  WARNING | WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury. |
|  CAUTION | CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions. |
|  | Explosion protection This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EC Directive 2014/34/EU (ATEX). |
|  | General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury. |
|  | Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage. |
|  | Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions. |

2.2 General

This manual contains general installation, operating and maintenance instructions that must be observed to ensure safe pump operation and prevent personal injury and damage to property.

The safety information in all sections of this manual must be complied with.

This manual must be read and completely understood by the specialist personnel/operators responsible prior to installation and commissioning.

The contents of this manual must be available to the specialist personnel at the site at all times.

Information attached directly to the pump must always be complied with and be kept in a perfectly legible condition at all times. This applies to, for example:

- Arrow indicating the direction of rotation
- Markings for connections
- Name plate

The operator is responsible for ensuring compliance with all local regulations not taken into account in this manual.

2.3 Intended use

- The pump (set) must only be operated within the operating limits described in the other applicable documents.
- Only operate pumps/pump sets which are in perfect technical condition.
- Do not operate the pump (set) in partially assembled condition.
- Only use the pump to handle the fluids described in the data sheet or product literature of the pump model or variant.
- Never operate the pump without the fluid to be handled.
- Observe the minimum flow rates indicated in the data sheet or product literature (to prevent overheating, bearing damage, etc).
- Observe the maximum flow rates indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage, etc).
- Do not throttle the flow rate on the suction side of the pump (to prevent cavitation damage).
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.

Prevention of foreseeable misuse

- Never open the discharge-side shut-off elements further than permitted.
 - The maximum flow rates specified in the product literature or data sheet would be exceeded.
 - Risk of cavitation damage
- Never exceed the permissible operating limits specified in the data sheet or product literature regarding pressure, temperature, etc.
- Observe all safety information and instructions in this manual.

2.4 Personnel qualification and training

All personnel involved must be fully qualified to transport, install, operate, maintain and inspect the machinery this manual refers to.

The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.

Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.

Training on the pump (set) must always be supervised by technical specialist personnel.

2.5 Consequences and risks caused by non-compliance with this manual

- Non-compliance with this operating manual will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices
 - Hazard to the environment due to leakage of hazardous substances

2.6 Safety awareness

In addition to the safety information contained in this manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

2.7 Safety information for the operator/user

- The operator shall fit contact guards for hot, cold and moving parts and check that the guards function properly.
- Do not remove any contact guards during operation.
- Provide the personnel with protective equipment and make sure it is used.
- Contain leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- If shutting down the pump does not increase potential risk, fit an emergency-stop control device in the immediate vicinity of the pump (set) during pump set installation.

2.8 Safety information for maintenance, inspection and installation

- Modifications or alterations of the pump are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts authorised by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- The pump casing must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the pump set out of service always adhere to the procedure described in the manual. [⇒ Section 6.1.6, Page 34] [⇒ Section 6.3, Page 37]
- Decontaminate pumps which handle fluids posing a health hazard. [⇒ Section 7.3, Page 41]
- As soon as the work has been completed, re-install and/or re-activate any safety-relevant and protective devices. Before returning the product to service, observe all instructions on commissioning. [⇒ Section 6.1, Page 32]

2.9 Unauthorised modes of operation

Never operate the pump (set) outside the limits stated in the data sheet and in this manual.

The warranty relating to the operating reliability and safety of the supplied pump (set) is only valid if the equipment is used in accordance with its intended use. [⇒ Section 2.3, Page 10]

2.10 Explosion protection



Always observe the information on explosion protection given in this section when operating the product in potentially explosive atmospheres.



Only pumps/pump sets marked as explosion-proof **and** identified as such in the data sheet may be used in potentially explosive atmospheres.

Special conditions apply to the operation of explosion-proof pump sets to EU Directive 2014/34/EU (ATEX).

Especially adhere to the sections in this manual marked with the Ex symbol and the following sections, [⇒ Section 2.10.1, Page 12] to [⇒ Section 2.10.4, Page 13]

The explosion-proof status of the pump set is only assured if the pump set is used in accordance with its intended use.

Never operate the pump set outside the limits stated in the data sheet and on the name plate. Prevent impermissible modes of operation at all times.

2.10.1 Marking

Pump The marking on the pump refers to the pump part only.

Example of such marking: II 2 G c TX

Refer to the Temperature Limits table for the temperatures permitted for the individual pump variants. [⇒ Section 2.10.2, Page 12]

Shaft coupling An EC manufacturer's declaration is required for the shaft coupling; the shaft coupling must be marked accordingly.

Motor The motor has its own marking. The marking is maintained on the condition that the temperatures the pump causes to develop at the motor flange and motor shaft are permitted by the motor manufacturer.

The motors used by DP on pumps with ATEX certification meet this condition.

2.10.2 Temperature limits

In normal pump operation, the highest temperatures are to be expected on the surface of the pump casing and at the shaft seal.

The surface temperature at the pump casing corresponds to the temperature of the fluid handled. If the pump is heated in addition, the operator of the system is responsible for observing the specified temperature class and fluid temperature (operating temperature). The table below lists the temperature classes and the resulting theoretical temperature limits of the fluid handled (a potential temperature rise in the shaft seal area has been taken into account).

The temperature class specifies the maximum permissible temperature at the surface of the pump set during operation. For the permissible operating temperature of the pump in question refer to the data sheet.

Table 4: Temperature limits

| Temperature class as per EN 13463-1 | Max. permissible fluid temperature |
|-------------------------------------|---|
| T1 | Temperature limit of the pump |
| T2 | 280 °C |
| T3 | 185 °C |
| T4 | 120 °C |
| T5 | 85 °C |
| T6 | Only after consultation with the manufacturer |

If the pump is to be operated at a higher temperature, the data sheet is missing or if the pump is part of a pool of pumps, contact DP for the maximum permissible operating temperature.

Motor supplied by the operator If a pump is supplied without motor (as part of a pool of pumps), the motor specified in the pump data sheet must meet the following conditions:

- The permissible temperature limits at the motor flange and motor shaft must be higher than the temperatures generated by the pump.
- Contact the manufacturer for the actual pump temperatures.

2.10.3 Monitoring equipment

The pump (set) must only be operated within the limits specified in the data sheet and on the name plate.

If the system operator cannot warrant compliance with these operating limits, appropriate monitoring devices must be used.

Check whether monitoring equipment is required to ensure that the pump set functions properly.

Contact KSB for further information on monitoring equipment.

2.10.4 Operating limits


The minimum flows indicated in [⇒ Section 6.2.4.1, Page 36] refer to water and water-like fluids handled. Longer operating periods with these fluids and at the flow rates indicated will not cause an additional increase in the temperatures at the pump surface. However, if the physical properties of the fluids handled are different from water, it is essential to check whether an additional heat build-up may occur and if the minimum flow rate must therefore be increased. The calculation formula in [⇒ Section 6.2.4.1, Page 36] can be used to check whether additional heat build-up may lead to a dangerous temperature increase at the pump surface.

3 Transport/Temporary Storage/Disposal

3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify DP or the supplying dealer (as applicable) and the insurer about the damage in writing immediately.

3.2 Transport



⚠ DANGER
The pump (set) could slip out of the suspension arrangement
Danger to life from falling parts!

- Always transport the pump (set) in the specified position.
- Never attach the suspension arrangement to the free shaft end or the motor eyebolt.
- Give due attention to the weight data and the centre of gravity.
- Observe the applicable local health and safety regulations.
- Use suitable, permitted lifting accessories, e.g. self-tightening lifting tongs.

To transport the pump/pump set suspend it from the lifting tackle as shown.

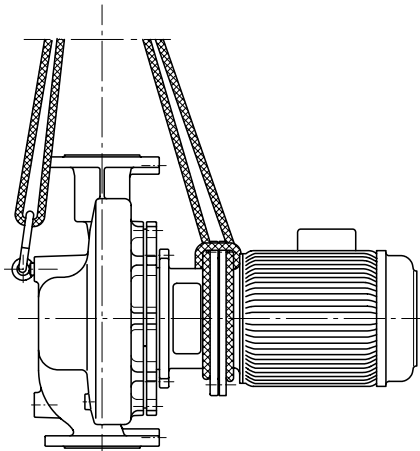



Fig. 1: Transporting the pump set



CAUTION
Incorrect transport of the pump
Damage to the shaft seal!

- For transport, lock the pump shaft with a suitable transport lock to prevent any movement of the shaft.

When transporting the pump without motor, shaft 210 must be locked.

1. Remove the screws on cover plates 68-3, press the cover plates slightly together and remove from drive lantern 341.
2. Insert lock washer 931.95 into the shaft groove.
3. Tighten hexagon head bolt 901.50.

To transport the pump/pump set suspend it from the lifting tackle as shown.

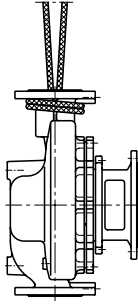


Fig. 2: Transporting the pump

3.3 Storage/preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for pump (set) storage.



CAUTION

Damage during storage by humidity, dirt, or vermin

Corrosion/contamination of the pump (set)!

- For outdoor storage cover the packed or unpacked pump (set) and accessories with waterproof material.



CAUTION

Wet, contaminated or damaged openings and connections

Leakage or damage to the pump!

- Clean and cover pump openings and connections as required prior to putting the pump into storage.

Store the pump (set) in a dry, protected room where the atmospheric humidity is as constant as possible.

Rotate the shaft by hand once a month, e.g. via the motor fan.

If properly stored indoors, the pump set is protected for a maximum of 12 months.

New pumps/pump sets are supplied by our factory duly prepared for storage.

For storing a pump (set) which has already been operated, the shutdown measures must be adhered to. [⇒ Section 6.3.1, Page 37]

3.4 Return to supplier

1. Drain the pump as per operating instructions. [⇒ Section 7.3, Page 41]
2. Always flush and clean the pump, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pump set has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pump set must also be neutralised, and anhydrous inert gas must be blown through the pump to ensure drying.
4. Always complete and enclose a certificate of decontamination when returning the pump (set).
Always indicate any safety and decontamination measures taken.
[⇒ Section 11, Page 59]



NOTE

If required, a blank certificate of decontamination can be downloaded from the KSB web site at: www.ksb.com/certificate_of_decontamination

3.5 Disposal



WARNING

Fluids, consumables and supplies which are hot and/or pose a health hazard

Hazard to persons and the environment!

- Collect and properly dispose of flushing fluid and any residues of the fluid handled.
- Wear safety clothing and a protective mask, if required.
- Observe all legal regulations on the disposal of fluids posing a health hazard.

1. Dismantle the pump (set).
Collect greases and other lubricants during dismantling.
2. Separate and sort the pump materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

4 Description of the Pump (Set)

4.1 General

- Non-self-priming in-line twin pump

Pump for handling clean or aggressive fluids which are neither chemically nor mechanically aggressive to the pump materials.

The pump set consists of two centrifugal pumps with separate hydraulics and drives. The pumps run in the same direction of rotation.

The changeover flap fitted in the discharge nozzle serves to shut off the stand-by pump.

4.2 Product Information as per Regulation No. 547/2012 (for water pumps with a maximum shaft power of 150 kW) implementing "Ecodesign" Directive 2009/125/EC

- Minimum efficiency index: see name plate, key to name plate
- The benchmark for the most efficient water pumps is $MEI \geq 0.70$.
- Year of construction: see name plate, key to name plate
- Manufacturer's name or trade mark, commercial registration number and place of manufacture: see data sheet or order documentation
- Product's type and size identifier: see name plate, key to name plate
- Hydraulic pump efficiency (%) with trimmed impeller: see data sheet
- Pump performance curves, including efficiency characteristics: see documented characteristic curve
- The efficiency of a pump with a trimmed impeller is usually lower than that of a pump with full impeller diameter. Trimming of the impeller will adapt the pump to a fixed duty point, leading to reduced energy consumption. The minimum efficiency index (MEI) is based on the full impeller diameter.
- Operation of this water pump with variable duty points may be more efficient and economic when controlled, for example, by the use of a variable speed drive that matches the pump duty to the system.
- Information on dismantling, recycling and disposal after decommissioning:
[⇒ Section 3.5, Page 16]
- Information on benchmark efficiency or benchmark efficiency graph for $MEI = 0.70$ (0.40) for the pump based on the model shown in the Figure are available at: <http://www.europump.org/efficiencycharts>

4.3 Designation

Example: Omega DS 032-032-160 GG X AA 06 D 2

Table 5: Designation key

| Code | Description | |
|------|--|--|
| OMDS | Pump type | |
| | OMDS | Omega DS |
| 032 | Nominal suction nozzle diameter [mm] | |
| 032 | Nominal discharge nozzle diameter [mm] | |
| 160 | Nominal impeller diameter [mm] | |
| G | Pump casing material | |
| | G | Grey cast iron EN-GJL-250/A48CL35 |
| G | Impeller material | |
| | G | Grey cast iron EN-GJL-250/A48CL35 |
| | B | Bronze CC480K-GS/B30 C90700 |
| | C | Stainless steel 1.4408/A743CF8M |
| X | Design | |
| | - | Standard |
| | X | Special design BT3D, BT3 |
| A | Casing cover | |
| | A | Conical seal chamber |
| A | Type of seal | |
| | V | Conical seal chamber with vent |
| | A | Conical seal chamber |
| 06 | Seal code | |
| | 06 | Mechanical seal material U3BEGG (shaft units 25, 35) |
| | 09 | Mechanical seal material U3U3VGG |
| | 10 | Mechanical seal material Q1Q1X4GG |
| | 11 | Mechanical seal material BQ1EGG |
| | 22 | Mechanical seal material AQ1EGG (shaft unit 55) |
| D | Scope of supply | |
| | A | Pump without motor |
| | D | Pump with motor |
| 2 | Shaft unit | |
| | 2 | Shaft unit 25 |
| | 3 | Shaft unit 35 |
| | 5 | Shaft unit 55 |

4.4 Name plate

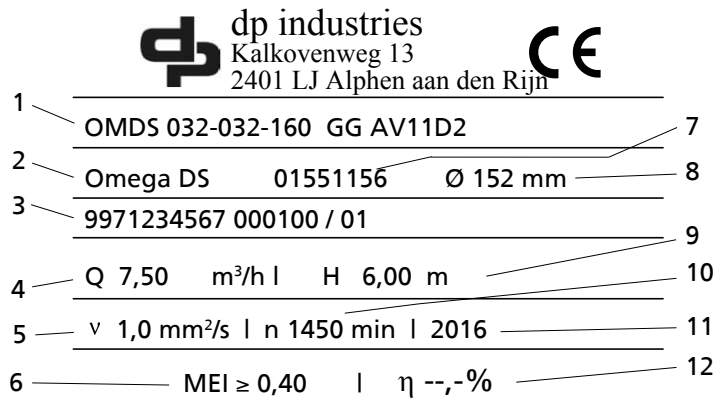


Fig. 3: Name plate (example)

| | | | |
|----|---|----|-----------------------------|
| 1 | Type series code, size and version | 2 | Type series |
| 3 | Order No., order item No. and consecutive No. | 4 | Flow rate |
| 5 | Kinematic viscosity of the fluid handled | 6 | Minimum efficiency index |
| 7 | Material number (if applicable) | 8 | Impeller diameter |
| 9 | Head | 10 | Speed |
| 11 | Year of construction | 12 | Efficiency (see data sheet) |

4.5 Design details

Design

- Volute casing pump
- Close-coupled design/in-line design
- Single-stage
- Horizontal/vertical installation
- Pump and motor on a common shaft
- Rigid connection between pump and motor
- Requirements to 2009/125/EC Directive

Pump casing

- Radially split volute casing
- Replaceable casing wear rings
- In-line design

Impeller type

- Closed radial impeller with multiply curved vanes

Shaft seal

- Single mechanical seals to EN 12756
- Shaft equipped with a replaceable shaft sleeve in the shaft seal area

Bearings

- Radial ball bearing in the motor housing

- Grease lubrication

Drive

- Efficiency class IE3

Standard design:

- KSB surface-cooled IEC frame three-phase current squirrel-cage motor
- 50 Hz winding, 220-240 V/380-420 V \leq 2.20 kW
- 50 Hz winding, 380-420 V/660-725 V \geq 3.00 kW
- 60 Hz winding, 440-480 V \leq 2.60 kW
- 60 Hz winding, 440-480 V \geq 3.60 kW
- Type of construction IM V1 \leq 4.00 kW
- Type of construction IM V1 \geq 5.50 kW
- IP55 enclosure
- Mode of operation: continuous operation S1
- Thermal class F with temperature sensor, 3 PTC thermistors

Explosion-proof version:

- KSB surface-cooled IEC frame three-phase current squirrel-cage motor
- 50 Hz winding, 220-240 V/380-420 V \leq 1.85 kW
- 50 Hz winding, 380-420 V/660-725 V \geq 2.50 kW
- Type of construction IM V1 \leq 3.30 kW
- Type of construction IM V15 \geq 4.60 kW
- Enclosure IP55 or IP54
- Mode of operation: continuous operation S1
- Type of protection EExe II
- Temperature class T3

4.6 Configuration and function

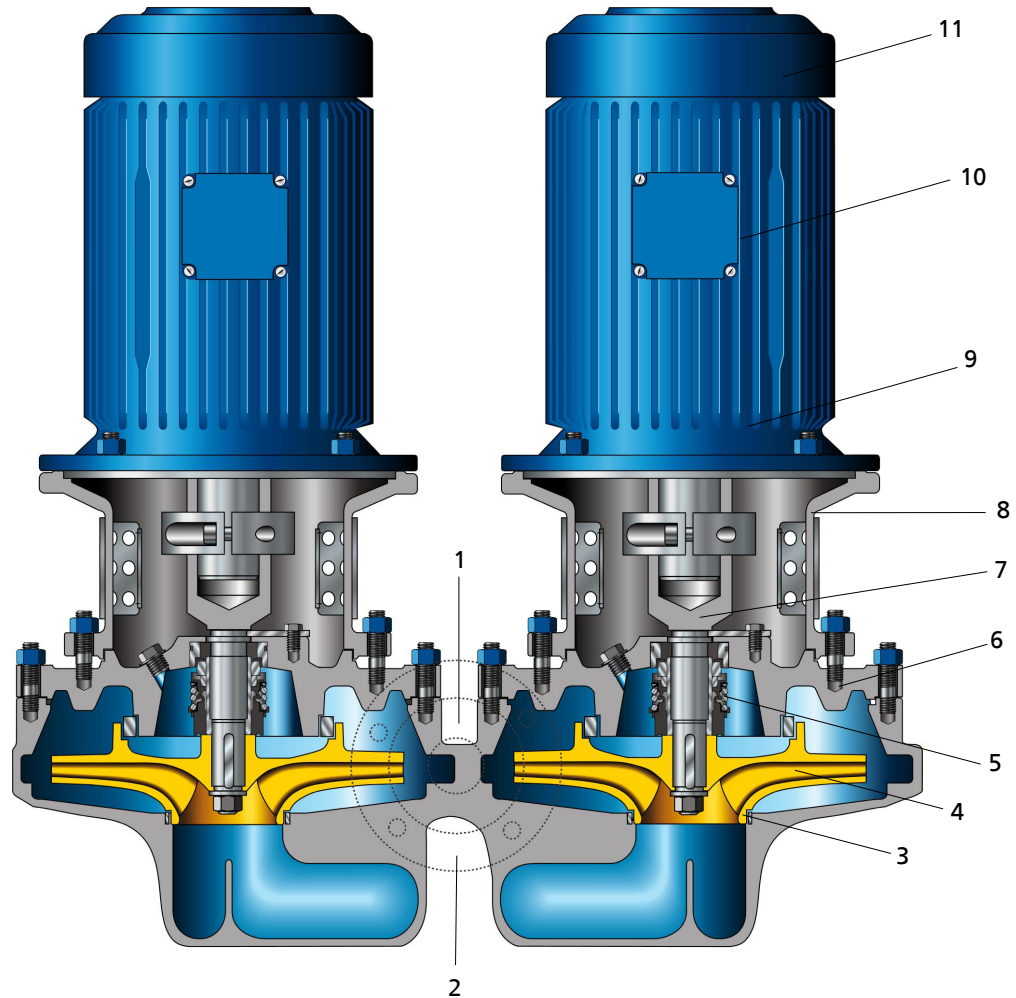


Fig. 4: Sectional drawing

| | | | |
|----|-------------------------|----|----------------|
| 1 | Discharge nozzle | 2 | Suction nozzle |
| 3 | Clearance gap | 4 | Impeller |
| 5 | Shaft seal | 6 | Casing cover |
| 7 | Shaft | 8 | Drive lantern |
| 9 | Rolling element bearing | 10 | Motor housing |
| 11 | Rolling element bearing | | |

Design The pump is designed with a radial fluid inlet (suction nozzle) and a radial outlet (discharge nozzle) arranged on the same axis. The hydraulic system is rigidly connected to the motor by a shaft coupling.

Function The fluid enters the pump via the suction nozzle (2) and is accelerated outward by the rotating impeller (4). In the flow passage of the pump casing the kinetic energy of the fluid is converted into pressure energy. The fluid is pumped to the discharge nozzle (1), where it leaves the pump. The clearance gap (3) prevents any fluid from flowing back from the casing to the suction nozzle. At the rear side of the impeller, the shaft (7) enters the casing via the casing cover (6). The shaft passage through the cover is sealed to the atmosphere with a dynamic shaft seal (5). The shaft runs in rolling element bearings (9 and 11), which are supported by a motor housing (10) linked with the pump casing and/or casing cover via the drive lantern (8).

Sealing The pump is sealed by a standardised mechanical seal.

4.7 Noise characteristics

Table 6: Surface sound pressure level L_{pA} ^{2) 3)}

| Rated power input P_N (kW) | Pump set |
|------------------------------|----------|
| | 1450 rpm |
| 0,25 | 53 |
| 0,37 | 54 |
| 0,55 | 55 |
| 0,75 | 56 |
| 1,1 | 57 |
| 1,5 | 58 |
| 2,2 | 59 |
| 3 | 60 |
| 4 | 61 |
| 5,5 | 62 |
| 7,5 | 64 |
| 11 | 65 |
| 15 | 67 |
| 18,5 | 68 |
| 22 | 69 |
| 30 | 70 |
| 37 | 71 |
| 45 | 73 |
| 55 | 74 |

²⁾ Spatial average; as per ISO 3744 and EN 12639; valid for pump operation in the $Q/Q_{opt} = 0.80 - 1.1$ range and for non-cavitating operation. If noise levels are to be warranted, add +3 dB for measuring and constructional tolerance.

³⁾ Increase for 60 Hz operation: 3500 rpm: +3 dB, 1750 rpm: +1 dB

4.8 Scope of supply

Depending on the model, the following items are included in the scope of supply:

- Pump

Drive

- Surface-cooled IEC three-phase current squirrel-cage motor

Accessories


- Pump foot for vertical installation (vertical position of shaft axis)
- Switchgears for single and twin pumps
- Blind flange for ensuring pump availability during servicing

4.9 Dimensions and weights

For dimensions and weights please refer to the general arrangement drawing/outline drawing of the pump/pump set.


5 Installation at Site

5.1 Safety regulations

| | |
|---|--|
|  | ⚠ DANGER Improper installation in potentially explosive atmospheres Explosion hazard! Damage to the pump set! |
| | <ul style="list-style-type: none">➤ Comply with the applicable local explosion protection regulations.➤ Observe the information in the data sheet and on the name plates of pump and motor. |


5.2 Checks to be carried out prior to installation


Place of installation

| | |
|---|---|
|  | ⚠ WARNING Installation on mounting surface which is unsecured and cannot support the load Personal injury and damage to property! |
| | <ul style="list-style-type: none">➤ Use a concrete of compressive strength class C12/15 which meets the requirements of exposure class XC1 to EN 206-1.➤ The mounting surface must have set and must be completely horizontal and even.➤ Observe the weights indicated. |

1. Check the structural requirements.
All structural work required must have been prepared in accordance with the dimensions stated in the outline drawing/general arrangement drawing.

5.3 Installing the pump set: twin pumps

| | |
|---|--|
|  | CAUTION Ingress of leakage into the motor Damage to the pump! |
| | <ul style="list-style-type: none">➤ Never install the pump set with the "motor below". |

| | |
|---|--|
|  | CAUTION Different direction of rotation of twin pumps Damage to the pump! |
| | <ul style="list-style-type: none">➤ Never arrange the pump set in "flow direction from top to bottom". |

- Pump sizes DN 32 to 80 may be flanged directly into the piping, with the nozzle axis in horizontal (vertical motor shaft) or vertical (horizontal motor shaft) position.
- Pump sizes DN 100 to DN 200 may be flanged directly into the piping, with the nozzle axis in horizontal position (vertical motor shaft). Take suitable steps to support the pump set.

Fastening



NOTE

Motors from size 180 on pump sets with horizontal motor axis need to be supported without transmitting any stresses and strains.
The foot fixing holes on the motor housing can be used for this purpose.

Table 7: Horizontal installation

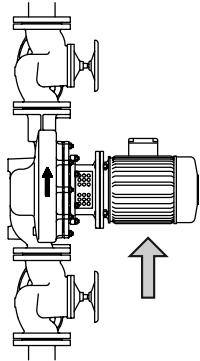
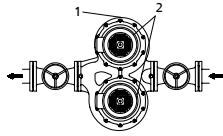
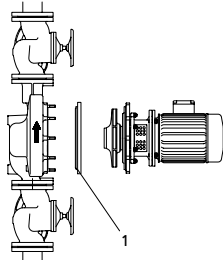
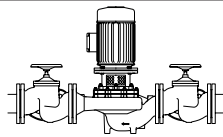
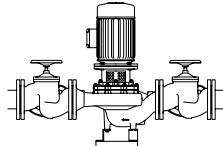
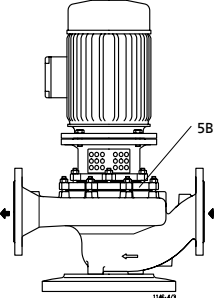
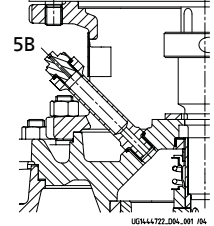
| Examples | Special features |
|---|--|
|  <p>Direction of flow from bottom to top</p> | <p>Direction of flow from bottom to top</p> <p>Motors of size 180 (18.5 kW) and above on pump sets with horizontal motor axis need to be supported adequately. The foot fastening holes on the motor housing can be used for this purpose.</p> |
|  <p>Horizontal piping</p> | <p>1 = screw plug 6D.1/.2 and 2 = valve 5B.1/.2</p> <p>If the piping is laid horizontally, the upper pump must be vented through the upper screw plug 6 B.1/.2 and vent valve 5B.1/.2. This will ensure trouble-free operation.</p> |
|  <p>Installation with blind flange</p> | <p>1 = Blind flange (accessories)</p> <p>If one of the pumps needs to be serviced, the pump chamber can be shut off by a blind flange so that the system remains operational.</p> |

Table 8: Vertical installation




| Examples | Special features |
|--|---|
|  <p>Vertical installation without feet</p> | <p>Sizes 032-032-160 to 080-080-250 are fastened without feet.</p> |
|  <p>Vertical installation, pump mounted with three feet</p> | <p>Sizes 032-032-160 to 200-200-315 are fastened with three angle feet (St37, accessories depend on the pump size).</p> |

| Examples | Special features |
|---|---|
|  <p data-bbox="391 510 606 593">Vertical installation - Information about vent valve</p> | <p data-bbox="632 208 1366 268">Provide a vent valve to prevent dry running of the mechanical seal. For vertical installation with the motor on top, use connection 5B for venting.</p> |
|  <p data-bbox="391 851 606 900">Vent, mechanical seal chamber</p> | <p data-bbox="632 602 1276 627">The mechanical seal chamber can be vented with the vent valve 5B.</p> |

1. Position the pump set on the foundation or in the piping and fasten it.
2. Place a spirit level on the discharge nozzle to align the pump set.
3. Change the position of the motor pipe plugs for the condensation drain holes (if any) depending on the installation position.

5.4 Piping

5.4.1 Connecting the piping

| | |
|---|---|
|  | <p data-bbox="513 1321 689 1355">⚠ DANGER</p> <p data-bbox="513 1361 1024 1395">Excessive loads acting on the pump nozzles</p> <p data-bbox="513 1402 1264 1435">Danger to life from leakage of hot, toxic, corrosive or flammable fluids!</p> <ul style="list-style-type: none"> <li data-bbox="534 1442 1184 1476">➤ Do not use the pump as an anchorage point for the piping. <li data-bbox="534 1482 1305 1543">➤ Anchor the pipelines in close proximity to the pump and connect them without transmitting any stresses or strains. <li data-bbox="534 1550 1369 1583">➤ Take appropriate measures to compensate thermal expansion of the piping. |
|  | <p data-bbox="513 1617 651 1650">⚠ CAUTION</p> <p data-bbox="513 1657 1114 1691">Incorrect earthing during welding work at the piping</p> <p data-bbox="513 1697 1088 1731">Destruction of rolling element bearings (pitting effect)!</p> <ul style="list-style-type: none"> <li data-bbox="534 1738 1305 1771">➤ Never earth the electric welding equipment on the pump or baseplate. <li data-bbox="534 1778 1209 1812">➤ Prevent current flowing through the rolling element bearings. |
|  | <p data-bbox="513 1841 598 1874">NOTE</p> <p data-bbox="513 1881 1337 1973">Installing check and shut-off elements in the system is recommended, depending on the type of plant and pump. However, such elements must not obstruct proper drainage or hinder disassembly of the pump.</p> |

- ✓ Suction lift lines have been laid with a rising slope, suction head lines with a downward slope towards the pump.
 - ✓ A flow stabilisation section having a length equivalent to at least twice the diameter of the suction flange has been provided upstream of the suction flange.
 - ✓ The nominal diameters of the pipelines are equal to or greater than the nominal diameters of the pump nozzles.
 - ✓ Adapters to larger nominal diameters are designed with a diffuser angle of approx. 8° to avoid excessive pressure losses.
 - ✓ The pipelines have been anchored in close proximity to the pump and connected without transmitting any stresses or strains.
1. Thoroughly clean, flush and blow through all vessels, pipelines and connections (especially of new installations).
 2. Before installing the pump in the piping, remove the flange covers on the suction and discharge nozzles of the pump.
 3. Check that the inside of the pump is free from any foreign objects. Remove any foreign objects.
 4. If required, install a filter in the piping (see drawing: Filter in the piping).

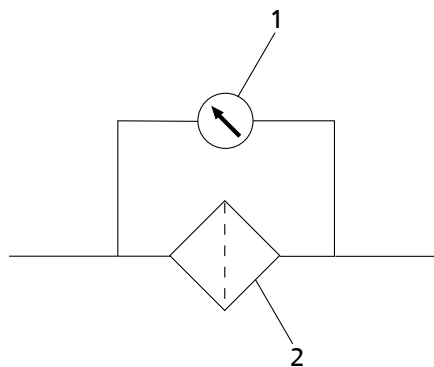


Fig. 5: Filter in the piping

| | | | |
|---|-----------------------------|---|--------|
| 1 | Differential pressure gauge | 2 | Filter |
|---|-----------------------------|---|--------|

5. Connect the pump nozzles to the piping.



CAUTION

Aggressive flushing and pickling agents

Damage to the pump!

- Match the cleaning operation mode and duration for flushing and pickling service to the casing and seal materials used.

5.4.2 Permissible forces and moments at the pump nozzles

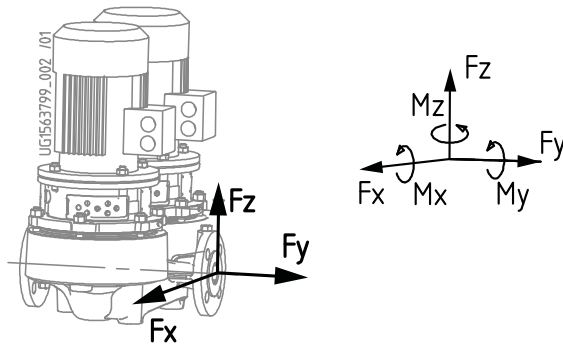


Fig. 6: Forces and moments at the pump nozzles

The data on forces and moments apply to static piping loads only. The values are only applicable if the pump is installed on a baseplate and bolted to a rigid and level foundation.

Table 9: Forces and moments at the pump nozzles

| Size | DN | F_x | F_y | F_z | ΣF | M_x | M_y | M_z |
|-------------|-----|-------|-------|-------|------------|-------|-------|-------|
| | | [N] | [N] | [N] | [N] | [Nm] | [Nm] | [Nm] |
| 032-032-160 | 32 | 320 | 370 | 300 | 574 | 390 | 265 | 300 |
| 032-032-200 | 32 | 320 | 370 | 300 | 574 | 390 | 265 | 300 |
| 040-040-160 | 40 | 400 | 450 | 350 | 696 | 450 | 320 | 370 |
| 040-040-250 | 40 | 400 | 450 | 350 | 696 | 450 | 320 | 370 |
| 050-050-160 | 50 | 530 | 580 | 470 | 916 | 500 | 350 | 400 |
| 050-050-250 | 50 | 530 | 580 | 470 | 916 | 500 | 350 | 400 |
| 065-065-160 | 65 | 650 | 740 | 600 | 1153 | 530 | 390 | 420 |
| 065-065-250 | 65 | 650 | 740 | 600 | 1153 | 530 | 390 | 420 |
| 080-080-160 | 80 | 790 | 880 | 720 | 1385 | 560 | 400 | 460 |
| 080-080-200 | 80 | 790 | 880 | 720 | 1385 | 560 | 400 | 460 |
| 080-080-250 | 80 | 790 | 880 | 720 | 1385 | 560 | 400 | 460 |
| 100-100-125 | 100 | 1050 | 1180 | 950 | 1843 | 620 | 440 | 510 |
| 100-100-160 | 100 | 1050 | 1180 | 950 | 1843 | 620 | 440 | 510 |
| 100-100-200 | 100 | 1050 | 1180 | 950 | 1843 | 620 | 440 | 510 |
| 100-100-250 | 100 | 1050 | 1180 | 950 | 1843 | 620 | 440 | 510 |
| 125-125-160 | 125 | 1250 | 1400 | 1120 | 2186 | 740 | 530 | 670 |
| 125-125-200 | 125 | 1250 | 1400 | 1120 | 2186 | 740 | 530 | 670 |
| 125-125-250 | 125 | 1250 | 1400 | 1120 | 2186 | 740 | 530 | 670 |
| 150-150-200 | 150 | 1600 | 1750 | 1400 | 2754 | 880 | 610 | 720 |
| 150-150-250 | 150 | 1600 | 1750 | 1400 | 2754 | 880 | 610 | 720 |
| 200-200-250 | 200 | 2100 | 2350 | 1900 | 3680 | 1150 | 800 | 930 |
| 200-200-315 | 200 | 2100 | 2350 | 1900 | 3680 | 1150 | 800 | 930 |

5.4.3 Vacuum balance line



NOTE

Where fluid has to be pumped out of a vessel under vacuum, installing a vacuum balance line is recommended.

The following rules apply to vacuum balance lines:

- Minimum nominal line diameter 25 mm.
- The line extends above the highest permissible fluid level in the vessel.

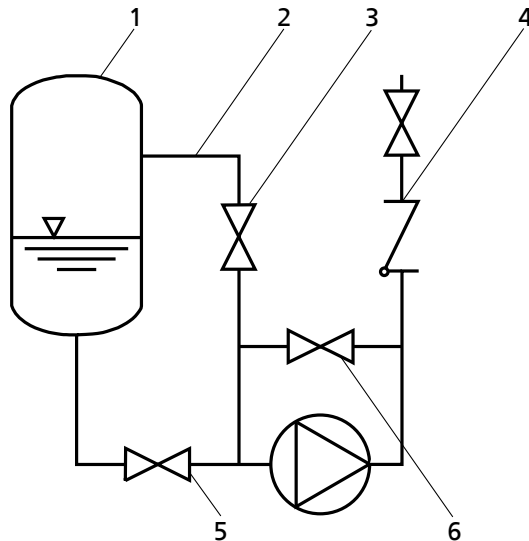


Fig. 7: Vacuum balance system

| | | | |
|---|-----------------------|---|-------------------------------|
| 1 | Vessel under vacuum | 2 | Vacuum balance line |
| 3 | Shut-off element | 4 | Swing check valve |
| 5 | Main shut-off element | 6 | Vacuum-tight shut-off element |



NOTE

An additional line fitted with a shut-off valve (from the pump discharge nozzle to the balance line) facilitates venting of the pump before start-up.

5.4.4 Auxiliary connections



⚠ DANGER

Risk of potentially explosive atmosphere by mixing of incompatible fluids in the auxiliary piping



Risk of burns!

Explosion hazard!

- Make sure that the barrier fluid and quench liquid are compatible with the fluid pumped.



⚠ WARNING

Failure to use or incorrect use of auxiliary connections (e.g. barrier fluid, flushing liquid, etc.)

Risk of injury from escaping fluid!

Risk of burns!

Malfunction of the pump!

- Refer to the general arrangement drawing, the piping layout and pump markings (if any) for the quantity, dimensions and locations of auxiliary connections.
- Use the auxiliary connections provided.

5.5 Casing/insulation



⚠ DANGER

Explosive atmosphere forming due to insufficient venting

Explosion hazard!

- Make sure the space between the casing cover/discharge cover and the motor flange is sufficiently vented.
- Do not cover the perforated holes of the contact guards at the drive lantern (e.g. by insulation).



⚠ WARNING

The volute casing and casing/discharge cover take on the same temperature as the fluid handled

Risk of burns!

- Insulate the volute casing.
- Fit protective equipment.



CAUTION

Heat build-up inside the drive lantern

Damage to the bearing!

- Never insulate the casing cover and the drive lantern.

5.6 Electrical connection



⚠ DANGER

Incorrect electrical installation

Explosion hazard!

- For electrical installation, also observe the requirements of IEC 60079-14.
- Always use a motor protection switch for explosion-proof motors.



⚠ DANGER

Electrical connection work by unqualified personnel

Danger of death from electric shock!

- Always have the electrical connections installed by a trained and qualified electrician.
- Observe regulations IEC 60364 and, for explosion-proof models, EN 60079.

**WARNING****Incorrect connection to the mains**

Damage to the mains network, short circuit!

- Observe the technical specifications of the local energy supply companies.

1. Check the available mains voltage against the data on the motor name plate.
2. Select an appropriate start-up method.

**NOTE**

A motor protection device is recommended.

5.6.1 Setting the time relay**CAUTION****Switchover between star and delta on three-phase motors with star-delta starting takes too long.**

Damage to the pump (set)!

- Keep switch-over intervals between star and delta as short as possible.

Table 10: Time relay settings for star-delta starting:

| Motor rating [kW] | Y time to be set [s] |
|----------------------|-------------------------|
| ≤ 30 | < 3 |
| > 30 | < 5 |

5.6.2 Earthing**DANGER****Electrostatic charging**

Explosion hazard!



Fire hazard!

Damage to the pump set!

- Connect the PE conductor to the earthing terminal provided.

5.6.3 Connecting the motor**NOTE**

In compliance with IEC 60034-8, three-phase motors are always wired for clockwise rotation (looking at the motor shaft stub).

The pump's direction of rotation is indicated by an arrow on the pump.

1. Match the motor's direction of rotation to that of the pump.
2. Observe the manufacturer's product literature supplied with the motor.

5.7 Checking the direction of rotation



⚠ DANGER

Temperature increases resulting from contact between rotating and stationary components



Explosion hazard!
Damage to the pump set!

- Never check the direction of rotation by starting up the unfilled pump.



⚠ WARNING

Hands inside the pump casing

Risk of injuries, damage to the pump!

- Always disconnect the pump set from the power supply and secure it against unintentional start-up before inserting your hands or other objects into the pump.



CAUTION

Incorrect direction of rotation with non-reversible mechanical seal

Damage to the mechanical seal and leakage!

- Check the direction of rotation by starting the pump set and stopping it again immediately.



CAUTION

Drive and pump running in the wrong direction of rotation

Damage to the pump!

- Refer to the arrow indicating the direction of rotation on the pump.
- Check the direction of rotation. If required, check the electrical connection and correct the direction of rotation.

The correct direction of rotation of motor and pump is clockwise (seen from the motor end).

1. Start the pump set and stop it again immediately to determine the motor's direction of rotation.
2. Check the direction of rotation.
The motor's direction of rotation must match the arrow indicating the direction of rotation on the pump.
3. If the pump runs in the wrong direction of rotation, check the electrical connection of the motor and the control system, if necessary.

6 Commissioning/Start-up/Shutdown

6.1 Commissioning/start-up

6.1.1 Prerequisites for commissioning/start-up

Before commissioning/starting up the pump set, make sure that the following conditions are met:

- The pump set has been properly connected to the power supply and is equipped with all protection devices. [⇒ Section 5.6, Page 29]
- The pump has been primed with the fluid to be handled. The pump has been vented.
- The direction of rotation has been checked.
- All auxiliary connections required are connected and operational.
- The lubricants have been checked.
- After prolonged shutdown of the pump (set), the activities required for returning the pump (set) to service have been carried out. [⇒ Section 6.4, Page 37]
- The lock washers, if any, have been removed from the shaft groove.

6.1.2 Filling in lubricants

Grease-lubricated bearings have been packed with grease at the factory.

6.1.3 Checking the shaft seal

Mechanical seal The mechanical seal only leaks slightly or invisibly (as vapour) during operation. Mechanical seals are maintenance-free.

6.1.4 Priming and venting the pump



⚠ DANGER

Risk of potentially explosive atmosphere inside the pump

Explosion hazard!

- Before starting up the pump, vent the suction line and the pump and prime them with the fluid to be handled.



CAUTION

Increased wear due to dry running

Damage to the pump set!

- Never operate the pump set without liquid fill.
- Never close the shut-off element in the suction line and/or supply line during pump operation.

1. Vent the pump and suction line and prime both with the fluid to be handled. Connection 6D can be used for venting (see drawing of auxiliary connections). For vertical installation with the motor on top, use connection 5B (if provided) for venting (see drawing of auxiliary connections) and .
2. Fully open the shut-off element in the suction line.
3. Fully open all auxiliary feed lines (barrier fluid, flushing liquid, etc.), if any.

4. Open the shut-off valve (3), if any, in the vacuum balance line (2) and close the vacuum-tight shut-off valve (6), if any. [⇒ Section 5.4.3, Page 28]



⚠ WARNING

Hot water escaping under pressure when the vent plug is opened

Risk of electric shock!

Risk of scalding!

- Protect the electric components against escaping fluid.
- Wear protective clothing (e.g. gloves).



NOTE

For design-inherent reasons some unfilled volume in the hydraulic system cannot be excluded after the pump has been primed for commissioning/start-up. However, once the motor is started up the pumping effect will immediately fill this volume with the fluid handled.

6.1.5 Start-up



⚠ DANGER

Non-compliance with the permissible pressure and temperature limits if the pump is operated with the suction and/or discharge line closed.



Explosion hazard!

Leakage of hot or toxic fluids!

- Never operate the pump with the shut-off elements in the suction line and/or discharge line closed.
- Only start up the pump set with the discharge-side shut-off element slightly or fully open.



⚠ DANGER

Excessive temperatures due to dry running or excessive gas content in the fluid handled



Explosion hazard!

Damage to the pump set!

- Never operate the pump set without liquid fill.
- Prime the pump as per operating instructions.
- Always operate the pump within the permissible operating range.



CAUTION

Abnormal noises, vibrations, temperatures or leakage

Damage to the pump!

- Switch off the pump (set) immediately.
- Eliminate the causes before returning the pump set to service.

- ✓ The system piping has been cleaned.
 - ✓ The pump, suction line and inlet tank, if any, have been vented and primed with the fluid to be pumped.
 - ✓ The lines for priming and venting have been closed.
1. Fully open the shut-off element in the suction head/suction lift line.
 2. Close or slightly open the shut-off element in the discharge line.
 3. Start up the motor.

4. Immediately after the pump has reached full rotational speed, slowly open the shut-off element in the discharge line and adjust it to comply with the duty point.

6.1.6 Shutdown



CAUTION

Heat build-up inside the pump

Damage to the shaft seal!

- Depending on the type of installation, the pump set requires sufficient after-run time – with the heat source switched off – until the fluid handled has cooled down.

✓ The shut-off element in the suction line is and remains open.

1. Close the shut-off element in the discharge line.
2. Switch off the motor and make sure the pump set runs down smoothly to a standstill.



NOTE

If the discharge line is equipped with a check valve, the shut-off element in the discharge line may remain open, provided the site's requirements and regulations are taken into account and observed.

For prolonged shutdown periods:

1. Close the shut-off element in the suction line.
2. Close the auxiliary connections.
If the fluid handled is fed in under vacuum, also supply the shaft seal with barrier fluid during standstill.



CAUTION

Risk of freezing during prolonged pump shutdown periods

Damage to the pump!

- Drain the pump and the cooling/heating chambers (if any) or otherwise protect them against freezing.

6.2 Operating limits



⚠ DANGER

Non-compliance with operating limits for pressure, temperature, fluid handled and speed

Explosion hazard!

Hot or toxic fluid could escape!

- Comply with the operating data indicated in the data sheet.
- Never use the pump for handling fluids it is not designed for.
- Avoid prolonged operation against a closed shut-off element.
- Never operate the pump at temperatures, pressures or rotational speeds exceeding those specified in the data sheet or on the name plate unless the written consent of the manufacturer has been obtained.



NOTE

Comply with the VdTÜV 1466 or VDI 2035 guidelines for circulating water when operating the pumps in superheated and hot water systems.

6.2.1 Operating limits for twin pumps

Twin pumps can be run in two operating modes:

- Alternating operation**
 - While one pump is running, the second pump is kept in stand-by mode.
 - If the duty pump fails, the stand-by pump is started up automatically.
- Parallel operation**
 - Both pumps are operated in parallel if higher energy requirements have to be met.
 - The two pumps must be equipped with identical rotating assemblies (impeller diameter, etc.).

6.2.2 Ambient temperature



CAUTION

Operation outside the permissible ambient temperature

Damage to the pump (set)!

- Observe the specified limits for permissible ambient temperatures.

Observe the following parameters and values during operation:

Table 11: Permissible ambient temperatures

| Permissible ambient temperature | Value |
|---------------------------------|-----------------|
| Maximum | 40 °C |
| Minimum | See data sheet. |

6.2.3 Frequency of starts



DANGER

Excessive surface temperature of the motor

Explosion hazard!

Damage to the motor!

- In case of explosion-proof motors, observe the frequency of starts specified in the manufacturer's product literature.

The frequency of starts is usually determined by the maximum temperature increase of the motor. This largely depends on the power reserves of the motor in steady-state operation and on the starting conditions (DOL, star-delta, moments of inertia, etc). If the start-ups are evenly spaced over the period indicated, the following limits serve as orientation for start-up with the discharge-side gate valve slightly open:

Table 12: Frequency of starts

| Impeller material | Maximum frequency of starts |
|--------------------------|-----------------------------|
| | [Start-ups/hour] |
| G (JL1040/ A48CL35B) | 15 |
| B (CC480K-GS/B30 C90700) | 6 |
| C (1.4408/ A743 GR CF8M) | |



CAUTION

Re-starting while motor is still running down

Damage to the pump (set)!

- Do not re-start the pump set before the pump rotor has come to a standstill.

6.2.4 Fluid handled

6.2.4.1 Flow rate

Table 13: Flow rate

| Temperature range (t) | Minimum flow rate | Maximum flow rate |
|-----------------------|--------------------------|-------------------------------------|
| -30 to +70 °C | ≈ 15 % of $Q_{Opt}^{4)}$ | See hydraulic characteristic curves |
| > 70 to +140 °C | ≈ 25 % of $Q_{Opt}^{4)}$ | |

The calculation formula below can be used to check if an additional heat build-up could lead to a dangerous temperature increase at the pump surface.

$$T_O = T_f + \Delta \vartheta$$

$$\Delta \vartheta = \frac{g \times H}{c \times \eta} \times (1 - \eta)$$

Table 14: Key

| Symbol | Description | Unit |
|--------------------|-----------------------------------|------------------|
| c | Specific heat capacity | J/kg K |
| g | Gravitational constant | m/s ² |
| H | Pump discharge head | m |
| T_f | Fluid temperature | °C |
| T_O | Temperature at the casing surface | °C |
| η | Pump efficiency at duty point | - |
| $\Delta \vartheta$ | Temperature difference | K |

⁴⁾ Best efficiency point

6.2.4.2 Density of the fluid handled

The pump input power changes in proportion to the density of the fluid handled.



CAUTION

Impermissibly high density of the fluid handled

Motor overload!

- Observe the information on fluid density in the data sheet.
- Make sure the motor has sufficient power reserves.

6.2.4.3 Abrasive fluids

Do not exceed the maximum permissible solids content specified in the data sheet. When the pump handles fluids containing abrasive substances, increased wear of the hydraulic system and shaft seal are to be expected. In this case, reduce the commonly recommended inspection intervals.

6.3 Shutdown/storage/preservation

6.3.1 Measures to be taken for shutdown

The pump (set) remains installed

- ✓ Sufficient fluid is supplied for the operation check run of the pump.
- 1. Start up the pump (set) regularly between once a month and once every three months for approximately five minutes during prolonged shutdown periods.
This will prevent the formation of deposits within the pump and the pump intake area.

The pump (set) is removed from the pipe and stored

- ✓ The pump has been properly drained [⇒ Section 7.3, Page 41] and the safety instructions for dismantling the pump have been observed.
- 1. Spray-coat the inside wall of the pump casing and, in particular, the impeller clearance areas with a preservative.
- 2. Spray the preservative through the suction and discharge nozzles.
It is advisable to then close the pump nozzles (e.g. with plastic caps or similar).
- 3. Oil or grease all exposed machined parts and surfaces of the pump (with silicone-free oil and grease, food-approved if required) to protect them against corrosion.
Observe the additional instructions [⇒ Section 3.3, Page 15] .

If the pump set is to be stored temporarily, only preserve the wetted components made of low-alloy materials. Commercially available preservatives can be used for this purpose. Observe the manufacturer's instructions for application/removal.

Observe any additional instructions and information provided. [⇒ Section 3, Page 14]

6.4 Returning to service

For returning the pump to service, observe the sections on commissioning/start-up [⇒ Section 6.1, Page 32] and the operating limits .

In addition, carry out all servicing/maintenance operations before returning the pump (set) to service. [⇒ Section 7, Page 38]



WARNING

Failure to re-install or re-activate protective devices

Risk of personal injury from moving parts or escaping fluid!

- As soon as the work is complete, re-install and/or re-activate any safety-relevant and protective devices.








NOTE

If the pump has been out of service for more than one year, replace all elastomer seals.



7 Servicing/Maintenance



7.1 Safety regulations



| | |
|---|--|
|  | <p> DANGER Sparks produced during servicing work Explosion hazard!</p> <ul style="list-style-type: none">➤ Observe the safety regulations in force at the place of installation!➤ Always perform maintenance work at an explosion-proof pump (set) outside of potentially explosive atmospheres. |
|---|--|

| | |
|--|---|
|   | <p> DANGER Improperly serviced pump set Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none">➤ Service the pump set regularly.➤ Prepare a maintenance schedule with special emphasis on lubricants, shaft seal and coupling. |
|--|---|

The operator ensures that maintenance, inspection and installation is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

| | |
|---|---|
|  | <p> WARNING Unintentional starting of pump set Risk of injury by moving parts!</p> <ul style="list-style-type: none">➤ Ensure that the pump set cannot be started up unintentionally.➤ Always make sure the electrical connections are disconnected before carrying out work on the pump set. |
|---|---|

| | |
|---|--|
|  | <p> WARNING Fluids, consumables and supplies which are hot and/or pose a health hazard Risk of injury!</p> <ul style="list-style-type: none">➤ Observe all relevant laws.➤ When draining the fluid take appropriate measures to protect persons and the environment.➤ Decontaminate pumps which handle fluids posing a health hazard. |
|---|--|

| | |
|---|--|
|  | <p> WARNING Insufficient stability Risk of crushing hands and feet!</p> <ul style="list-style-type: none">➤ During assembly/dismantling, secure the pump (set)/pump parts to prevent tipping or falling over. |
|---|--|

A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation of the pump, pump set and pump parts with a minimum of servicing/maintenance expenditure and work.



NOTE

All maintenance, service and installation work can be carried out by DP Service or authorised workshops.

Never use force when dismantling and reassembling the pump set.

7.2 Servicing/inspection

7.2.1 Supervision of operation



DANGER

Risk of potentially explosive atmosphere inside the pump

Explosion hazard!

- The pump internals in contact with the fluid to be handled, including the seal chamber and auxiliary systems must be filled with the fluid to be handled at all times.
- Provide sufficient inlet pressure.
- Provide an appropriate monitoring system.



DANGER

Incorrectly serviced shaft seal

Explosion hazard!



Leakage of hot, toxic fluids!
Damage to the pump set!
Risk of burns!
Fire hazard!

- Regularly service the shaft seal.



DANGER

Excessive temperatures as a result of bearings running hot or defective bearing seals

Explosion hazard!



Fire hazard!
Damage to the pump set!

- Regularly check the rolling element bearings for running noises.



DANGER

Incorrectly serviced barrier fluid system

Explosion hazard!



Fire hazard!
Damage to the pump set!
Leakage of hot and/or toxic fluids!

- Regularly service the barrier fluid system.
- Monitor the barrier fluid pressure.



CAUTION

Increased wear due to dry running

Damage to the pump set!

- Never operate the pump set without liquid fill.
- Never close the shut-off element in the suction line and/or supply line during pump operation.



CAUTION

Impermissibly high temperature of fluid handled

Damage to the pump!

- Prolonged operation against a closed shut-off element is not permitted (heating up of the fluid).
- Observe the temperature limits in the data sheet and in the section on operating limits.

While the pump is in operation, observe and check the following:

- The pump must run quietly and free from vibrations at all times.
- Check the shaft seal. [⇒ Section 6.1.3, Page 32]
- Check the sealing elements for leakage.
- Check the rolling element bearings for running noises.
Vibrations, noise and an increase in current input occurring during unchanged operating conditions indicate wear.
- Monitor the correct functioning of any auxiliary connections.
- Monitor the stand-by pump.
To make sure that the stand-by pumps are ready for operation, start them up once a week.
- Monitor the bearing temperature.
The bearing temperature must not exceed 90 °C (measured at the motor housing).



CAUTION

Operation outside the permissible bearing temperature

Damage to the pump!



- The bearing temperature of the pump (set) must never exceed 90 °C (measured on the outside of the motor housing).



NOTE

After commissioning, increased temperatures may occur at grease-lubricated rolling element bearings due to the running-in process. The final bearing temperature is only reached after a certain period of operation (up to 48 hours depending on the conditions).

7.2.2 Inspection work



⚠ DANGER
Excessive temperatures caused by friction, impact or frictional sparks
Explosion hazard!
Fire hazard!
Damage to the pump set!

- Regularly check the cover plates, plastic components and other guards of rotating parts for deformation and sufficient distance from rotating parts.

7.2.2.1 Checking the clearances

For checking the clearances remove the impeller, if required.


If the clearance is larger than permitted (see the following table), fit new casing wear ring 502.01 and, if applicable, 502.02.

The clearances given refer to the diameter.

Table 15: Clearances between impeller and casing and/or between impeller and casing cover

| Impeller material | Permissible clearance | |
|--|-----------------------|---------|
| | New | Maximum |
| G (JL1040/ A48CL35B) B (CC480K-GS/B30 C90700) | 0.3 mm | 0.9 mm |
| C (1.4408/ A743 GR CF8M) | 0.5 mm | 1.5 mm |


7.2.2.2 Cleaning filters



⚠ CAUTION
Insufficient inlet pressure due to clogged filter in the suction line
Damage to the pump!

- Monitor contamination of filter with suitable means (e.g. differential pressure gauge).
- Clean filter at appropriate intervals.

7.3 Drainage/cleaning




⚠ WARNING
Fluids, consumables and supplies which are hot and/or pose a health hazard
Hazard to persons and the environment!


- Collect and properly dispose of flushing fluid and any residues of the fluid handled.
- Wear safety clothing and a protective mask, if required.
- Observe all legal regulations on the disposal of fluids posing a health hazard.


1. Use connection 6B to drain the fluid handled (see auxiliary connections).
2. Always flush the pump if it has been used for handling noxious, explosive, hot or other hazardous fluids.
Always flush and clean the pump before transporting it to the workshop. Provide a certificate of decontamination for the pump.


7.4 Dismantling the pump set

7.4.1 General information/safety regulations

| | |
|---|---|
|  | <p>⚠ DANGER Insufficient preparation of work on the pump (set) Risk of injury!</p> <ul style="list-style-type: none">➤ Properly shut down the pump set. [⇒ Section 6.1.6, Page 34]➤ Close the shut-off elements in suction and discharge line.➤ Drain the pump and release the pump pressure. [⇒ Section 7.3, Page 41]➤ Close any auxiliary connections.➤ Allow the pump set to cool down to ambient temperature. |
|---|---|

| | |
|---|---|
|  | <p>⚠ WARNING Unqualified personnel performing work on the pump (set) Risk of injury!</p> <ul style="list-style-type: none">➤ Always have repair and maintenance work performed by specially trained, qualified personnel. |
|---|---|


| | |
|--|--|
|  | <p>⚠ WARNING Hot surface Risk of injury!</p> <ul style="list-style-type: none">➤ Allow the pump set to cool down to ambient temperature. |
|--|--|


| | |
|---|---|
|  | <p>⚠ WARNING Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none">➤ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components. |
|---|---|

Observe all safety instructions and information.

For any work on the motor, observe the instructions of the relevant motor manufacturer.

For dismantling and reassembly observe the exploded views or the general assembly drawing.

| | |
|---|---|
|  | <p>NOTE All maintenance, service and installation work can be carried out by DP Service or authorised workshops.</p> |
|---|---|

| | |
|---|---|
|  | <p>NOTE After a prolonged period of operation the individual components may be hard to pull off the shaft. If this is the case, use a brand name penetrating agent and/or - if possible - an appropriate puller.</p> |
|---|---|

7.4.2 Preparing the pump set

1. De-energise the pump set and secure it against unintentional start-up.
2. Reduce pressure in the piping by opening a consumer installation.

3. Disconnect and remove all auxiliary pipework.

7.4.3 Dismantling the complete pump set



NOTE

The pump casing can remain installed in the piping for further dismantling.

- ✓ The notes and steps stated into [⇒ Section 7.4.2, Page 42] have been observed/carried out.
1. Disconnect the discharge and suction nozzles from the piping.
 2. Depending on the pump/motor size, remove the supports from the pump set.
 3. Remove the complete pump set from the piping.

7.4.4 Removing the motor



WARNING

Motor tipping over

Risk of crushing hands and feet!

- Suspend or support the motor to prevent it from tipping over.

- ✓ The notes and steps stated in to [⇒ Section 7.4.3, Page 43] have been observed/carried out.
1. Remove the screws on cover plates 68-3, press the cover plates slightly together and remove from drive lantern 341.
 2. Undo hexagon nuts 920.11.
 3. Undo hexagon head bolts 901.50.



CAUTION

Back pull-out unit knocking against the pump casing

Damage to the shaft/back pull-out unit!

- With the motor removed, push lock washers 931.95 into the shaft groove.

4. Insert both lock washers 931.95 into the groove in shaft 210.
5. Tighten hexagon head bolts 901.50.
6. Undo socket head cap screw 914.24.
7. Remove the motor.

7.4.5 Removing the back pull-out unit



WARNING

Back pull-out unit tipping over

Risk of squashing hands and feet!

- Suspend or support the back pull-out unit at the pump end.

- ✓ The notes and steps stated in to [⇒ Section 7.4.4, Page 43] have been observed/carried out.
1. If required, suspend or support the back pull-out unit to prevent it from tipping over.

2. Undo hexagon nut 920.15 (on variant with bolted discharge cover) or 920.01 (on variant with clamped discharge cover) at the volute casing.
3. Pull the back pull-out unit out of the volute casing.
4. Remove and dispose of gasket 400.10.
5. Place the back pull-out unit on a clean and level surface.

7.4.6 Removing the impeller

- ✓ The notes and steps stated in to [⇒ Section 7.4.5, Page 43] have been observed/carried out.
 - ✓ The back pull-out unit has been placed in a clean and level assembly area.
1. Undo impeller nut 920.95 (right-hand thread).
Take washer 930.95 and disc 550.95 off the impeller hub.
 2. Remove impeller 230 with an impeller removal tool.
 3. Place impeller 230 on a clean and level surface.
 4. Remove key 940.01 from shaft 210.

7.4.7 Removing the mechanical seal

- ✓ The notes and steps stated in to [⇒ Section 7.4.6, Page 44] have been observed/carried out.
 - ✓ The back pull-out unit has been placed in a clean and level assembly area.
1. Remove shaft sleeve 523 with the rotating assembly of the mechanical seal (primary ring) from shaft 210.
 2. Remove the rotating assembly of the mechanical seal (primary ring) from shaft sleeve 523.
 3. Undo hexagon nuts 920.15 and socket head cap screw 914.22, if any, on drive lantern 341.
 4. Remove casing cover 161 from drive lantern 341.
 5. Remove the stationary assembly of the mechanical seal (mating ring) from casing cover 161.
 6. Remove and dispose of gasket 400.75.

7.5 Reassembling the pump set

7.5.1 General information/Safety regulations



DANGER

Wrong selection of motor

Explosion hazard!

- Use an original motor or a motor of identical design from the same manufacturer.
- The permissible temperature limits at the motor flange and motor shaft must be higher than the temperatures generated by the pump. (Contact DP for temperatures).



WARNING

Improper lifting/moving of heavy assemblies or components

Personal injury and damage to property!

- Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.



CAUTION

Improper reassembly

Damage to the pump!

- Reassemble the pump (set) in accordance with the general rules of sound engineering practice.
- Use original spare parts only.

Sequence Always re-assemble the pump in accordance with the corresponding general assembly drawing or exploded view.

Sealing elements Check O-rings for any damage and replace by new O-rings, if required.

Always use new gaskets. Make sure that new gaskets have the same thickness as the old ones.

Always fit gaskets of asbestos-free materials or graphite without using lubricants (e.g. copper grease, graphite paste).

Assembly adhesives Avoid the use of assembly adhesives, if possible.

Should an assembly adhesive be required after all, use a commercially available contact adhesive (e.g. Pattex) or sealant (e.g. HYLOMAR or Eppl 33).

Only apply adhesive at selected points and in thin layers.

Never use quick-setting adhesives (cyanoacrylate adhesives).

Coat the locating surfaces of the individual components with graphite or similar before reassembly.

Tightening torques For reassembly, tighten all screws and bolts as specified in this manual.

7.5.2 Installing the mechanical seal

Installing the mechanical seal

The following rules must be observed when installing the mechanical seal:

- Work cleanly and accurately.
 - Only remove the protective wrapping of the contact faces immediately before installation takes place.
 - Prevent any damage to the sealing surfaces or O-rings.
 - ✓ The notes and steps stated in [⇒ Section 7.5.1, Page 44] have been observed/carried out.
 - ✓ The bearing assembly as well as the individual parts are kept in a clean and level assembly area.
 - ✓ All dismantled parts have been cleaned and checked for wear.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
 - ✓ The sealing surfaces have been cleaned.
1. Clean shaft sleeve 523, and touch up any score marks or scratches with a polishing cloth, if necessary.
If score marks or scratches are still visible, fit new shaft sleeve 523.
 2. Slide shaft sleeve 523 with new gasket 400.75 onto shaft 210.
 3. Clean the mating ring location in casing cover 161.
 4. Carefully insert the mating ring. Make sure to apply pressure evenly.

5. On variants with a bolted casing cover undo forcing screws 901.31 without removing them.
6. Place casing cover 161 into the locating fit of drive lantern 341.
7. Fit and tighten hexagon nuts 920.01 and/or 920.15, if any.
8. Fit the rotating assembly of the mechanical seal (primary ring) on shaft sleeve 523.

Observe the following installation dimension b for mechanical seals with installation length L_{1k} to EN 12756 (design KU):

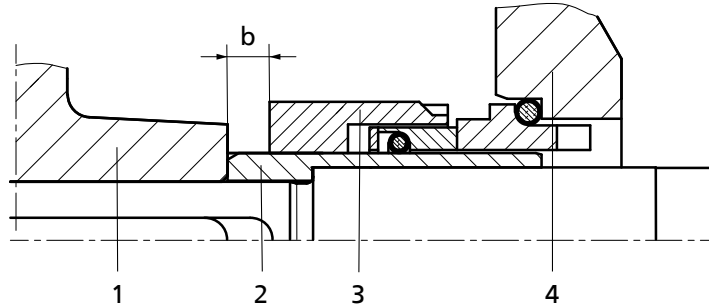


Fig. 8: Installation dimension b of mechanical seal

| | | | |
|---|-----------------|---|--------------|
| 1 | Impeller | 2 | Shaft sleeve |
| 3 | Mechanical seal | 4 | Casing cover |

Table 16: Installation dimensions of the mechanical seal

| Shaft unit ⁹⁾ | Installation dimension b |
|--------------------------|--------------------------|
| 25 | 7,5 mm |
| 35 | 10 mm |
| 55 | 15 mm |

⁹⁾ Shaft unit see data sheet.

7.5.3 Fitting the impeller

- ✓ The notes and steps stated in [⇒ Section 7.5.1, Page 44] to [⇒ Section 7.5.2, Page 45] have been observed/carried out.
 - ✓ The pre-assembled unit (motor, shaft, drive lantern, casing cover) as well as the individual parts have been placed in a clean and level assembly area.
 - ✓ All dismantled parts have been cleaned and checked for wear.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
 - ✓ The sealing surfaces have been cleaned.
1. Insert key 940.01 and slide impeller 230 onto shaft 210.
 2. Fasten impeller nut 920.95, safety device 930.95 and disc 550.95, if any. [⇒ Section 7.6, Page 48]

7.5.4 Installing the back pull-out unit



WARNING

Back pull-out unit tipping over

Risk of squashing hands and feet!

- Suspend or support the back pull-out unit at the pump end.

- ✓ The notes and steps stated in [⇒ Section 7.5.1, Page 44] to [⇒ Section 7.5.3, Page 46] have been observed/carried out.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
 - ✓ The sealing surfaces have been cleaned.
1. If required, suspend or support the back pull-out unit to prevent it from tipping over.
 2. Fit new gasket 400.10 into the recess of volute casing 102.
 3. **On variants with a bolted casing cover** undo forcing screws 901.31 without removing them.
 4. Push the back pull-out unit into volute casing 102.
 5. Tighten hexagon nut 920.15 (on variant with a bolted casing cover) or 920.01 (on variant with a clamped casing cover) at volute casing 102.

7.5.5 Mounting the motor

Ex

⚠ DANGER

Incorrect shaft connection

Explosion hazard!

➤ Connect the shafts between pump and motor as described in this manual.

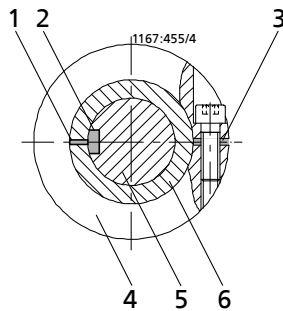


Fig. 9: Fitting the motor shaft stub on the shaft

| | | | |
|---|-----------------------------|---|-------------------------------|
| 1 | Shaft slot | 2 | Keyway of the motor shaft end |
| 3 | Slot of the taper lock ring | 4 | Taper lock ring |
| 5 | Motor shaft | 6 | Shaft |

- ✓ The notes and steps stated in [⇒ Section 7.5.1, Page 44] to have been observed/carried out.
1. Fit the motor shaft stub on shaft 210 and make sure that the keyway of the motor shaft end aligns with the slot in shaft 210 and that both are located opposite the slot of taper lock ring 515 (see illustration: Fitting the motor shaft stub on the shaft).
 2. Tighten hexagon socket head cap screws 914.24.
 3. Undo hexagon head bolts 901.50.

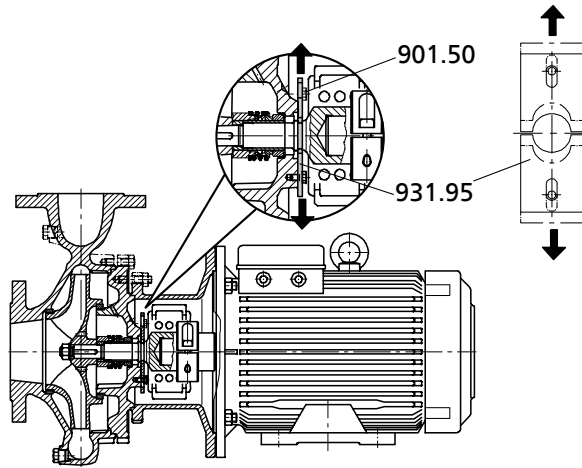


Fig. 10: Removing the lock washers

| | | | |
|--------|--------------------|--------|-------------|
| 901.50 | Hexagon head bolts | 931.95 | Lock washer |
|--------|--------------------|--------|-------------|

4. Pull both lock washers 931.95 out of the groove in shaft 210.
5. Tighten hexagon head bolts 901.50.
6. Fit and tighten hexagon nuts 920.11.

7.6 Tightening torques

Table 17: Tightening points

| | |
|--------------------------------|---------------------------------|
| | |
| Model with bolted casing cover | Model with clamped casing cover |

Table 18: Tightening torques for screwed connections at the pump

| Position | Thread | Tightening torque |
|----------|-----------|-------------------|
| | | [Nm] |
| A | M12 | 55 |
| | M16 | 130 |
| B | M12 × 1,5 | 55 |
| | M24 × 1,5 | 130 |
| | M30 × 1,5 | 170 |
| C | M8 | 20 |

| Position | Thread | Tightening torque |
|----------|--------|-------------------|
| | | [Nm] |
| | M10 | 38 |
| D | M12 | 90 |
| E | M8 | 20 |
| | M10 | 38 |
| | M12 | 55 |
| | M16 | 130 |
| F | M6 | 15 |
| | M8 | 38 |
| | M10 | 38 |
| | M12 | 55 |
| G | M6 | 5 |
| X | 1/8 | 25 |
| | 1/4 | 55 |
| | 3/8 | 80 |
| | 1/2 | 130 |
| | 3/4 | 220 |

7.7 Spare parts stock

7.7.1 Ordering spare parts

Always quote the following data when ordering replacement or spare parts:

- Order number
- Order item number
- Consecutive number
- Type series
- Size
- Material variant
- Seal code
- Year of construction

Refer to the name plate for all data.

Also specify the following data:

- Part number and description
- Quantity of spare parts
- Shipping address
- Mode of dispatch (freight, mail, express freight, air freight)

7.7.2 Recommended spare parts stock for 2 years' operation to DIN 24296

Table 19: Quantity of spare parts for recommended spare parts stock

| Part No. | Description | Number of pumps (including stand-by pumps) | | | | | | |
|----------|-----------------|--|---|---|---|---------|---------|-------------|
| | | 2 | 3 | 4 | 5 | 6 and 7 | 8 and 9 | 10 and more |
| 210 | Shaft | 1 | 1 | 1 | 2 | 2 | 2 | 20 % |
| 230 | Impeller | 1 | 1 | 1 | 2 | 2 | 2 | 20 % |
| | Gaskets (set) | 4 | 6 | 8 | 8 | 9 | 10 | 100 % |
| 433 | Mechanical seal | 1 | 1 | 2 | 2 | 2 | 3 | 25 % |

| Part No. | Description | Number of pumps (including stand-by pumps) | | | | | | |
|----------|------------------|--|---|---|---|---------|---------|-------------|
| | | 2 | 3 | 4 | 5 | 6 and 7 | 8 and 9 | 10 and more |
| 502.1 | Casing wear ring | 2 | 2 | 2 | 3 | 3 | 4 | 50 % |
| 502.2 | Casing wear ring | 2 | 2 | 2 | 3 | 3 | 4 | 50 % |
| 523 | Shaft sleeve | 2 | 2 | 2 | 3 | 3 | 4 | 50 % |

8 Trouble-shooting



⚠ WARNING

Improper work to remedy faults

Risk of injury!

- For any work to remedy faults observe the relevant information in this manual or in the relevant accessory manufacturer's product literature.

If problems occur that are not described in the following table, consultation with the DP customer service is required.

- A Pump delivers insufficient flow rate
- B Motor is overloaded
- C Motor protection switch / thermistor trip device trips the unit
- D Increased bearing temperature
- E Leakage at the pump
- F Excessive leakage at the shaft seal
- G Vibrations during pump operation
- H Impermissible temperature increase in the pump

Table 20: Trouble-shooting

| A | B | C | D | E | F | G | H | Possible cause | Remedy ⁶⁾ |
|---|---|---|---|---|---|---|---|--|--|
| X | - | - | - | - | - | - | - | Pump delivers against an excessively high pressure. | Re-adjust to duty point. Check system for impurities. Fit a larger impeller. ⁶⁾ Increase the speed (frequency inverter). |
| X | - | - | - | - | - | X | X | Pump and/or piping are not completely vented or primed. | Vent and/or prime. |
| X | - | - | - | - | - | - | - | Supply line or impeller clogged | Remove deposits in the pump and/or piping. |
| X | - | - | - | - | - | - | - | Formation of air pockets in the piping | Alter piping layout. Fit vent valve. |
| X | - | - | - | - | - | X | X | Suction lift is too high/NPSH _{available} (positive suction head) is too low. | Check/alter liquid level (open system). Increase system pressure (closed system). Install pump at a lower level. Fully open the shut-off element in the suction line. Change suction line, if the friction losses in the suction line are too high. Check any strainers installed/suction opening. Observe permissible speed of pressure fall. |
| X | - | - | - | - | - | - | - | Wrong direction of rotation | Check the electrical connection of the motor and the control system, if any. |
| X | - | - | - | - | - | - | - | Speed is too low. - Operation with frequency inverter - Operation without frequency inverter | - Increase voltage/frequency at the frequency inverter in the permissible range- Check voltage. |
| X | - | - | - | - | - | X | - | Wear of internal components | Replace worn components by new ones. |
| - | X | - | - | - | - | X | - | Pump back pressure is lower than specified in the purchase order. | Re-adjust to duty point. In the case of persistent overloading, turn down impeller. ⁶⁾ |
| - | X | - | - | - | - | - | - | Density or viscosity of fluid handled higher than stated in purchase order | Contact KSB. |
| - | - | - | - | - | X | - | - | Use of unsuitable shaft seal materials | Change the material combination. ⁶⁾ |
| - | X | X | - | - | - | - | - | Speed is too high. | Reduce speed. ⁶⁾ |

| A | B | C | D | E | F | G | H | Possible cause | Remedy ⁶⁾ |
|---|---|---|---|---|---|---|---|--|--|
| - | - | - | - | X | - | - | - | Tie bolts/sealing element defective | Fit new sealing element between volute casing and casing cover. Re-tighten the bolts. |
| - | - | - | - | - | X | - | - | Worn shaft seal | Fit new shaft seal. |
| X | - | - | - | - | X | - | - | Score marks or roughness on shaft sleeve | Fit new shaft sleeve. Fit new shaft seal. |
| - | - | - | - | - | X | - | - | Dismantle to find out. | Correct. Fit new shaft seal, if required. |
| - | - | - | - | - | X | - | - | Vibrations during pump operation | Correct the suction conditions. Re-balance the impeller. Increase pressure at the pump suction nozzle. |
| - | - | - | X | - | X | X | - | Pump is warped or sympathetic vibrations in the piping. | Check the piping connections and secure fixing of pump; if required, reduce distances between the pipe clamps. Fix the pipelines using anti-vibration material. |
| - | - | - | X | - | - | - | - | Increased axial thrust ¹⁾ | Clean balancing holes in the impeller. Replace the casing wear rings. |
| - | - | - | X | - | - | - | - | Insufficient or excessive quantity of lubricant or unsuitable lubricant. | Top up, reduce or change lubricant. |
| X | X | - | - | - | - | - | - | Motor is running on two phases only. | Replace the defective fuse. Check the electric cable connections. Check the motor winding. |
| - | - | - | - | - | - | X | - | Rotor out of balance | Clean the impeller. Re-balance the impeller. |
| - | - | - | - | - | - | X | - | Defective bearing(s) | Replace. |
| - | - | - | X | - | - | X | X | Flow rate is too low. | Increase the minimum flow rate. |
| - | - | X | - | - | - | - | - | Incorrect setting of motor protection switch | Check setting. Fit new motor protection switch. |
| - | X | X | - | - | - | - | - | Transport lock has not been removed from the shaft groove. | Remove. |

⁶⁾ Pump pressure must be released before attempting to remedy faults on parts which are subjected to pressure.

9 Related Documents

9.1 Exploded view and list of components

9.1.1 Variant with bolted casing cover

[Supplied in packaging units only]

Table 21: This view applies to the following pump sizes:

| | | | | | | | | |
|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| 032-032-20 | 040-040-25 | 050-050-25 | 065-065-25 | 080-080-250 | 100-100-250 | 125-125-250 | 150-150-250 | 200-200-250 |
| 0 | 0 | 0 | 0 | | | | | 200-200-315 |

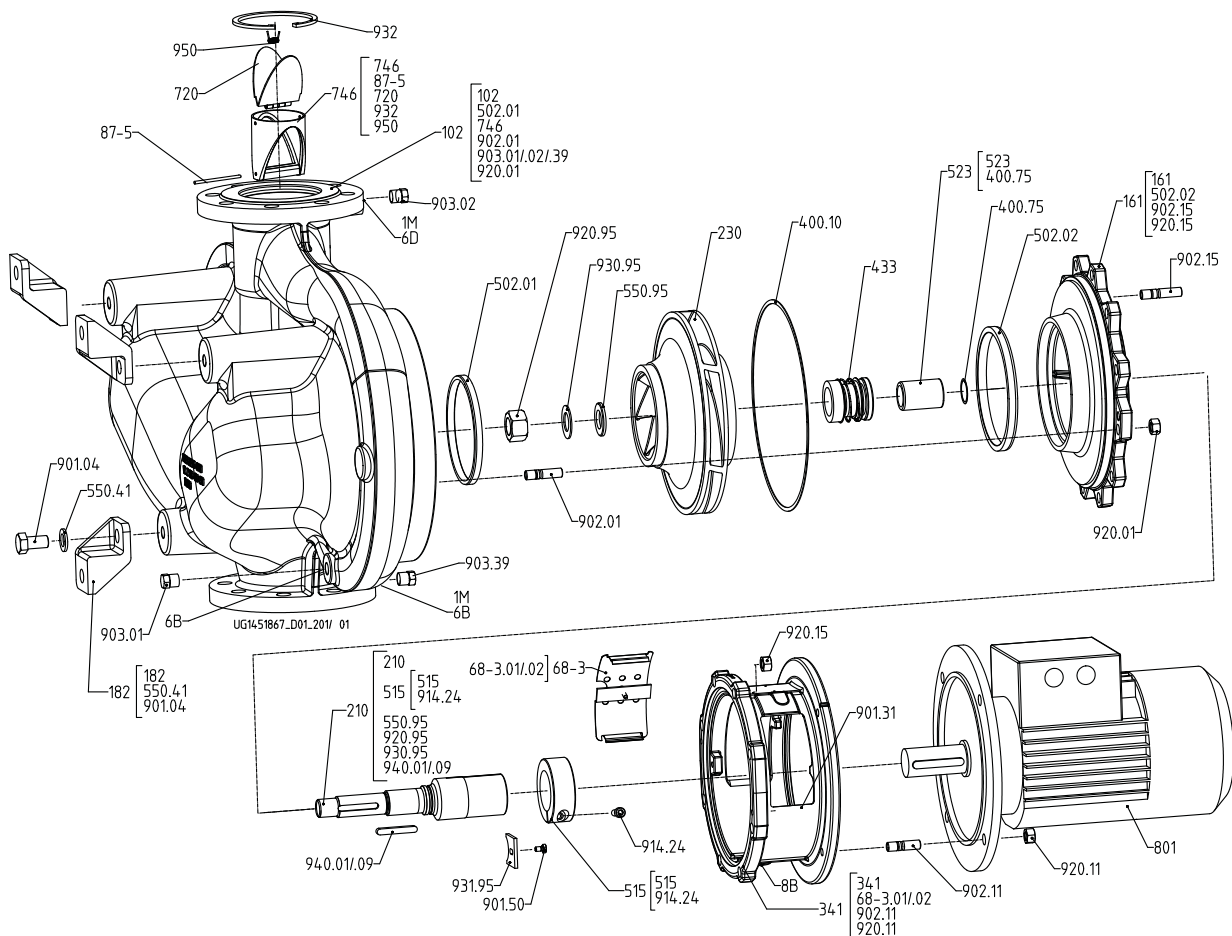


Fig. 11: Model with bolted casing cover

Table 22: List of components

| Part No. | Description | Part No. | Description |
|------------|-----------------|--------------------|-------------------------------|
| 102 | Volute casing | 87-5 | Hinge pin |
| 161 | Casing cover | 901.04/.31/.50 | Hexagon head bolt |
| 182 | Foot | 902.01/.11/.15 | Stud |
| 210 | Shaft | 903.01/.02/.39 | Screw plug |
| 230 | Impeller | 914.24 | Hexagon socket head cap screw |
| 341 | Drive lantern | 920.01/.11/.15/.95 | Hexagon nut |
| 400.10/.75 | Gasket | 930.95 | Safety device |
| 433 | Mechanical seal | 931.95 | Lock washer |

| Part No. | Description | Part No. | Description |
|-------------|-----------------------|--------------------|---------------------------|
| 502.01/.02 | Casing wear ring | 932 | Circlip |
| 515 | Taper lock ring | 940.01/.09 | Key |
| 523 | Shaft sleeve | 950 | Spring |
| 550.41/.95 | Disc ⁷⁾ | Connections | |
| 68-3.01/.02 | Cover plate | 1M | Pressure gauge |
| 720 | Fitting | 6B | Fluid drain |
| 746 | Changeover flap valve | 6D | Fluid priming and venting |
| 801 | Flanged motor | 8B | Leakage drain |

⁷⁾ For shaft unit 25 only

9.1.2 Variant with clamped casing cover

[Supplied in packaging units only]

Table 23: This view applies to the following pump sizes:

032-032-160 040-040-160 050-050-160 065-065-160 080-080-160 100-100-200 125-125-200

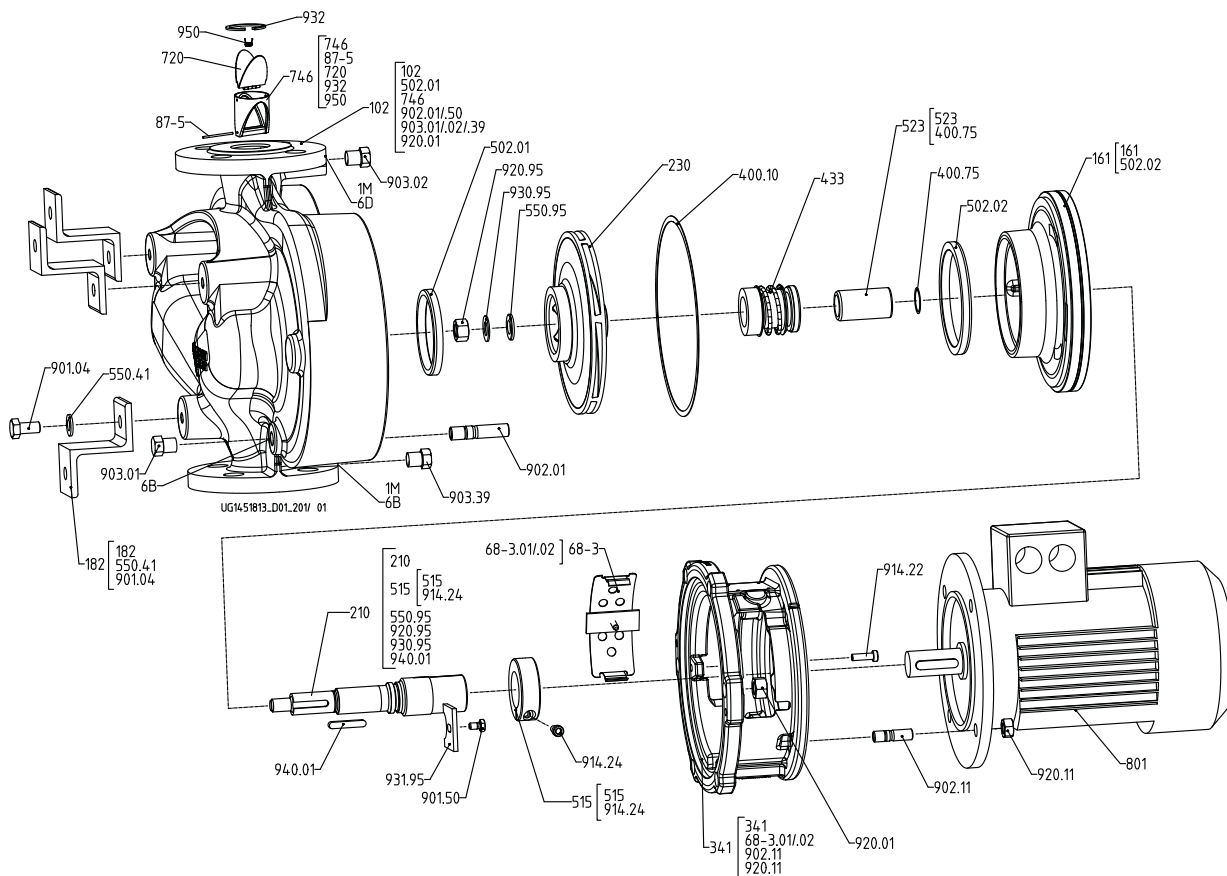


Fig. 12: Variant with single mechanical seal and clamped casing cover

Table 24: List of components

| Part No. | Description | Part No. | Description |
|----------|---------------|----------------|-------------------------------|
| 102 | Volute casing | 87-5 | Hinge pin |
| 161 | Casing cover | 901.04/.50 | Hexagon head bolt |
| 182 | Foot | 902.01/.11/.50 | Stud |
| 210 | Shaft | 903.01/.02/.39 | Screw plug |
| 230 | Impeller | 914.22/.24 | Hexagon socket head cap screw |

| Part No. | Description | Part No. | Description |
|-------------|--------------------|--------------------|---------------------------|
| 341 | Drive lantern | 920.01/.11/.95 | Hexagon nut |
| 400.10/.75 | Gasket | 930.95 | Lock washer |
| 433 | Mechanical seal | 931.95 | Lock washer |
| 502.01/.02 | Casing wear ring | 932 | Circlip |
| 515 | Taper lock ring | 940.01 | Key |
| 523 | Shaft sleeve | 950 | Spring |
| 550.41/.95 | Disc ⁸⁾ | | |
| 68-3.01/.02 | Cover plate | Connections | |
| 720 | Fitting | 1M | Pressure gauge |
| 746 | Valve disc | 6B | Fluid drain |
| 801 | Flanged motor | 6D | Fluid priming and venting |

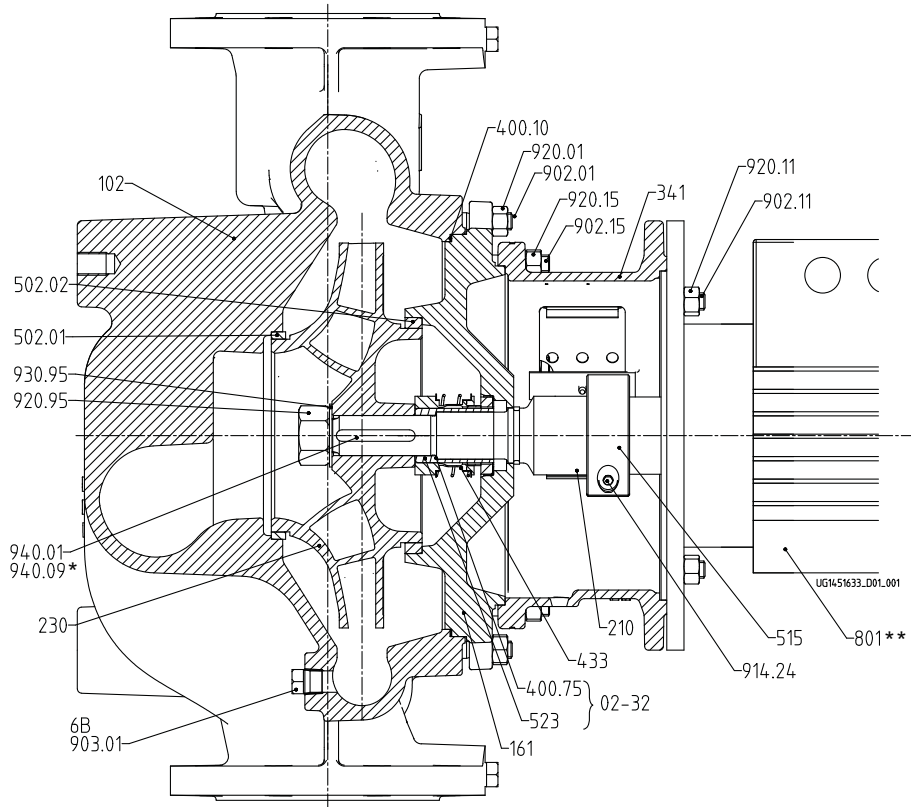
⁸⁾ For shaft unit 25 only



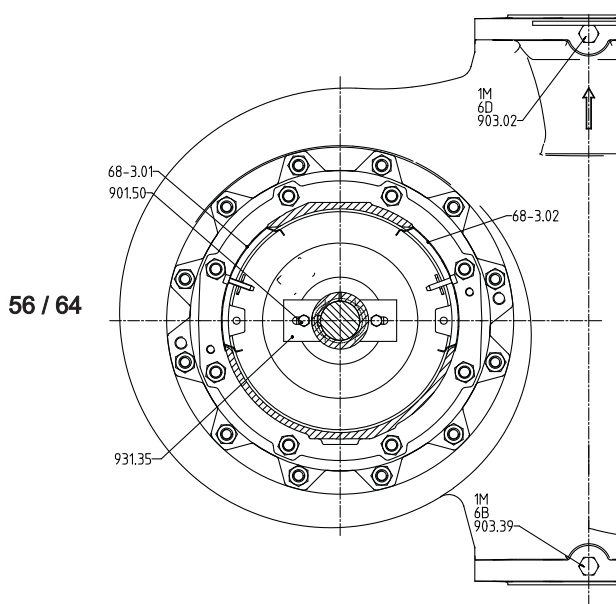
9.2 General assembly drawing with list of components

Table 25: This view applies to the following pump sizes with clamped casing cover:

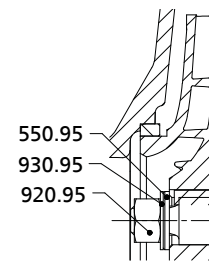
| | | | | | | | | |
|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| 032-032-20 | 040-040-25 | 050-050-25 | 065-065-25 | 080-080-250 | 100-100-250 | 125-125-250 | 150-150-250 | 200-200-250 |
| 0 | 0 | 0 | 0 | | | | | 200-200-315 |



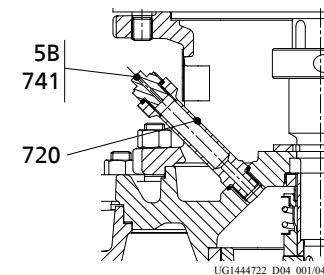
General assembly drawing, * Second key for WS 55 only; ** With motor foot from motor size 132



General assembly drawing: side view



Fastening elements for the impeller, WS 25



Vent valve 5B

Table 26: This view applies to the following pump sizes with clamped casing cover:

032-032-160 040-040-160 050-050-160 065-065-160 080-080-160 100-100-200 125-125-200

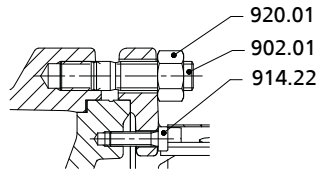


Fig. 13: Fastening elements for the clamped casing cover

Table 27: List of components

| Part No. | Description | Part No. | Description |
|-------------|---|--------------------|----------------------------------|
| 02-32 | Spare shaft protecting sleeve/ gasket assembly | 801 | Flanged motor |
| 102 | Volute casing | 901.50 | Hexagon head bolt |
| 161 | Casing cover | 902.01/.11/.15 | Stud |
| 210 | Shaft | 903.01/.02/.39 | Screw plug |
| 230 | Impeller | 914.22/.24 | Hexagon socket head cap screw |
| 341 | Drive lantern | 920.01/.11/.15/.95 | Hexagon nut |
| 400.10/.75 | Gasket | 930.95 | Lock washer |
| 433 | Mechanical seal | 931.35 | Lock washer |
| 502.01/.02 | Casing wear ring | 940.01/.09 | Key |
| 515 | Taper lock ring | | |
| 523 | Shaft sleeve | Connections | |
| 550.95 | Disc ⁹⁾ | 1M | Pressure gauge |
| 68-3.01/.02 | Cover plate | 5B | Vent, mechanical seal chamber |
| 720 | Fitting ⁷⁾ | 6B | Fluid drain |
| 741 | Vent valve | 6D | Fluid priming and venting |

⁹⁾ For shaft unit 25 only

10 EU Declaration of Conformity

Manufacturer:

Duijvelaar Pompen
DP Pumps
Kalkovenweg 13
2401 LJ Alphen aan den Rijn (The Netherlands)

The manufacturer herewith declares that **the product**:

Omega S, Omega DS

Order number:

- is in conformity with the provisions of the following Directives as amended from time to time:
 - Pump (set): Machinery Directive 2006/42/EC

The manufacturer also declares that

- the following harmonised international standards have been applied:
 - ISO 12100
 - EN 809

Person authorised to compile the technical file:

Wil Ouwehand
Technical Director
Duijvelaar Pompen
DP-Pumps
Kalkovenweg 13
2401 LJ Alphen aan den Rijn (The Netherlands)

The EU Declaration of Conformity was issued in/on:

Place, date

.....¹⁰⁾.....
Name
Function
Company
Address

¹⁰⁾ A signed, legally binding EU Declaration of Conformity is supplied with the product.

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