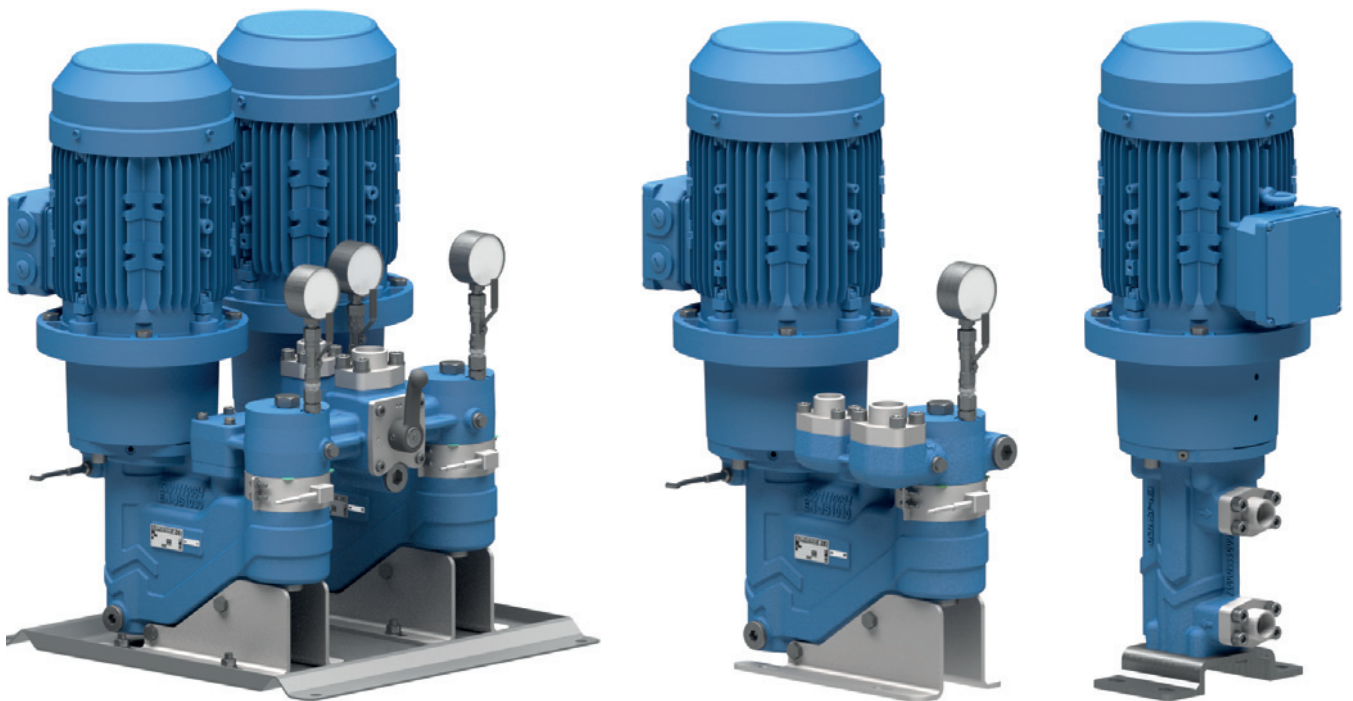


# Screw Pump

Original Operating Manual

**ALLFUEL Series**



Version BA-2024.05 en-US  
147-276/J  
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ALLWEILER GmbH  
Postfach 1140  
Allweilerstraße 1  
78301 Radolfzell  
Germany  
Phone: +49 (0) 7732-86-0  
Fax: +49 (0) 7732-86-436  
E-mail: [service@allweiler.de](mailto:service@allweiler.de)  
Internet: [pumps.circor.com](http://pumps.circor.com)

We reserve the right to make technical changes.  
Read carefully before use.  
Retain for future use.

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# 1 About this document

This manual:

- Is part of the pump
- Applies to the pump series mentioned above
- Describes safe and appropriate operation during all operating phases

## 1.1 Target groups

Target group	Duty
Operating company	<ul style="list-style-type: none"><li>▶ Keep this manual available at the site of operation of the equipment, including for later use.</li><li>▶ Ensure that personnel read and follow the instructions in this manual and the other applicable documents, especially all safety instructions and warnings.</li><li>▶ Observe any additional rules and regulations referring to the system.</li></ul>
Qualified personnel	<ul style="list-style-type: none"><li>▶ Read, observe and follow this manual and the other applicable documents, especially all safety instructions and warnings.</li></ul>





Tab. 1 Target groups and their duties

## 1.2 Other applicable documents



Document	Purpose
ATEX additional instructions	Operation in explosion-hazard areas
Order data sheet	Technical specifications, conditions of operation
Setup drawing	Setup dimensions, connection dimensions etc.
Technical description	Technical specifications, operating limits
Sectional drawing	Sectional drawing, part numbers, component designations
Supplier documentation	Technical documentation for parts supplied by subcontractors
Declaration of conformity	Conformity with standards, contents of the declaration of conformity (→ 9.4 Declaration of conformity, Page 41).

Tab. 2 Other applicable documents and their purpose

### 1.3 Warnings and symbols


Warning	Risk level	Consequences of disregarding the warning
	Immediate acute risk	Death, serious bodily harm
	Potential acute risk	Death, serious bodily harm
	Potentially hazardous situation	Minor bodily harm
	Potentially hazardous situation	Material damage

Tab. 3 Warnings and consequences of disregarding them

Symbol	Meaning
	Safety warning sign ► Take note of all information highlighted by the safety warning sign and follow the instructions to avoid injury or death.
►	Instruction
1. , 2. , ...	Multiple-step instructions
✓	Precondition
→	Cross reference
	Information, notes

Tab. 4 Symbols and their meaning

## 2 Safety

 The manufacturer does not accept any liability for damages caused by disregarding the entire documentation.


### 2.1 Intended use

- Only use the pump to pump the agreed pumped liquids (→ order data sheet).
- Adhere to the operating limits.
- Avoid dry running:
  - Make sure the pump is only operated with, and never without, pumped liquid.
- Avoid cavitation:
  - Fully open the suction-side fitting and do not use it to adjust the flow rate.
  - Open the pressure-side fitting completely.
- Avoid damage to the motor:
  - Note the maximum permissible number of times the motor can be switched on per hour (→ manufacturer's specifications).
- Consult the manufacturer about any other use of the pump.
- Pumps delivered without a motor must be assembled into a pump unit according to the provisions of EC Machine Directive 2006/42/EC (UK legislation: UK Statutory Instruments 2008 No. 1597).

#### Prevention of obvious misuse (examples)

- Note the operating limits of the pump with regard to temperature, pressure, viscosity, flow rate and motor speed (→ order data sheet).  
The pressures given in the order data sheet only apply for approximate static pressure. Consult the manufacturer on dynamically changing pressure.
- When using auxiliary systems, ensure there is a continuous supply of the appropriate operating medium.
- Do not operate the pump while the pressure-side fitting is closed.
- Pumps may not be used with foodstuffs if they have not been adapted accordingly. The use of the pump for foodstuffs must be specified in the order data sheet.
- Only select the setup type according to these operating instructions. For example, the following are not allowed:
  - Hanging base plate pumps in the pipe
  - Overhead installation
  - Installation in the immediate vicinity of extreme heat or cold sources
  - Installation too close to the wall

### 2.2 General safety instructions

 Observe the following regulations before carrying out any work.

#### 2.2.1 Product safety

The pump has been constructed according to the latest technology and recognized technical safety rules. Nevertheless, operation of the pump can still put the life and health of the user or third parties at risk or damage the pump or other property.

- Only operate the pump if it is in perfect technical condition and only use it as intended, remaining aware of safety and risks, and in adherence to the instructions in this manual.
- Keep this manual and all other applicable documents complete, legible and accessible to personnel at all times.
- Refrain from any procedures and actions that would pose a risk to personnel or third parties.
- In the event of any safety-relevant malfunctions, shut down the pump immediately and have the malfunction corrected by the personnel responsible.
- In addition to the entire documentation for the product, comply with statutory or other safety and accident-prevention regulations and the applicable standards and guidelines in the country where the pump is operated.

#### 2.2.2 Obligations of the operating company

##### Safety-conscious operation

- Only operate the pump if it is in perfect technical condition and only use it as intended, remaining aware of safety and risks, and in adherence to the instructions in this manual.
- Ensure that the following safety aspects are observed and monitored:
  - Intended use
  - Statutory or other safety and accident-prevention regulations
  - Safety regulations governing the handling of hazardous substances
  - Applicable standards and guidelines in the country where the pump is operated
- Make protective equipment available.

### Qualified personnel

- Make sure all personnel tasked with work on the pump have read and understood this manual and all other applicable documents, especially the safety, maintenance and repair information, before they start any work.
- Organize responsibilities, areas of competence and the supervision of personnel.
- Make sure that trainee personnel only work on the pump under the supervision of specialist technicians.
- All activities may only be carried out by specialist personnel with the required qualifications:

Activities	Required personnel qualifications
Mechanical work (installation, repairs, maintenance)	Mechanic
Electro-technical work (electrical installation)	Qualified electrician
All other work	Instruction from operator

### Safety equipment

- Provide the following safety equipment and verify its functionality:
  - For hot, cold and moving parts: on-site safety guards for the pump
  - If there is no pressure relief valve in the pump: Provide an appropriate safety valve on the pressure side between the pump and the first shut-off device
- Grounding and electrical bonding for pump with flanged motor:
  - Ensure that the mounting surface of the motor is metallically bare.

### Warranty

- Obtain the manufacturer's approval prior to carrying out any modifications, repairs or alterations during the warranty period.
- Only use genuine parts or parts that have been approved by the manufacturer.

### Drive system

For pumps delivered without a drive system, comply with the following requirements for the drive system:

- When using three-phase asynchronous motors, observe IEC 60034-30-1.
- Power of the drive according to EN ISO 5199 is recommended (EN ISO 5199 also applicable for drives of screw pumps).
- When using combustion engines, consult Allweiler.
- For pumps with stub shaft, connect drive system and pump directly with stub shaft.

- Use flexible coupling according to DIN 740-2.
- Use coupling guard with the following requirements:
  - Fastening elements must be connected to the pump unit in undetachable design (cannot get lost).
  - Safety distances against the reaching of hazardous areas according to EN ISO 13857 must be complied with.

### 2.2.3 Obligations of personnel

- All directions given on the pump must be followed (and kept legible), e.g. the arrow indicating the sense of rotation and the markings for fluid connections.
- Pump, coupling guard and components:
  - Do not step on them or use as a climbing aid
  - Do not use them to support boards, ramps or beams
  - Do not use them as a fixing point for winches or supports
  - Do not use them for storing paper or similar materials
  - Do not use hot pump or motor parts as a heating point
  - Do not de-ice using gas burners or similar tools
- Do not remove the safety guarding for hot, cold or moving parts during operation.
- If necessary, protective equipment that is appropriate for the respective assignment must be used:
  - Helmet
  - Safety shoes
  - Safety goggles
  - Gloves (min. protection class 3/C)
  - Other protective equipment depending on the (pumped) liquid
- Only carry out work on the pump while it is not running.
- Isolate the motor from its supply voltage and secure it against being switched back on again when carrying out any fitting or maintenance work.
- Reinstall the safety equipment on the pump as required by regulations after any work on the pump.

## 2.3 Specific hazards

### 2.3.1 Explosion-hazard area

- (→ ATEX additional instructions).

### 2.3.2 Electric shock

In case of contact with live parts (for example, cables in the terminal box of the electric motor) there is a risk of electric shock resulting in serious injuries or death.

- Have all electrical work carried out by qualified electricians only.



### 2.3.3 Hazardous and spraying (pumped) liquids

(Pumped) liquids can be toxic and hot and can spray out. There is a risk of burns and skin rashes on contact.

- Follow the safety regulations for handling hazardous substances when handling hazardous (e.g. hot, flammable, poisonous or potentially harmful) pumped liquids.
- Before carrying out any work, allow the pump to cool down properly and then depressurize it.
- Safely collect any leaking (pumped) liquid and dispose of it in accordance with the environmental rules and requirements.
- Drain the pump when carrying out maintenance and repair work.
- Use protective equipment when carrying out any work on the pump.

### 2.3.4 Moving parts

With moving parts (e.g. shaft, coupling) there is a risk of fatal injuries from being pulled in, crushed or caught.

- Do not touch the pump during operation.
- Do not carry out any work on the pump during operation.
- Keep a sufficient distance away from moving parts.
- Isolate the motor from its supply voltage and secure it against being switched back on again when carrying out any installation or maintenance work.

### 2.3.5 Hot surfaces

During operation and after switching off, high temperatures occur on the housing surfaces. There is a risk of burns when touching hot surfaces.

- Do not touch the pump during operation.
- Allow the pump to cool down completely before carrying out any work.
- Wear protective gloves.

3 Layout and function

3.1 Label

3.1.1 Nameplate

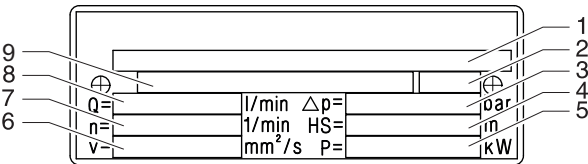


Fig. 1 Nameplate (example)

- 1 Pump type
- 2 Year of manufacture
- 3 Discharge pressure
- 4 Suction head
- 5 Power consumption
- 6 Kinematic viscosity
- 7 Motor speed
- 8 Flow rate
- 9 Pump number

3.1.2 Digital nameplate

The digital nameplate is an additional plate and contains a machine-readable pump identification number. The number is a globally unique identifier for this pump.

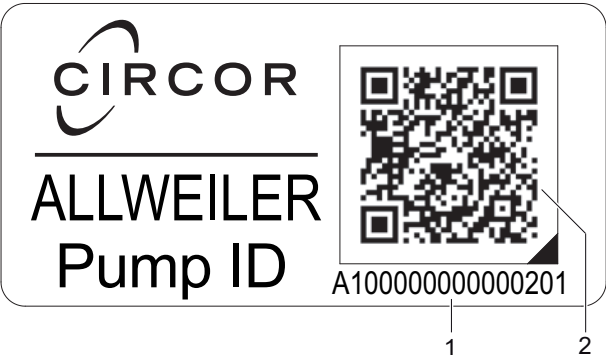


Fig. 2 Digital nameplate, standard version (example)

- 1 Identification number
- 2 QR code

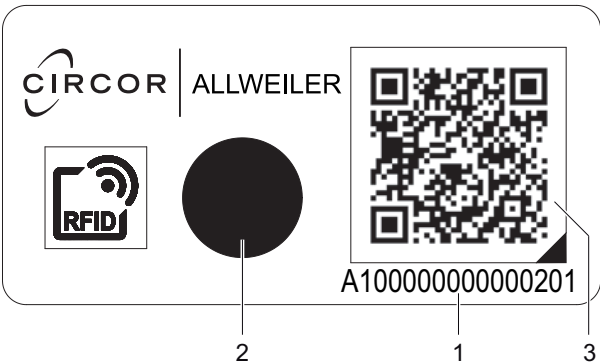


Fig. 3 Digital nameplate, variant with optional RFID transmitter (example)

- 1 Identification number
- 2 RFID transponder (HF)
- 3 QR code

3.1.3 ATEX plate

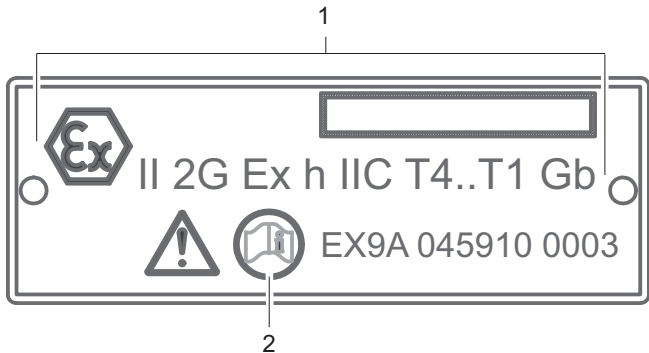


Fig. 4 ATEX plate (EN 80079-36)

- 1 Explosion protection mark
- 2 Reference to ATEX additional instructions

### 3.1.4 Pump type code

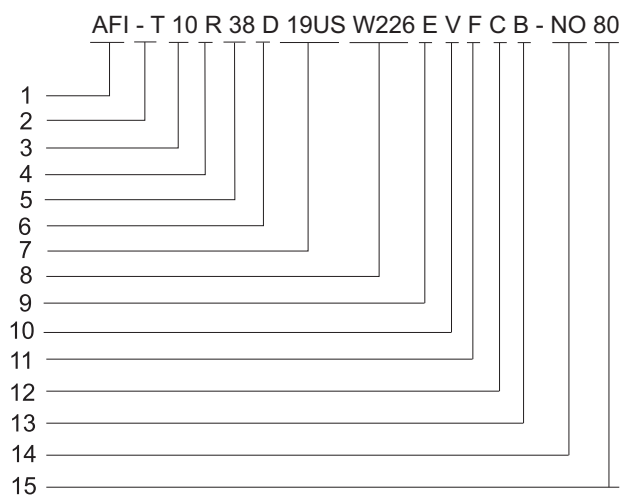


Fig. 5 Pump type code (example)

Position	Meaning	
1	Series	
2	Version	
	-E	Insert unit
	-F	Single unit with filter
	-T	Twin unit with filter
	Omitted for individual units without filter (AFI)	
3	Size	
	Theoretical flow rate Q in l/min at 1450 rpm and 46° pitch angle	
4	Spindle pitch direction	
	R	Right
5	Spindle pitch angle in degrees	
6	Bearing type	
	D	Outside antifriction bearing
7	Non-heated, non-cooled, single-action mechanical shaft seal	
8	Material version	
9	Version with electrically heated mechanical seal and filter housing	
	Omitted in the unheated version	
10	Type of installation	
	V	vertical
	H	horizontal
	Applicable for individual units without filter (AFI), omitted for version -E, -F, -T according to pos. 2	
11	Flange	
	F	Counter flange
	A	Adapter flange
	Omitted for versions without counter flange or adapter flange	
12	Coupling for motor size according to pos. 15	
	Option if motor not included in the scope of delivery, according to pos. 14	
	Omitted if motor in scope of delivery	
13	Pump carrier for motor size according to pos. 15	
	Option if motor not included in the scope of delivery, according to pos. 14	
	Omitted if motor in scope of delivery	
14	No motor included in delivery contents	
	Omitted if motor in scope of delivery	
15	Motor size	

Tab. 5 Pump type code

### 3.2 Layout

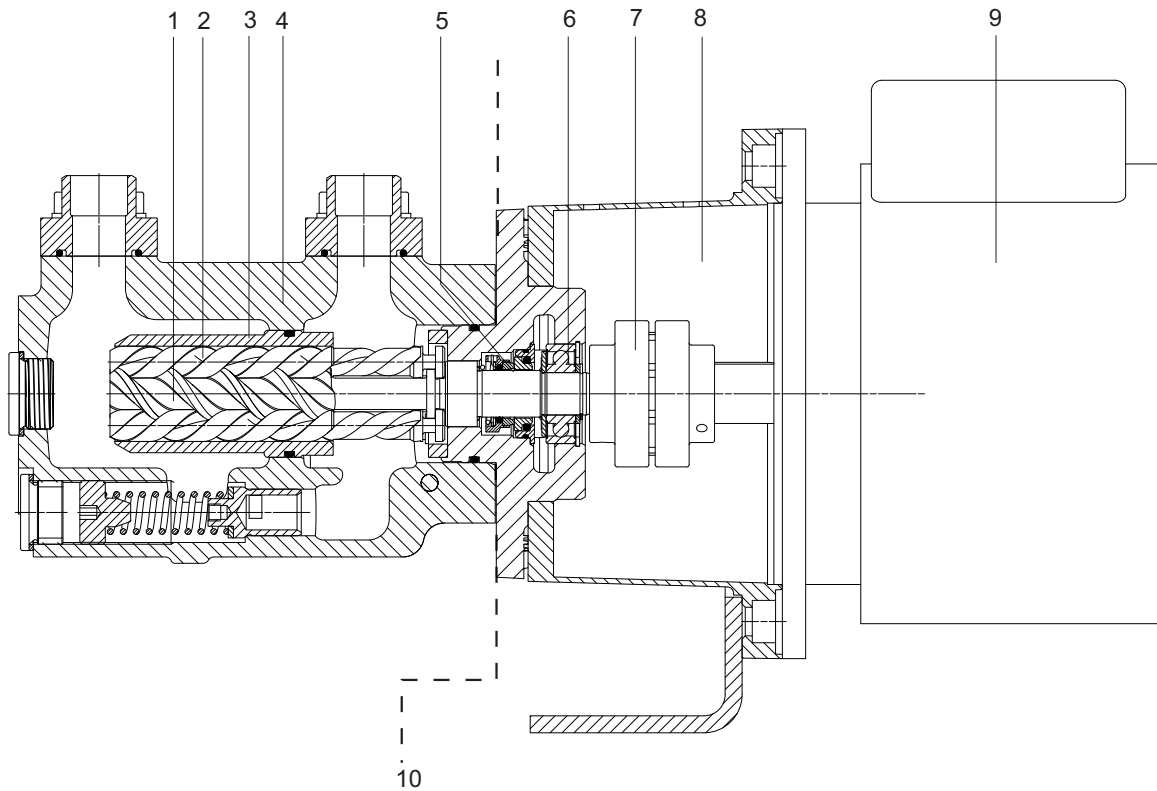


Fig. 6 Pump layout

- |                 |                |                              |
|-----------------|----------------|------------------------------|
| 1 Drive screw   | 5 Shaft seal   | 9 Motor                      |
| 2 Idler rotor   | 6 Bearing      | 10 Limit for heat insulation |
| 3 Casing insert | 7 Coupling     |                              |
| 4 Pump casing   | 8 Pump carrier |                              |

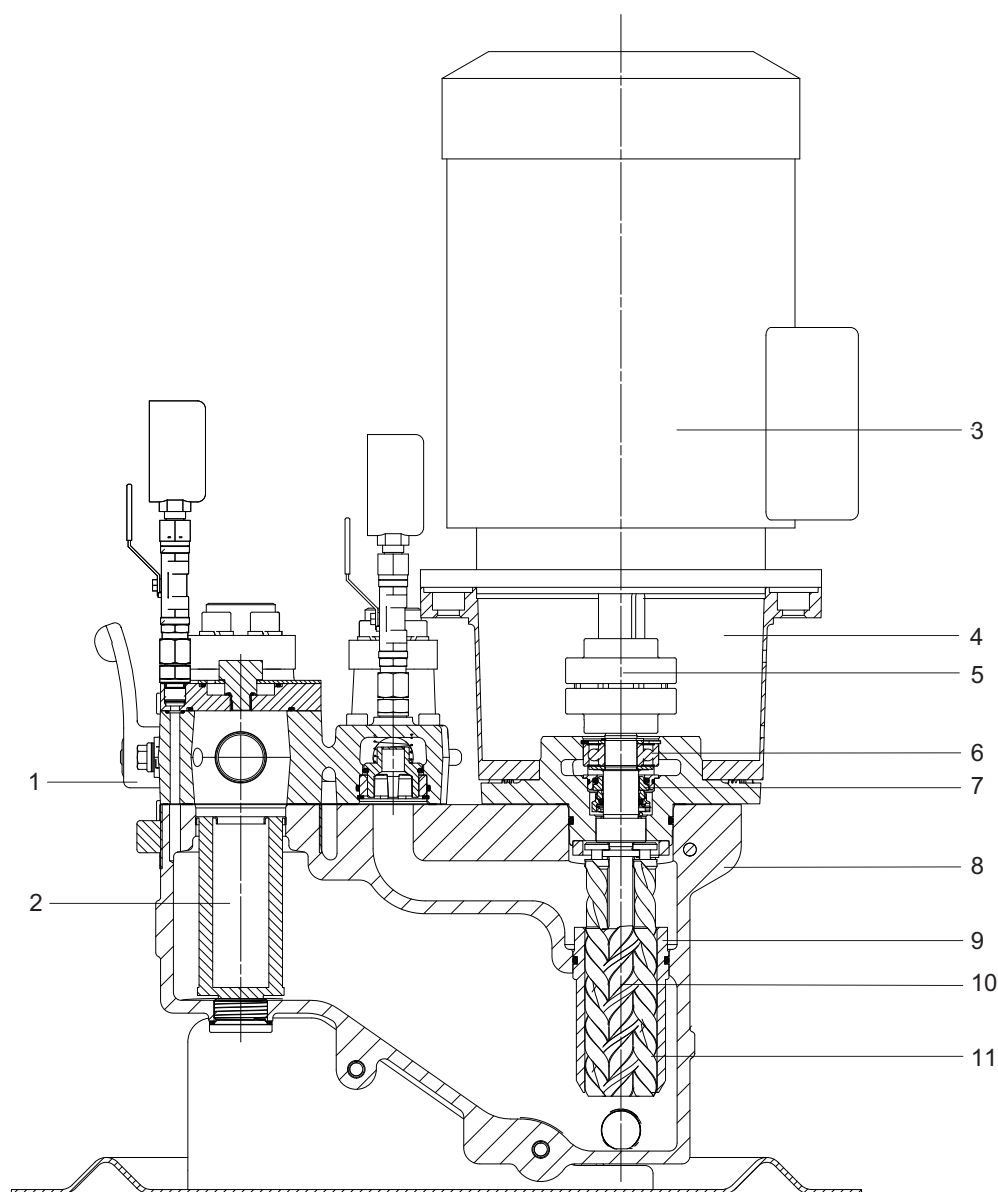



Fig. 7 Layout of twin unit with filter

- |                |               |                 |
|----------------|---------------|-----------------|
| 1 Ball valve   | 5 Coupling    | 9 Casing insert |
| 2 Filter       | 6 Bearing     | 10 Drive screw  |
| 3 Motor        | 7 Shaft seal  | 11 Idler rotor  |
| 4 Pump carrier | 8 Pump casing |                 |

### 3.3 Shaft seals

#### 3.3.1 Mechanical seals


 Mechanical seals have functional leakage.

- Mechanical seal, standard version
  - Uncooled, maintenance-free unbalanced mechanical seal construction


### 3.4 Bearings and lubrication

- External antifriction bearing lubricated with grease according to DIN 625
  - Not capable of relubrication, lifetime grease fill

### 3.5 Auxiliary systems (heating)

 The mechanical seal area can be electrically heated. This allows the mechanical seal area to be pre-heated when the pump is not running.

### 3.6 Hydraulic diagram

 For twin unit with filter (AFI-T) only.

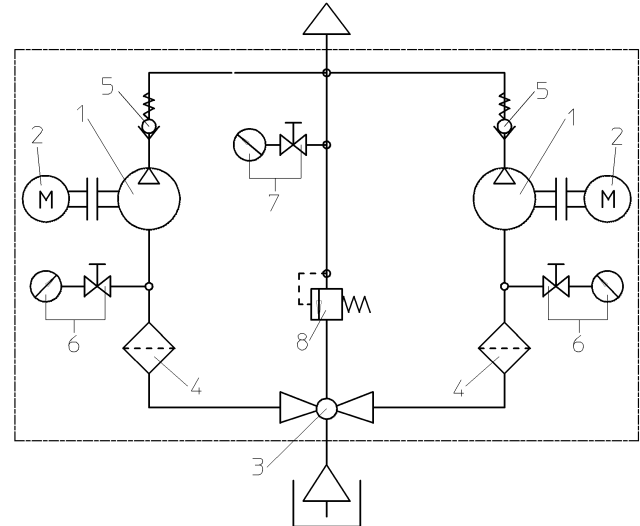



Fig. 8 Circuit diagram of twin unit with filter

- 1 Main and stand-by pump
- 2 Motor (910)
- 3 Ball valve (24)
- 4 Filter (480)
- 5 Check valve (335)
- 6 Compound gauge with stop valve (360)
- 7 Pressure gauge with stop valve (361)
- 8 Pressure relief valve (330)

## 4 Transport, storage and disposal

### 4.1 Transport

 Weight specifications (→ order data sheet).

#### 4.1.1 Unpacking and inspection on delivery

1. Unpack the pump/unit on delivery and inspect it for transport damage.
2. Report any transport damage to the manufacturer immediately.
3. Dispose of packaging material according to local regulations.

#### 4.1.2 Lifting

### DANGER

**Death or crushing of limbs caused by falling or overturning loads!**

- ▶ Use lifting gear appropriate for the total weight to be transported.
  - ▶ Select the attachment points according to their center of gravity and weight distribution.
  - ▶ Use at least two hoisting cables.
  - ▶ For vertical transport: Provide a securing rope between the hook and load eyebolt of the motor.
  - ▶ Never fasten the lifting gear onto the motor eyebolt (unless used as a safety device against tipping over for units with a high center of gravity).
  - ▶ Do not stand under suspended loads.
- 
- ▶ Fasten the lifting gear to the pump unit (see illustrations).

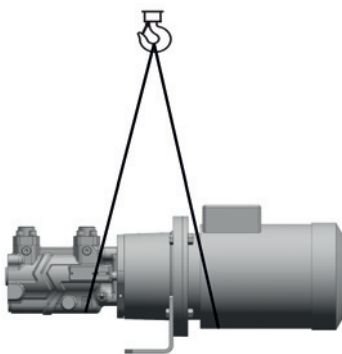


Fig. 9 Fastening the lifting gear to the pump unit horizontally (as illustrated)




Fig. 10 Fastening the lifting gear to the pump unit vertically or the filter unit with single pump (as illustrated)



Fig. 11 Fastening the lifting gear to the twin unit with filter

## 4.2 Treatment for storage


-  The pump has not been treated for storage at the factory. Treatment is not necessary for non-rusting materials. Contact the manufacturer for recommendations regarding preservatives.

### NOTE

**Material damage due to missing or inappropriate treatment for storage!**

- Treat the pump properly, inside and outside, for storage.

### 4.2.1 Applying preservative to the inside

-  Spray the insert units with preservative and shrink-wrap them in plastic film.

1. Close the suction-side flange with a blank flange.
2. Fill up the pump with preservative.
3. Turn the shaft slowly against the pump's sense of rotation.
4. Continue filling and turning until preservative escapes from the discharge flange without bubbles.
5. Close the pressure-side flange with a blank flange.
6. Every 6 months:
  - Renew the preservative if necessary.

### 4.2.2 Applying preservative to the outside

1. Apply preservative to all bare metal parts.
2. Every 6 months:
  - Renew the preservative if necessary.

## 4.3 Storage


### NOTE

**Material damage due to inappropriate storage!**

- Treat and store the pump properly.

1. Seal all openings with blank flanges, blind plugs or plastic covers.
2. Make sure the storage room meets the following conditions:
  - Dry
  - Frost-free
  - Vibration-free
  - Dust-free
3. Turn the shaft once a month.
4. Make sure the shaft and bearing change their rotational position in the process.

## 4.4 Removing the preservative

-  Only necessary for pumps treated for storage.

### NOTE

**High water pressure or spray water can damage bearings!**

- Do not clean bearing areas with a water or steam jet.

### NOTE

**Damage to seals due to wrong cleaning agents!**

- Ensure the cleaning agent does not corrode the seals.

1. Choose the cleaning agent according to the application. (→ 9.2.4 Cleaning agents, Page 39).
2. Remove the preservative from all bare internal parts of the pump.
3. Dispose of cleaning agents in accordance with local regulations.
4. For storage times in excess of 6 months:
  - Replace the elastomer parts made of EP rubber (EPDM).
  - Check all elastomer parts (O-rings, shaft seals) for proper elasticity and replace them if necessary.
5. Check that all pressure relief valves and check valves can move freely.



## 4.5 Disposal

### 4.5.1 Preparing for disposal

#### WARNING

##### **Risk of poisoning and environmental damage by the pumped liquid or oil!**

- ▶ Use protective equipment when carrying out any work on the pump.
- ▶ Display of the pump:
  - Collect and dispose of any leaking pumped fluid or oil in accordance with local regulations.
  - Neutralize residues of pumped liquid in the pump.
  - Removing preservative (→ 4.4 Removing the preservative, Page 16).

1. If the pump/unit has been exposed to toxic or radioactive contamination, decontaminate the pump/unit properly.
2. If present, delete personal data.

### 4.5.2 Disposal



The pump/unit contains valuable recyclable materials. Disposal via the manufacturer's return system is an important contribution to health and environmental protection, recycling and reuse.

The pump/unit must be collected and disposed of separately from domestic waste:




Fig. 12 Disposal note

- ▶ Dispose of the pump/unit according to the manufacturer's instructions:  
[www.circor.com/brands/allweiler#17026](http://www.circor.com/brands/allweiler#17026)



## 5 Setup and connection

 For pumps in explosion-hazard areas (→ ATEX additional instructions).

### NOTE

#### Material damage due to distortion or passage of electrical current in the bearing!

- ▶ Do not make any structural modifications to the pump unit or pump casing.
- ▶ Do not carry out any welding work on the pump unit or pump casing.

### NOTE

#### Material damage caused by dirt!

- ▶ Do not remove any covers or transport and screw plugs until immediately before connecting the pipes to the pump.

### 5.1 Preparing the setup

#### 5.1.1 Checking the ambient conditions

- ▶ Make sure the required ambient conditions are fulfilled (→ 9.2.1 Ambient conditions, Page 39).

#### 5.1.2 Preparing the installation site

- ▶ Ensure the installation site meets the following conditions:
  - Pump is freely accessible from all sides
  - Sufficient space for the installation/removal of the pipes and for maintenance and repair work, especially for the removal and installation of the pump and the motor
  - Pump not exposed to external vibrations (damage to bearings)
  - Frost protection


#### 5.1.3 Preparing the surface

- ▶ Make sure the surface meets the following conditions:
  - Level
  - Clean (no oil, dust or other impurities)
  - Capable of bearing the weight of the pump unit and all operating forces
  - The pump is stable and cannot tip over

#### 5.1.4 Removing the preservative

- ▶ If the pump is to be put into operation immediately after setup and connection: Remove the preservative prior to installation (→ 4.4 Removing the preservative, Page 16).

#### 5.1.5 Installing the heat insulation (optional)

 Only necessary to maintain the temperature of the pumped liquid.

### NOTE

#### Material damage on the bearing or shaft seal due to overheating!

- ▶ Only install the heat insulation on the pump casing.
- ▶ Install the heat insulation properly.

### 5.2 Setup

#### 5.2.1 Set up with pump carrier


### CAUTION

#### Material damage due to air pockets in the pump, dry running and leakage accumulation in the pump cover (3)!

- ▶ For horizontal setup, position the flange upward.
- ▶ For horizontal setup, position the air release plug (160) upward.
- ▶ For vertical setup, position the motor upward.

1. Lift the pump unit and set it down at the installation location (→ 4.1 Transport, Page 15).
2. Install the pump unit (→ setup drawing).

#### 5.2.2 Setup with base

 Pump units and pump filter units with a base are installed vertically (motor at the top).

1. Lift the pump unit and set it down at the installation location (→ 4.1 Transport, Page 15).
2. Install the pump unit (→ setup drawing).

### 5.3 Planning the motor and drive system

#### NOTE

##### Material damage due to inappropriate planning

- ▶ Only use trained specialists to plan, install and connect the electric motor and integrate it into the drive system.
- ▶ Ensure that the specialist personnel are familiar with the use of the pump.

1. For the installation and connection of electric motors, read and apply the applicable technical documentation of the motor manufacturer.
2. Observe the standards and regulations:
  - IEC 60034-12 and cited standards
  - generally applicable connection and installation specifications
3. Ensure that the motor documentation matches the information on the rating plate.
4. Determine the mains voltage and system at the installation site.
5. Use a suitable circuit:
  - Observe starting currents, select components with appropriate safety (especially for direct starting, soft starting or frequency inverter operation).
  - Observe the maximum switching frequency.
  - Select the changeover time for star-delta start to be as short as possible and set the timing relay accordingly.
  - When operating with a frequency inverter, observe the technical documentation of the frequency inverter.

### 5.4 Installing the motor

#### 5.4.1 Installing the motor on pumps in flange versions



Only necessary if the pump unit is assembled on site.

#### NOTE

##### Material damage caused by knocks and bumps!

- ▶ Keep the coupling halves properly aligned when slipping them on.
- ▶ Do not knock or hit any components of the pump.

1. Smear a very thin coat of molybdenum disulfide (e.g. Molykote) on the shaft ends of the pump and motor.
2. Insert the shaft keys.
3. Slip on the pump-side and motor-side coupling halves in line.
  - Without a mounting fixture: Remove the rubber buffers and heat the coupling halves up to approximately 100 °C.
4. Tighten the grub screws on both coupling halves.
5. Lift the motor and position it on the pump carrier.
6. Tighten the motor bolts.

### 5.5 Planning the pipes

#### 5.5.1 Specifying supports and flange connections

#### NOTE

##### Material damage due to excessive forces and torques exerted by the piping on the pump!

- ▶ Do not exceed the permissible values (→ flange loads according to EN ISO 14847)

1. Calculate the pipe forces, taking every possible operating condition into account:
  - Cold/warm
  - Empty/full
  - Depressurized/pressurized
  - Positional changes of the flanges
2. Ensure the pipe supports have permanent low-friction properties and do not seize up due to corrosion.

#### 5.5.2 Specifying nominal diameters



Keep the flow resistance in the pipes as low as possible.

1. Make sure the nominal suction pipe diameter is  $\geq$  as possible to the nominal suction branch diameter.
  - Recommended flow rate speed  $< 1$  m/s
2. Make sure the nominal pressure line diameter is  $\geq$  as possible to the nominal outlet flange diameter.
  - Recommended flow rate speed  $< 3$  m/s

### 5.5.3 Specifying pipe lengths

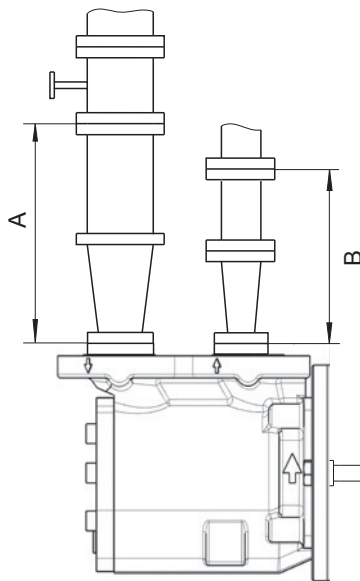



Fig. 13 Straight pipe lengths upstream and downstream of the pump (recommended)

A > 5 x nominal suction pipe diameter

B > 5 x nominal pressure line diameter

- Recommendation: Provide long, straight pipes upstream and downstream of the pump.
  - This will improve the suction performance of the pump.

 Suction side: Shorter pipes are possible but may restrict the hydraulic performance.

Pressure side: Shorter pipes are possible but can result in increased operating noise.

### 5.5.4 Optimizing changes in cross-section and direction

1. Avoid bending radii of less than 1.5 times the nominal pipe diameter.
2. Avoid abrupt changes of cross-section and direction along the piping.

### 5.5.5 Discharging leakage

#### WARNING

**Risk of injury and poisoning due to hazardous pumped liquids!**

- Safely collect any leakage, then discharge and dispose of it in accordance with environmental regulations.

1. Provide equipment for collecting and discharging leakage.
2. Ensure the free discharge of leakage.

### 5.5.6 Avoiding excessive pressure

#### WARNING

**Risk of injury due to excessive pressure!**

- If no pressure relief valve is present: Provide an appropriate safety valve in the pressure line.

#### NOTE


**Material damage due to overheating of the pump!**

- If the return flow of the pressure relief valve flows directly into the pump suction side or suction pipe: Monitor the temperature.

1. Observe the operating instructions of the manufacturer.
2. Make sure the factory setting of the pressure relief valve meets the requirements of the system.
3. Do **not** feed the return flow of the safety valve directly back into the suction pipe.

### 5.5.7 Providing safety and control devices (recommended)

#### Avoid impurities


 Not necessary with filter units.

1. Install a dirt trap in the suction pipe (mesh size of 0.4 mm).
2. To monitor impurities, install a differential pressure gauge with contact pressure gauge.
3. Provide a fine filter if necessary:
  - Select the filter mesh, depending on the type, level of dirt and discharge pressure.

#### Avoiding reverse running


- ▶ Install a check valve between the outlet flange and the stop valve to ensure the liquid does not flow back when the pump is switched off.

#### Making provisions for isolating and shutting off pipes

 For maintenance and repair work.


- ▶ Provide shut-off devices in the suction and pressure lines.

#### Allowing measurement of the operating conditions

 Not necessary with filter units.

1. Provide pressure gauges for measurements in the suction and pressure lines.
2. Provide for suction-side temperature measurements.

#### Monitoring leakage

 Only necessary for hot or hazardous pumped liquids.

1. Provide leak monitoring equipment.
2. Safely collect any leakage (e.g. following a seal malfunction) and dispose of it.

## 5.6 Connecting the pipes

### 5.6.1 Keeping the pipes clean

#### NOTE

##### Material damage due to impurities in the pump!

- Make sure no impurities can enter the pump.

1. Flush all pipe parts and fittings prior to assembly.
2. Ensure no flange seals protrude inwards.
3. Remove any blank flanges, plugs, protective foils and/or protective paint from the flanges.
4. On welded pipes: Remove the welding beads.

### 5.6.2 Installing the suction pipe

1. Remove the transport and screw plugs from the pump.
2. To avoid air pockets:
  - For supply operation: Run the pipes with a continuous downward slope to the pump.
3. Ensure no seals protrude inwards.
4. On wet pit installations: Observe the minimum immersion depth (→ technical description).

### 5.6.3 Installing the pressure line

1. Remove the transport and screw plugs from the pump.
2. To avoid air pockets:
  - Run the pressure line with a continuous upward or downward slope.
  - Otherwise, include a vent valve at the highest point of the pressure line.
3. Install the pressure line.
4. Ensure no seals protrude inwards.

### 5.6.4 Checking the stress-free pipe connections

- ✓ Piping installed and cooled down

#### NOTE

##### Material damage due to distorted pump casing

- Ensure that all pipes are stress relieved when connected to the pump.

1. Disconnect the pipe connecting flanges from the pump.
2. Check whether the pipes can be moved freely in all directions within the expected range of expansion:
  - Nominal diameter < 150 mm: by hand
  - Nominal diameter > 150 mm: with a small lever
3. Make sure the flange surfaces are parallel.
4. Reconnect the pipe connecting flanges to the pump.


## 5.7 Electrical connection

### DANGER

#### Risk of death due to electric shock!


- Have all electrical work carried out by qualified electricians only.

### 5.7.1 Connecting the motor

-  Follow the instructions of the motor manufacturer.

1. Connect the motor according to the connection diagram.
2. Make sure no danger arises due to electric power.
3. Install an EMERGENCY STOP switch.

### 5.7.2 Connecting the heater

-  Observe the manufacturer's specifications for the heater.

1. Connect the heater according to the connection diagram.

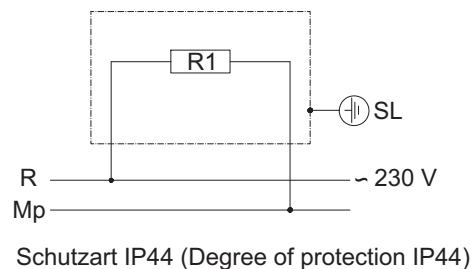


Fig. 14 Connection diagram heater


2. Make sure no danger arises due to electric power.
3. Install an EMERGENCY STOP switch.


## 5.8 Installing the coupling guard

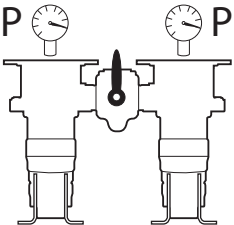
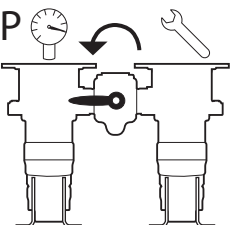
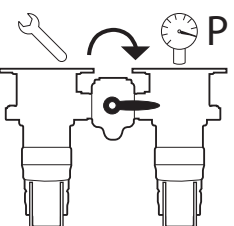
### Flanged drive

1. If present, install the coupling guard (two plates) on the pump carrier.

## 6 Operation


 For pumps in explosion-hazard areas (→ ATEX additional instructions).

 Operation of twin units: Using the changeover ball valve (401), one of the pumps can be switched to Service (depressurized):

	<p>Changeover ball valve (401) in center position (normal position):</p> <ul style="list-style-type: none"> <li>Both pumps ready for operation; activation <b>of each of the pumps</b> with manual motor On/Off switch</li> </ul>
	<p>Changeover ball valve (401) in left position (Service/maintenance mode):</p> <ul style="list-style-type: none"> <li>Left pump in operation</li> <li>Right pump in Service (depressurized)</li> </ul>
	<p>Changeover ball valve (401) in right position (Service/maintenance mode):</p> <ul style="list-style-type: none"> <li>Left pump in Service (depressurized)</li> <li>Right pump in operation</li> </ul>


### 6.1 Putting the pump into service for the first time

#### 6.1.1 Removing the preservative


 Only necessary for pumps treated for storage.

► (→ 4.4 Removing the preservative, Page 16).

#### 6.1.2 Preparing auxiliary systems (if available)

 The manufacturer does not accept any liability for damage caused by installing or using a third-party or unapproved auxiliary system.

#### Pressure relief valve

 The pressure relief valve supplied by the manufacturer is pre-set.

► Make sure the safety valve on the system side meets the requirements of the pump.

#### 6.1.3 Filling and bleeding

1. Open the suction-side fitting.  
On twin units:  
Move the changeover ball valve (401) to the center position.
2. Fill the pump and suction pipe with pumped liquid until pumped liquid escapes without bubbles.
3. Fill the seal chamber with pumped liquid and bleed it using the air release plug (160).
4. Open the pressure-side fitting.
5. Ensure that no pipe connections are leaking.

#### 6.1.4 Checking the sense of rotation

✓ Pump filled and bled

### NOTE

#### Material damage caused by dry running!

► Make sure the pump is filled properly.

### NOTE

#### Material damage due to incorrect sense of rotation!

► Uncouple the motor from pump.

1. Switch the motor on and immediately off again.
2. Check whether the motor's sense of rotation is the same as that of the arrow on the pump.
3. If the sense of rotation is different: Swap two phases.
4. Couple the motor to the pump again.

### 6.1.5 Switching on

- ✓ Pump set up and connected properly
- ✓ Motor set up and connected properly
- ✓ All connections stress-free and sealed
- ✓ All safety equipment installed and tested for functionality
- ✓ Pump prepared, filled and bled properly
- ✓ Sufficient filling level in the container
- ✓ Sense of rotation checked

#### NOTE

#### Risk of cavitation when throttling down the suction flow rate!

- ▶ Fully open the suction-side fitting and do not use it to adjust the flow rate.
- ▶ On twin units: Move the changeover ball valve (401) to the center position.

#### NOTE

#### Material damage due to excessive pressure!

- ▶ Do not operate the pump while the pressure-side fitting is closed.

#### NOTE

#### Material damage caused by dry running!

- ▶ Make sure the pump is filled properly.

#### NOTE

#### Material damage due to incorrect sense of rotation!

- ▶ Ensure that the motor's sense of rotation is the same as that of the arrow on the pump.
- ▶ If the sense of rotation is incorrect, switch the motor off immediately and correct the sense of rotation.

1. Open the pressure-side fitting.
2. Open the suction-side fitting.
3. On twin units:  
Move the changeover ball valve (401) to the center position.
4. Switch on the motor and check it for smooth running.
5. Make sure the temperature rises at a rate of no more than 2 K/min.
6. Make sure the minimum discharge pressure is above 2 bar.
7. After the first load under pressure and at operating temperature, check that the pump is not leaking.

### 6.1.6 Switching off

1. Switch off the motor.
2. After initial start-up: Check all tie bolts and retighten them if necessary.

## 6.2 Operation

### 6.2.1 Switching on

- ✓ Pump initially put into service properly
- ✓ Pumps filled and bled

#### NOTE

#### Risk of cavitation when throttling down the suction flow rate!

- ▶ Fully open the suction-side fitting and do not use it to adjust the flow rate.
- ▶ On twin units: Move the changeover ball valve (401) to the center position.

#### NOTE

#### Material damage due to excessive pressure!

- ▶ Do not operate the pump while the pressure-side fitting is closed.

#### NOTE

#### Material damage caused by dry running!

- ▶ Make sure the pump is filled properly.


#### NOTE

#### Material damage due to incorrect sense of rotation!

- ▶ Ensure that the motor's sense of rotation is the same as that of the arrow on the pump.
- ▶ If the sense of rotation is incorrect, switch the motor off immediately and correct the sense of rotation.

1. Open the pressure-side fitting.
2. Open the suction-side fitting.
3. On twin units:  
Move the changeover ball valve (401) to the center position.
4. Switch on the motor and check it for smooth running.
5. Make sure the temperature rises at a rate of no more than 2 K/min.
6. Make sure the minimum discharge pressure is above 2 bar.
7. If the pressure relief valve is activated when the pump is switched on:
  - Check that the operating limits are not exceeded
  - Switch on the pump in a depressurized condition if necessary

### 6.2.3 Checking the working pressure

-  Only open the ball valves to the pressure gauges for measuring.

1. Open the ball valve.
2. Read the working pressure.
3. Close the ball valves.



### 6.2.4 Switching off

- Switch off the motor.

## 6.3 Shutting down the pump

- Take the following measures whenever the pump is shut down:

Pump is	Measure
...shut down for a prolonged period	► Perform measures according to the pumped liquid (→ Tab. 7 Measures depending on the behavior of the pumped liquid, Page 25).
...emptied	► Close the suction-side and pressure-side fittings.
...dismounted	► Isolate the motor from its power supply and secure it against unauthorized switch-on.
...put into storage	► Observe the storage instructions (→ 4.3 Storage, Page 16).

Tab. 6 Measures to be taken if the pump is shut down

Behavior of the pumped liquid	Duration of shutdown (depending on process)	
	Short	Long
Solids sedimenting	► Flush the pump.	► Flush the pump.
Solidifying/freezing, non-corrosive	► Heat up or empty the pump and containers <sup>1)</sup> .	► Empty the pump and containers <sup>1)</sup> .
Solidifying/freezing, corrosive	► Heat up or empty the pump and containers <sup>1)</sup> .	► Empty the pump and containers <sup>1)</sup> . ► Treat the pump and containers with preservative.
Remains liquid, non-corrosive	–	–
Remains liquid, corrosive	–	► Empty the pump and containers <sup>1)</sup> . ► Treat the pump and containers with preservative.

Tab. 7 Measures depending on the behavior of the pumped liquid

<sup>1)</sup> See section 6.3.2. on draining the pump

### 6.3.2 Draining the pump

1. Drain the pump using the suction and pressure lines and the built-in sealing and air release plugs.
2. If the adjusting screw (333) of the pressure relief valve has to be removed for draining:
  - Measure the screw-in depth
  - Remove the adjusting screw and drain the pump
  - Screw the adjusting screw back in to the measured depth


## 6.4 Start-up following a shutdown period


1. If the pump is shut down for over 6 months, take the following measures before starting it up again:
  - Replace the elastomer seals (O-rings, shaft seal rings).
  - Replace the antifriction bearings.
  - If necessary: Replace the motor bearing (→ operating instructions of the motor manufacturer).
2. Carry out the same steps as for the initial start-up (→ 6.1 Putting the pump into service for the first time, Page 23).


## 6.5 Operating the stand-by pump

- ✓ Stand-by pump filled and bled
- Operate the stand-by pump at least once a week.

## 6.6 Cleaning the filter

 Only necessary with filter units.


 Cleaning agents (→ 9.2.4 Cleaning agents, Page 39).  
Use a soft brush for cleaning.  
Do not use sharp implements for cleaning.  
Replace the radial screen filter if it is very dirty.


 On twin units, you may have to switch on the stand-by pump using the the pump controller.

1. Switch off the pump (whose filter you are cleaning) and secure it against being switched on again.
2. Make sure that the integrated check valve is closed – the pump must not turn.
3. On twin units:  
Turn the changeover ballcock (401) to the stand-by pump and let the pump cool down. (→ 6 Operation, Page 23).
4. Unscrew the air release plug (333) and catch any liquid that escapes.
5. Loosen the cylinder screws (202).
6. Take off the housing cover (22).
7. Lift the radial screen filter (480) out of the filter housing.
8. For cleaning and to dissolve encrustation, put the filter in a container with cleaning agent, rinse it through from the clean side to the dirty side (from outside inward) and blow it out with compressed air.


9. After cleaning, put the filter (480) back into the filter housing so that the magnet on the filter base rests against the drain plug (217).
10. Fill the pump casing with liquid (1).
11. Screw on the housing cover (22).  
The O-rings (122, 126) must lie in the groove and must be undamaged.
12. On twin units:  
Move the changeover ball valve (401) to the center position.
13. If necessary, switch the pump controller to normal mode.

## 7 Maintenance

 For pumps in explosion-hazard areas (→ ATEX additional instructions).


 Trained service technicians are available for fitting and repair work. Present a pumped liquid certificate (DIN safety data sheet or safety certificate) when requesting service.


### 7.1 Inspections

 The inspection intervals depend on the operational strain on the pump.

1. Check at appropriate intervals:
  - Temperature of antifriction bearings < 150 °C
  - Normal operating conditions unchanged
  - Check whether the pressure relief valve is working
2. For trouble-free operation, always ensure the following:
  - No dry running
  - No leaks
  - No cavitation
  - Suction-side stop valves open
  - Unclogged and clean filters
  - Sufficient pump inlet pressure
  - No unusual running noises or vibrations
  - No excessive leakage at the shaft seal
  - Proper functioning of auxiliary systems

### 7.2 Maintenance


 Service life of the antifriction bearings for operation within the permissible operating range: > 2 years  
Intermittent operation, high temperatures and aggressive ambient and process conditions reduce the service life of antifriction bearings.

 Mechanical seals are subject to natural wear, which strongly depends on the respective operating conditions. Therefore, general statements regarding their service life cannot be made.

#### 7.2.1 Antifriction bearing

- ▶ As a precautionary measure, replace the antifriction bearing every 2 years (recommended).

#### 7.2.2 Mechanical seals

 Mechanical seals have functional leakage (→ manufacturer's specifications).

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#### NOTE

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##### Material damage caused by dry running!

- ▶ Make sure the pump is filled properly.
- 
- ▶ In the event of major leakage: Replace the mechanical seal and its auxiliary seals.

#### 7.2.3 Cleaning the pump

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#### NOTE

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##### High water pressure or spray water can damage bearings!

- ▶ Do not clean bearing areas with a water or steam jet.
- 
- ▶ Clean large-scale grime from the pump.

## 7.3 Repairs

### WARNING

#### Risk of injury due to heavy components!

- ▶ Pay attention to the component weight. Lift and transport heavy components using suitable lifting gear.
- ▶ Set down components safely and secure them against overturning or rolling away.


#### 7.3.1 Returning the pump to the manufacturer


- ✓ Pump depressurized
  - ✓ Pump completely empty
  - ✓ Electrical connections disconnected and motor secured against being switched on again
  - ✓ Pump cooled down
  - ✓ Coupling guard dismantled
  - ✓ On couplings with spacer piece: Distance piece removed
  - ✓ Auxiliary systems shut down, depressurized and emptied
  - ✓ Pressure gauge lines, pressure gauge and holdings dismantled
1. Enclose a truthful, and fully completed, safety certificate when returning pumps or components to the manufacturer. (→ 9.3 Declaration of harmlessness, Page 40).
  2. Take necessary measures, depending on the required repair work, as listed in the table below when returning the pump to the manufacturer.

Repairs	Measure for return
...at the customer's premises	▶ Return the defective component to the manufacturer.
...at the manufacturer's premises	▶ Flush the pump and decontaminate it if it was used for hazardous pumped liquids.
...at the manufacturer's premises for warranty repairs	▶ Return the complete pump (not disassembled) to the manufacturer.

Tab. 8 Measures for returning the pump

#### 7.3.2 Removing the pump from the unit

 Only operate the twin unit with one pump for brief periods.

 On twin units, you may have to switch on the stand-by pump using the pump controller.

- ✓ Pump depressurized
  - ✓ Pump completely empty
  - ✓ Electrical connections disconnected and motor secured against being switched on again
  - ✓ Pump cooled down
1. For twin units:  
Move the changeover ball valve (401) to the stand-by pump position.
  2. Removing the motor and pump carrier (→ 9.1 Sectional drawings, Page 33).
  3. Remove the pump from the reversing valve housing.

#### 7.3.3 Dismounting

- ✓ Pump depressurized
- ✓ Pump completely empty, flushed and decontaminated
- ✓ Electrical connections disconnected and motor secured against being switched on again
- ✓ Pump cooled down
- ✓ Coupling guard dismantled
- ✓ On couplings with spacer piece: Distance piece removed
- ✓ Auxiliary systems shut down, depressurized and emptied
- ✓ Pressure gauge lines, pressure gauge and holdings dismantled


### WARNING

#### Risk of injury during disassembly!

- ▶ Secure the pressure-side stop valve against accidental opening.
- ▶ Depressurize the blocking pressure system, if available.
- ▶ Wear protective gloves as components can become very sharp through wear or damage.
- ▶ Remove spring-loaded components carefully (e.g. mechanical seal, tensioned bearing, valves etc.), as components can be ejected by the spring tension.
- ▶ Observe the manufacturer's specifications (e.g. for the motor, coupling, mechanical seal, blocking pressure system, cardan shaft, gear box, belt drive etc.).

1. Observe the following during removal:
  - Mark the precise orientation and position of all components before dismantling them.
  - Dismount components concentrically without canting.
2. Dismount the pump (→ sectional and exploded drawing).

### 7.3.4 Installing

-  Install the components concentrically, without canting, in accordance with the markings made.

#### NOTE

##### Material damage due to unsuitable components!


- ▶ Always replace lost or damaged screws with screws of the same strength. (→ 9.2.3 Tightening torques, Page 39).
  - ▶ Only replace seals with seals of the same material.
1. Observe the following during installation:
    - Replace worn parts with genuine spare parts.
    - Replace seals, inserting them in such a way that they are unable to rotate.
    - Adhere to the prescribed tightening torques (→ 9.2.3 Tightening torques, Page 39).
  2. Clean all parts (→ 9.2.4 Cleaning agents, Page 39). Do not remove any markings which have been applied.
  3. Replace the antifriction bearings.
  4. Installing the pump (→ 9.1 Sectional drawings, Page 33).
  5. Installing the pump in the system (→ 5 Setup and connection, Page 18).

### 7.3.5 Adjusting the pressure relief valve

#### NOTE


##### Material damage due to excessive pressure!

- ▶ Make sure the setting of the pressure relief valve meets the requirements of the system and the operating limits of the pump.

-  The pressure relief valves are factory-set to the required opening pressure (10% above working pressure).

1. Remove the screw plug (219).
2. Turn the adjusting screw (331).
  - Turn clockwise to increase the opening pressure.
  - Turn anticlockwise to reduce the opening pressure.
3. Check the activation pressure during operation using a pressure gauge. Adjust the setting if necessary.

## 7.4 Ordering spare parts

-  For trouble-free replacement in the event of faults, we recommend keeping entire spare pumps or insert units available on site.

Parts which can be replaced can be found in the parts list (→ 9.1.2 Part numbers and designations, Page 33).

- ▶ Have the following information ready to hand when ordering spare parts (→ nameplate):
  - Pump type
  - Pump number
  - Year of manufacture
  - Part number
  - Designation
  - Quantity

## 8 Troubleshooting

### 8.1 Pump malfunctions

If malfunctions occur which are not specified in the following table or cannot be traced back to the specified causes, please consult the manufacturer.

Possible malfunctions are identified by a number in the following table. This number identifies the respective cause and remedy in the troubleshooting list.

Malfunction	Number
Pump not pumping	1
Pumping rate insufficient	2
Pumping rate excessive	3
No pump suction	4
Pump running roughly	5
Pump jammed	6
Pump leaking	7
Excessive motor power uptake	8

Tab. 9 Fault number assignment

Malfunction number								Cause	Remedy
1	2	3	4	5	6	7	8		
X	–	–	–	–	–	–	–	Transport screw plugs still in place	<ul style="list-style-type: none"> <li>▶ Remove the transport screw plugs.</li> <li>▶ Dismount the pump and inspect it for dry-running damage.</li> </ul>
X	–	–	–	–	–	–	–	Supply/suction pipe closed by fitting	<ul style="list-style-type: none"> <li>▶ Open the fitting.</li> </ul>
X	–	–	–	X	–	–	–	Supply/suction pipe not bled properly or not filled up completely	<ul style="list-style-type: none"> <li>▶ Fill up the pump and/or pipe completely and bleed them.</li> </ul>
X	–	–	–	X	–	–	–	Formation of air pockets in the supply or suction pipe	<ul style="list-style-type: none"> <li>▶ Install the fitting for bleeding.</li> <li>▶ Correct the piping layout.</li> </ul>
X	–	–	–	X	–	–	–	Pressure line blocked	<ul style="list-style-type: none"> <li>▶ Clean the pressure line.</li> </ul>
X	–	–	X	X	–	–	–	Pump running in the wrong sense of rotation	<ul style="list-style-type: none"> <li>▶ Swap any two phases on the motor (→ 6.1.4 Checking the sense of rotation, Page 23).</li> </ul>
X	–	–	X	–	X	–	–	Pump very dirty	<ul style="list-style-type: none"> <li>▶ Dismount and clean the pump.</li> </ul>
X	X	–	X	X	–	–	–	Supply/suction pipe, pump or suction strainer blocked or encrusted	<ul style="list-style-type: none"> <li>▶ Clean the supply/suction pipe, pump or suction strainer.</li> <li>▶ Clean the suction strainer.</li> </ul>
X	X	–	X	X	–	–	–	Air is sucked in	<ul style="list-style-type: none"> <li>▶ Seal the source of malfunction.</li> </ul>
X	X	–	X	X	–	–	–	Excessive amount of gas: Pump is cavitating	<ul style="list-style-type: none"> <li>▶ Check the cable gland.</li> <li>▶ Clean/enlarge the filter.</li> <li>▶ Enlarge the supply/suction pipe cross-section.</li> </ul>

Malfunction number								Cause	Remedy
1	2	3	4	5	6	7	8		
X	X	–	X	X	–	–	–	Excess play between: <ul style="list-style-type: none"> <li>• Spindles</li> <li>• Spindles and housing</li> </ul>	► Repair or replace any worn parts.
X	X	–	X	–	–	X	–	Shaft seal leaky	► Replace the shaft seal.
–	X	–	–	–	–	–	–	For AFI-T: The stand-by pump runs in the wrong direction, the check valve is blocked	► Remove the stand-by pump. ► Clean/replace the check valve.
–	X	–	X	–	–	–	–	Motor speed too low	► Compare the required motor speed with the specifications on the pump nameplate. Replace the motor if necessary. ► Increase the motor speed if speed control is available.
–	X	–	X	–	–	–	–	Supply/suction pipe not fully opened	► Open the fitting.
–	X	–	X	X	–	–	–	Supply/suction pipe cross-section too narrow	► Enlarge the supply/suction pipe cross-section. ► Remove any encrustations from the suction pipe. ► Open the fitting completely.
–	X	–	X	X	–	–	–	Suction head excessive: $NPSH_{\text{pump}}$ larger than $NPSH_{\text{system}}$	► Increase the pump inlet pressure. ► Consult the manufacturer.
–	X	–	X	X	–	–	–	Pumped liquid temperature too high: Pump is cavitating	► Increase the pump inlet pressure. ► Lower the temperature. ► Consult the manufacturer.
–	X	–	X	X	–	–	–	Hydraulic parts of the pump dirty, clotted or encrusted	► Dismount the pump. ► Clean the parts.
–	X	–	X	–	–	–	X	Viscosity or specific gravity of the pumped liquid outside the range specified for the pump	► Consult the manufacturer.
–	–	–	–	X	–	–	–	Pressure-side fitting not opened wide enough	► Open the pressure-side fitting.
–	X	–	X	X	X	–	–	Pump parts worn	► Replace the worn pump parts.
–	–	X	–	X	–	–	X	Motor speed too high	► Compare the required motor speed with the specifications on the pump nameplate. Replace the motor if necessary. ► Reduce the motor speed if speed control is available.
–	–	–	–	X	X	–	X	Antifriction bearing defective	► Replace the antifriction bearing.
–	–	–	–	–	X	–	X	Defective antifriction bearing in motor	► Replace the antifriction bearing.
–	–	–	–	–	–	X	–	Tie bolts not tightened properly	► Tighten the tie bolts (→ 9.2.3 Tightening torques, Page 39).
–	–	–	–	–	–	X	–	Mechanical seal worn	► Replace the mechanical seal.
–	–	–	–	–	–	X	–	Housing seal defective	► Replace the housing seal.

Malfunction number								Cause	Remedy
1	2	3	4	5	6	7	8		
–	–	–	–	X	X	X	X	Pump distorted	► Check the pipe connections and pump attachment.
–	–	–	–	X	–	–	–	Coupling elements worn	► Replace the coupling elements.
–	X	–	X	X	–	–	X	Motor running on 2 phases	► Check the fuse and replace it if necessary. ► Check the cable connections and insulation.

Tab. 10 Pump troubleshooting list

## 8.2 Pressure relief valve malfunctions

If malfunctions occur which are not specified in the following table or cannot be traced back to the specified causes, please consult the manufacturer.

Possible malfunctions are identified by a number in the following table. This number identifies the respective cause and remedy in the troubleshooting list.

Malfunction	Number
Discharge pressure drops	1
Pressure relief valve does not open	2
Pressure relief valve does not close	3
Pressure relief valve rattles	4

Tab. 11 Fault number assignment

Malfunction number				Cause	Remedy
1	2	3	4		
X	–	–	–	Spring worn out	► Install a new spring.
X	–	–	–	Valve seat leaky	► Install a new valve cone.
–	X	–	–	Spring tension too high	► Relieve the pressure on the spring by turning the adjusting screw, then reset the pressure relief valve.
–	X	–	–	Foreign particles in the valve	► Remove the pressure relief valve. ► Clean the internal parts. ► Install the pressure relief valve.
–	X	–	–	Pump operating temperature too high	► Consult the manufacturer.
–	–	X	–	Spring has no or insufficient tension	► Reset the pressure relief valve (→ 7.3.5 Adjusting the pressure relief valve, Page 29).
–	–	X	–	Valve seat leaky	► Rework or replace the valve cone or valve casing.
–	–	–	X	Pressure relief valve rattles	► Measure the excess pressure with the fitting on the pressure side closed. ► Reset the pressure relief valve (opening pressure 10% higher than the working pressure) (→ 7.3.5 Adjusting the pressure relief valve, Page 29).

Tab. 12 Pressure relief valve troubleshooting list



## 9 Appendix

### 9.1 Sectional drawings

#### 9.1.1 Auxiliary connections

Abbreviation	Connection
B7	Drain
E7	Bleeding the pump
E8	Bleeding the filter
H7	Heating cartridge
M1, M2, M3	Pressure gauge, temperature gauge

Tab. 13 Abbreviations of the connection designations

#### 9.1.2 Part numbers and designations

Part no.	Designation
1	Pump casing
2 <sup>1)</sup>	Casing insert
3	Pump cover, drive end
7	Right pump foot
8	Left pump foot
12 <sup>1)</sup>	Drive spindle
13 <sup>1)</sup>	Idler rotor
20	Reversing valve housing
21 <sup>2)</sup>	Valve housing
22	Housing cover
23	Housing cover
24 <sup>1)</sup>	Sealing ball
25 <sup>1)</sup>	Shaft
100 <sup>1)</sup>	Gasket
101 <sup>1)</sup>	Gasket
102 <sup>1)</sup>	Gasket
122 <sup>1)</sup>	O-ring
123 <sup>1)</sup>	O-ring
124 <sup>1)</sup>	O-ring
125 <sup>1)</sup>	O-ring
126 <sup>1)</sup>	O-ring
127 <sup>1)</sup>	O-ring
128 <sup>1)</sup>	O-ring

Part no.	Designation
129 <sup>1)</sup>	O-ring
132 <sup>1)</sup>	O-ring
133 <sup>1)</sup>	O-ring
134 <sup>1)</sup>	O-ring
140 <sup>1)</sup>	Seal ring
141 <sup>1)</sup>	Seal ring
142 <sup>1)</sup>	Seal ring
143 <sup>1)</sup>	Seal ring
145 <sup>1) 2)</sup>	Seal ring
146 <sup>1)</sup>	Sealing washer
147 <sup>1)</sup>	Seal ring
149 <sup>1)</sup>	Seal ring
151 <sup>1)</sup>	Seal ring
153 <sup>1)</sup>	Seal ring
154 <sup>1)</sup>	Seal ring
155 <sup>1)</sup>	Seal ring
156 <sup>1)</sup>	Seal ring
157 <sup>1)</sup>	Seal ring
160	Screw plug
186 <sup>1)</sup>	Mechanical seal
187 <sup>1)</sup>	Mechanical seal adapter
200	Hexagon head bolt
201	Cheese head screw
202	Cheese head screw
203	Cheese head screw
205	Cheese head screw
209	Cheese head screw
210	Hexagon head bolt
211 <sup>3)</sup>	Hexagon head bolt
212 <sup>2)</sup>	Cheese head screw
213	Cheese head screw
214	Screw plug
215	Screw plug

Part no.	Designation
216 <sup>2)</sup>	Screw plug
217	Screw plug
218 <sup>1)</sup>	Screw plug
219	Screw plug
220	Hexagon nut
221	Hexagon nut
222	Hexagon nut
223	Screw plug
224	Screw plug
230	Disc
231	Splash guard
250	Circlip
251	Circlip
254	Circlip
261	Disc
263	Tension disc
264	Disc
270	Clamping sleeve
280	Blind rivet
290	Shaft key
292 <sup>1)</sup>	Groove ball bearing
330 <sup>1)</sup>	Valve cone
331	Adjusting screw
333	Air release plug
334	Air release plug
335 <sup>1)</sup>	Valve cone
336 <sup>1)</sup>	Valve seat bush
337 <sup>1)</sup>	Spring
340 <sup>1)</sup>	Spring
360	Pressure gauge
361	Pressure gauge
363	Ball valve
365	Fitting
372	Screwed connection
374	Screwed socket

Part no.	Designation
380	Heater
381	Heater
390	Cover plate
401	Changeover ball valve
440	Welding neck flange
441	Welding neck flange
460	Pump carrier
471 <sup>3)</sup>	Mounting foot
475	Oil sump
480 <sup>1)</sup>	Filter
900	Coupling
910	Motor
970	Rating plate
979	Additional plate (digital nameplate)

Tab. 14 Designation of components according to part numbers

1) Can be ordered as spare part/spare part kit

2) Not shown on sectional drawing

3) Only for horizontal setup of AFI

### 9.1.3 Sectional drawings

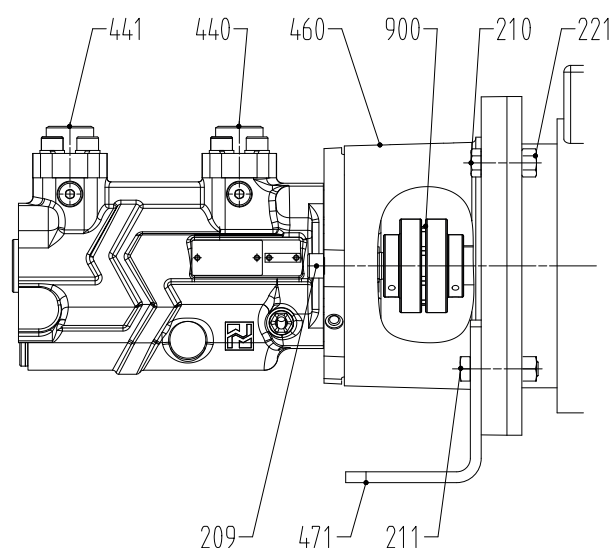


Fig. 15 Pump unit

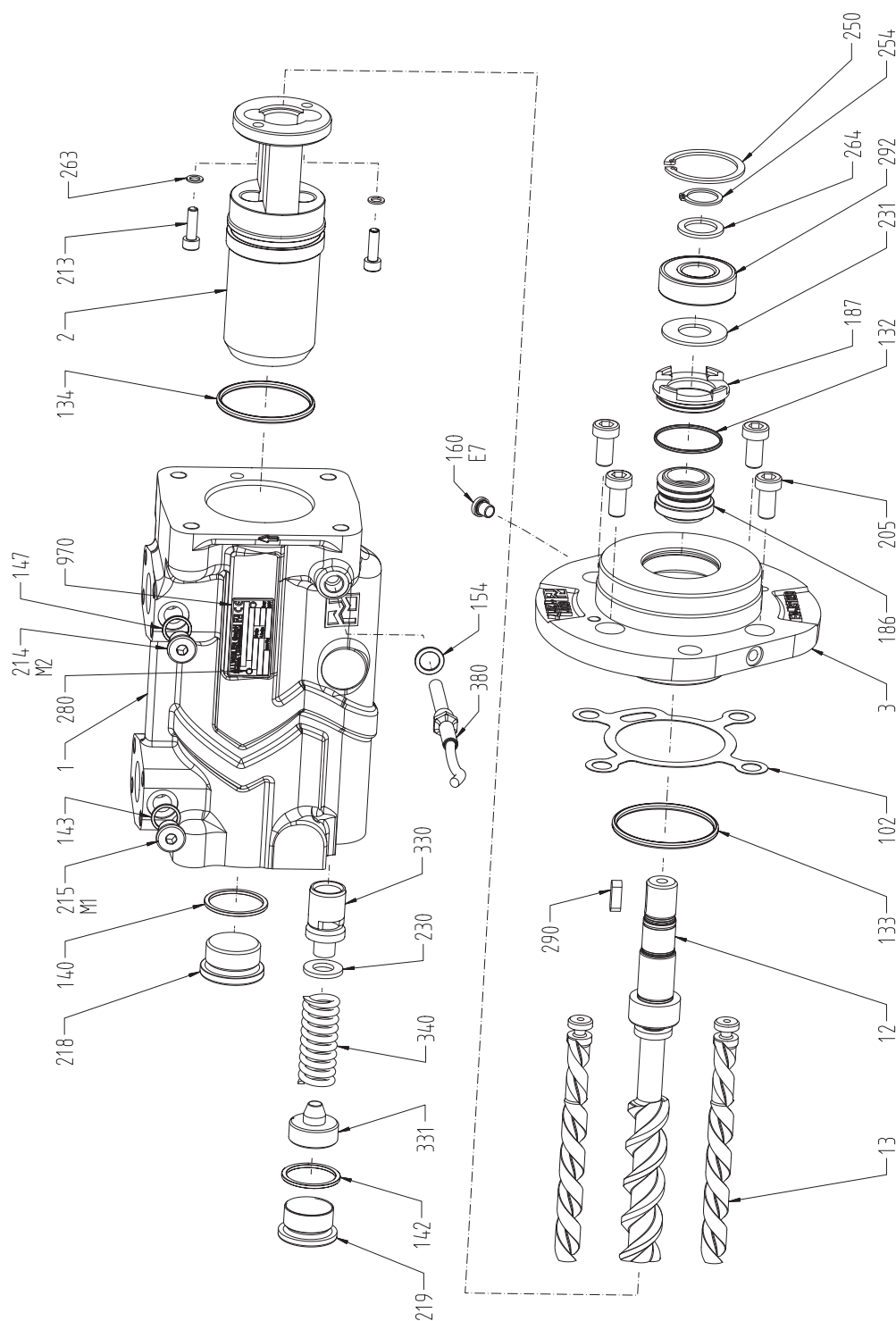


Fig. 16 Pump

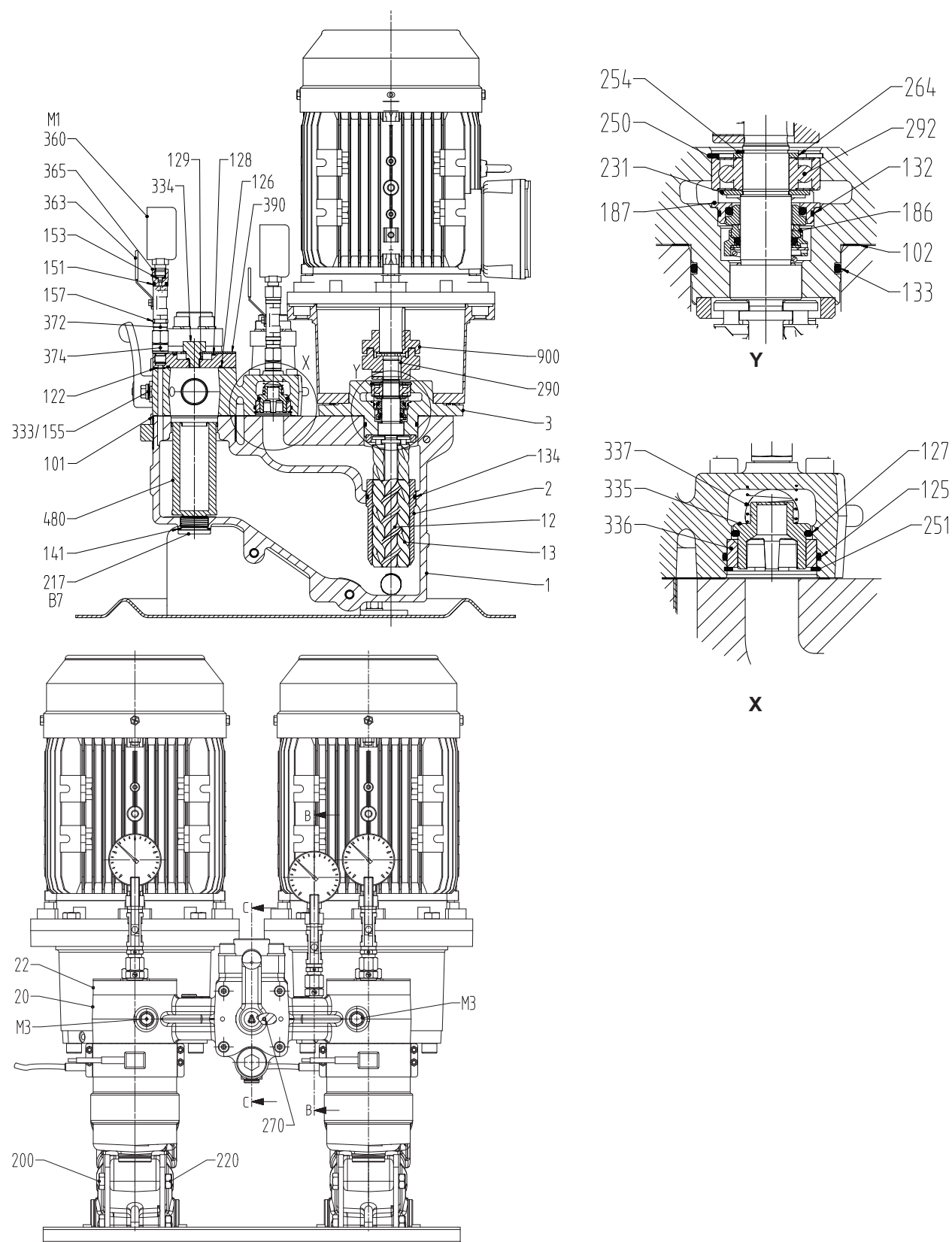


Fig. 17 Twin unit with filter 1/2

X Check valve

Y Bearing and gasket

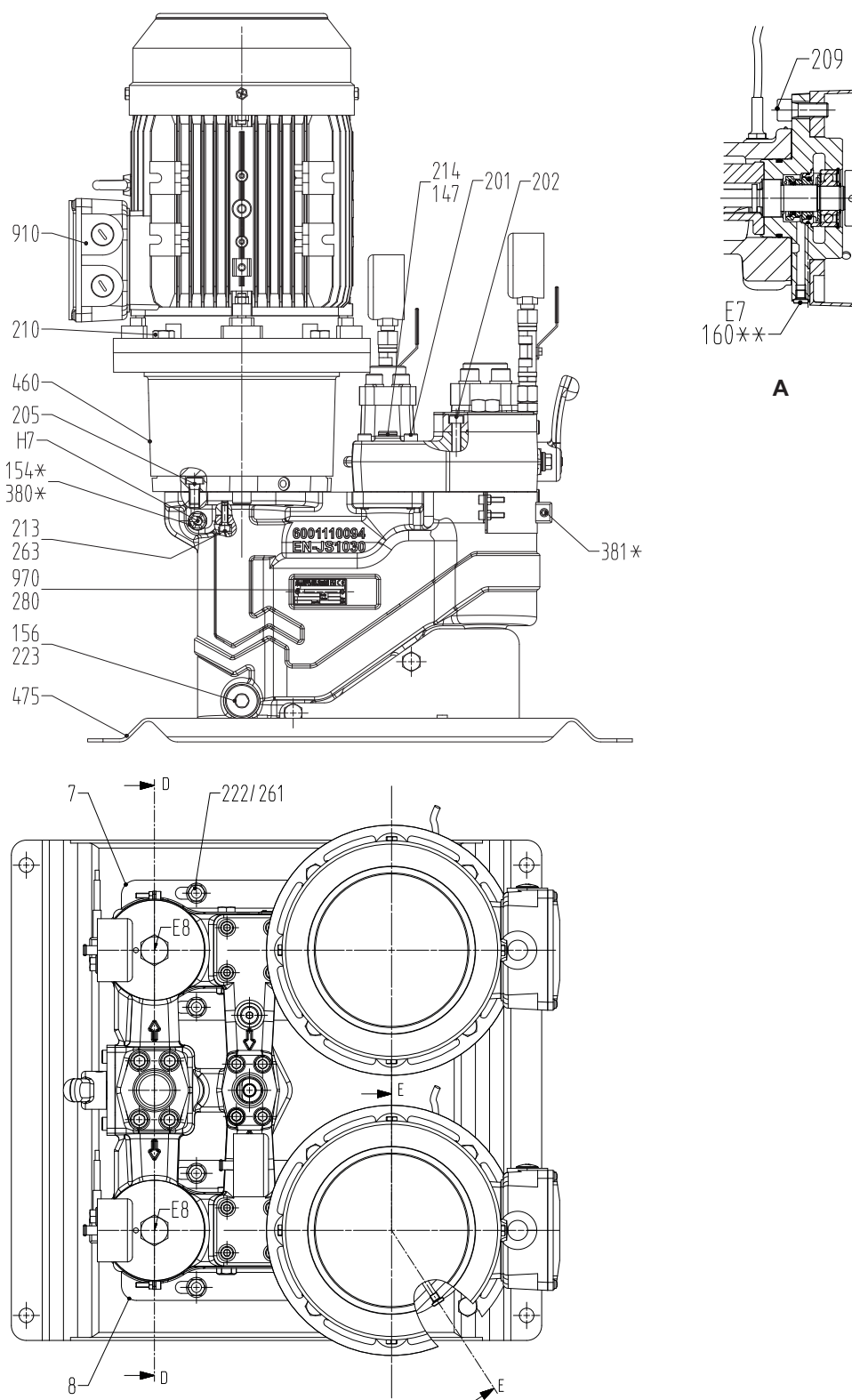


Fig. 18 Twin unit with filter 2/2

A Vent

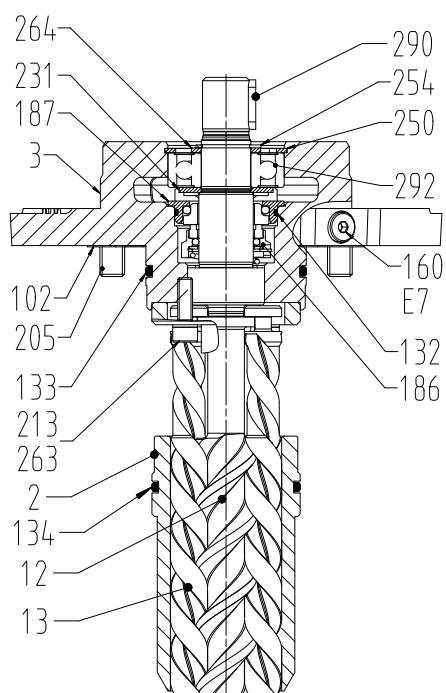


Fig. 19 Insert unit

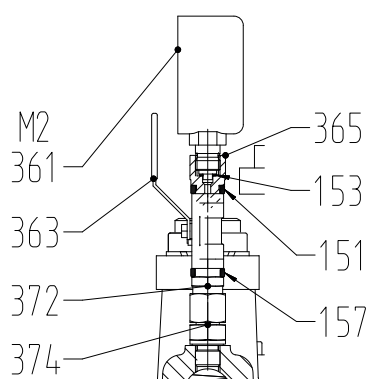


Fig. 20 Pressure gauge

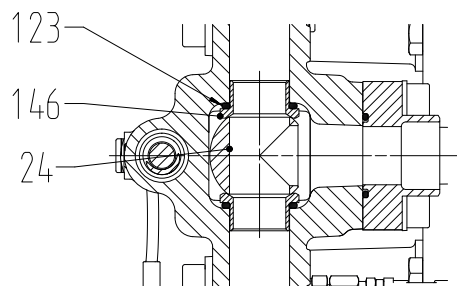


Fig. 21 Changeover ball valve

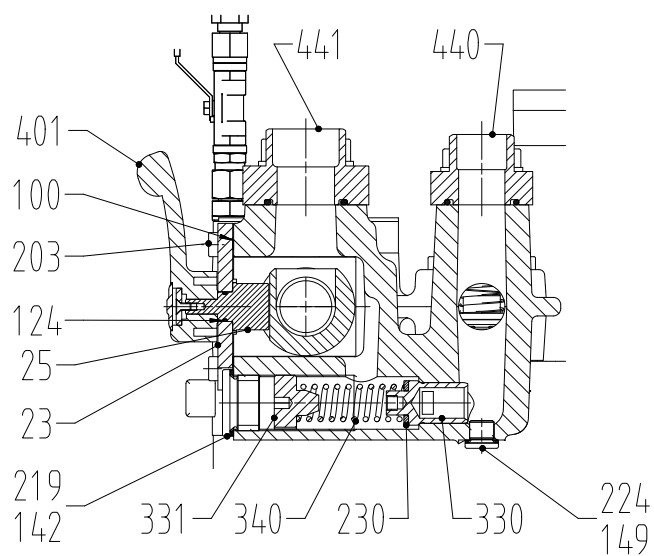




Fig. 22 Pressure relief valve

## 9.2 Technical specifications

 More technical specifications (→ order data sheet).

### 9.2.1 Ambient conditions

 Operation under any other ambient conditions should be agreed with the manufacturer.

Temperature [°C]	Relative humidity [%]		Setup height above sea level [m]
	Long-term	Short-term	
–20 to +40	≤ 85	≤ 100	≤ 1000

Tab. 15 Ambient conditions

### 9.2.2 Sound pressure level


Measuring conditions:

- Distance to the pump: 1 m
- Operation: cavitation-free
- Tolerance ±3 dB

Size	Sound pressure level [dB] for pumps at speed [rpm]			
	1450	1750	2900	3500
10	48	50	57	59
20	49	51	58	60
40	50	52	59	61

Tab. 16 Sound pressure level

### 9.2.3 Tightening torques

 The following values apply to oiled screws and torque tightening processes.

Thread size	Quality	Tightening torque [Nm]
M5 M 6 M 8 M 10 M 12	8.8	5 9 22 43 74
M 8 M 22 M 30 G1/4 G1/2 G1 G1 1/4 G1 1/2	Screw plugs	10 60 130 30 60 130 240 280
M 10	Bolt (oil sump)	25

Tab. 17 Tightening torques

### 9.2.4 Cleaning agents

Application area	Cleaning agents
Other	Benzine, wax solvents, diesel, paraffin, alkaline cleaners

Tab. 18 Cleaning agents

### 9.3 Declaration of harmlessness

This declaration of harmlessness of the operator is used to ensure work safety and the protection of our employees, the transport company and the environment from harmful effects when handling dangerous materials as well as to protect you from claims for compensation.

Every commercial company is obligated to comply with the legal regulations on work safety, set forth for example in Germany in the Workplace Ordinance (ArbStättV), the Accident Prevention Regulations (UVV), the Hazardous Substances Ordinance (GefStoffV) and the applicable environmental regulations.

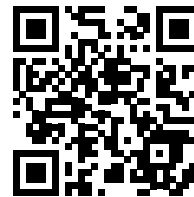
When returning pumps and their accessories, please send them back to us in a properly cleaned condition (safe and harmless for health and environment) and confirm the safety and harmlessness of the medium used.

If used with toxic, microbiological, explosive, radioactive or other hazardous substances, the safety data sheet must be provided to us and enclosed to the shipment.

Failure to follow the above instructions will lead to the implementation of measures that ensure the safe handling of the pump or the device, at your cost. We reserve the right to reject contaminated pumps and accessories and to return them for cleaning at your cost!

This declaration of harmlessness must be attached clearly visible outside of the packaging of the return shipment, and if possible sent in advance by e-mail including the safety data sheet, if applicable, to: service-emea-gr@circor.com. Please understand that return shipments without a declaration of harmlessness cannot be processed until such declaration is received.

Please copy this document and send it together with the pump.  
www.allweiler.de/en/sales-service/downloads



Pump type

Serial number:

Was the pump operated with hazardous substances or other media that are hazardous to health or the environment?

- ☐ No  
☐ Yes

Medium used:

UN / CAS number (see safety data sheet):

☐ The pump has been thoroughly drained and cleaned outside and inside prior to dispatch or provision.

☐ Special safety precautions are not necessary.

☐ Special safety precautions regarding residual liquid, rinsing media, personal protective equipment and disposal are necessary (safety data sheets are required and must be sent in advance/enclosed).

☐ Aside from the medium specified, are there any other safety aspects that need to be observed (for example, the cleaning medium used)?  
If yes, which:

☐ Up-to-date safety data sheet enclosed.

**We do not accept return shipment of pumps or parts thereof that have been exposed to radioactive or microbiological contamination and that were not properly decontaminated.**

Contact:

Tel. / fax / e-mail:

#### Legally binding declaration:

We hereby certify that we have completed this declaration fully and truthfully to the best of our knowledge. The dispatch is performed in compliance with all legal requirements that apply to the packaging, shipping, and labeling of hazardous substances. The sender is liable for all damages caused by unmarked decontaminations of the returned object.

Place, date


Signature

Stamp

Tab. 19 Declaration of harmlessness



## 9.4 Declaration of conformity

 The following declarations do not contain serial numbers or signatures. The original declaration is delivered with the respective pump.

### 9.4.1 Declaration of conformity according to EC Machine Directive

<b>EC declaration of conformity according to Machine Directive, Appendix II A</b> We, ALLWEILER GmbH, Postfach 1140, 78301 Radolfzell, Germany; Tel. +49 (0)7732 86-0, Fax. +49 (0)7732 86-436 hereby declare that the pump unit/pump:	
Designation	ALLFUEL
Equipment no.	
Order no.	
– when the conditions in the operating instructions are observed – complies with the following applicable EC directive:	
<ul style="list-style-type: none"> <li>Machine Directive (2006/42/EC)</li> </ul>	
Applicable harmonized norms:	
<ul style="list-style-type: none"> <li>EN 809:1998 + A1:2009 + AC:2010</li> <li>EN ISO 12100:2010</li> </ul>	
Responsible for the documentation	ALLWEILER GmbH ET-TDR Allweilerstraße 1 78315 Radolfzell
<b>Date: 02.10.2015</b>	<b>Company stamp / signature:</b>
	<div style="display: flex; justify-content: space-around;"> <div>Sr. Director Engineering</div> <div>Director Quality</div> </div>

Tab. 20 Declaration of conformity according to EC Machine Directive

## UK declaration of conformity

Name

Equipment no.

Order no.

- Supply of Machinery (Safety) Regulations 2008

- EN 809:1998+A1:2009+AC:2010
- EN ISO 12100:201

ALLWEILER GmbH  
ET-TDR  
Allweilerstraße 1  
78315 Radolfzell

**Company stamp / signature:**

Sr. Director Engineering

### Director Quality



550 851 – 147-276/J



