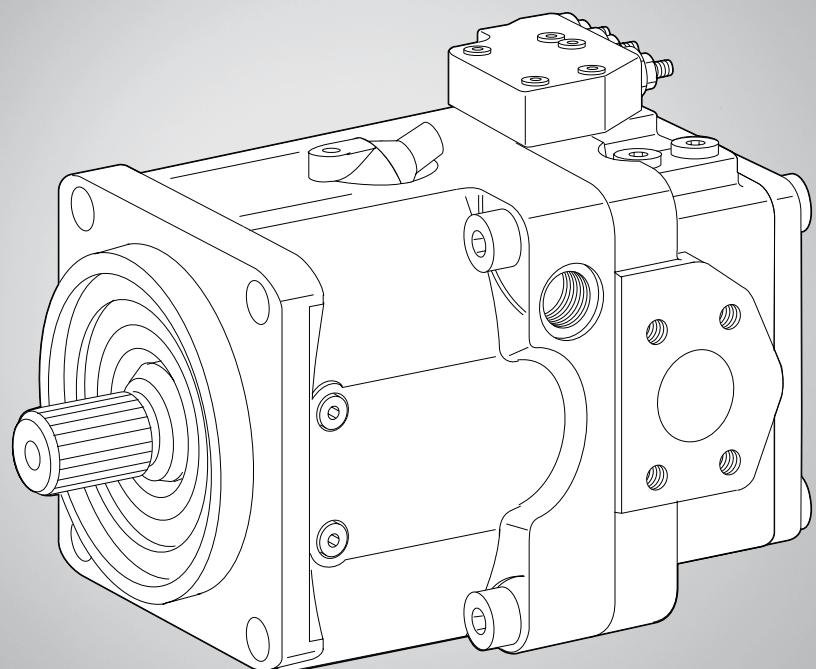


Axial Piston Variable Pump

A11V(L)O

Series 10 and 11

Operating Instructions



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1 About this document

These instructions contain important information on the safe and appropriate installation, transport, commissioning, maintenance, disassembly and simple troubleshooting of the axial piston variable pump A11V(L)O Series 10 and 11.

- ▶ Read these instructions completely, especially chapter "2 General safety instructions", before working with the A11V(L)O axial piston variable pump.

1.1 Related documents

The axial piston variable pump A11V(L)O is a system component. Also observe the instructions for the other system components.

Further information on the axial piston variable pump A11V(L)O, its installation and operation can be found in the Rexroth documents listed in the following table.

Table 1: Related documents

| Related documents | Contents |
|--------------------------|--|
| Order confirmation | Contains the preset technical data of your A11V(L)O axial piston variable pump. |
| Installation drawing | Contains the outer dimension, all ports and the hydraulic circuit diagram for your A11V(L)O axial piston variable pump. The installation drawing can be requested from your responsible contact person at Rexroth. |
| Data sheet RE 92500 | Contains the permissible technical data for the A11V(L)O axial piston variable pump Series 10 and 11. |
| Data sheet RE 90220 | Describes the requirements on a mineral-oil based hydraulic fluid and related hydrocarbons for the operation with Rexroth hydraulic components, and assists you in selecting a hydraulic fluid for your system. |
| Data sheet RE 90221 | Describes the requirements for an environmentally acceptable hydraulic fluid for operation with Rexroth hydraulic Components and supports you in your choice of hydraulic fluid for your system. |
| Data sheet RE 90223 | Contains additional information on the use of Rexroth axial piston units with HF hydraulic fluids. |
| Data sheet RE 90300-03-B | Contains additional information on the use of Rexroth axial piston units at low temperatures. |

Also observe the generally applicable, legal or otherwise binding regulations of the European and national legislation and the rules for the prevention of accidents and for environmental protection applicable in your country.

1.2 Abbreviations used

As umbrella term for "axial piston variable pump A11V(L)O", the designation "axial piston unit" will be used in the following.

Table 2: Abbreviations

| Abbreviation | Meaning |
|--------------|---|
| A11VLO | Axial piston variable pump, with charge pump, open circuit |
| A11VO | Axial piston variable pump, without charge pump, open circuit |
| DIN | Deutsche Industrie Norm (German Institute for Standardization) |
| EP | Proportional control, electric |
| HD | Hydraulic control, pilot-pressure related |
| ISO | International Organization for Standardization |
| LRDS | Power control with pressure cut-off and load sensing |
| LRH | Power control with hydraulic stroke limiter |
| LRS | Power control with load sensing |
| LRU | Power control with electric stroke limiter |
| RE | Rexroth document in the English language |
| VDI 2230 | Directive for the systematic calculation of high duty bolted joints and joints with one cylindrical bolt from the VDI (Verein Deutscher Ingenieure - Association of German Engineers) |

2 General safety instructions

The axial piston unit has been manufactured according to the generally accepted rules of current technology. There is, however, still a danger of personal injury or damage to equipment if the following general safety instructions and the warnings before the steps contained in these instructions are not complied with.

- ▶ Read these instructions completely and thoroughly before starting work with the axial piston unit.
- ▶ Keep these instructions in a location where they are accessible to all users at all times.
- ▶ Always include the operating instructions when you pass the axial piston unit on to third parties

2.1 Intended use

Axial piston units are hydraulic components, meaning that in their application they are classified neither as complete nor as incomplete machines in the sense of the EU machine directive 2006/42/EC. A component is exclusively intended to form an incomplete or a complete machine together with other components. The component may only be commissioned after it has been installed in the machine/system for which it is intended.

The axial piston unit is only approved as a pump for hydrostatic drives in an open circuit.

- ▶ Observe the technical data, application operating conditions and performance limits as specified in data sheet RE 92500 and in the order confirmation. Information about approved hydraulic fluids can be found in data sheet RE 92500.

The axial piston unit is only intended for professional use and not for private use. Intended use includes having read and understood this documentation, especially the chapter "2 General safety instructions".

2.2 Improper use

Any use other than that described as intended use shall be considered as improper and is therefore impermissible.

If unsuitable products are installed or used in applications that are of relevance to safety, unexpected operating states may occur in the application which could result in injury to persons or material damage. For this reason, products should only be used in safety-relevant applications if this usage is expressly specified and approved in the documents related to the product. For example in protection areas or in safety-related parts of a control system (function safety).

Bosch Rexroth AG shall accept no liability whatsoever resulting from improper use. The user shall bear all risks arising from improper use.

Similarly, the following predictable faulty usages are also considered to be not as intended:

- Using the axial piston unit in an explosive environment
- Pumping non-approved fluids compliant with data sheet RE 92500, e.g. water or polyurethane components.
- Modification of factory settings by non-authorized persons
- Using axial piston unit fitting (e.g. mountable filter, control unit, valves) for other applications
- Using the axial piston unit under water at a depth of more than 10 metres
- Using the axial piston unit in aircraft or space craft

- Use under a continuous pressure differential between internal and external pressure greater than 6 bar, whereby the external pressure must always be lower than the internal pressure (case pressure)
- Using the axial piston unit in an aggressive atmosphere
- Use outside the operating parameters approved in the data sheet (unless special approval has been granted)

2.3 Personnel qualifications

Installation, commissioning and operation, disassembly, maintenance and repair require basic mechanical, hydraulic and electrical knowledge, as well as knowledge of the appropriate technical terms. For transporting and handling the product, additional knowledge is necessary with regard to working with a lifting device and the corresponding attachment equipment. In order to ensure operating safety, these activities may therefore only be carried out by qualified personnel or an instructed person under the direction and supervision of qualified personnel.

Qualified personnel are those who can recognize possible hazards and institute the appropriate safety measures due to their professional training, knowledge, and experience, as well as their understanding of the relevant regulations pertaining to the work to be done. Qualified personnel must observe the rules relevant to the subject area.

2.4 Safety instructions in this document

In this manual, there are safety instructions before the steps whenever there is a risk of personal injury or damage to equipment. The measures described to avoid these hazards must be observed.

Safety instructions are set out as follows:

| SIGNAL WORD! | Type of danger! |
|---|--|
|  | <p>Type of danger!</p> <p>Consequences</p> <p>► Precautions</p> <ul style="list-style-type: none"> • Safety sign (warning triangle): draws attention to the danger • Signal word: identifies the degree of the danger • Type of danger: identifies the type or source of the danger • Consequences: describes what occurs if the safety instructions are not complied with • Precautions: states how the danger can be avoided. |

General safety instructions

The signal words have the following meaning:

| Signal word | Application |
|--|--|
| DANGER!  | Indicates an imminently hazardous situation which, if not avoided, will certainly result in death or serious injury. |
| WARNING!  | Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. |
| CAUTION!  | Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or damage to equipment. |
|  | If this information is disregarded, the operating procedure may be impaired. |

2.5 Adhere to the following instructions

General instructions

- Observe the regulations for accident prevention and environmental protection for the country where the product is used and at the workplace.
- Only use Rexroth axial piston units in good technical order and condition.
 - Inspect the product for obvious defects.
- Do not modify or convert the axial piston unit.
- Use the product only within the performance range provided in the technical data.
- Persons who install, commission, operate, disassemble or maintain Rexroth products must not consume any alcohol, drugs or pharmaceuticals that may affect their ability to respond.
- The warranty applies only to the delivered configuration.
- The warranty is rendered void if the product is incorrectly installed, commissioned or operated, as well as if not used as intended and/or handled improperly.
- Do not expose the product to any mechanical loads under any circumstances. Never use the product as a handle or step. Do not place/lay any objects on it.
- The noise emission of axial piston units depends on speed, operating pressure and installation conditions. The sound pressure level may rise above 70 dBA during normal operating conditions. This can cause hearing damage.
 - Always wear hearing protection while working in the vicinity of the operating axial piston unit.
- The axial piston unit heats up so much during operation that you can burn yourself on it:
 - Allow the axial piston unit to cool down sufficiently before touching it.
 - Wear heat-resistant protective clothing, e.g. gloves.
- Hydraulic fluid is easily flammable.
 - Keep open flames and ignition sources away from the axial piston unit.

During transport

- Make certain that the lifting device has adequate lifting capacity. The weight can be found in chapter "5 Transport and storage".

During installation

- Before installing, make sure that all fluids have been removed from the axial piston unit to prevent mixing with the hydraulic fluid used in the system.

- Always set up the relevant part of the system so that it is depressurized and free of electrical voltage before you install the product or when connecting and disconnecting plugs. Protect the system against being energized.
- Lay cables and lines so that they cannot be damaged and no one can trip over them.
- Before commissioning, make certain that all hydraulic connections are tight and that all of the connection seals and plugs are installed correctly to ensure that they are leakproof and fluids and contaminants are prevented from penetrating the product.
- When installing, provide for absolute cleanliness in order to prevent contaminants, such as welding beads or metal cuttings, from getting into the hydraulic lines and causing product wear or malfunctions.

During commissioning

- Ensure that all electrical and hydraulic connections and ports are occupied or plugged. Only commission a completely installed product.

During cleaning

- Plug all openings with the appropriate protective equipment in order to prevent detergents from penetrating the system.
- Never use solvents or aggressive detergents. Use only water and, if necessary, a mild detergent to clean the axial piston unit.
- Do not point the high-pressure cleaner at sensitive components, e.g. shaft seal ring, electrical connections and electrical components.

During maintenance and repair

- Perform the prescribed maintenance work at the intervals specified in the operating instructions (see chapter "9.3 Maintenance").
- Make certain that no lines, connections or components are disconnected as long as the system is under pressure. Protect the system against being energized.

During disposal

- Dispose of the product and the hydraulic fluid in accordance with the currently applicable national regulations in your country.

2.6 Operator's obligations

The operator of the Rexroth axial piston unit must provide personnel training on a regular basis regarding the following subjects:

- Observation and use of the operating instructions and the legal regulations
- Intended use and operation of the axial piston unit
- Observation of the instructions from the factory security offices and of the work instructions from the operator



3 Delivery contents

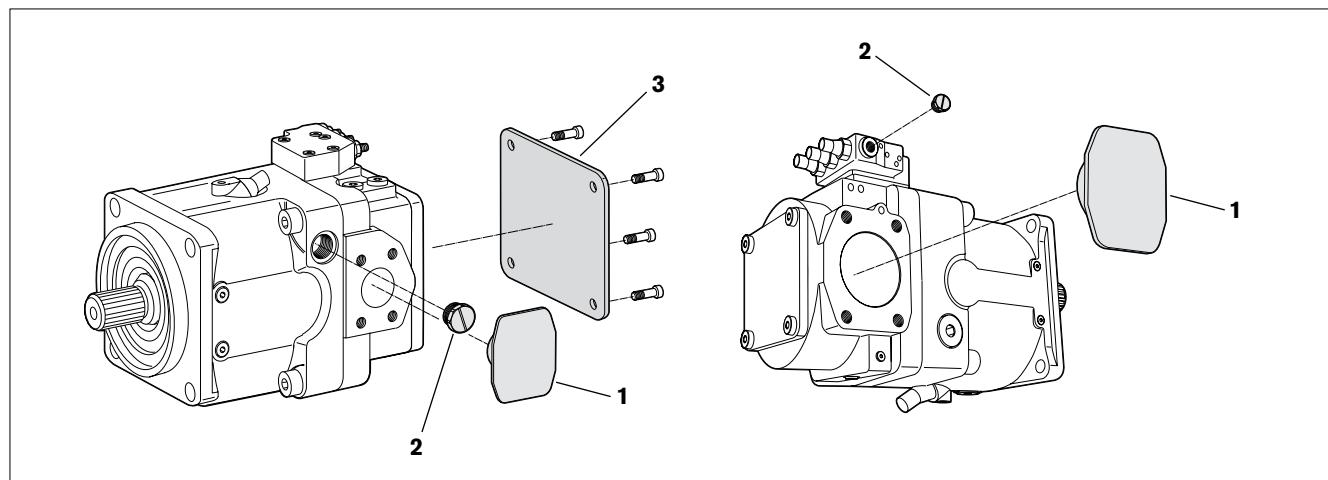


Fig. 1: Axial piston unit

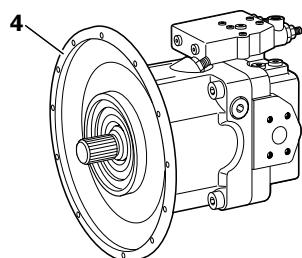
Included in the delivery contents are:

- 1 axial piston unit

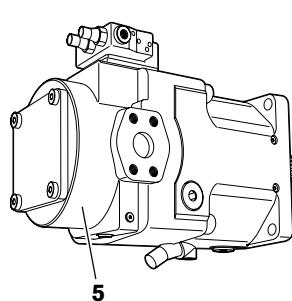
The following parts are also installed on delivery:

- Protective covers made of plastic (1) (metal protective covers are used for painted axial piston units)
- Plastic plugs / locking screws (2)
- Metal flange cover and fixing screws for versions with through drive (3)

The axial piston unit can be fitted with an optional mounting flange SAE J617 No. 3 (4), which fit onto the flywheel case of a combustion engine.



The axial piston unit A11VLO (size 130 to 260) is equipped with a charge pump (5), allowing the axial piston unit to be operated at higher speeds.



4 Product description

4.1 Performance description

The axial piston variable pump generates, controls and regulates a hydraulic fluid flow. The A11V(L)O has been designed for stationary applications.

Refer to the data sheet and order confirmation for the technical data, operating conditions and operating limits of the axial piston unit.

4.2 Device description

The A11V(L)O axial piston variable pump is an axial piston variable pump with swashplate design for hydrostatic drives in open circuits. Flow is proportional to drive speed and displacement. The flow can be steplessly changed by controlling the swashplate (13).

Open circuit With an open circuit, the hydraulic fluid flows from the tank to the variable pump and is transported from there to the consumer via a directional valve. From the consumer, the hydraulic fluid flows back to the tank via the directional valve.

4.2.1 Assembly of the axial piston unit

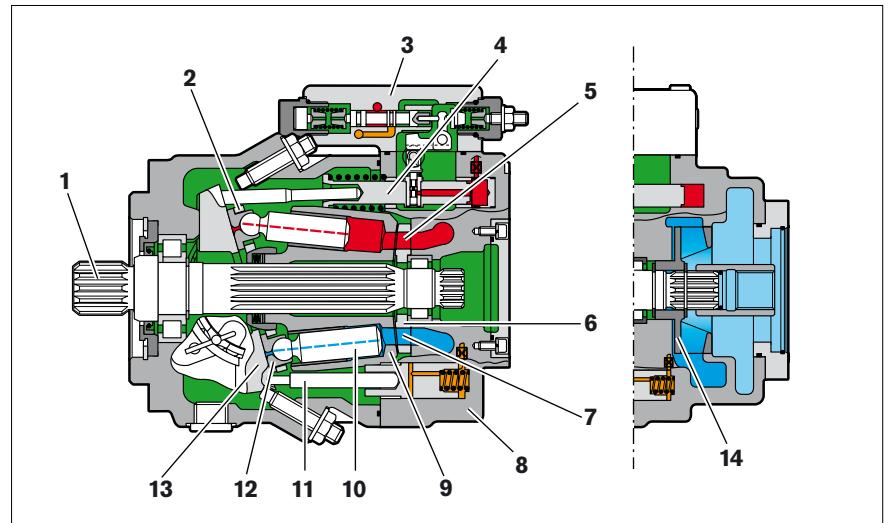


Fig. 2: Left-hand illustration: Assembly of A11VO. Right-hand illustration: A11VLO

| | | |
|-------------------|-----------------|---------------------------|
| 1 Drive shaft | 6 Control plate | 11 Counterset piston |
| 2 Retaining plate | 7 Suction side | 12 Slipper pad |
| 3 Control valve | 8 Port plate | 13 Swashplate |
| 4 Stroke piston | 9 Cylinder | 14 Charge pump (impeller) |
| 5 Pressure side | 10 Piston | |

For axial piston units with swashplate design, the pistons (10) are arranged axially with respect to the drive shaft (1). They are guided in the rotating cylinder (9) and support themselves with the slipper pads (12) on the non-rotating swashplate (13). The drive shaft (1) and cylinder (9) are connected to one another by means of gearing.

4.2.2 Functional description

Pump Torque is applied to the drive shaft (1) by an engine. The cylinder (9) turns with the drive shaft, turning with it the pistons (10). On each rotation, the pistons perform a stroke movement which is defined by the pitch of the swashplate (13). The slipper pads (12) are held on and guided along the glide surface of the swashplate by the retaining plate (2). During a rotation, each piston moves over the bottom and top dead centers back to its initial position. During this action, the fluid volume defined by the piston surface and the stroke is fed in or removed through the two control slits in the control plate (6). On the low-pressure side, fluid flows into the enlarging piston chamber. At the same time, on the pressure side the fluid is pushed out of the cylinder chamber into the hydraulic system by the pistons.

Control The swivel angle of the swashplate (13) is steplessly varied. By changing the swivel angle, the piston stroke and, therefore, the displacement change. The swivel angle is controlled hydraulically via the stroke piston (4). The swashplate is mounted for easy motion in swivel bearings and it is kept in balance by the opposing piston (11). Increasing the swivel angle increases the displacement; reducing the angle results in a corresponding reduction in displacement.

The pressure in the service line must not drop below the minimum pressure $p_{B\ min}$, even in unactuated working function, see data sheet RE 92500. To guarantee this, it is necessary, depending on the system concerned, to set a minimum hydraulic fluid displacement at the variable pump that is sufficient for

- cooling the pistons,
- supplying the control,
- compensating for case drain fluid and
- lubricating all moving parts.



Additional information on the control devices, e.g. the circuit diagram or characteristics, can be found in technical data sheet RE 92500.

The following warning notice applies to all axial piston units with the LRH, LRU, HD and EP controllers:

CAUTION!



The spring return in the controller is not a safety device.

The spool valve of the controller can be blocked in an undefined position by internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the axial piston unit can no longer supply the flow specified by the operator.

- Check whether your application requires that remedial measures be taken on your machine in order to bring the driven consumer into a safe position (e. g. immediate stop).
-

Charge pump (optional)

The A11VLO axial piston unit (size 130 to 260) is equipped with a charge pump (14). The charge pump (impeller) is a circulating pump with which the A11VLO is filled and therefore can be operated at higher speeds. This simplifies cold starting at low temperatures and high viscosity of the hydraulic fluid. Tank charging is therefore unnecessary in most cases. A maximum tank pressure of 2 bar is permissible with charge pump.

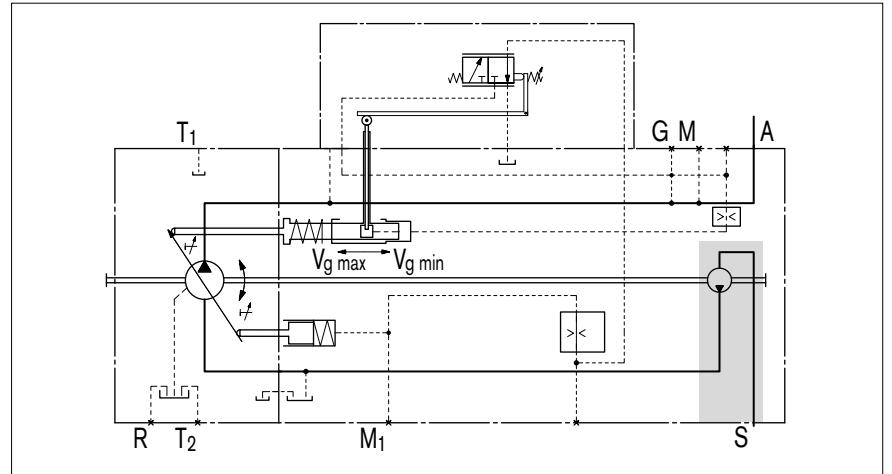


Fig. 3: Circuit diagram A11VLO with charge pump

4.3 Product identification

The axial piston unit can be identified from the name plate. The following example shows an A11VLO name plate:

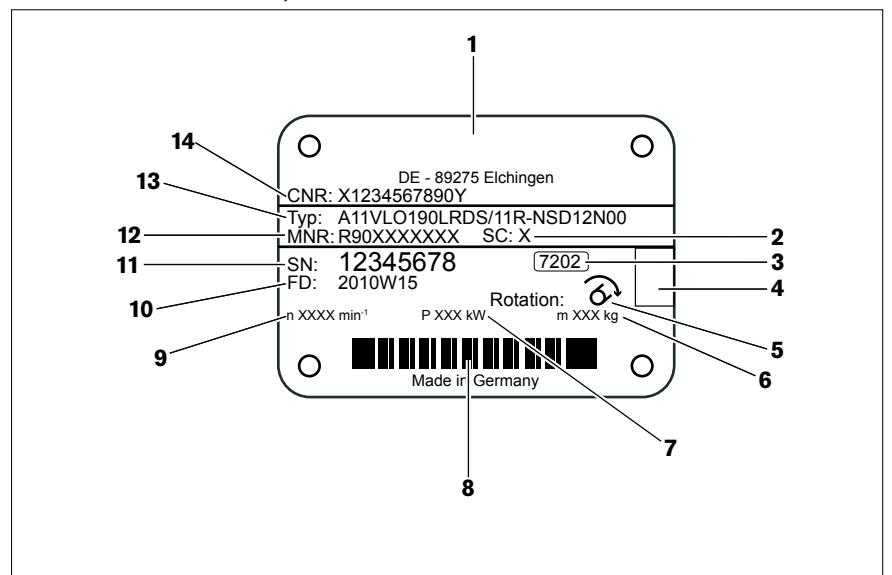


Fig. 4: Name plate A11VLO

- | | | | |
|---|--|----|--|
| 1 | Manufacturer | 8 | Barcode |
| 2 | Sample category (optional) | 9 | Rotational speed |
| 3 | Internal plant designation | 10 | Production date |
| 4 | Specified area for test stamp | 11 | Serial number |
| 5 | Direction of rotation (looking at drive shaft) – here: clockwise | 12 | Material number of the axial piston unit |
| 6 | Ground (optional) | 13 | Ordering code |
| 7 | Power | 14 | Customer material number |

5 Transport and storage

5.1 Transporting the axial piston unit

CAUTION!



Risk of damage!

Striking or impulsive forces could damage the axial piston unit.

- ▶ Do not strike the coupling or drive shaft of the axial piston unit.
- ▶ Do not set/place the axial piston unit on the drive shaft.
- ▶ Do not strike sensitive fittings (e.g. sensors or valves).
- ▶ Do not strike sealing areas (e.g. the suction port or through drive).

Axial piston units can be transported with a forklift truck or with a lifting device.

- ▶ Make certain that the forklift truck or lifting device has adequate lifting capacity.

Dimensions and weights

Table 3: Dimensions and weights A11VO

| Size | 40 | 60 | 75 | 95 | 130 | 145 | 190 | 260 |
|-----------|----|----|----|----|-----|-----|-----|-----|
| Ground kg | 32 | 40 | 45 | 53 | 66 | 76 | 95 | 125 |
| Width mm | | | | | | | | |
| Height mm | | | | | | | | |
| Depth mm | | | | | | | | |

The dimensions vary with the unit type. The values applicable for your axial piston unit can be found in the installation drawing (request if necessary).

Table 4: Dimensions and weights A11VLO

| Size | 130 | 145 | 190 | 260 |
|-----------|-----|-----|-----|-----|
| Ground kg | 72 | 73 | 104 | 138 |
| Width mm | | | | |
| Height mm | | | | |
| Depth mm | | | | |

The dimensions vary with the unit type. The values applicable for your axial piston unit can be found in the installation drawing (request if necessary).

The weight specifications may vary depending on the unit type.

5.1.1 Transporting with lifting device

For transporting, the axial piston unit can be connected to a lifting device via a ring screw or a lifting strap.

Transport with ring screw

The drive shaft can be used to transport the axial piston unit as long as only outward (pulling) axial forces occur. Thus, you can suspend the axial piston unit from the drive shaft.

- ▶ To do this, screw a ring screw completely into the thread on the drive shaft. The thread sizes is stated in the installation drawing.
- ▶ Make sure that each ring screw can bear the total weight of the axial piston unit plus approx. 20%.

You can hoist the axial piston unit as shown in Fig. 5 with the ring screw screwed into the drive shaft.

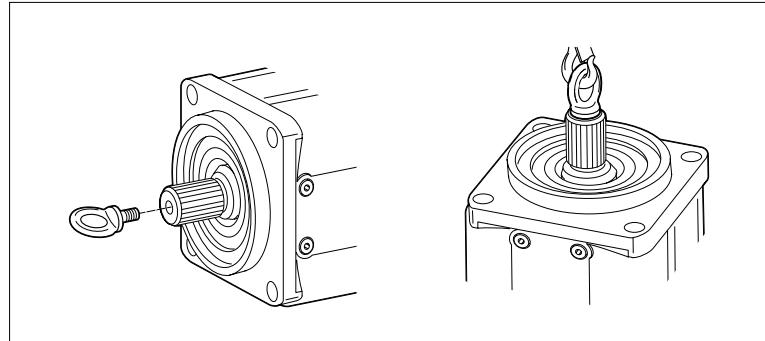


Fig. 5: Fixing the ring screw

Transport with lifting strap

- ▶ Place the lifting strap around the axial piston unit in such a way that it passes over neither the attachment parts (e.g. valves) nor such that the axial piston unit is hung from attachment parts (see Fig. 6).

WARNING!



Risk of injury!

During transport with a lifting device, the axial piston unit can fall out of the lifting strap and cause injuries.

- ▶ Use the widest possible lifting strap.
- ▶ Make sure that the axial piston unit is securely fixated with the lifting strap.
- ▶ The axial piston unit is only to be guided by hand for fine positioning and to avoid vibrations.
- ▶ Never stand under or put your hands under suspended loads.

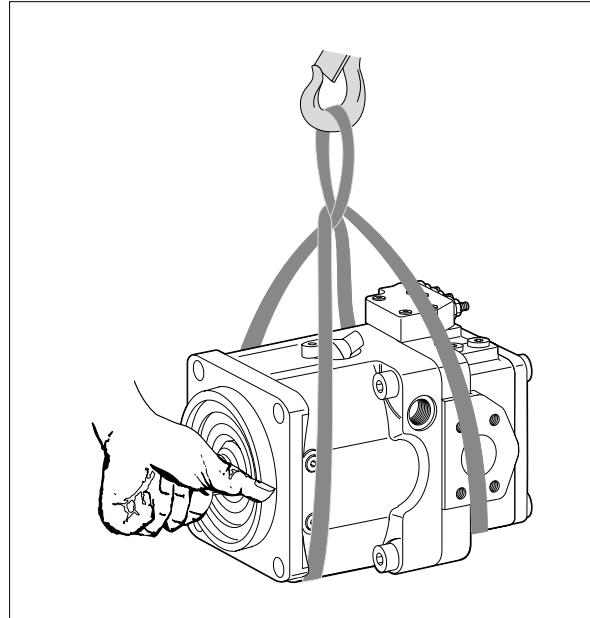


Fig. 6: Transport with lifting strap

5.2 Storing the axial piston unit

| Requirement | <ul style="list-style-type: none"> The storage areas must be free from corrosive materials and gasses. The storage areas must be dry. Ideal storage temperature: +5 °C to +20 °C Minimum storage temperature: -50 °C. Maximum storage temperature: +60 °C. Avoid intense lights. Do not stack axial piston units and store them shock-proof. Do not store the axial piston unit on sensitive attachment parts, e.g. sensors. For other storage conditions, see Table 5. <p>► Check the axial piston unit monthly to ensure proper storage.</p> | | | | | | |
|---|---|--------------------------------|-------------------------------|--------------------------------|---|-------------------|-------------------|
| After delivery | <p>The axial piston units are provided ex-works with corrosion protection packaging (corrosion protection film).</p> <p>Listed in the following table are the maximum permissible storage times for an originally packed axial piston unit.</p> | | | | | | |
| Table 5: Storage time with factory corrosion protection | | | | | | | |
| Storage conditions | <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Storage conditions</th><th style="text-align: left;">Standard corrosion protection</th><th style="text-align: left;">Long-term corrosion protection</th></tr> </thead> <tbody> <tr> <td>Closed, dry room, uniform temperature between +5 °C and +20 °C. Undamaged and closed corrosion protection film.</td><td>Maximum 12 months</td><td>Maximum 24 months</td></tr> </tbody> </table> | Storage conditions | Standard corrosion protection | Long-term corrosion protection | Closed, dry room, uniform temperature between +5 °C and +20 °C. Undamaged and closed corrosion protection film. | Maximum 12 months | Maximum 24 months |
| Storage conditions | Standard corrosion protection | Long-term corrosion protection | | | | | |
| Closed, dry room, uniform temperature between +5 °C and +20 °C. Undamaged and closed corrosion protection film. | Maximum 12 months | Maximum 24 months | | | | | |



The warranty is rendered void if the requirements and storage conditions are not adhered to or after expiration of the maximum storage time (see Table 5).

Procedure after expiration of the maximum storage time:

1. Check the entire axial piston unit for damage and corrosion prior to installation.
2. Check the axial piston unit for proper function and leaks during a test run.
3. If the storage time exceeds 24 months, the shaft seal ring must be replaced.



After expiry of the maximum storage time, we recommend that you have the axial piston unit inspected by your responsible Rexroth Service partner.

In the event of questions regarding repair and spare parts, contact your responsible Rexroth Service partner or the service department of the manufacture's plant for the axial piston unit, see chapter "9.5 Spare parts" for further information.

After disassembly If a dismounted axial piston unit is to be stored, it must be preserved against corrosion for the duration of the storage.



The following instructions only refer to axial piston units which are operated with a mineral-oil based hydraulic fluid. Other hydraulic fluids require preservation methods that are specifically designed for them. In such a case, consult with Rexroth Service (see chapter "9.5 Spare parts" for address).

Rexroth recommends the following procedure:

1. Clean the axial piston unit, see chapter "9.1 Cleaning and care".
2. Completely empty the axial piston unit.
3. For storage time up to 12 months: Moisten the inside of the axial piston unit with mineral oil and fill with approx. 100 ml mineral oil.
For storage time up to 24 months: Filling the axial piston unit with corrosion protection VCI 329 (20 ml).
Fill via case drain port **T₁**, **T₂** or **R**, see chapter "6.4 Installing the axial piston unit", Fig. 13 to 15.
4. Seal all ports airproof.
5. Moisten the unpainted areas of the axial piston unit with mineral oil or with a suitable, easily removable corrosion protection agent, e.g. acid-free grease.
6. Package the axial piston unit airproof together with desiccant in corrosion protection film.
7. Store the axial piston unit so that it is protected against jolts. See "Requirement" in this chapter for further conditions.

6 Installation

Prior to installation, the following documents must be available:

- Installation drawing for axial piston unit (can be obtained from your responsible contact person at Rexroth)
- Hydraulic circuit diagram for the axial piston unit (in the installation drawing)
- Hydraulic circuit diagram for the system (available from the system manufacturer)
- Order confirmation (contains the preset data of the axial piston unit)
- Data sheet for the axial piston unit (contains the technical data)

6.1 Unpacking

The axial piston unit is delivered in a corrosion protection film made of polyethylene material (PE).

- ▶ Dispose of the packaging according to the national regulations of your country.

CAUTION!



Risk of parts falling out

If the packaging is not opened correctly, parts may fall out and damage the parts or even result in injury.

- ▶ Place the packaging on a flat and solid surface.
 - ▶ Only open the packaging from the top.
-

6.2 Installation conditions

- The installation location and position of the axial piston unit essentially determine the procedures during installation and commissioning (such as when filling and air bleeding the axial piston unit).
- Correct filling and air bleeding is necessary to prevent damage to the axial piston unit and to maintain correct function.
- Note that you can expect certain installation positions to affect the control device. Because of gravity, dead weight and case pressure, minor characteristic displacements and actuating time changes may occur.
- ▶ Observe all limits specified in the data sheet, e.g. temperature, viscosity hydraulic fluid purity and direction of rotation.
- ▶ Make sure that the axial piston unit is air bled and filled with hydraulic fluid during commissioning and operation. This is also to be observed following relatively long standstill periods as the axial piston unit may empty via the hydraulic lines.
- ▶ The case drain fluid in the case interior must be directed to the tank via the highest case drain port. Use the line size which is appropriate for the port.
- ▶ A check valve in the case drain line (cracking pressure 0.5 bar) can prevent the system emptying through the case drain line.
- ▶ To achieve favorable noise values, decouple all connecting lines from all vibration-capable components (e.g. tank) using elastic elements.
- ▶ Make certain that the suction line, case drain fluid, and return line flow into the tank below the minimum fluid level in all operational states. This will prevent air from being drawn in, which could result in the formation of foam.

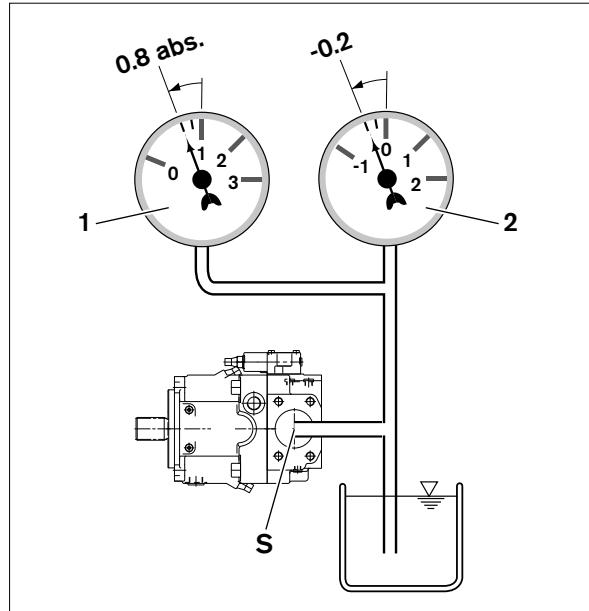


Fig. 7: Suction pressure

- 1 Absolute pressure gauge
2 Standard pressure gauge

- ▶ Make sure that a minimum suction pressure of 0.8 bar without charge pump (0.6 bar with charge pump) absolute is present at port "S" during operation, in all installation positions and installation locations for the axial piston pump, see Fig. 7. See data sheet for additional values.
- ▶ Absolute cleanliness is required. The axial piston unit must be installed in a clean condition. Contamination of the hydraulic fluid can have a considerable impact on the function and service life of the axial piston unit.
- ▶ Do not use any cotton waste or linty cloths for cleaning.
- ▶ Use suitable liquid detergents to remove lubricants and other difficult-to-remove contamination. Detergents must not penetrate the hydraulic system.

CAUTION!



Risk of damage due to lack of lubrication!

Sufficient lubrication must be guaranteed to prevent damage to the axial piston unit.

- ▶ During installation, make sure that the motor case is completely filled with hydraulic fluid during commissioning and during operation with the installation position "drive shaft upwards" (e.g. no air inclusions).
- ▶ During commissioning and during operation, the suction line must be filled with hydraulic fluid.

CAUTION!



Risk of damage by hydraulic fluid loss!

With above-tank installation, the case interior may drain via the case drain line after longer standstill periods (air enters via the shaft seal ring) or via the service line (gap leakage). The bearings are thus insufficiently lubricated when the pump is restarted.

- ▶ Check the hydraulic fluid level in the case interior regularly; if necessary, recommission.

6.3 Installation position

The following installation positions are permissible. The shown piping layout illustrates the basic layout.

6.3.1 Below-tank installation (standard)

Below-tank installation is when the axial piston unit is installed outside of the tank below the minimum fluid level.



Recommended installation positions: 1 and 2.

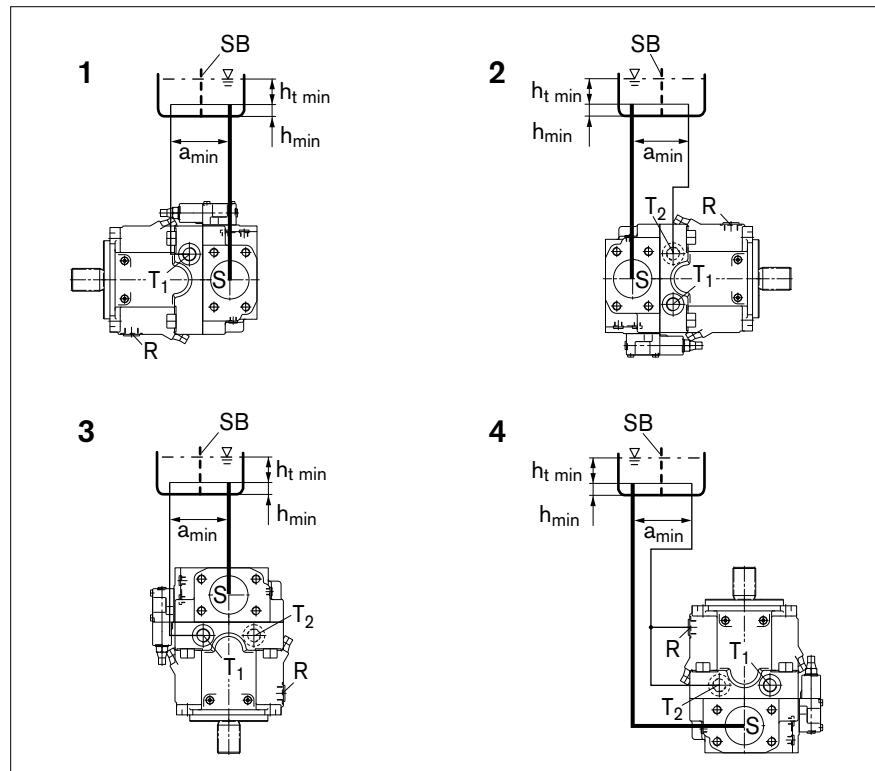


Fig. 8: Below-tank installation with installation positions 1–4

| | | | |
|-------------------------------------|--|------------------------|---|
| T₁, T₂ | Highest case drain port | h_{min} | Minimum necessary spacing from suction port to tank base (100 mm) |
| R | | a_{min} | When designing the tank, ensure adequate distance between the suction line and the case drain line. This prevents the heated, return flow from being drawn directly back into the suction line. |
| L₁ | Air bleed and filling port | | |
| S | Suction port | | |
| SB | Baffle (baffle plate) | | |
| h_{t min} | Minimum necessary immersion depth (200 mm) | | |

Table 6: Below-tank installation

| Installation position | Air bleeding | Filling |
|-------------------------------------|--------------------------------|------------------------------------|
| 1 (drive shaft, horizontal) | T ₁ | S + T ₁ |
| 2 (drive shaft, horizontal) | R | S + T ₂ |
| 3 (drive shaft vertically downward) | T ₁ /T ₂ | S + T ₁ /T ₂ |
| 4 (drive shaft vertically upward) | R | S + T ₁ /T ₂ |

6.3.2 Tank installation

Tank installation is when the axial piston unit is installed in the tank below the minimum fluid level. The axial piston unit is completely below the hydraulic fluid.

If the minimum fluid level is equal to or below the upper edge of the pump, see chapter "6.3.3 Above-tank installation".

CAUTION!



Risk of damage during tank installation!

To prevent damages to the axial piston unit, all plastic parts (e.g. protective caps, covers) must be removed prior to installation in the tank.

- ▶ Remove all plastic parts before installing the axial piston unit in the tank. Make certain that no pieces of these parts remain in the tank.
- ▶ Axial piston units with electrical component must not be installed below the hydraulic fluid level.
- ▶ Open the ports **T₁**, **T₂** and **R** for air bleeding and to directly drain off the case drain fluid.
- ▶ Before filling the tank, connect the service line port **A (A₁)**.
- ▶ The suction port **S** must not be piped up.



Our advice is to fit a suction pipe to the suction port **S** and to fit a pipe to case drain port **T₁**, **T₂** or **R**. In such cases, the other case drain ports must be plugged. The case of the axial piston unit should be filled before fitting the piping and filling the tank with hydraulic fluid.



It is only permissible to install the tank of an axial piston unit with solenoids, e.g. EP control, if hydraulic fluids based on mineral oil are used and if the oil temperature in the tank does not exceed 80° C.

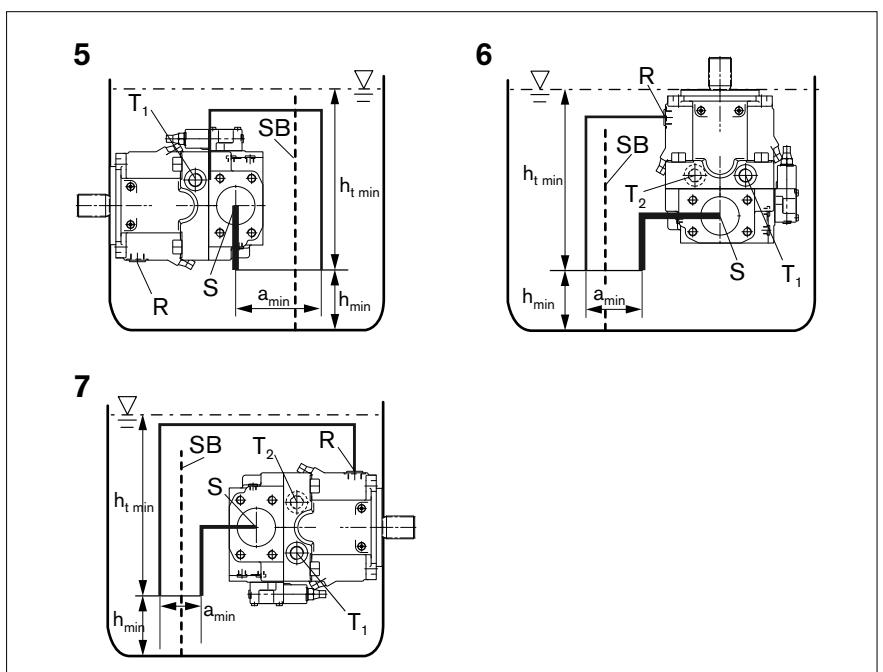


Fig. 9: Tank installation with installation positions 5–7

Installation

| | | | |
|--------------------------------------|---|------------------------|---|
| T₁, T₂, | Highest case drain port | a_{min} | When designing the tank, ensure adequate distance between the suction line and the case drain line. This prevents the heated, return flow from being drawn directly back into the suction line. |
| R | | | |
| S | Suction port | | |
| h_{t min} | Minimum permissible immersion depth (200 mm) | | |
| h_{min} | Minimum permissible spacing from lower edge of suction port to tank base (100 mm) | | |

Table 7: Tank installation

| Installation position | Air bleeding | Filling |
|-----------------------------------|--|---|
| 5 (drive shaft, horizontal) | via the highest open port T ₁ | automatically via all open ports T ₁ , T ₂ , R and S, by position below hydraulic fluid level |
| 6 (drive shaft vertically upward) | via the highest open port R | automatically via all open ports T ₁ , T ₂ , R and S, by position below hydraulic fluid level |
| 7 (drive shaft, horizontal) | via the highest open port R | automatically via all open ports T ₁ , T ₂ , R and S, by position below hydraulic fluid level |

6.3.3 Above-tank installation

Above-tank installation is when the axial piston unit is installed above the minimum fluid level of the tank.

CAUTION!



Risk of damage due to lack of lubrication!

Sufficient lubrication must be guaranteed to prevent damage to the axial piston unit.

- ▶ Make sure that the motor case is completely filled with hydraulic fluid during commissioning and during operation with the installation position "drive shaft upwards" (e.g. no air inclusions).
- ▶ Check the hydraulic fluid level in the case interior regularly; if necessary, recommission. With above-tank installation, the case interior may drain via the case drain line after longer standstill periods (air enters via the shaft seal ring) or via the service line (gap leakage). The bearings are thus insufficiently lubricated when the pump is restarted.
- ▶ Make certain that the suction line is always filled with hydraulic fluid during commissioning and operation.



Observe the maximum permissible suction height $h_{s \max} = 800$ mm. The permissible suction height h_s is derived from the total pressure loss.



The A11VLO version (with charge pump) is not designed for above-tank installation.



For control options with pressure controllers, stroke limiters, HD and EP control, the minimum displacement setting must be $V_g \geq 5\% V_{g \max}$.



Recommendation for installation position 7 (shaft upwards): A check valve in the case drain line (cracking pressure 0.5 bar) can prevent draining of the case interior.

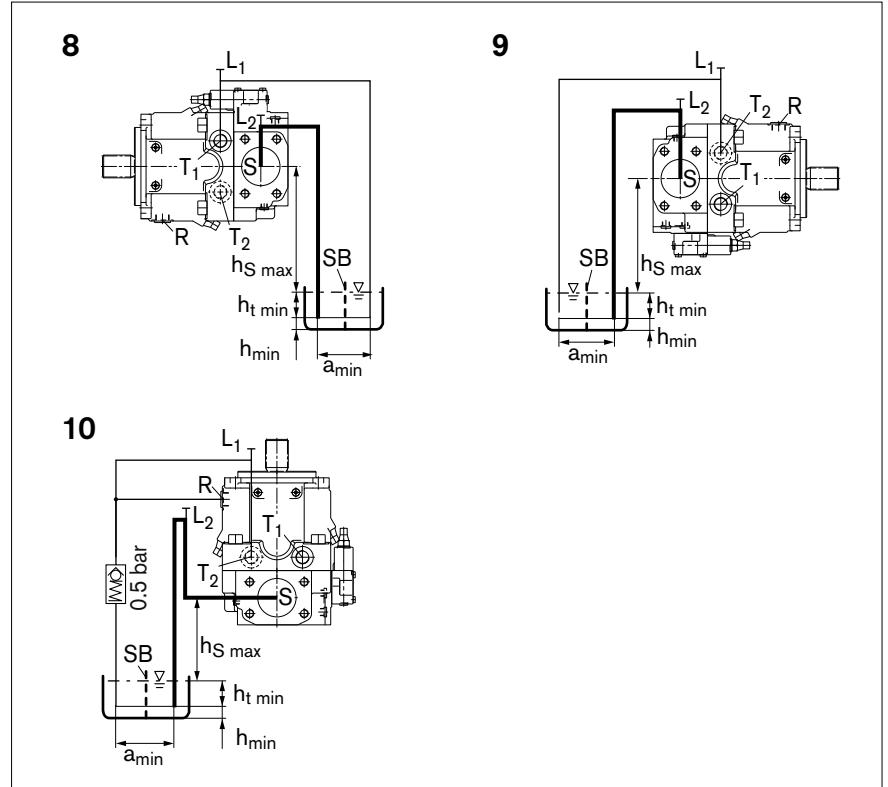


Fig. 10: Above-tank installation with installation positions 8–10

| | | | |
|--|------------------------------------|--------------------------|---|
| T₁, T₂, R | Highest case drain port | h_t min | Minimum necessary immersion depth (200 mm) |
| L₁, L₂ | Air bleed and filling port | h_{min} | Minimum necessary spacing from suction port to tank base (100 mm) |
| S | Suction port | a_{min} | When designing the tank, ensure adequate distance between the suction line and the case drain line. This prevents the heated, return flow from being drawn directly back into the suction line. |
| SB | Baffle (baffle plate) | | |
| h_S max | Maximum permissible suction height | | |

Table 8: Above-tank installation

| Installation position | Air bleeding | Filling |
|------------------------------------|---------------------------------|---|
| 8 (drive shaft, horizontal) | L ₁ + L ₂ | L ₂ (S) + L ₁ (T ₂) |
| 9 (drive shaft, horizontal) | R + L ₂ | L ₂ (S) + L ₁ (T ₂) |
| 10 (drive shaft vertically upward) | L ₁ + L ₂ | L ₂ (S) + L ₁ (T ₁ /T ₂) |

6.4 Installing the axial piston unit

DANGER!



Systems which are in operation pose a risk of injury!

Working on operating systems poses a danger to life and limb. The work steps described in this chapter must only be performed on systems which are at a standstill. Before beginning work:

- ▶ Ensure that the engine cannot be switched on.
- ▶ Ensure that all power-transmitting components and connections (electric, pneumatic, hydraulic) are switched off according to the manufacturer's instructions and are secured against being switched on again. If possible, remove the main fuse for the system.
- ▶ Ensure that the system is completely hydraulically relieved and depressurized. Please follow the system manufacturer's instructions.
- ▶ Only qualified personnel (see chapter "2.3 Personnel qualifications") are authorized to install the axial piston unit.

6.4.1 Preparation

1. Check the delivery contents for completeness and transport damages.
2. Compare the material number and designation (ordering code) with the details in the order confirmation.



If the material number for the axial piston unit does not correspond to the one in the order confirmation, contact Rexroth Service for clarification, see chapter "9.5 Spare parts" for address.

3. Before installing, completely empty the axial piston unit to prevent mixing with the hydraulic fluid used in the system.
4. Check the direction of rotation of the axial piston unit (on the name plate) and make sure that this corresponds to the direction of rotation of the engine.

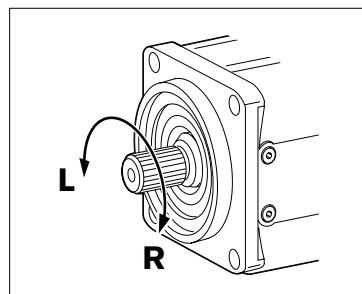


Fig. 11: Direction of rotation

L Counter-clockwise

R Clockwise



The direction of rotation as specified on the name plate determines the direction of rotation of the axial piston unit as viewed on the drive shaft. For information on the direction of rotation of the engine, please refer to the engine manufacturer's operating instructions.

6.4.2 Dimensions

The installation drawing contains the dimensions for all connections and ports on the axial piston unit. Also observe the instructions provided by the manufacturers of the other components when selecting the required tools.

6.4.3 General instructions

During installation (and disassembly) of the axial piston unit, observe the following general instructions and handling instructions:

- After a short operating time, toothed belts lose a major portion of their pre-tension and thus cause speed variations and torsional vibrations. Torsional vibrations may cause leakages on the shaft seal ring or increased rotary angle accelerations of the rotary group of the driven axial piston unit. Particularly at risk are diesel drives with a small number of cylinders and low flywheel mass.
 - V-belt drives without automatic tensioning device are also critical with regard to speed variations and torsional vibrations. These can also lead to leakages on the shaft seal ring. An automatic tensioning device can lessen the speed variations and vibrations and thus avoid consequential damage.
 - When transferring the input or output drive of an axial piston unit with the aid of a cardan shaft, vibrations may occur which may result in leakages on the shaft seal ring of the axial piston unit depending on the temperature and frequency.
- When using toothed belts or v-belts to transfer the input or output drive, always use an automatic tensioning device.
- Fix the axial piston unit so that the expected forces and torques can be transferred without any danger.
- The permissible axial and radial loading of the drive shaft, the permissible torsional vibrations, the optimum direction of load force, as well as the limit speeds can be found in the data sheet.
- Observe the permissible radial forces on the drive shaft when driving with radial loading (belt drives). If necessary, the belt pulley must be separately mounted.

CAUTION!



Risk of damage!

Striking or impulsive forces could damage the axial piston unit.

- Do not strike the coupling or drive shaft of the axial piston unit.
- Do not set/place the axial piston unit on the drive shaft.
- Do not strike sensitive fittings (e.g. sensors or valves).
- Do not strike sealing areas (e.g. the suction port or through drive).

How to install the axial piston unit depends on the connecting elements to the drive side. The following descriptions explain the installation of the axial piston unit:

- with a coupling
- on a gearbox

6.4.4 Installation with coupling

How to install the axial piston unit with a coupling is described in detail in the following:

1. Install the specified coupling half onto the drive shaft of the axial piston unit according to the instructions of the coupling manufacturer.



The drive shaft of the axial piston unit is equipped with a threaded bore. Use this threaded bore to pull the coupling element onto the drive shaft. Refer to the installation drawing for the dimensions of the threaded bore.

2. Make certain that the installation location is clean and free from dirt and contaminants.
3. Clamp the coupling hub onto the drive shaft or ensure permanent lubrication of the drive shaft. This prevents the formation of frictional corrosion and the associated wear.
4. Transport the axial piston unit to the installation location.
5. Install the coupling onto the drive according to the instructions of the coupling manufacturer.



The axial piston unit must not be tightened down until the coupling has been correctly installed.

6. Fix the axial piston unit at the installation location.
7. If necessary, details on the required tools and tightening torques for the fixing screws are available from the machine or system manufacturer.
 - For bell housing installation, check the coupling axial play through the bell window according to the manufacturer's instructions.
 - For flange installation, align the support for the axial piston unit with the drive.
8. When using flexible couplings, check that the drive is free of resonance after completing the installation.

6.4.5 Installation on a gearbox

How to install the axial piston unit on a gearbox is described in detail in the following:

After installing on a gearbox, the axial piston unit is covered and is difficult to access:

- ▶ Therefore, before installing, make sure that the centering spigot centers the axial piston unit (observe tolerances) and that no impermissible axial or radial forces act on the drive shaft of the axial piston unit (installation length).
- ▶ Protect the spline of the drive shaft from frictional corrosion by providing permanent lubrication.

6.4.6 Completing installation

1. Remove any mounted transport screws.
2. Remove the transport protection.
The axial piston unit was delivered with protective covers and plastic plugs or locking screws. These must be removed before connecting. Use appropriate tools.
3. Make certain that the sealing and functional surfaces are not damaged.



Ports which are intended for connecting lines are provided with plastic plugs or locking screws which serve as transport protection. If no connection is made, these ports must be plugged with a suitable metal locking screw since the plastic plugs are not pressure-proof.

CAUTION!



Risk of damage to persons and property!

Operating the axial piston unit with plastic plugs can result in injuries or damage to the axial piston unit.

- Before commissioning, remove all plastic plugs and replace them with suitable, pressure-proof, metal locking screws.

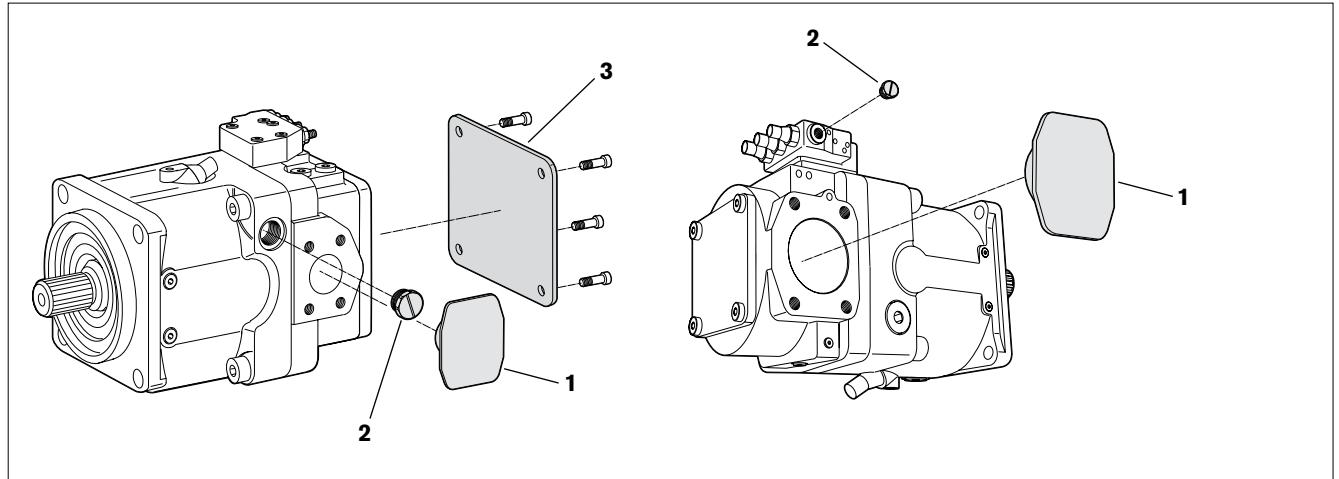


Fig. 12: Removing transport protection

- | | |
|---|---|
| <p>1 Protective covers made of plastic (metallic protective covers are used for painted axial piston units)</p> <p>2 Plastic plugs / locking screws</p> | <p>3 For version with through drive, metallic flange cover and fixing screws</p> |
|---|---|



The adjusting screws are protected against unauthorized resetting by means of protective caps. Removal of the protective caps will void the warranty. If you need to modify the setting, please contact your responsible Rexroth Service (address as to chapter "9.5 Spare parts").

4. For versions with through drive, install the auxiliary pump according to the pump manufacturer's instructions.

6.4.7 Hydraulically connecting the axial piston unit

The machine or system manufacturer is responsible for dimensioning the lines. The axial piston unit must be connected to the rest of the hydraulic system in accordance with the hydraulic circuit diagram of the machine or system manufacturer.

CAUTION!



Damage to the axial piston unit!

Hydraulic lines and hoses that are installed under mechanical stress generate additional mechanical forces during operation, which will reduce the service life of the axial piston unit and the entire machine or system.

- ▶ Install hydraulic lines and hoses without mechanical stress.

CAUTION!



Risk of damage!

Generally, a minimum permissible suction pressure at port **S** is specified for axial piston pumps in all installation positions. If the pressure at port **S** drops below the specified values, damage may occur which may lead to the axial piston pump being damaged beyond repair.

- ▶ Make sure that the necessary suction pressure is not undercut. This is influenced by:
 - the piping (e.g. suction cross-section, pipe diameter, length of suction line)
 - the position of the tank
 - the viscosity of the hydraulic fluid
 - a filter cartridge or check valve in the suction line, if these are fitted (regularly check the level of soiling of the filter cartridge)



Only connect suitable hydraulic lines to the service and function ports.

CAUTION!



Wear and malfunctions

The cleanliness of the hydraulic fluid has a considerable impact on the cleanliness and service life of the hydraulic system. Any contamination of the hydraulic fluid leads to wear and malfunctions. In particular, contaminants, such as welding beads or metal cuttings in the hydraulic lines, may damage the axial piston unit.

- ▶ Absolute cleanliness is required.
- ▶ The axial piston unit must be installed in a clean condition.
- ▶ Make certain that all ports, hydraulic lines and add-on units (e.g. measuring devices) are clean.
- ▶ Make certain that no contaminants penetrate when sealing the ports.
- ▶ Make certain that no detergents enter the hydraulic system.
- ▶ Do not use any cotton waste or linty cloths for cleaning.
- ▶ Do not use hemp as sealant under any circumstances.



When installing the tank, the case of the axial piston unit should be filled before fitting the piping and filling the tank with hydraulic fluid.

Notes on routing the lines Observe the following notes when routing the suction, pressure and case drain lines.

- ▶ Make certain that the suction line (pipe or hose) is as short and straight as possible.
- ▶ The line cross section of the suction line is to be measured so that the minimum permissible pressure at the suction port is not dropped below and the maximum permissible pressure is not exceeded.
- ▶ Observe the air tightness of the junctions and the pressure resistance of the hose, also with respect to the external air pressure.
- ▶ With the pressure lines, make certain that the pipes, hoses and connecting elements are approved for the operating pressure range.
- ▶ Always route the case drain lines so that the housing is constantly filled with hydraulic fluid and to ensure that no air gets through the shaft seal ring even during extended standstill periods. The case internal pressure must not exceed the maximum values listed for the axial piston unit in the data sheet under any operating conditions. The case drain line in the tank must end up below the minimum fluid level under all conditions (see chapter "6.3 Installation position").



The ports and fixing threads are designed for the maximum pressure specified in the data sheet. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified operating conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.

Procedure

To connect the axial piston unit to the hydraulic system:

1. Remove the locking screws at the ports at which the connections are to be made according to the hydraulic circuit diagram.
2. Only use clean hydraulic lines or rinse out the hydraulic system with a flushing unit before commissioning. Follow the specifications of the flushing unit manufacturer.
3. Connect the lines according to the hydraulic circuit diagram. Either pipes or hoses must be connected to all ports according to the installation drawing and machine or system circuit diagram or the ports plugged using suitable locking screws.



The installation drawing contains the dimensions for all connections and ports on the axial piston unit. Also observe the instructions provided by the manufacturers of the other hydraulic components when selecting the required tools.

4. Make certain that the cap nuts on the fittings and flanges are tightened correctly (observe the manufacturer's tightening torques!). Mark all checked fittings using e.g. a permanent marker pen.
5. Make certain that the pipes and hose lines and every combination of connecting piece, coupling or connecting point with hoses or pipes have been inspected by a technically qualified person for safe working condition.

Port overview

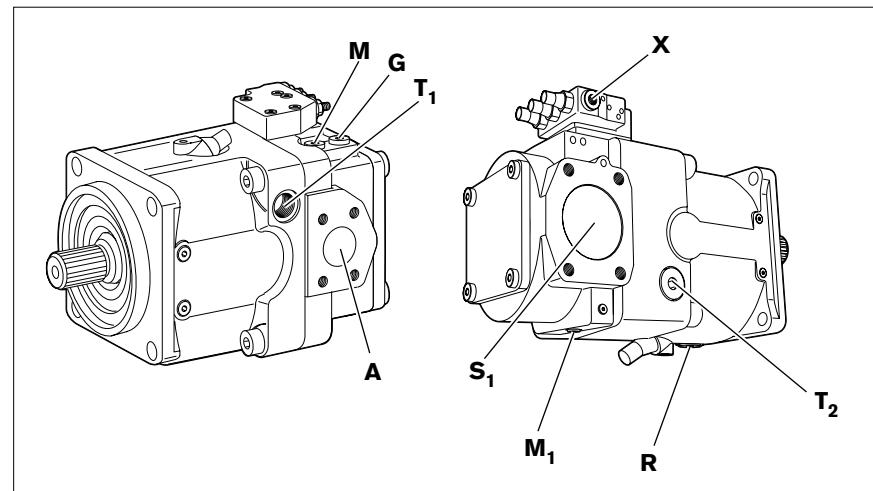


Fig. 13: Port overview A11VLO Series 10 and 11, LRDS control, clockwise rotation

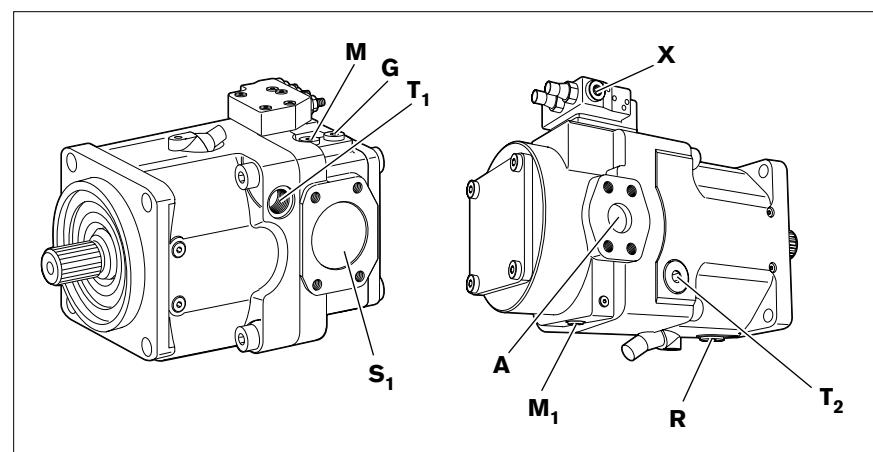


Fig. 14: Port overview A11VLO Series 10 and 11, LRS control, counter-clockwise rotation

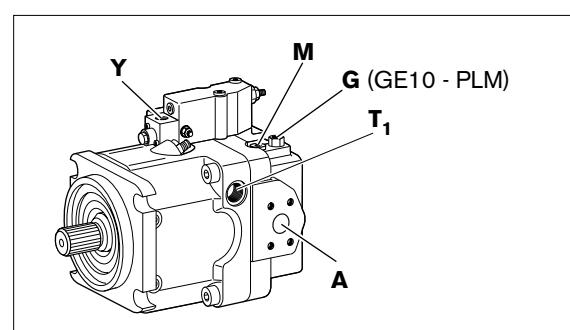


Fig. 15: Port overview A11VO Series 10 and 11, LRH control, clockwise rotation



Port **G** must be connected with fitting GE10 - PLM. If no external control pressure is connected at **G** the shuttle valve must be removed by Rexroth Service.

Table 9: Ports A11V(L)O Series 10 and 11

| Designation | Port for | Standard | Maximum pressure [bar] ¹⁾ | State |
|-------------------------------------|---|----------------------------------|--------------------------------------|-----------------|
| A, A₁ | Service line Fixing threads | SAE J518 ²⁾ DIN 13 | 400 | O |
| S | Suction (without charge pump) Fixing threads | SAE J518 ²⁾ DIN 13 | 30 | O |
| S₁ | Suction (with charge pump) Fixing threads | SAE J518 ²⁾ DIN 13 | 2 | O |
| T₁, T₂ | Tank | DIN 3852 ³⁾ | 10 | O ⁴⁾ |
| R | Air bleed | DIN 3852 ³⁾ | 10 | X |
| M₁ | Measurement point, stroking chamber | DIN 3852 ³⁾ | 400 | X |
| M | Measurement point, service line port | DIN 3852 ³⁾ | 400 | X |
| X | Pilot pressure in version with load sensing (S) and remote controlled pressure cut-off (G) | DIN 3852 ³⁾ | 400 | O |
| Y | Pilot pressure in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD | DIN 3852 ³⁾ | 40 | O |
| Z | Pilot pressure in version with cross sensing (C) and power override (LR3) | DIN 3852 ³⁾ | 400 | O |
| | Pilot pressure in version with power override (LG1) | DIN 3852 ³⁾ | 40 | O |
| G | Control pressure (controller) in version with stroke limiter (H.., U2), HD and EP with fitting GE10 - PLM (otherwise plugged) | DIN 3852 ³⁾ | 40 | O |

¹⁾ Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.

²⁾ Metric fixing thread, deviating from standard.

³⁾ The countersink may be deeper than specified in the standard.

⁴⁾ Depending on installation position, either "T₁" or "T₂" must be connected (see also chapter "6.3 Installation position")

O = Must be connected (plugged on delivery)

X = Plugged (in normal operation)

Tightening torques

The following tightening torques apply:

- Threaded hole of the axial piston unit:
The maximum permissible tightening torques $M_{G\ max}$ are maximum values of the threaded holes and must not be exceeded. For values, see the following table.
- Fittings:
Observe the manufacturer's instruction regarding the tightening torques of the used fittings.
- Fixing screws:
For fixing screws according to DIN 13/ISO 68, we recommend checking the tightening torque in individual cases as per VDI 2230.
- Locking screws:
For the metallic locking screws supplied with the axial piston unit, the required tightening torques of locking screws M_V apply. For values, refer to the following table.

Table 10: Tightening torques of the threaded holes and locking screws

| Ports Standard | Thread size | Maximum permissible tightening torque of the threaded holes M_G max | Required tightening torque of the locking screws M_V | WAF hexagon socket for the locking screws |
|-------------------|-------------|---|---|--|
| DIN 3852 | M12 x 1.5 | 50 Nm | 25 Nm | 6 mm |
| | M14 x 1.5 | 80 Nm | 35 Nm | 6 mm |
| | M22 x 1.5 | 210 Nm | 80 Nm | 10 mm |
| | M26 x 1.5 | 230 Nm | 120 Nm | 12 mm |
| | M33 x 2 | 540 Nm | 225 Nm | 17 mm |

Risk of mix-ups with threaded connections The axial piston units are used in application areas with metric as well as with Imperial systems of units. Both the system of units as well as the size of threaded hole and threaded plug (e.g. locking screw) must match. Due to the limited options for visually detecting differences, there is a risk of mix-ups.

WARNING!**Risk of damage to persons and property!**

If a threaded plug which is of a different measurement system and size with respect to the threaded hole is pressurized, the threaded plug may loosen itself or even be ejected from the hole in a projectile-like manner.

This can result in serious injury and damage to equipment. Hydraulic fluid can be discharged from this leakage point.

- ▶ Use the drawings (installation drawing/data sheet) to determine the required threaded plug for each fitting.
- ▶ Make certain that there are no mix-ups when installing fittings, fixing screws and locking screws.
- ▶ For all threaded holes, use a threaded plug from the same system of units and of the correct size.

6.4.8 Electrically connecting the axial piston unit

The machine or system manufacturer is responsible for the layout of the electric control.

For electrically controlled axial piston units, the electric control must be connected according to the circuit diagram of the system manufacturer.

CAUTION!**Missing seals and connections lead to noncompliance with the protection class!**

Fluids and contaminants may penetrate and damage the product beyond repair.

- ▶ Prior to installation, make sure that all seals and connectors are tight.

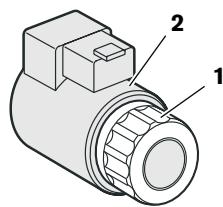
CAUTION!**Short circuit in event of penetrating hydraulic fluid!**

Fluid can penetrate the product and cause a short circuit.

- ▶ Do not install electrically controlled axial piston units in a tank below the tank fluid level (tank installation).

1. Switch off power supply to the relevant system component.

2. Electrically connect the axial piston unit (12 or 24V).

Changing plug position

If necessary, you can change the position of the connector by turning the solenoid.

To do this, proceed as follows:

1. Loosen the fixing nut (1) of the solenoid. To do this, turn the fixing nut (1) one turn counter-clockwise.
2. Turn the solenoid body (2) to the desired position.
3. Retighten the fixing nut. Tightening torque of the fixing nut: 5+1 Nm.

For further details and technical data, e.g. regarding the selection of a suitable mating connector, refer to data sheet RE 92500.

Tightening torque for HIRSCHMANN connector

On axial piston units with Hirschmann connector, the following tightening torques apply when securing line connectors:

- Fixing screw M3 (1):0.5
- Cap nuts M16 x 1.5 (2): 1.5–2.5 Nm

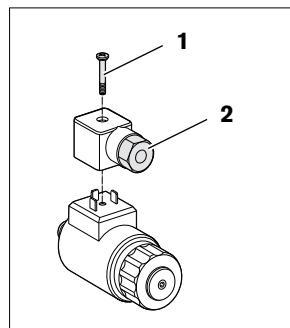


Fig. 16: Tightening torque for HIRSCHMANN connector

7 Commissioning

WARNING!



Danger while working in the danger zone of a machine or system!

It is not permissible to work in the danger zone of a machine or system.

- ▶ The machine or system must only be commissioned if safe working is ensured.
- ▶ Pay attention to and rectify potential danger sources before commissioning the machine or system.
- ▶ Nobody may stand in the danger zone of the machine or system.
- ▶ The emergency stop button for the machine or system must be within the operator's reach.
- ▶ Always follow the instructions of the machine or system manufacturer during commissioning.

CAUTION!



Risk of damage to persons and property!

Commissioning of the axial piston unit requires basic mechanical and hydraulic knowledge.

- ▶ Only qualified personnel (see chapter "2.3 Personnel qualifications") are authorized to commission the axial piston unit.

WARNING!



Risk of toxication and injury!

Contact with hydraulic fluids may damage your health (e.g. eye injuries, skin damage, toxication upon inhalation).

- ▶ Always check the lines for wear and damage before each commissioning.
- ▶ While performing these checks, wear safety gloves, safety glasses and suitable working clothes.
- ▶ If hydraulic fluid should, nevertheless, come into contact with your eyes or penetrate your skin, consult a doctor immediately.
- ▶ When working with hydraulic fluids, strictly observe the safety instructions provided by the hydraulic fluid manufacturer.

WARNING!



Fire hazard!

Hydraulic fluid is easily flammable.

- ▶ Keep open flames and ignition sources away from the axial piston unit.

7.1 First commissioning

CAUTION!



Risk of damage to the product!

Any contamination of the hydraulic fluid leads to wear and malfunctions. In particular, contaminants, such as welding beads or metal cuttings in the hydraulic lines, may damage the axial piston unit.

- ▶ Ensure utmost cleanliness during commissioning.
- ▶ Make sure that no contaminants may penetrate when sealing the gauge ports.

CAUTION!



Risk of damage to the product!

If you commission the axial piston unit without or with insufficient hydraulic fluid, the axial piston unit could be damaged immediately, possibly beyond repair.

- ▶ When commissioning or recommissioning a machine or system, make sure that the case interior and the suction and service lines of the axial piston unit are filled with hydraulic fluid and remain filled during operation.



When commissioning the axial piston unit, observe the basic safety instructions and intended use provided in chapter "2 General safety instructions".

- ▶ Connect the pressure gauge to the measurement points provided for operating pressure, case pressure and suction pressure to allow the technical data to be checked during initial operation.

7.1.1 Filling the axial piston unit

You will require an approved hydraulic fluid:

The machine or system manufacturer can provide you with precise details on the hydraulic fluid. Specifications regarding the minimum requirements for hydraulic fluids on mineral oil basis and related hydrocarbons, environmentally acceptable hydraulic fluid and HF hydraulic fluids for operation with Rexroth hydraulic components can be found in the Rexroth publications RE 90220, RE 90221 and RE 90223.

To ensure the functional reliability of the axial piston unit, cleanliness level 20/18/15 according to at least ISO 4406 is necessary for the hydraulic fluid. At very high hydraulic fluid temperatures (+90 °C to maximum +115 °C), cleanliness level 19/17/14 according to at least ISO 4406 is necessary. For permissible temperatures, see the data sheet.

CAUTION!



Risk of damage due to lack of lubrication!

Sufficient lubrication must be guaranteed to prevent damage to the axial piston unit.

- ▶ Make sure that the motor case is completely filled with hydraulic fluid during commissioning and during operation with the installation position "drive shaft upwards" (e.g. no air inclusions).
- ▶ Make certain that the suction line is always filled with hydraulic fluid during commissioning and operation.



The axial piston unit should be filled with a filling unit (10 µm filter grade). The axial piston unit must not be operated while it is being filled with the filling unit.

CAUTION!**Danger of environmental contamination!**

The discharge or spillage of hydraulic fluid while filling the axial piston unit can lead to environmental pollution and contamination of the groundwater.

- ▶ When filling and changing the hydraulic fluid, always place a drip tray under the axial piston unit.
- ▶ Observe the information in the safety data sheet for the hydraulic fluid and the specifications provided by the system manufacturer.

1. Fill and air bleed the axial piston unit via the appropriate ports, see chapter "6.3 Installation position". The hydraulic lines of the system must also be filled.
2. Test the direction of rotation of the engine. To do this, rotate the engine briefly at the lowest rotational speed (inching). Make sure that direction of rotation of the axial piston unit matches the details on the name plate, see also chapter "4.4 Product identification", Fig. 4: Name plate.
3. Operate the axial piston pump at a lower speed (starter speed for internal combustion engines or inching operation for electric motors) until the pump system is completely filled and bled. To inspect, drain the hydraulic fluid at the case drain port and wait until it drains without bubbles.
4. Make certain that all ports are either piped up or plugged according to the general circuit diagram.

7.1.2 Testing the hydraulic fluid supply

The axial piston unit must always have a sufficient supply of hydraulic fluid. For this reason, the supply of hydraulic fluid must be ensured at the start of the commissioning process.

When you test the hydraulic fluid supply, constantly monitor the noise development and check the hydraulic fluid level in the tank. If the axial piston unit becomes louder (cavitation) or the case drain fluid is discharged with bubbles, this is an indication that the axial piston unit is not being sufficiently supplied with hydraulic fluid.

Notes on troubleshooting can be found in chapter "14 Troubleshooting".

To test the hydraulic fluid supply:

1. Allow the engine to run at the slowest speed. The axial piston unit must be operated without load. Pay attention to leakage and noise.
2. Check the axial piston unit's case drain line during the test. The case drain fluid should not contain any bubbles.
3. Increase the load and check whether the operating pressure rises as expected.
4. Check the suction pressure at port **S** of the axial piston pump at nominal speed and maximum flow. Refer to data sheet RE 92500 for the permissible value.
5. Check the case drain pressure at the connected port **T₁** or **T₂** at maximum pressure. Refer to data sheet RE 92500 for the permissible value.

7.1.3 Performing functional test

WARNING!**Risk of injury in case of incorrectly connected machine or system!**

Any change of the connections will lead to malfunctions (e.g. lift instead of lower) and thus represents a corresponding danger to persons and equipment.

- ▶ When connecting hydraulic components, observe the specified piping according to the hydraulic circuit diagram of the machine or system manufacturer.

Once you have tested the hydraulic fluid supply, you must perform a functional test on the machine or system. The functional test should be performed according to the instructions of the machine or system manufacturer.

The axial piston unit is checked for functional capability before delivery according to the technical data. During commissioning, it must be ensured that the axial piston unit was installed in accordance with the design of the machine or system.

- ▶ In particular, check whether the axial piston unit builds up pressure after the engine is started and that the case pressure does not rise to an impermissible level.
- ▶ If necessary, remove the pressure gauge and plug the ports so that they are airproof.

7.1.4 Performing flushing cycle

In order to remove foreign bodies from the system, Rexroth recommends a flushing cycle for the entire system.



During the flushing cycle, the axial piston unit must be operated without load. The flushing cycle can be performed, e.g. by using an additional flushing unit. Follow the instructions of the flushing unit's manufacturer for the exact procedure during the flushing cycle.

7.2 Recommissioning after standstill

Depending on the installation conditions and ambient conditions, changes may occur in the system which make recommissioning necessary.

Among others, the following criteria may make recommissioning necessary:

- Air in the hydraulic system
 - Water in the hydraulic system
 - Old hydraulic fluid
 - Other contamination
- Before recommissioning, proceed as described in chapter "7.1 First commissioning".

7.3 Running-in phase

The bearings and sliding surfaces are subject to a running-in phase. The increased friction at the start of the running-in phase results in increased heat development which decreases with increasing operating hours. The volumetric and mechanical-hydraulic efficiency increases as well through the conclusion of the running-in phase of approx. 10 operating hours.

CAUTION!



Risk of damage by insufficient viscosity!

The increased temperature of the hydraulic fluid during the running-in phase can cause the viscosity to drop to impermissible levels.

- Monitor the operating temperature during the running-in phase.
 - Reduce the loading (pressure, rpm) of the axial piston unit if impermissible operating temperatures and/or viscosities occur.
-

8 Operation

The product is a component which requires no settings or changes during operation. For this reason, this chapter of the instructions does not contain any information on adjustment options. Use the product only within the performance range provided in the technical data. The machine or system manufacturer is responsible for the proper project planning of the hydraulic system and its control.

9 Maintenance and repair

9.1 Cleaning and care

CAUTION!



Damage to the surface caused by solvents and aggressive detergents!

Aggressive detergents may damage the seals on the axial piston unit and cause them to age faster.

- ▶ Never use solvents or aggressive detergents.

CAUTION!



Damage to the hydraulic system and the seals!

A high-pressure cleaner's water pressure could damage the electronics and the seals of the axial piston unit.

- ▶ Do not point the high-pressure cleaner at sensitive components, e.g. shaft seal ring, electrical connections and electrical components.

For cleaning and care of the axial piston unit, observe the following:

- ▶ Plug all openings with suitable protective caps/devices.
- ▶ Check whether all seals and plugs of the plug connections are securely seated to ensure that no moisture can penetrate into the axial piston unit during cleaning.
- ▶ Use only water and, if necessary, a mild detergent to clean the axial piston unit.
- ▶ Remove coarse dirt from the outside of the machine and keep sensitive and important components, such as solenoids, valves and indicators, clean.

9.2 Inspection

In order to enable long and reliable operation of the axial piston unit, Rexroth recommends testing the hydraulic system and axial piston unit on a regular basis and documenting the following operating conditions:

Table 11: Inspection schedule

| Task to be carried out | Interval |
|------------------------|--|
| Hydraulic system | Check level of hydraulic fluid in the tank. |
| | Check operating temperature (comparable load state). |
| | Perform a hydraulic fluid analysis: viscosity, ageing, contamination |
| Axial piston unit | Check axial piston unit for leakage. Early detection of hydraulic fluid loss can help identify and rectify faults on the machine or system. For this reason, Rexroth recommends that the axial piston unit and system always be kept in a clean condition. |
| | Check axial piston unit for noise development. |
| | Check fixing elements for tight seating. All fixing elements have to be checked when the system is switched off, depressurized and cooled down. |

9.3 Maintenance

The axial piston unit is low maintenance when used as intended.

The service life of the axial piston unit is heavily dependent on the quality of the hydraulic fluid. For this reason, we recommend changing the hydraulic fluid at least once per year or every 2000 operating hours (which ever occurs first) or having it analyzed by the hydraulic fluid manufacturer or a laboratory to determine its suitability for further use.

The service life of the axial piston unit is limited by the service life of the bearings fitted. The service life can be requested from the responsible Rexroth Service partner, see "9.5 Spare parts" for address. Based on these details, a maintenance period is to be determined by the system manufacturer for the replacement of the bearings and included in the maintenance schedule of the hydraulic system.

9.4 Repair

Rexroth offers a comprehensive range of services for the repair of Rexroth axial piston units.

Repairs to the axial piston unit may only be performed by authorized, skilled and instructed staff.

- ▶ Only use genuine spare parts from Rexroth for repairing the Rexroth axial piston units.

Tested and pre-installed original Rexroth installation groups allow for successful repair requiring only little time.

9.5 Spare parts

CAUTION!**Damage to persons and property due to faulty spare parts!**

Spare parts that do not meet the technical requirements specified by Rexroth may cause personal injury or property damage.

- ▶ Use only original spare parts from Rexroth.
-

The spare parts lists for axial piston units are order specific. When ordering spare parts, quote the material and serial number of the axial piston unit as well as the material numbers of the spare parts.

Address all questions regarding spare parts to your responsible Service partner or the service department of the manufacturer's plant for the axial piston unit.

10 Decommissioning

The axial piston unit is a component that does not require decommissioning. For this reason, this chapter of the manual does not contain any information. For details about how to disassemble or replace your axial piston unit, please refer to chapter "11 Disassembly and replacement".

11 Disassembly and replacement

11.1 Required tools

Disassembly can be performed with standard tools. No special tools are necessary.

11.2 Preparing for disassembly

WARNING!



Risk of injuries due to disassembling under pressure and voltage!

If you do not switch off the pressure and power supply before disassembling the product, you may get injured or the device or system components may be damaged.

- ▶ Make certain that the relevant system components are not under pressure or voltage.
-
1. Decommission the entire system as described in the overall manual for the machine or system.
 2. Relieve the hydraulic system according to the instructions of the machine or system manufacturer.

11.3 Disassembling the axial piston unit

Proceed as follows to disassemble the axial piston unit:

1. Make sure that the hydraulic system is non-pressurized.
 2. Check whether the axial piston unit has cooled down far enough so that it can be disassembled without danger.
 3. Place a drip tray under the axial piston unit to collect any hydraulic fluid that may escape.
-

CAUTION!



Danger of environmental contamination!

The discharge or spillage of hydraulic fluid while disassembling the axial piston unit can lead to environmental pollution and contamination of the groundwater.

- ▶ When draining the hydraulic fluid, always place a drip tray under the axial piston unit.
 - ▶ Observe the information in the safety data sheet for the hydraulic fluid and the specifications provided by the system manufacturer.
-

4. Loosen the lines and collect the escaping hydraulic fluid in the container.
5. Remove the axial piston unit. Use an appropriate lifting device.
6. Completely empty the axial piston unit.
7. Plug all openings.

11.4 Preparing the components for storage or further use

- Proceed as described in section "5.2 Storing the axial piston unit".

12 Disposal

Observe the following points when disposing of the axial piston unit:

1. Completely empty the axial piston unit.
2. Dispose of the hydraulic fluid according to the national regulations of your country.
3. Disassemble the axial piston unit into its individual parts and properly recycle these parts.
4. Separate parts by:
 - Cast parts
 - Steel
 - Non-ferrous metal
 - Electronic waste
 - Plastic
 - Seals.

12.1 Environmental protection

Careless disposal of the axial piston unit, the hydraulic fluid and the packaging material could lead to pollution of the environment.

- ▶ Therefore, dispose of the axial piston unit, the hydraulic fluid and the packaging material in accordance with the currently applicable regulations in your country.
- ▶ Dispose of hydraulic fluid residues according to the applicable safety data sheets for these hydraulic fluids.

13 Extension and conversion

Do not convert the axial piston unit. This also includes a modification of the adjusting screws.



The warranty from Rexroth only applies to the delivered configuration. In case of extensions or conversions, the warranty will become void.



Adjusting screws are protected against unauthorized resetting by means of protective caps. Removal of the protective caps will void the warranty. If you need to modify the setting, please contact your responsible Rexroth Service (address as to chapter "9.5 Spare parts").

14 Troubleshooting

The following table may assist you in troubleshooting. The table makes no claim for completeness.

In practical use, problems which are not listed here may also occur.

14.1 How to proceed for troubleshooting

- ▶ Always act systematically and targeted, even under pressure of time. Random and imprudent disassembly and readjustment of settings could result in the inability to ascertain the original error cause.
- ▶ First obtain a general overview of how your product works in conjunction with the entire system.
- ▶ Try to determine whether the product worked properly in conjunction with the entire system before the error occurred.
- ▶ Try to determine any changes of the entire system in which the product is integrated.
 - Were there any changes to the product's operating conditions or operating range?
 - Were there any changes (conversions) or repairs on the complete system (machine / system, electrics, control) or on the product? If yes, which?
 - Was the product or machine operated as intended?
 - How did the malfunction appear?
- ▶ Try to get a clear idea of the error cause. Directly ask the (machine) operator.
- ▶ If you cannot rectify the error, contact one of the contact addresses which can

14.2 Malfunction table

Table 12: Malfunction table for variable pumps

| Fault | Possible cause | Remedy |
|-------------------------|---|--|
| Unusual noises | Drive speed too high. | Machine or system manufacturer. |
| | Wrong direction of rotation. | Ensure correct direction of rotation. |
| | Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line. | Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid). |
| | | Completely air bleed axial piston unit, fill suction line with hydraulic fluid. |
| | | Remove contaminants from the suction line. |
| | Improper fixing of the axial piston unit. | Check fixing of the axial piston unit according to the specifications of the machine or system manufacturer. Observe tightening torques. |
| | Improper fixing of the attachment parts, e.g. coupling and hydraulic lines. | Fix attachment parts according to the information provided by the coupling or fitting manufacturer. |
| No or insufficient flow | Pressure relief valve of the axial piston unit (pressure cut-off). | Bleeding the axial piston unit Check viscosity of the hydraulic fluid Contact Rexroth Service. |
| | Mechanical damage to the axial piston unit (e.g. bearing damage). | Exchange axial piston unit, contact Rexroth Service. |
| | Faulty mechanical drive (e.g. defective coupling). | Machine or system manufacturer. |
| | Drive speed too low. | Machine or system manufacturer. |
| | Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line. | Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid). |
| | | Completely air bleed axial piston unit, fill suction line with hydraulic fluid. |
| | | Remove contaminants from the suction line. |
| | Hydraulic fluid not in optimum viscosity range. | Use suitable hydraulic fluid (machine or system manufacturer). |
| | External control of the control device defective. | Check external control (machine or system manufacturer). |
| | Insufficient pilot pressure or control pressure. | Check pilot pressure or control pressure, contact Rexroth Service. |
| | Malfunction of the control device or controller of the axial piston unit. | Contact Rexroth Service. |
| | Wear of axial piston unit. | Exchange axial piston unit, contact Rexroth Service. |
| | Mechanical damage to the axial piston unit. | Exchange axial piston unit, contact Rexroth Service. |

Table 12: Malfunction table for variable pumps

| Fault | Possible cause | Remedy |
|---|---|--|
| No or insufficient pressure | Faulty mechanical drive (e.g. defective coupling). | Machine or system manufacturer. |
| | Drive power too low. | Machine or system manufacturer. |
| | Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line. | Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid). |
| | | Completely air bleed axial piston unit, fill suction line with hydraulic fluid. |
| | | Remove contaminants from the suction line. |
| | Hydraulic fluid not in optimum viscosity range. | Use suitable hydraulic fluid (machine or system manufacturer). |
| | External control of the control device defective. | Check external control (machine or system manufacturer). |
| | Insufficient pilot pressure or control pressure. | Check pilot pressure or control pressure, contact Rexroth Service. |
| | Malfunction of the control device or controller of the axial piston unit. | Contact Rexroth Service. |
| | Wear of axial piston unit. | Exchange axial piston unit, contact Rexroth Service. |
| | Mechanical damage to the axial piston unit (e.g. bearing damage). | Exchange axial piston unit, contact Rexroth Service. |
| | Output unit defective (e.g. hydraulic motor or cylinder). | Machine or system manufacturer. |
| Pressure/flow fluctuations | Axial piston unit not or insufficiently air bled. | Completely air bleed axial piston unit. |
| | Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line. | Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid). |
| | | Completely air bleed axial piston unit, fill suction line with hydraulic fluid. |
| | | Remove contaminants from the suction line. |
| Excessive temperature of hydraulic fluid and case | Excessive inlet temperature at the axial piston unit. | Machine or system manufacturer: inspect system, e.g malfunction of the cooler, insufficient hydraulic fluid in the tank. |
| | Malfunction of the pressure control valves (e.g. pressure cut-off, pressure controller). | Contact Service. |
| | Wear of axial piston unit. | Exchange axial piston unit, contact Rexroth Service. |
| Instability/vibrations | Setpoint value not stable. | Machine or system manufacturer. |
| | Resonance in the case drain line. | Machine or system manufacturer. |
| | Malfunction in control device or controller. | Contact Service. |

15 Technical data

16 Appendix

16.1 Address directory

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