

# Axial piston variable pump A10VO, A10VSO

Series 31

**Instruction manual**  
**RE 92701-01-B/04.2018**

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English



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The data specified within only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

The cover shows an example application. The product delivered may differ from the image on the cover.

The original instruction manual was created in the German language.

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# 1 About this documentation

## 1.1 Validity of the documentation

This documentation applies to the following products:

- Axial piston variable pump A10VO Series 31
- Axial piston variable pump A10VSO Series 31

This documentation is intended for machine/system manufacturers, assemblers and service engineers.

It contains important information on the safe and appropriate transport, installation, commissioning, operation, maintenance, removal and simple troubleshooting of the axial piston unit.

- Read this manual completely, in particular chapter 2 “Safety instructions” on page 9 and chapter 3 “General notices regarding property and product damage” on page 15 before you start work with the axial piston unit.

## 1.2 Required and supplementary documentation

- Only commission the axial piston unit if the documentation marked with the book symbol  is available to you and you have understood and observed it.

**Table 1: Required and supplementary documentation**

|  | Title                                                                                                                                                                                                                                                                                              | Document number                                                             | Document type        |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------|
|  | <b>Order confirmation</b><br>Contains the order-related technical data of your axial piston variable pump A10VO or A10VSO.                                                                                                                                                                         | –                                                                           | Order confirmation   |
|  | <b>Installation drawing</b><br>Contains the outer dimensions, all connections and the hydraulic circuit diagram for your axial piston variable pump A10VO or A10VSO.                                                                                                                               | Please request the installation drawing from your contact at Bosch Rexroth. | Installation drawing |
|  | <b>Axial piston variable pump A10V(S)O, size 18 (A10VSO), size 28 to 140 (A10VO)</b><br>Contains the permissible technical data.                                                                                                                                                                   | 92701                                                                       | Data sheet           |
|  | <b>Axial piston variable pump A10VSO, size 18 to 140</b><br>Contains the permissible technical data.                                                                                                                                                                                               | 92711                                                                       | Data sheet           |
|  | <b>Hydraulic fluids based on mineral oils and related hydrocarbons</b><br>Describes the requirements on a hydraulic fluid based on mineral oil and related hydrocarbons for operation with Rexroth hydraulic components, and assists you in selecting a hydraulic fluid for your system.           | 90220                                                                       | Data sheet           |
|  | <b>Environmentally acceptable hydraulic fluids</b><br>Describes the requirements on an environmentally acceptable hydraulic fluid for operation with Rexroth hydraulic components and assists you in selecting a hydraulic fluid for your hydraulic system.                                        | 90221                                                                       | Data sheet           |
|  | <b>Fire-resistant, water-free hydraulic fluids (HFDR/HFDU)</b><br>Describes the requirements on fire-resistant, anhydrous hydraulic fluids (HFDR/HFDU) for operation with Rexroth hydraulic components and assists you in selecting a hydraulic fluid for your hydraulic system.                   | 90222                                                                       | Data sheet           |
|  | <b>Fire-resistant hydraulic fluids – hydrous (HFAE, HFAS, HFB, HFC)</b><br>Describes the requirements on fire-resistant, hydrous hydraulic fluids (HFAE, HFAS, HFB, HFC) for operation with Rexroth hydraulic components and assists you in selecting a hydraulic fluid for your hydraulic system. | 90223                                                                       | Data sheet           |

**Table 1: Required and supplementary documentation**

| Title                                                                                                                                                                                                                                                                                                                                                                                                                  | Document number | Document type |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|
|  <b>Axial piston units for operation with fire-resistant hydraulic fluids – anhydrous and hydrous (HFDR, HFDU, HFA, HFB, HFC)</b><br>Describes the requirements on fire-resistant, anhydrous and hydrous hydraulic fluids (HFDR, HFDU, HFA, HFB, HFC) and contains the technical data for operation with Rexroth hydraulic components. | 90225           | Data sheet    |
| <b>Information on the use of hydrostatic drives at low temperatures</b><br>Contains additional information on the use of Rexroth axial piston units at low temperatures.                                                                                                                                                                                                                                               | 90300-03-B      | Manual        |
| <b>Storage and preservation of axial piston units</b><br>Contains additional information on storage and preservation.                                                                                                                                                                                                                                                                                                  | 90312           | Data sheet    |
| <b>Axial piston variable pump A10V(S)O, A10VO series 3x and 5x with electro-proportional differential pressure control EF</b>                                                                                                                                                                                                                                                                                          | 92709           | Data sheet    |
| <b>Pressure relief valve, direct controlled</b>                                                                                                                                                                                                                                                                                                                                                                        | 25402           | Data sheet    |
| <b>Proportional pressure relief valve</b>                                                                                                                                                                                                                                                                                                                                                                              | 29166           | Data sheet    |
| <b>Pump safety block</b>                                                                                                                                                                                                                                                                                                                                                                                               | 25880           | Data sheet    |
| <b>Pump safety block</b>                                                                                                                                                                                                                                                                                                                                                                                               | 25891           | Data sheet    |
| <b>Pressure and flow control system</b>                                                                                                                                                                                                                                                                                                                                                                                | 30030           | Data sheet    |

### 1.3 Representation of information

Standardized safety instructions, symbols, terms and abbreviations are used throughout this documentation so that you can work quickly and safely with your product. For clarification, they are explained in the sections below.

#### 1.3.1 Safety instructions

This manual contains safety instructions in chapter 2.6 “Product-specific safety instructions” on page 12 and in chapter 3 “General notices regarding property and product damage” on page 15, as well as before a sequence of actions or an instruction for action involving a risk of personal injury or property damage. Always follow the instructions on avoiding the dangers associated with the use of this product.

Safety instructions are set out as follows:

|  <b>SIGNAL WORD</b> |
|--------------------------------------------------------------------------------------------------------|
| <b>Type and source of danger!</b><br>Consequences of noncompliance<br>► Measures to prevent danger     |

- **Warning sign:** draws attention to the danger
- **Signal word:** identifies the degree of the danger
- **Type and source of danger:** indicates the type and source of the danger
- **Consequences:** describes what occurs if safety instructions are disregarded
- **Precautions:** states how the danger can be avoided

**Table 2: Danger classes as defined in ANSI Z535.6**

| Warning sign, signal word                                                                        | Meaning                                                                                            |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|  <b>DANGER</b>  | Identifies a dangerous situation that will result in death or serious injury if it is not avoided. |
|  <b>WARNING</b> | Identifies a dangerous situation that may result in death or serious injury if it is not avoided.  |
|  <b>CAUTION</b> | Identifies a dangerous situation that may result in minor to moderate injury if it is not avoided. |
| <b>NOTICE</b>                                                                                    | Property damage: The product or surrounding area may be damaged.                                   |

### 1.3.2 Symbols

The following symbols indicate information that is not safety-relevant but increases understanding of the documentation.

**Table 3: Meaning of symbols**

| Symbol                                                                            | Meaning                                                                                            |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|  | If this information is disregarded, the product cannot be used and/or operated to its full extent. |
|  | Single, independent action                                                                         |
| 1.                                                                                | Numbered instruction:                                                                              |
| 2.                                                                                | The numbers indicate that the actions must be completed in order.                                  |
| 3.                                                                                |                                                                                                    |

### 1.3.3 Designations

This documentation uses the following designations:

**Table 4: Designations**

| Designation     | Meaning                                                                                         |
|-----------------|-------------------------------------------------------------------------------------------------|
| A10VO           | Axial piston variable pump, open circuit, maximum pressure 350 bar, for mobile applications     |
| A10VSO          | Axial piston variable pump, open circuit, maximum pressure 350 bar, for stationary applications |
| Threaded plug   | Metal screw, pressure-resistant                                                                 |
| Protective plug | Made out of plastic, not pressure-resistant, only for transportation                            |

As an umbrella term for “axial piston variable pump A10VO” and/or “A10VSO” the designation “axial piston unit” is used in the following.

### 1.3.4 Abbreviations

This documentation uses the following abbreviations:

**Table 5: Abbreviations**

| Abbreviation  | Meaning                                                                                                                                                                                                         |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ATEX          | EC directive on explosion protection ( <b>A</b> tmosphère <b>e</b> xplosible)                                                                                                                                   |
| DG            | Two-point control, directly controlled                                                                                                                                                                          |
| DFLR          | Pressure flow power controller                                                                                                                                                                                  |
| DFR/DFR1/DRSC | Pressure flow controller                                                                                                                                                                                        |
| DIN           | <b>D</b> eutsches <b>I</b> nstitut für <b>N</b> ormung (German Institute for Standardization)                                                                                                                   |
| DRG           | Pressure controller, remotely controlled                                                                                                                                                                        |
| EF            | Electro-proportional differential pressure control                                                                                                                                                              |
| ISO           | <b>I</b> nternational <b>O</b> rganization for <b>S</b> tandardization                                                                                                                                          |
| JIS           | <b>J</b> apan <b>I</b> ndustrial <b>S</b> tandard                                                                                                                                                               |
| RE            | <b>R</b> exroth document in the <b>E</b> nglish language                                                                                                                                                        |
| VDI 2230      | Directive for the systematic calculation of high duty screwed joints and cylindrical screw joints from the VDI ( <b>V</b> erein <b>D</b> eutscher <b>I</b> ngenieur <b>e</b> - Association of German Engineers) |

## 2 Safety instructions

### 2.1 About this chapter

The axial piston unit has been manufactured to generally accepted engineering standards. There is still, however, a risk of personal injury or property damage if this chapter and the safety instructions in this documentation are not observed.

- Read this documentation completely and thoroughly before working with the axial piston unit.
- Keep it in a location where it is accessible to all users at all times.
- Always include the required documentation when you pass the axial piston unit on to third parties.

### 2.2 Intended use

Axial piston units are hydraulic components, meaning that in their application area they are classified neither as complete nor as partly completed machinery as defined in the EC Machinery Directive 2006/42/EC. The component is exclusively intended to form partly completed machinery or complete machinery together with other components. The component should only be commissioned after it has been installed in the machine/system for which it is intended and the safety of the entire system has been established in accordance with the Machinery Directive.

This product is intended for the following use:

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

- Observe the technical data, application and operating conditions and performance limits as specified in data sheet 92701 and 92711 and in the order confirmation. Information about approved hydraulic fluids can be found in data sheet 92701 and 92711.

The axial piston unit is only intended for commercial use and not for private use. Intended use includes having fully read and understood this manual, especially chapter 2 “Safety instructions” on page 9.

### 2.3 Improper use

Any use other than that described as intended use is considered improper.

Bosch Rexroth AG is not liable for damages resulting from improper use. The user is solely responsible for any risks arising from improper use.

The following foreseeable misuses are also considered improper (this list is not exhaustive):

- Use outside the operating parameters approved in the data sheet or in the order confirmation (unless specifically approved by the customer)
- Use of non-approved fluids, e.g. water or polyurethane components
- Changes to factory settings by unauthorized persons
- Use of assembled parts (e.g. attachment filter, control unit, valves) other than the specified Rexroth components
- Use of the axial piston unit with assembled parts under water at a depth of more than 10 meters without the necessary additional measures, e.g. pressure equalization. Units with electrical components (e.g. sensors) generally cannot

come into contact with water. Axial piston units may only be used on a case-to-case basis for this application.

- The maximum permissible case pressure specified in the data sheet must not be exceeded.
- Use of the axial piston unit in explosive environments unless the component or machine/system has been certified as compliant with the ATEX Directive 2014/34/EU
- Use of the axial piston unit in a corrosive atmosphere
- Use of the axial piston unit in aircraft or spacecraft

## 2.4 Personnel qualifications

The activities described in this manual require a basic understanding of mechanics, electricity and hydraulics, as well as familiarity with associated technical terms. For transporting and handling the product, additional familiarity with the use of lifting devices and lifting accessories is required. In order to ensure safe use, these activities should only be performed by skilled personnel or an instructed person under the direction and supervision of skilled personnel.

Skilled personnel refers to persons who possess the professional training, knowledge and experience, as well as the understanding of the regulations relevant to the work to be done that are necessary to recognize possible hazards and take the appropriate safety measures. Skilled personnel must follow the rules relevant to their field and have the necessary hydraulics expert knowledge.

Expertise in hydraulics includes:

- Being able to read and fully understand hydraulic circuit diagrams
- In particular, fully understanding the relationships with regard to safety devices
- Understanding how hydraulic components work and are put together.



Bosch Rexroth offers training support for specialized fields. An overview of the training contents can be found online at: [www.boschrexroth.com/training](http://www.boschrexroth.com/training).

## 2.5 General safety instructions

- Observe applicable accident prevention and environmental protection regulations.
- Observe the safety regulations of the country in which the product is used/operated.
- Use Rexroth products only when they are in good working order.
- Observe all notices on the product.
- Do not install, operate, remove or maintain Rexroth products if under the influence of alcohol, drugs or medication that may affect your reaction time.
- Only use genuine Rexroth accessories and spare parts to ensure there is no risk to personnel from unsuitable spare parts.
- Observe the technical data and ambient conditions specified in the product documentation.
- If unsuitable products are installed or used in applications that are of relevance to safety, unexpected operating conditions may occur in the application, which could result in personal injury or property damage. For this reason, only use the product in safety-relevant applications if this use is expressly indicated and approved in the product documentation, e.g., in explosion protection applications or in safety-related parts of a control system (functional safety).
- Only commission the product if it has been determined that the end product (e.g., machinery or system) in which the Rexroth products are installed complies with the country-specific provisions, safety regulations and standards for the application.
- Use tools appropriate for the work being performed and wear appropriate protective clothing to prevent punctures and cuts (e.g. when removing protective covers, disassembly).
- There is a risk of entanglement when operating the axial piston unit with a bare shaft end. Check whether or not your machine requires additional safety measures for your application. If necessary, make sure these are properly implemented.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. The use of the direct current (DC) on the electromagnet does not produce any electromagnetic interference (EMI), nor is the electromagnet influenced by EMI. Potential electromagnetic interference (EMI) exists if the solenoid is energized with a modulated direct current (e.g. PWM signal). The machine manufacturer should conduct appropriate tests and take appropriate measures to ensure that other components or operators (e.g. with a pacemaker) are not affected by this potentiality.

## 2.6 Product-specific safety instructions

The following safety instructions apply to chapters 6 to 14.



### WARNING

#### **Danger from excessive pressure!**

Risk of death or injury, or property damage!

Improperly changing the factory pressure settings can result in a pressure increase beyond the max. permissible pressure.

Operating the unit above the max. permissible pressure can cause components to burst and hydraulic fluid to escape under high pressure.

- ▶ Changes to the factory settings may only be made by Bosch Rexroth specialists.
- ▶ In addition, a pressure relief valve is required in the hydraulic system as a back-up. If the axial piston unit is equipped with a pressure cut-off and/or pressure controller, this is not an adequate safeguard against pressure overload.

#### **Danger from suspended loads!**

Risk of death or injury, or property damage!

Improper transportation may cause the axial piston unit to fall down and lead to injury, e.g. crushing or fracture, or damage to the product.

- ▶ Make sure that the load bearing capacity of the lifting device is sufficient to safely bear the weight of the axial piston unit.
- ▶ Never stand or reach under suspended loads.
- ▶ Make sure the unit remains stable during transport.
- ▶ Wear your personal protective equipment (e.g. safety goggles, safety gloves, suitable working clothes, safety shoes).
- ▶ Use suitable lifting devices for transportation.
- ▶ Observe the prescribed position of the lifting strap.
- ▶ Observe the national laws and regulations on occupational health and safety, and transportation.

#### **System/machine under pressure!**

Risk of death or serious injury when working on unsecured machines/systems!

Risk of property damage!

- ▶ Switch off the entire system and secure it against reactivation according to the parameters provided by the machine/system manufacturer.
- ▶ Make sure all relevant components in the hydraulic system are depressurized. Follow the machine/system manufacturer's specifications.
- ▶ Note that the hydraulic system may still be under pressure even after the pressure supply itself has been disconnected.
- ▶ Do not disconnect any line connections, ports or components as long as the hydraulic system is under pressure.

## **WARNING**

### **Escaping hydraulic fluid mist!**

Risk of explosion and fire, health hazard, risk of environmental pollution!

- ▶ Depressurize the relevant machine/system component and repair the leak.
- ▶ Only perform welding work when the machine/system is depressurized.
- ▶ Keep open flames and ignition sources away from the axial piston unit.
- ▶ If axial piston units are located in the vicinity of ignition sources or powerful thermal radiators, a shield must be erected to ensure any escaping hydraulic fluid cannot be ignited, and to protect hose lines from premature aging.

### **Electrical voltage!**

Risk of injury from electric shock or risk of property damage!

- ▶ Always disconnect the relevant part of the machine/system before installing the product or when inserting/removing connectors. Protect the machine/system against being re-energized.

### **Restriction of control function!**

Risk of injury or property damage!

Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. impure hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk.

- ▶ 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. safe stop).
- ▶ If necessary, make sure these are properly implemented.

## **CAUTION**

### **High noise development during operation!**

Risk of hearing damage or hearing loss!

The noise emission of axial piston units depends on, among other factors, rotational speed, working pressure and installation conditions. The sound pressure level may rise above 70 dB (A) in certain application conditions.

- ▶ Always wear hearing protection near a running axial piston unit.

### **Hot surfaces on axial piston unit!**

Risk of burning!

- ▶ Allow the axial piston unit to cool down sufficiently before touching it.
- ▶ Wear heat-resistant protective clothing, e.g. gloves.

### **Improper cable and line routing!**

Risk of stumbling and property damage! Improper routing of cables and lines can cause a risk of stumbling as well as damage to equipment and components, e.g. due to lines and connectors being torn off.

- ▶ Always lay cables and lines so no one can trip over them, they do not become kinked or twisted, do not rub on edges and do not run through sharp-edged ducts without adequate protection.

### **Contact with hydraulic fluid!**

Risk of adverse health effects, e.g. eye injury, skin irritation, poisoning from inhalation!

- ▶ Avoid contact with hydraulic fluids.
- ▶ When working with hydraulic fluids, strictly follow the safety instructions provided by the lubricant manufacturer.
- ▶ Wear your personal protective equipment (e.g. safety goggles, safety gloves, suitable working clothes, safety shoes).
- ▶ Consult a doctor immediately if hydraulic fluid gets in your eyes or bloodstream, or is swallowed.

### **Escaping hydraulic fluid due to leakage from machine/system components!**

Risk of burning and risk of injury due to escaping hydraulic fluid jet!

- ▶ Depressurize the relevant machine/system component and repair the leak.
- ▶ Never attempt to block or seal the leak or hydraulic fluid jet with a cloth.

### **Danger from improper handling!**

Risk of slipping! Risk of slipping on wet surfaces when climbing on the axial piston unit.

- ▶ Never grab or climb onto the axial piston unit.
- ▶ Check how to safely get on top of the machine/system.

## **2.7 Personal protective equipment**

Personal protective equipment is the responsibility of the user of the axial piston unit. Observe the safety regulations in your country.

All pieces of personal protective equipment should be intact.

### 3 General notices regarding property and product damage

The following instructions apply to chapters 6 to 14.

## **NOTICE**

### **Danger from improper handling!**

Product can be damaged!

- ▶ Do not subject the product to improper mechanical loads.
- ▶ Never grab or climb onto the product.
- ▶ Do not place/lay any objects on the product.
- ▶ Do not strike the drive shaft of the axial piston unit.
- ▶ Do not set/place the axial piston unit on the drive shaft or assembled parts.
- ▶ Do not strike assembled parts (e.g. sensors or valves).
- ▶ Do not strike sealing surfaces (e.g. at working ports).
- ▶ Leave the protective covers on the axial piston unit until you connect the lines.
- ▶ Disconnect all electrical connectors before arc welding or painting.
- ▶ Make sure the electronic components (e.g., sensors) do not build up electrostatic charges (e.g., during painting).

### **Risk of property damage due to inadequate lubrication!**

Product can be damaged or destroyed!

- ▶ Never operate the axial piston unit with insufficient hydraulic fluid. Specifically, make sure that the rotary group has sufficient lubrication.
- ▶ When commissioning a machine/system, make sure that the housing area and the working lines of the axial piston unit are filled with hydraulic fluid and remain filled during operation. Avoid air inclusions in the forward drive shaft bearing, especially with the axial piston unit installed with the drive shaft up.
- ▶ Check the hydraulic fluid level in the housing regularly and recommission, if necessary. For above-reservoir installation, the housing may drain out through the drain line after prolonged standstill periods (air enters through the shaft seal) or through the working line (gap leakage). This means the bearings are insufficiently lubricated when the system is turned on.
- ▶ Make sure the suction line is always filled with hydraulic fluid during commissioning and operation.
- ▶ With above-reservoir installation, an axial piston unit must be moved to full swivel angle after no more than three seconds during commissioning and recommissioning. Make sure that the axial piston unit really does suck in hydraulic fluid and build up pressure.

### **Mixing hydraulic fluids!**

Product can be damaged!

- ▶ Before installation, remove all fluids from the axial piston unit to prevent mixing with the hydraulic fluid used in the machine/system.
- ▶ Never mix hydraulic fluids from different manufacturers or different types from the same manufacturer.

## **NOTICE**

### **Contamination of hydraulic fluid!**

The cleanliness of the hydraulic fluid has a considerable impact on the cleanliness and service life of the hydraulic system. Contamination of the hydraulic fluid can cause premature wear and malfunctions!

- ▶ Make sure that the working environment at the installation site is completely free of dust and foreign substances in order to prevent foreign particles, such as welding beads or metal cuttings, from getting into the hydraulic lines and causing product wear or malfunctions. The axial piston unit should be clean when installed.
- ▶ Use only clean connections, hydraulic lines and assembled parts (e.g. measuring devices).
- ▶ Do not allow any contamination into the ports when they are being plugged.
- ▶ Before commissioning, make sure all hydraulic connections are tight, and all seals and plug-in connections are installed correctly to ensure they are leak-proof, and fluids and foreign particles cannot enter into the product.
- ▶ Use a suitable filter system to filter hydraulic fluid during filling to minimize solid particle contamination and water in the hydraulic system.

### **Improper cleaning!**

Product can be damaged!

- ▶ Close all openings with appropriate protective covers in order to prevent cleaning agents from entering the hydraulic system.
- ▶ Never use solvents or corrosive cleaning agents. Use only water and, if necessary, a mild cleaning agent to clean the axial piston unit.
- ▶ Do not point a high-pressure cleaner at sensitive components, e.g. shaft seal, electrical connections and components.
- ▶ Use fiber-free cloths for cleaning.

### **Environmental pollution due to improper disposal!**

Careless disposal of the axial piston unit and its assembled parts, the hydraulic fluid and the packaging material can cause environmental pollution!

- ▶ Dispose of the axial piston unit, hydraulic fluid and packaging in accordance with the regulations in your country.
- ▶ Dispose of the hydraulic fluid in accordance with the applicable safety data sheet for the hydraulic fluid.

### **Danger from chemical or corrosive environmental conditions!**

Product can be damaged! If the axial piston unit is exposed to chemical or corrosive environmental conditions, such as sea water, fertilizer or road salt, it can result in corrosion or, in extreme cases, malfunction. Hydraulic fluid can escape if leaks occur.

- ▶ Take appropriate steps to protect the axial piston unit from chemical or corrosive environmental conditions.

## **NOTICE**

### **Escaping or spilling hydraulic fluid!**

Risk of environmental pollution and contamination of ground water!

- ▶ Always place a drip tray under the axial piston unit when adding and draining the hydraulic fluid.
- ▶ Use a suitable binding agent if hydraulic fluid is spilled.
- ▶ Observe the safety data sheet for the hydraulic fluid and the specifications provided by the system manufacturer.

### **Danger from hot components!**

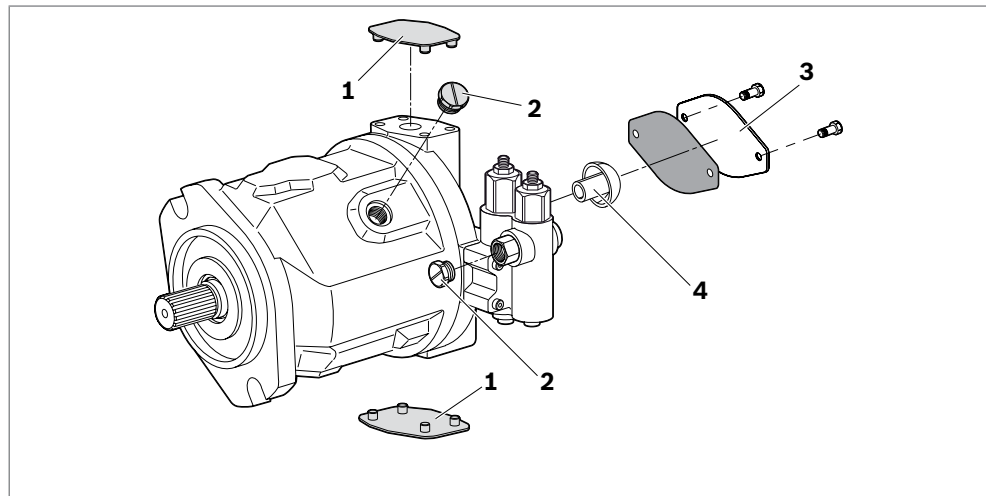
Nearby products can be damaged! Components that heat up (e.g. solenoids) can cause damage to nearby products if they are too close.

- ▶ When installing the axial piston unit, check the distances to nearby products to ensure that they are not damaged.

The warranty only applies to the machine as delivered.

The warranty will be voided if the product is incorrectly installed, commissioned or operated, or if it is used or handled improperly.

## 4 Scope of delivery



**Fig. 1: Axial piston unit A10VSO**

The scope of delivery includes the following:

- Axial piston unit as per order confirmation

The following parts come assembled on the unit:

- Protective covers **(1)**
- Protective/threaded plugs **(2)**
- For version with through drive, protective cover and mounting bolts **(3)**
- For version with through drive, spacer **(4)** made of plastic (serves as transport protection)

## 5 About this product

### 5.1 Performance description

The axial piston variable pump generates, controls and regulates a hydraulic-fluid flow. The A10VO is designed for mobile applications such as construction machinery. The A10VSO is designed for stationary applications such as tooling machines. Refer to data sheets 92701 and 92711 and the order confirmation for the technical data, operating conditions and operating limits of the axial piston unit.

### 5.2 Product description

The A10VO and A10VSO are variable pumps with axial piston rotary group in swashplate design for hydrostatic drive in an open circuit. Flow is proportional to drive speed and displacement. The flow can be steplessly changed by controlling the cradle (14). For axial piston units with swashplate design, the pistons are arranged axially relative to the drive shaft (1).

**Open circuit** In an open circuit, the hydraulic fluid flows from the reservoir to the hydraulic pump from where it is fed to the consumer, e.g. hydraulic motor. From the consumer, the hydraulic fluid flows directly back to the reservoir.

#### 5.2.1 Axial piston unit layout

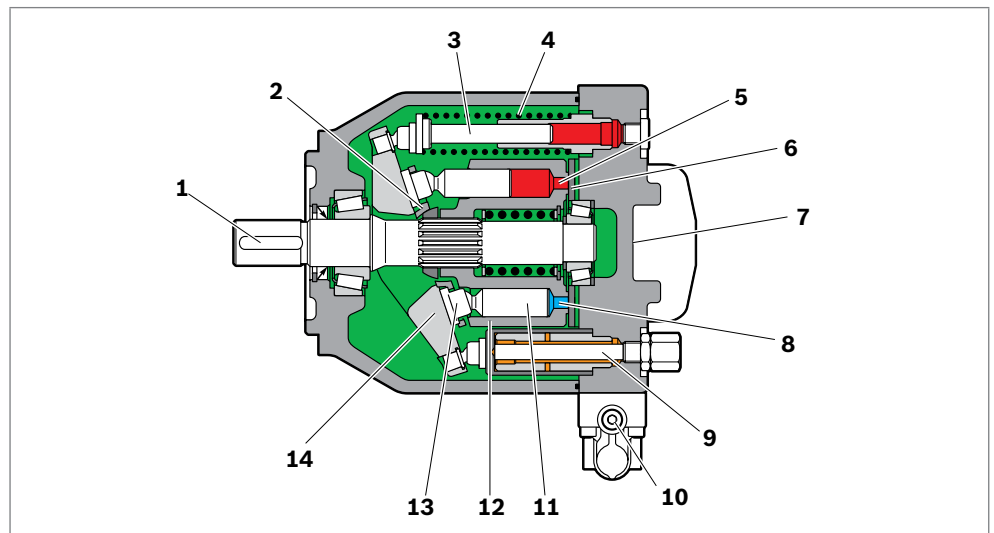


Fig. 2: Layout of the A10VO/A10VSO

- |                                        |                    |                |
|----------------------------------------|--------------------|----------------|
| 1 Drive shaft                          | 7 Connection plate | 13 Slipper pad |
| 2 Retaining plate                      | 8 Suction side     | 14 Cradle      |
| 3 Opposed piston                       | 9 Stroking piston  |                |
| 4 Spring                               | 10 Control valve   |                |
| 5 High-pressure side                   | 11 Piston          |                |
| 6 Control plate<br>(distributor plate) | 12 Cylinder        |                |

### 5.2.2 Functional description

**Pump** Torque and rotational speed are applied to the drive shaft **(1)** by a drive motor. The cylinder **(12)** is picked up and turned by the splines of the drive shaft. With every revolution, the pistons **(11)** execute a stroke in the cylinder bores, the size of which depends on the pitch of the cradle **(14)**. The slipper pads **(13)** are held on with the pistons and guided along the glide surface of the cradle by the retaining plate **(2)**. The swashplate setting during a rotation causes each piston to move over the bottom and top dead centers and back to its initial position. Here, hydraulic fluid is fed in and drained out through the two control slots in the control plate **(6)** according to the stroke displacement. On the suction side **(8)** hydraulic fluid flows into the piston chamber as the piston recedes. At the same time, on the high-pressure side **(5)** the fluid is pushed out of the cylinder chamber into the hydraulic system by the pistons.

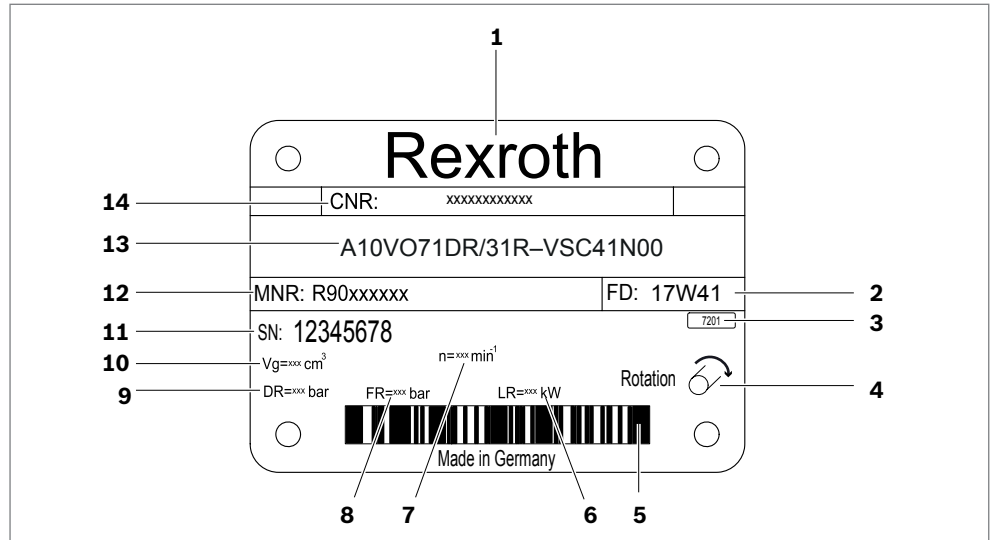
**Control** The swivel angle of the cradle **(14)** is infinitely variable. Adjusting the swivel angle changes the piston stroke and, with it, the displacement. The swivel angle is controlled hydraulically by means of the stroking piston. The swashplate is mounted in swivel bearings for smooth operation and it is kept in balance by the opposing piston **(3)**. Increasing the swivel angle increases the displacement; reducing the angle reduces displacement accordingly.



Various control devices are available depending on requirements. Information about this can be found in data sheet 92701, 92711 and 92709.

### 5.3 Product identification

The axial piston unit can be identified by the name plate. The following example shows an A10VO name plate:



**Fig. 3: A10VO name plate**

- |                                                                          |                                                    |
|--------------------------------------------------------------------------|----------------------------------------------------|
| <b>1</b> Manufacturer                                                    | <b>8</b> Flow setting (optional)                   |
| <b>2</b> Manufacturing date                                              | <b>9</b> Pressure control setting (optional)       |
| <b>3</b> Internal plant designation                                      | <b>10</b> Displacement                             |
| <b>4</b> Direction of rotation (viewed on drive shaft) – here: clockwise | <b>11</b> Serial number                            |
| <b>5</b> Bar code                                                        | <b>12</b> Material number of the axial piston unit |
| <b>6</b> Power setting (optional)                                        | <b>13</b> Type code                                |
| <b>7</b> Rotational speed                                                | <b>14</b> Customer material number                 |

## 6 Transport and storage

- ▶ Always observe the necessary ambient conditions for transport and storage, see chapter 6.2 “Storing the axial piston unit” on page 24.



Information on unpacking can be found in chapter 7.1 “Unpacking” on page 26.

### 6.1 Transporting the axial piston unit

The following transportation options are available depending on weight and duration of transport:

- Transporting by hand
- Transporting with a lifting device (eye bolt or lifting strap)

#### Dimensions and weights

**Table 6: Dimensions and weights**

| Size                         |    | 18                                                                                                                                              | 28   | 45   | 71   | 88   | 100  | 140  |
|------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|------|------|
| Weight without through drive | kg | 12.9                                                                                                                                            | 18   | 23.5 | 35.2 | 35.2 | 49.5 | 65.4 |
| Weight with through drive    | kg | 14                                                                                                                                              | 19.3 | 25.1 | 38   | 38   | 55.4 | 74.4 |
| Width                        | mm | Dimensions vary by equipment. The values applicable for your axial piston unit can be found in the installation drawing (request if necessary). |      |      |      |      |      |      |
| Height                       | mm |                                                                                                                                                 |      |      |      |      |      |      |
| Depth                        | mm |                                                                                                                                                 |      |      |      |      |      |      |

Weight may vary by equipment.

#### 6.1.1 Transporting by hand

Axial piston units with a weight of up to 15 kg can be transported by hand for a short time, if necessary.

#### **CAUTION!** Danger from heavy loads!

Health hazard from carrying axial piston units.

- ▶ Use appropriate lifting, lowering and moving techniques.
- ▶ Wear your personal protective equipment (e.g. safety goggles, safety gloves, suitable working clothes, safety shoes).
- ▶ Do not transport the axial piston unit by sensitive assembled parts (e.g. sensors or valves).
- ▶ Carefully place the axial piston unit on the seating to prevent it from being damaged.

#### 6.1.2 Transporting with a lifting device

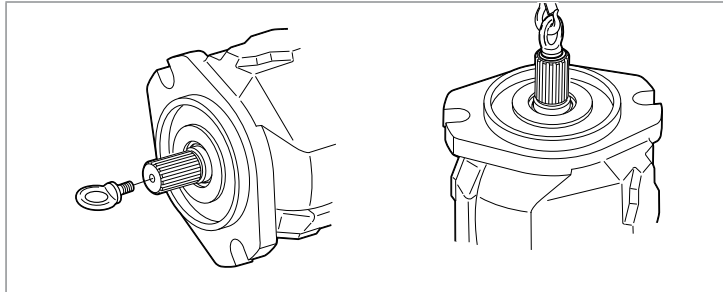
For transporting, the axial piston unit can be connected to a lifting device via an eye bolt or a lifting strap.

#### Transporting with eye bolt

The axial piston unit can be transported suspended from an eye bolt screwed into the drive shaft as long as only outward (pulling) axial forces are applied.

- ▶ For all female threads, use a stud end from the same system of units and of the correct size.
- ▶ To do this, screw an eye bolt completely into the female thread on the drive shaft. The thread size is indicated in the installation drawing.
- ▶ Make sure that the eye bolt can bear the total weight of the axial piston unit plus 20%.

You can lift the axial piston unit as shown in Fig. 4 with the eye bolt screwed into the drive shaft.



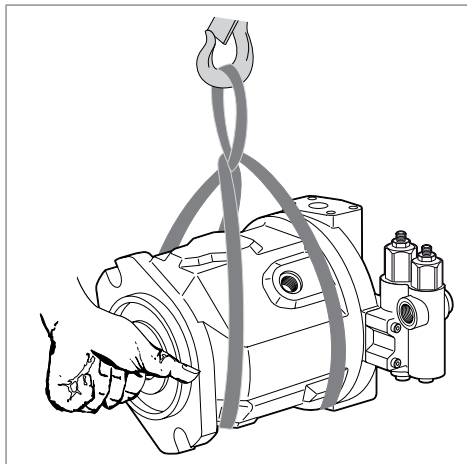
**Fig. 4: Installing the eye bolt**

#### Transporting with lifting strap

**WARNING!** Danger from suspended loads!

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

- ▶ Use the widest possible lifting strap.
- ▶ Make sure that the axial piston unit is securely fixed with the lifting strap.
- ▶ Only guide the axial piston unit by hand for fine positioning and to avoid swinging.
- ▶ Never stand or reach under suspended loads.
- ▶ Place the lifting strap around the axial piston unit in such a way that it does not pass over assembled parts (e.g. valves, piping) and that the axial piston unit is not suspended from assembled parts (see Fig. 5).



**Fig. 5: Transporting with lifting strap**

6.2    Storing the axial piston unit

- Requirements
- Storage areas should be free of corrosive materials and gases.
  - To prevent damage to the seals, do not operate ozone-forming equipment (e.g. mercury-vapor lamps, high-voltage equipment, electric motors, sources of electrical sparks or electrical discharge) in storage areas.
  - Storage areas should be dry.  
Recommended relative humidity ≤ 60%.
  - Ideal storage temperature: +5 °C to +20 °C.
  - Min. storage temperature: -50 °C.
  - Max. storage temperature: +60 °C.
  - Keep out of direct sunlight.
  - Do not stack axial piston units and store them in a shock-proof manner.
  - Do not store the axial piston unit on the drive shaft or on assembled parts, e.g. sensors or valves.
  - For further storage conditions, see Table 7.
- Check the axial piston unit monthly to ensure proper storage.

After delivery

The axial piston units come in corrosion protection packaging (corrosion protection film).  
Table 7 lists the max. permissible storage times for an unpackaged axial piston unit as per data sheet 90312.

Table 7: Storage time with factory corrosion protection

| Storage conditions                                                                                                         | Standard corrosion protection | Long-term corrosion protection (optional) |
|----------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------|
| Closed, dry room, at a consistent temperature between +5 °C and +20 °C.<br>Undamaged and sealed corrosion protection film. | Max. 12 months                | Max. 24 months                            |



The warranty will be voided if the requirements and storage conditions are not observed or after expiration of the max. storage time (see Table 7).

- What to do once the max. storage time elapses:
1. Check the entire axial piston unit for damage and corrosion prior to installation.
  2. Perform a test run to check the axial piston unit for proper function and leaks.
  3. If storage time exceeds 24 months, replace the shaft seal.



Once the max. storage time has elapsed, we recommend that you have the axial piston unit inspected by your Bosch Rexroth service partner.

For questions regarding repair and spare parts, contact your proper Bosch Rexroth service partner or the service department of the factory that manufactured the axial piston unit, see chapter 10.5 “Spare parts” on page 49.

**After removal** An uninstalled axial piston unit must be preserved with corrosion protection for the duration of storage.



The following instructions only refer to axial piston units operated with a mineral oil-based hydraulic fluid. Other hydraulic fluids require preservation measures specifically designed for them. In such a case, consult your local contact person; you can find their contact information under [www.boschrexroth.com/addresses](http://www.boschrexroth.com/addresses)

Bosch Rexroth recommends the following procedure:

1. Clean the axial piston unit; see chapter 10.1 "Cleaning and care" on page 47.
2. Drain the axial piston unit.
3. For storage times up to 12 months: Coat the inside of the axial piston unit with mineral oil and fill with approx. 100 ml of mineral oil.  
For storage times up to 24 months: Fill the axial piston unit with VCI 329 corrosion protection (20 mL).  
Fill via the drain port **L** or **L<sub>1</sub>**, see chapter 7.4 "Installing the axial piston unit", Fig. 13 and Fig. 14 on page 38.
4. Seal all ports so they are airtight.
5. Coat unpainted areas of the axial piston unit with mineral oil or suitable, easily removable corrosion protection, e.g. acid-free grease.
6. Package the axial piston unit with desiccant in corrosion protection film so it is airtight.
7. Store the axial piston unit in a shock-proof manner; see "Requirements" on page 24 in this chapter.

## 7 Installation

Have the following documents on hand before installation:

- Installation drawing for the axial piston unit (can be obtained from your contact person at Bosch Rexroth)
- Hydraulic circuit diagram for the axial piston unit (in the installation drawing)
- Hydraulic circuit diagram for the machine/system (available from the machine/system manufacturer)
- Order confirmation (contains the order-related technical data for your axial piston unit)
- Data sheet for the axial piston unit (contains the permissible technical data)

### 7.1 Unpacking

The axial piston unit comes in a polyethylene (PE) corrosion protection film.

**CAUTION!** Danger from parts falling out!

Improperly opening the packaging can result in parts falling out, which can be damaged or cause injury!

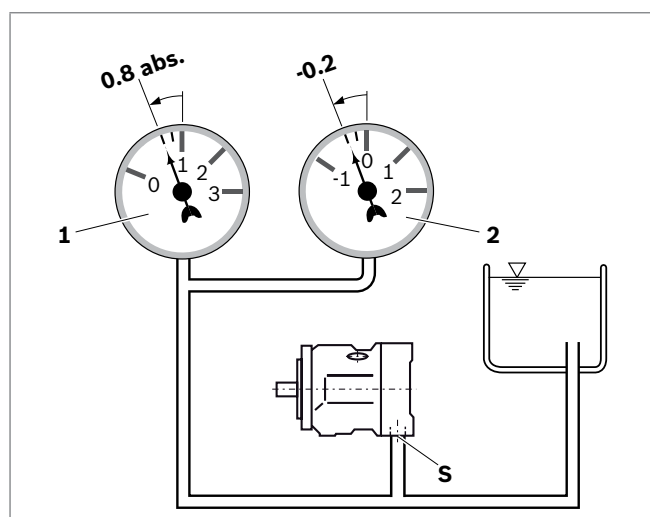
- ▶ Place the packaging on a level, load-bearing surface.
- ▶ Only open the packaging from the top.
  
- ▶ Remove the packaging from the axial piston unit.
- ▶ Check the axial piston unit for transport damage and completeness; see chapter 4 “Scope of delivery” on page 18.
- ▶ Dispose of the packaging in accordance with the regulations in your country.

### 7.2 Installation conditions

The installation position and location of the axial piston unit essentially determine how it is installed and commissioned (such as when filling and air bleeding the axial piston unit).

- ▶ Install the axial piston unit so that the expected forces and torque can be transferred without any danger. The machine/system manufacturer is responsible for sizing the fasteners.
- ▶ Observe the maximum permissible radial forces on the drive shaft when transferring drive/output drive with radial loading (belt drives). If necessary, store the belt pulley separately.
- ▶ Make sure the axial piston unit is always filled with hydraulic fluid during commissioning and operation. Also do this also after relatively long standstill periods, since the axial piston unit may drain out through the hydraulic lines.
- ▶ Direct the leakage in the housing to the reservoir through the highest drain port. Use a line size that matches the port.
- ▶ A check valve in the drain line is only permissible on a case-by-case basis following consultation. Please consult your proper contact person at Bosch Rexroth.
- ▶ To keep noise levels low, use elastic elements to isolate all connecting lines from all vibration-capable components (e.g. reservoir).
- ▶ Make sure the suction, drain, and return lines flow into the reservoir below the min. fluid level under all operating conditions. This will prevent air from being drawn in and foam from forming.

- ▶ When designing the reservoir, ensure that there is an adequate distance between the suction line and the drain line. This prevents the heated, return flow from being drawn directly back into the suction line.
- ▶ Make sure that a minimum suction pressure of 0.8 bar absolute is present at port **S** during operation for all installation positions and installation locations of the axial piston pump; see Fig. 6. Please note that the values stated in the data sheet for the maximum speed are valid for a suction pressure of 1 bar absolute at suction port **S**. See data sheet for other pressure values.



**Fig. 6: Suction pressure**

- 1** Absolute pressure gage
- 2** Standard pressure gage (relative)



The suction conditions improve with installation below and inside the reservoir.

- ▶ Make sure that the working environment at the installation site is completely free of dust and foreign substances. The axial piston unit should be clean when installed. Contamination of the hydraulic fluid can considerably affect the function and service life of the axial piston unit.
- ▶ Use fiber-free cloths for cleaning.
- ▶ Use suitable, mild cleaning agents to remove lubricants and other heavy contamination. Do not allow cleaning agents to enter into the hydraulic system.

## 7.3 Installation position

The axial piston unit can be installed in the following positions. The pipeline routing shown illustrates the basic layout.

### 7.3.1 Below-reservoir installation (standard)

Below-reservoir installation means that the axial piston unit is installed outside of the reservoir and below the min. fluid level of the reservoir.



Recommended installation position: 1 and 3.

Because complete air bleeding and filling are not possible in installation positions 2 and 4, the axial piston unit should be air bled and filled in a horizontal position prior to installation.

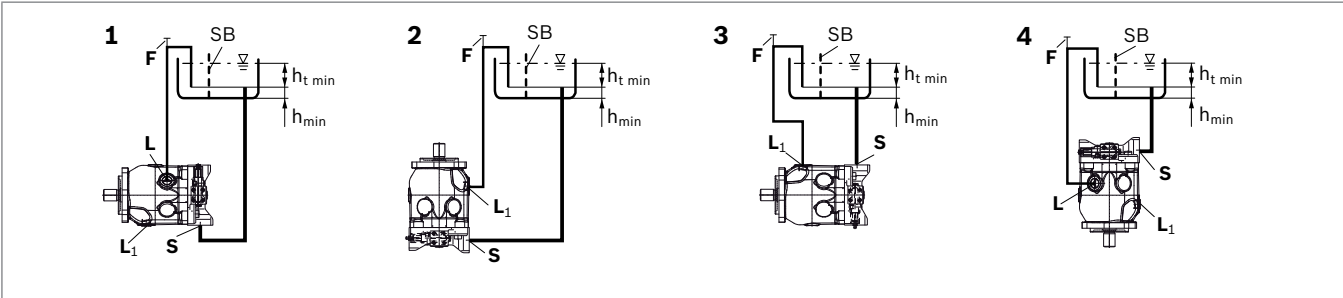


Fig. 7: Below-reservoir installation A10VO/A10VSO with installation position 1–4

|                   |                      |              |                                                        |
|-------------------|----------------------|--------------|--------------------------------------------------------|
| L, L <sub>1</sub> | Highest drain port   | $h_{t\ min}$ | Minimum required immersion depth (200 mm)              |
| F                 | Filling/air bleeding | $h_{min}$    | Minimum required distance to reservoir bottom (100 mm) |
| S                 | Suction port         | SB           | Baffle (baffle plate)                                  |



Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

Table 8: Below-reservoir installation

| Installation position      | Air bleed | Filling            |
|----------------------------|-----------|--------------------|
| 1 (drive shaft horizontal) | F         | L (F)              |
| 2 (drive shaft up)         | F         | L <sub>1</sub> (F) |
| 3 (drive shaft horizontal) | F         | L <sub>1</sub> (F) |
| 4 (drive shaft down)       | F         | L (F)              |

7.3.2 Inside-reservoir installation

**NOTICE**

**Risk of damage with inside-reservoir installation!**

- To prevent damage to the axial piston unit, all plastic parts (e.g. protective plugs, covers), except for the tamper-proof caps, must be removed prior to installation in the reservoir.
- Remove all plastic parts, except for the tamper-proof caps, before you install the axial piston unit in the reservoir. Make sure that no parts of them remain in the reservoir.
  - Remove the protective plug from the suction port **S** and open at least one **L** port.

Inside-reservoir installation is when the axial piston unit is installed in the reservoir below the minimum fluid level. The axial piston unit is completely below the hydraulic fluid.

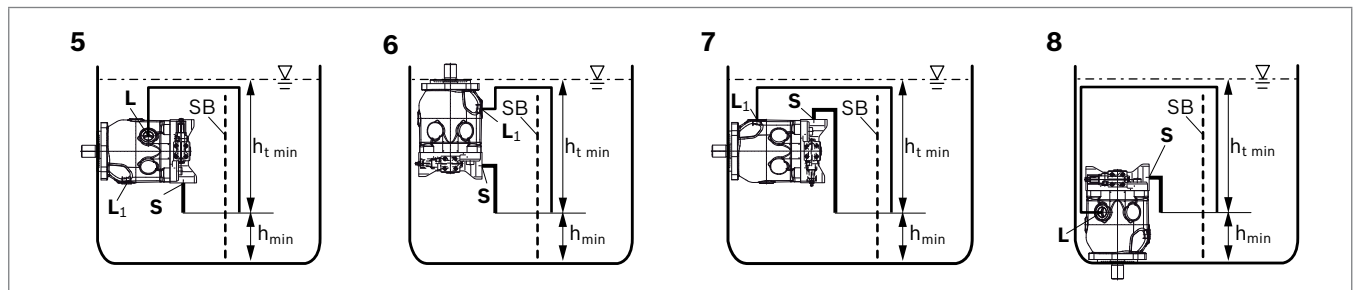
If the minimum fluid level is equal to or below the upper edge of the pump, see section 7.3.3 “Above-reservoir installation” on page 30.



Axial piston units with electric components (e.g. electric controls, sensors) must not be installed in a reservoir below the fluid level.



Our advice is to fit a suction pipe to the suction port **S** and to fit a pipe to case drain port **L** or **L<sub>1</sub>**. In this case, the other drain port must be plugged. The case of the axial piston unit must be filled before fitting the piping and filling the reservoir with hydraulic fluid. Because complete air bleeding and filling is not possible in installation positions 6 and 8, the axial piston unit should be air bled and filled in a horizontal position prior to installation.



**Fig. 8: Inside-reservoir installation A10VO/A10VSO with installation position 5-8**

|                          |                                           |                        |                                                        |
|--------------------------|-------------------------------------------|------------------------|--------------------------------------------------------|
| <b>L, L<sub>1</sub></b>  | Highest drain port                        | <b>h<sub>min</sub></b> | Minimum required distance to reservoir bottom (100 mm) |
| <b>S</b>                 | Suction port                              | <b>SB</b>              | Baffle (baffle plate)                                  |
| <b>h<sub>t min</sub></b> | Minimum required immersion depth (200 mm) |                        |                                                        |

**Table 9: Inside-reservoir installation**

| Installation position      | Air bleed                                      | Filling                                                                                                       |
|----------------------------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 5 (drive shaft horizontal) | via the highest open port <b>L</b>             | automatically via the open port <b>L</b> and <b>S</b> by position below the hydraulic fluid level             |
| 6 (drive shaft up)         | via the highest open port <b>L<sub>1</sub></b> | automatically via the open port <b>L<sub>1</sub></b> and <b>S</b> by position below the hydraulic fluid level |
| 7 (drive shaft horizontal) | via the highest open port <b>L<sub>1</sub></b> | automatically via the open port <b>L<sub>1</sub></b> and <b>S</b> by position below the hydraulic fluid level |
| 8 (drive shaft down)       | via the highest open port <b>L</b>             | automatically via the open port <b>L</b> and <b>S</b> by position below the hydraulic fluid level             |

7.3.3    Above-reservoir installation

Above-reservoir installation means that the axial piston unit is installed above the min. fluid level of the reservoir.



To prevent the axial piston unit from draining, a height difference  $h_{ES\ min}$  of at least 25 mm at port **F** is required in installation position 10.



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



Because complete air bleeding and filling are not possible in installation positions 10 and 12, the axial piston unit should be air bled and filled in a horizontal position before installation.

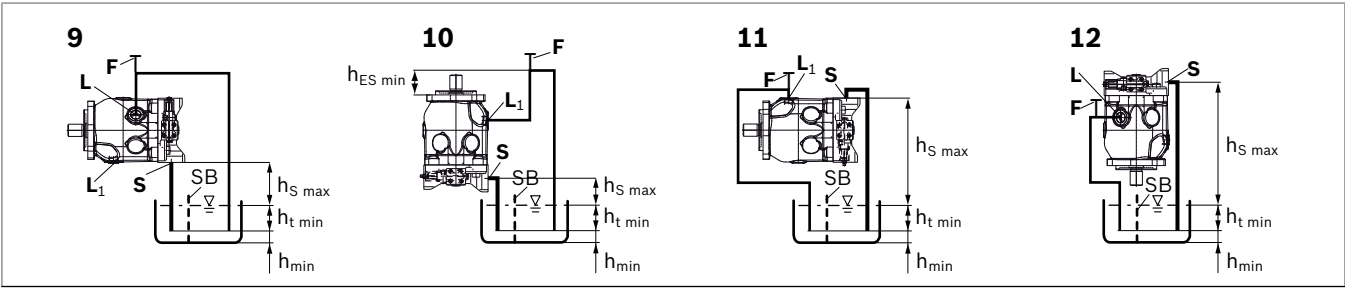


Fig. 9: Above-reservoir installation A10VO/A10VSO with installation position 9-12

|                         |                                           |               |                                                                                       |
|-------------------------|-------------------------------------------|---------------|---------------------------------------------------------------------------------------|
| <b>L, L<sub>1</sub></b> | Highest drain port                        | $h_{min}$     | Minimum required distance to reservoir bottom (100 mm)                                |
| <b>F</b>                | Filling/air bleeding                      | $h_{ES\ min}$ | Minimum required height needed to protect the axial piston unit from draining (25 mm) |
| <b>S</b>                | Suction port                              | $h_{S\ max}$  | Permissible suction height (800 mm)                                                   |
| $h_{t\ min}$            | Minimum required immersion depth (200 mm) | <b>SB</b>     | Baffle (baffle plate)                                                                 |



Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

Table 10: Above-reservoir installation

| Installation position       | Air bleed | Filling                  |
|-----------------------------|-----------|--------------------------|
| 9 (drive shaft horizontal)  | <b>F</b>  | <b>L (F)</b>             |
| 10 (drive shaft up)         | <b>F</b>  | <b>L<sub>1</sub> (F)</b> |
| 11 (drive shaft horizontal) | <b>F</b>  | <b>L<sub>1</sub> (F)</b> |
| 12 (drive shaft down)       | <b>F</b>  | <b>L (F)</b>             |

## 7.4 Installing the axial piston unit

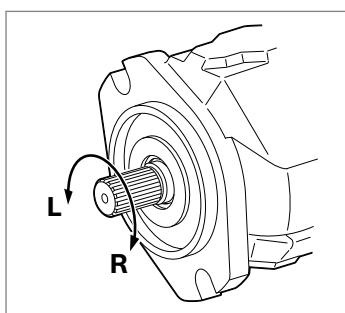
### 7.4.1 Preparation

1. Check the specifications on the name plate to see you have the correct axial piston unit.
2. Compare the material number and designation (type 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 your local contact person for clarification, you can find the address under [www.boschrexroth.com/addresses](http://www.boschrexroth.com/addresses)

3. Before installing, completely drain the axial piston unit to prevent mixing with the hydraulic fluid used in the machine/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 drive motor.



**Fig. 10: Direction of rotation**

- L** Counter-clockwise  
**R** Clockwise



The direction of rotation as indicated on the name plate determines the direction of rotation of the axial piston unit as viewed on the drive shaft; see chapter 5.3 “Product identification” on page 21. For information on the direction of rotation of the drive motor, please refer to the drive motor manufacturer's instruction manual.

### 7.4.2 Dimensions

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

### 7.4.3 General instructions

Follow these general instructions when installing the axial piston unit:

- Note that certain installation positions will affect the control system. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in response time.

- Torsional vibrations and speed variations may cause leaks in the shaft seal and increased rotary angular acceleration of the rotary group of the axial piston unit. At risk are diesel drives with a small number of cylinders and low flywheel mass and toothed belt or V-belt drives. Belts can lose much of their pre-charge pressure after just a short operating time.  
An automatic clamping device can lessen the speed variations and vibrations, and thus avoid subsequent damage.  
– When using drives with toothed belts or V-belts, always use an automatic clamping device.
- On the drive of an axial piston unit, a cardan shaft may cause vibrations and excessive rotary angular acceleration. Depending on the frequency and temperature, these may result in leakage in the shaft seal and damage to the rotary group.
- If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating conditions, particularly at cold start. If this is not possible, lay separate drain lines, if necessary.

The type of installation used for 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
- On a cardan shaft

#### 7.4.4 Installation with a coupling

The following describes how to install the axial piston unit with a clutch:

**NOTICE!** Danger from improper handling!

Product can be damaged!

- Do not install the coupling hub on the drive shaft of the axial piston unit by striking it.

1. Install the specified coupling half on 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 female thread. Use this female thread to pull the coupling element onto the drive shaft. The size of the female thread can be seen in the installation drawing.

2. 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.
3. Transport the axial piston unit to the installation location.
4. Remove dirt and foreign particles from the installation location.
5. Install the clutch on the output shaft of the drive motor in accordance with the specifications provided by the clutch manufacturer.



Do not fasten down the axial piston unit until the coupling has been correctly installed.

6. Fasten the axial piston unit at the installation location.
7. Align the drive shaft of the axial piston unit and the output shaft of the drive motor so there is no angular deviation.
8. Make sure no excessive axial and radial forces are acting on the drive shaft.
9. For bell housing installation, check the axial play of the clutch through the bell window in accordance with the manufacturer's specifications.
10. Details on the required tools and tightening torques for the mounting bolts are available from the machine/system manufacturer.
11. When using elastic couplings, check that the drive does not resonate after completing the installation.

#### 7.4.5 Installation on a gearbox

The following describes how to install the axial piston unit on a gearbox.

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

- ▶ Before installing, make sure that the spigot diameter centers the axial piston unit (observe tolerances) and that no excessive axial or radial forces are acting on the drive shaft of the axial piston unit (installation length).
- ▶ Protect the drive shaft against frictional corrosion by providing permanent lubrication.
- ▶ Fasten the axial piston unit at the installation location.

#### For attachment via gear wheel or helical gear shaft

No gearing forces higher than the permissible axial and radial forces should act on the shaft; if necessary, support the gear wheel at the gearbox output separately.

#### 7.4.6 Installation with cardan shaft

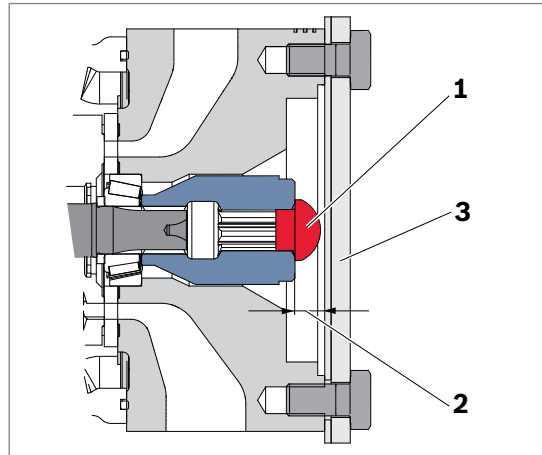
The following describes how to connect the axial piston unit to the drive motor with a cardan shaft.

**NOTICE!** Damage to the axial piston unit and leaks at the shaft seal!

Improperly installed cardan shafts generate unbalances. This results in vibrations and excessive forces on the drive shaft.

- ▶ Observe the cardan shaft manufacturer's assembly instructions.
1. Position the axial piston unit close to the specified installation location.  
Allow enough space for the cardan shaft to fit through on both sides.
  2. Place the cardan shaft on the output shaft of the drive motor.
  3. Push the axial piston unit to the cardan shaft and place the cardan shaft on the drive shaft of the axial piston unit.
  4. Bring the axial piston unit to the installation position and fasten it. Details of the required tools and tightening torque for the mounting bolts can be obtained from the system manufacturer.

#### 7.4.7 Remove the spacer (for version with through drive)



**Fig. 11: Removing the spacer**

Axial piston units with through drive are delivered with a spacer (1). The spacer is designed for transport protection and to reduce the hub's axial clearance (2).

**CAUTION!** Operation with spacers!

Operating the axial piston unit with spacer may result in damage to the axial piston unit.

- ▶ Remove the spacer prior to commissioning.
- ▶ Remove the spacer (1).  
The spacer must be removed before the second pump is fitted. If you operate the axial piston unit without installing a further pump on the through drive, it is absolutely necessary to remove the spacer and the hub. Since the metallic protective cover (3) is not pressure-resistant, it must be replaced with a pressure-resistant cover. If you need a pressure-resistant cover, contact your Bosch Rexroth Service partner. Use a suitable tool for this to prevent damage to the functional surfaces. If functional surfaces are damaged, contact your Bosch Rexroth service partner or the service department of the factory that manufactured the axial piston unit.

### 7.4.8 Completing installation

1. Remove any installed transport screws.

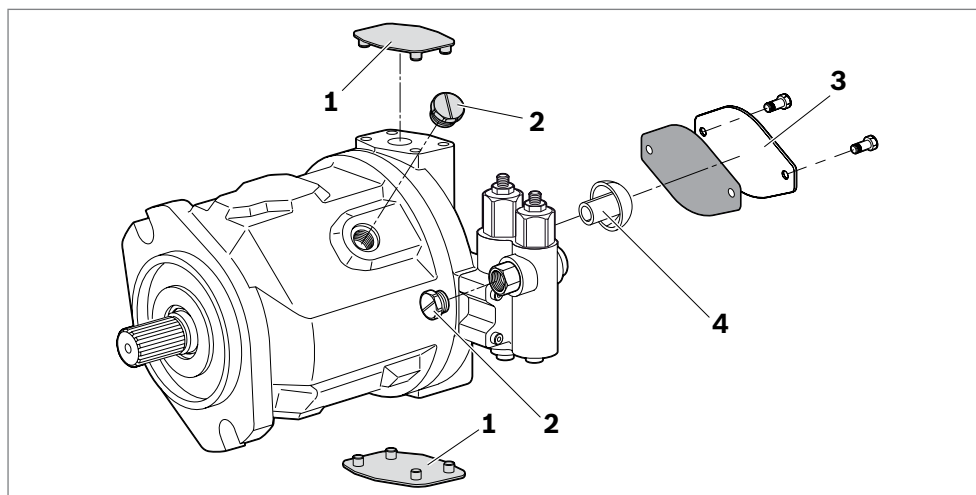
#### **CAUTION!** Operation with protective plugs!

Operating the axial piston unit with protective plugs may result in injury or damage to the axial piston unit.

- Before commissioning, remove all protective plugs and replace them with suitable, pressure-resistant, metal threaded plugs or connect the appropriate lines.

2. Remove the transport protection.

The axial piston unit is delivered with protective covers (1) and protection plugs (2). They are not pressure-resistant and have to be removed prior to connection. Use a suitable tool for this to prevent damage to the sealing and functional surfaces. If sealing or functional surfaces are damaged, contact your Bosch Rexroth service partner or the service department of the factory that manufactured the axial piston unit.



**Fig. 12: Removing transport protection**

- |                                                                       |                                                                                           |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 1 Protective covers                                                   | 4 For version with through drive, spacer made of plastic (serves as transport protection) |
| 2 Protective plugs/threaded plugs                                     |                                                                                           |
| 3 For version with through drive, protective cover and mounting bolts |                                                                                           |



Ports intended for connecting lines come with protective plugs or threaded plugs, which serve as transport protection. All ports required for functional operation must be connected (see Table 11 “Ports A10VO/A10VSO Series 31” on page 38). Failure to do so could lead to malfunctions or damage. If a port is not being used, plug it with a threaded plug since the protective plugs are not pressure-resistant.



Adjusting the setting screws will render the warranty void. If you need to change the settings, please contact your local contact person; you can find their contact information under [www.boschrexroth.com/adresses](http://www.boschrexroth.com/adresses)

3. For the version with through drive, first remove the spacer (4), see section 7.4.7 “Remove the spacer (for version with through drive)” on page 34 and fit the auxiliary pump in accordance with the pump manufacturer’s instructions. The protective cover (3) is not pressure-resistant and thus not permissible in operation.

#### 7.4.9 Hydraulically connecting the axial piston unit

### NOTICE

#### Insufficient suction pressure!

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 the necessary suction pressure is maintained. This is influenced by:
  - The piping (for example, suction cross-section, pipe diameter, length of suction line)
  - The position of the reservoir
  - The viscosity of the hydraulic fluid
  - A filter element or check valve in the suction line (check the level of contamination of the filter element regularly)

The machine/system manufacturer is responsible for sizing the lines. Connect the axial piston unit to the rest of the hydraulic system in accordance with the hydraulic circuit diagram of the machine/system manufacturer.

The ports and fastening threads are designed for the maximum permissible pressures  $p_{max}$ , see Table 11 “Ports A10VO/A10VSO Series 31” on page 38.

The machine/system manufacturer should make sure the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.



Connect only hydraulic lines that match the axial piston unit port (pressure level, size, system of units).

#### Notices on routing lines

Observe the following information when routing the suction, pressure and drain lines.

- Lines and hoses should be installed without pre-charge pressure so no further mechanical forces are applied during operation that will reduce the service life of the axial piston unit and, possibly, the entire machine/system.
- Use suitable seals as sealing material.
- Suction line (pipe or hose)
  - The suction line should be as short and straight as possible.
  - Measure the line cross-section of the suction line so the pressure at the suction port does not drop below the min. permissible pressure. Make sure that the maximum suction pressure is not exceeded (for example, when pre-filling).
  - Make sure the connections and connecting elements are airtight.
  - The hose must be pressure-resistant, also to external air pressure.
- Pressure line

- For the pressure lines, use only pipes, hoses and connecting elements that are rated for the working pressure range specified in data sheets 92701 and 92711 (see Table 11).
- Drain line
  - Always route the drain lines so that the case is constantly filled with hydraulic fluid and to ensure no air gets through the shaft seal, even during extended standstill periods.
  - The case pressure must never exceed the limits specified for the axial piston unit in the data sheet.
  - The drain line inflow in the reservoir should always be below the min. fluid level (see chapter 7.3 “Installation position” on page 27).
- If the axial piston unit is equipped with installed screw fittings, do not remove them. Screw the stud end of the fitting directly into the installed fitting.

#### **Risk of confusion with threaded connections**

Axial piston units are used in application areas that use the metric system as well as the Anglo-American (imperial) and the Japanese measuring system (JIS – Japan Industrial Standard). Various kinds of seals are also used.

The system of units, the kind of seal and the size of female thread and stud ends (e.g. threaded plug) must all match.

There is a risk of confusion due to the limited ways of visually telling them apart.

#### **WARNING!** Leaky or bursting stud ends!

For fittings, if a stud end that does not match the system of units, kind of seal and size of the female thread is pressurized, the stud end may loosen itself or even be ejected from the hole in a projectile-like manner. This can result in serious injury and property damage. Hydraulic fluid can escape from this leakage point.

- Use the drawings (installation drawing) to determine the required stud end for each fitting.
- Make sure the right fittings, mounting bolts and threaded plugs are installed.
- For all female threads, use a stud end from the same system of units and of the correct size.

Port overview

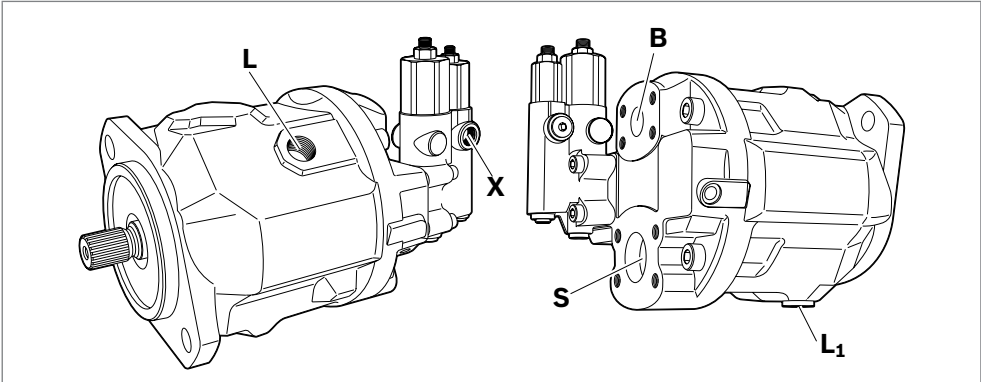


Fig. 13: Port overview A10VO Series 31, SAE flange ports at rear

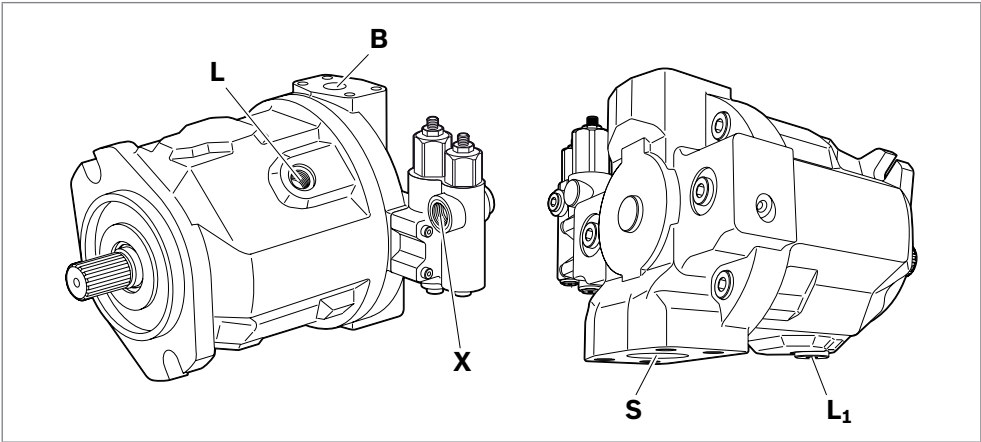


Fig. 14: Port overview A10VO/A10VSO Series 31, SAE flange ports at top, opposite at bottom

Table 11: Ports A10VO/A10VSO Series 31

| Ports <sup>1)</sup> |                                         | $p_{\max}$ [bar] <sup>2)</sup> | State <sup>3)</sup> |
|---------------------|-----------------------------------------|--------------------------------|---------------------|
| B                   | Working port (standard pressure series) | 350                            | O                   |
| S                   | Suction port (standard pressure series) | 10                             | O                   |
| L                   | Drain port                              | 2                              | O <sup>4)</sup>     |
| L <sub>1</sub>      | Drain port                              | 2                              | X <sup>4)</sup>     |
| X                   | Pilot pressure                          | 350                            | O                   |
| X                   | Pilot pressure with DG-control          | 350                            | O                   |

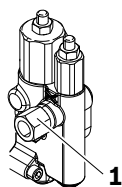
<sup>1)</sup> The measuring system and thread size can be found in the installation drawing.

<sup>2)</sup> Momentary pressure peaks may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.

<sup>3)</sup> O = Must be connected (plugged when delivered)  
X = Plugged (in normal operation)

<sup>4)</sup> Depending on the installation position, L or L<sub>1</sub> must be connected (see section 7.3 “Installation position” on page 27).

### Connect line to pilot pressure port with adapter



Please comply with the following information for the version with adapter (concerns controller DRG, DFR/DFR1/DRSC, DFLR).

- When connecting and tightening the connection line to the pilot pressure port **X**, the adapter (**1**) must be secured with a tightening torque of 20 Nm (WAF 19). The maximum permissible tightening torque of 45 Nm in the female thread of the adapter (M14 x 1.5, 12 deep) must not be exceeded.

If the adapter (**1**) is unscrewed from the pilot pressure port **X** and then screwed back in again, it must be tightened with a tightening torque of 23 + 2.5 Nm.



For the version without adapter, the pilot pressure port **X** has an ISO 11926 thread of size 7/16-20 UNF-2B; 11.5 deep.

### Tightening torques

The following tightening torques apply:

- Fittings:  
Observe the manufacturer's specifications regarding the tightening torques of the fittings used.
- Female threads in the axial piston unit:  
The maximum permissible tightening torques  $M_{G \max}$  are the max. values of the female threads and should not be exceeded. For values, see Table 12.
- Threaded plugs:  
For the metallic threaded plugs supplied with the axial piston unit, the required tightening torques of threaded plugs  $M_v$  apply. For values, see Table 12.
- Mounting bolts:  
For mounting bolts with metric ISO threads as defined in DIN 13 or threads defined in ASME B1.1, we recommend checking the tightening torque on a case-by-case basis in accordance with VDI 2230.

**Table 12: Tightening torques for female threads and threaded plugs**

| <b>Ports</b>    |                    | <b>Maximum permissible tightening torque of female threads <math>M_{G \max}</math></b> | <b>Required tightening torque of threaded plugs <math>M_V</math></b> | <b>WAF hexagon socket of the threaded plug</b> |
|-----------------|--------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------|
| <b>Standard</b> | <b>Thread size</b> |                                                                                        |                                                                      |                                                |
| DIN 3852        | M14 × 1.5          | 80 Nm                                                                                  | 35 Nm <sup>1)</sup>                                                  | 6 mm                                           |
|                 | M16 × 1.5          | 100 Nm                                                                                 | 50 Nm <sup>1)</sup>                                                  | 8 mm                                           |
|                 | M18 × 1.5          | 140 Nm                                                                                 | 60 Nm <sup>1)</sup>                                                  | 8 mm                                           |
|                 | M22 × 1.5          | 210 Nm                                                                                 | 80 Nm <sup>1)</sup>                                                  | 10 mm                                          |
|                 | M27 × 2            | 330 Nm                                                                                 | 135 Nm <sup>1)</sup>                                                 | 12 mm                                          |
| ISO 11926       | 7/16-20 UNF-2B     | 40 Nm                                                                                  | 18 Nm                                                                | 3/16 in                                        |
|                 | 9/16-18 UNF-2B     | 80 Nm                                                                                  | 35 Nm                                                                | 1/4 in                                         |
|                 | 3/4-16 UNF-2B      | 160 Nm                                                                                 | 70 Nm                                                                | 5/16 in                                        |
|                 | 7/8-14 UNF-2B      | 240 Nm                                                                                 | 110 Nm                                                               | 3/8 in                                         |
|                 | 1 1/16-12 UN-2B    | 360 Nm                                                                                 | 170 Nm                                                               | 9/16 in                                        |
| DIN ISO 228     | G 1/4 in           | 70 Nm                                                                                  | –                                                                    | –                                              |

<sup>1)</sup> The tightening torques for the threaded plugs apply when the plugs are dry or lightly oiled.

<sup>2)</sup> The tightening torques for the threaded plugs apply when the plugs are dry – when lightly oiled, the tightening torques for M10 × 1 are reduced to 10 Nm and to 17 Nm for M12 × 1.5.

**Procedure**

To connect the axial piston unit to the hydraulic system:

1. Remove the protective plugs or threaded plugs from the ports where the connections should be made according to the hydraulic circuit diagram.
2. Make sure the sealing surfaces of the hydraulic ports and functional surfaces are not damaged.
3. Use only clean hydraulic lines or flush them before installation.  
(Observe chapter 7.5 “Performing flushing cycle” on page 42 when you flush out the entire system.)
4. Connect the lines in accordance with the installation drawing and the machine or system circuit diagram. Check that all ports are connected or plugged with threaded plugs. With inside-reservoir installation, the case of the axial piston unit must be filled before fitting the lines and filling the reservoir with hydraulic fluid.
5. Tighten the fittings correctly (observe tightening torques!). Mark all correctly tightened fittings, e.g. with a permanent marker.
6. Check all pipes and hose lines and every combination of connecting pieces, couplings or connecting points with hoses or pipes to ensure they are in safe working condition.

### 7.4.10 Electrically connecting the axial piston unit

## NOTICE

### Short circuit due to penetrating hydraulic fluid!

Fluid can penetrate the product and cause a short circuit!

- Do not install axial piston units with electric components (e.g. electric controls, sensors) in a reservoir below the fluid level (inside-reservoir installation).

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

Electrically controlled axial piston units must be connected in accordance with the electrical circuit diagram for the machine/system.

For axial piston units with electrical control and/or mounted sensors, please comply with the details given in data sheet 92701, 92711 and 92709 e.g.:

- Permissible voltage range
- Permissible current
- Correct pin assignment
- Recommended electrical control units

Exact details on the connector, type of protection and matching mating connector can also be found in data sheets 92701 and 92711. The mating connector is not included in the scope of delivery.

1. Switch off the power supply to the relevant system component.
2. Electrically connect the axial piston unit (12 or 24 V). Before connecting, check that the connector, including all seals, is intact.

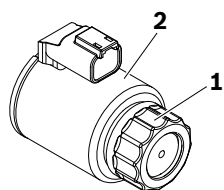
### Changing connector position

If necessary, you can change the position of the connector by turning the solenoid body. This is independent of the connector version.

### CAUTION! Hot surfaces on the solenoid!

Risk of burning!

- Allow the solenoid to cool down sufficiently before touching it.
- Wear heat-resistant protective clothing, e.g. gloves.



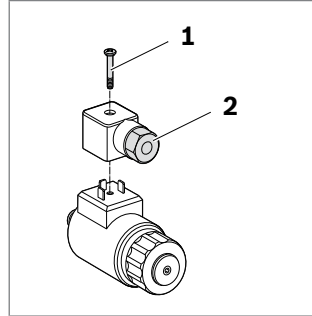
To do this, proceed as follows:

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

**Tightening torque for Hirschmann connectors**

On axial piston units with a Hirschmann connector according to DIN EN 175 301-803-A/ISO 4400, the following tightening torques apply when securing plug-in connectors:

- Mounting bolt, M3 **(1)**: 0.5 Nm
- Union nut M16 × 1.5 **(2)**: 1.5-2.5 Nm



**Fig. 15: HIRSCHMANN connector**

**7.5 Performing flushing cycle**

In order to remove foreign particles from the system, Bosch Rexroth recommends a flushing cycle for the entire system prior to initial commissioning. To avoid internal contamination, do not include the axial piston unit in the flushing cycle.



Use an additional flushing unit to perform the flushing cycle. Follow the instructions of the flushing unit's manufacturer for the exact procedure during the flushing cycle.

## 8 Commissioning

### **WARNING**

#### **Danger while working in the danger zone of a machine/system!**

Danger to life, risk of injury or serious injury!

- ▶ Pay attention to and eliminate potential danger sources before operating the axial piston unit.
- ▶ Make sure no one is in the danger zone of the machine/system.
- ▶ The emergency stop button for the machine/system should be within the operator's reach.
- ▶ Always follow the instructions of the machine/system manufacturer during commissioning.

### **CAUTION**

#### **Commissioning an improperly installed product!**

Risk of injury and property damage!

- ▶ Make sure all electrical and hydraulic ports are connected or plugged.
- ▶ Commission only a fully installed, fully functioning product with original accessories from Bosch Rexroth.

### 8.1 Initial commissioning



During all commissioning work on the axial piston unit, observe the general safety instructions and intended use detailed in chapter 2 “Safety instructions” on page 9.

- ▶ Connect the pressure gage for the working pressure, case pressure and suction pressure to the specified measuring points on the axial piston unit or in the hydraulic system, to check the technical data at first operation.
- ▶ During commissioning, monitor the temperature of the hydraulic fluid in the reservoir to ensure that it lies within permissible viscosity limits.

#### 8.1.1 Filling the axial piston unit

Professional filling and air bleeding is necessary to prevent damage to the axial piston unit and to maintain proper function.



Usually, the cleanliness level of commercial hydraulic fluids is insufficient for our components. These hydraulic fluids must be filtered using an appropriate filter system to minimize solid particle contamination and water in the system.

Use only a hydraulic fluid that conforms to the following requirements:

You can find details of the minimum requirements on hydraulic fluids in Bosch Rexroth data sheets 90220, 90221 and 90223. The titles of the data sheets can be found in Table 1 “Required and supplementary documentation” on page 5.

You can find details of permissible and optimal viscosity in data sheet 92701 and 92711.

To ensure the functional reliability of the axial piston unit, the hydraulic fluid must have a min. cleanliness level of 20/18/15 as defined in ISO 4406. At a hydraulic fluid viscosity of less than 10 mm<sup>2</sup>/s (e.g. due to high temperatures during short-term operation) at the drain port, a min. cleanliness level of 19/17/14 as defined in ISO 4406 is required. For permissible viscosities and temperatures, see data sheets 92701 and 92711.

1. Place a drip tray under the axial piston unit to collect any hydraulic fluid that may leak.

**NOTICE!** Contaminated hydraulic fluid!

The cleanliness levels of commercial hydraulic fluid are usually insufficient for our components.

- Use a suitable filter system to filter hydraulic fluids during filling to minimize solid particle contamination and water in the hydraulic system.

2. Fill and air bleed the axial piston unit using the appropriate ports; see chapter 7.3 “Installation position” on page 27. Also fill the hydraulic lines of the system.

**NOTICE!** Risk of property damage due to inadequate lubrication!

Product can be damaged or destroyed!

- When using a shut-off valve in the suction and/or drain line, make sure the drive of the axial piston unit can only be started when the shut-off valves are open.
3. When using a shut-off valve in the suction and/or drain line, only operate the axial piston unit when the shut-off valves are open.
  4. Test the direction of rotation of the drive motor. To do this, run the drive motor briefly at the lowest rotational speed (inching). Make sure the direction of rotation of the axial piston unit matches the specification on the name plate; see section 5.3 “Product identification”, Fig. 3: A10VO name plate on page 21.
  5. Operate the axial piston pump at a low rotational speed (starter speed for internal combustion engines or inching mode for electric motors) until the hydraulic system is completely filled and air bled. To verify, drain the hydraulic fluid at the drain port until there are no bubbles in the fluid.

### 8.1.2 Testing the hydraulic fluid supply

The axial piston unit should 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 noise development and check the hydraulic fluid level in the reservoir. If the axial piston unit becomes louder (cavitation) or the drain fluid is discharged with bubbles, this is an indication that the axial piston unit is not being sufficiently supplied with hydraulic fluid.

For information on troubleshooting, see chapter 14 “Troubleshooting” on page 52.

To test the hydraulic fluid supply:

1. Allow the drive motor to run at the lowest rotational speed. The axial piston unit should be operated without load. Pay attention to leaks and noises.
2. Check the axial piston unit's drain line during the test. The drain fluid should be without bubbles.
3. Increase the load and check whether the working pressure rises as expected.

4. Perform a leak test to ensure the hydraulic system is sealed and can withstand the max. pressure.
5. Check the suction pressure at port **S** of the axial piston pump at nominal speed and maximum swivel angle. Refer to data sheet 92701 and 92711 for the permissible value.
6. At maximum working pressure, check the case pressure at port **L**, or **L<sub>1</sub>**. Refer to data sheet 92701 and 92711 for the permissible value.

### 8.1.3 Performing a functional test

#### **WARNING**

##### **Improperly connected axial piston unit!**

Mixing up the ports will lead to malfunctions (e.g. lift instead of lower) and associated hazards to persons and equipment!

- ▶ Before the functional test, check whether the piping specified in the hydraulic circuit diagram has been installed.

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

The axial piston unit is tested for functional capability and performance before delivery according to the technical data. During commissioning, make sure the axial piston unit was installed properly in the machine/system.

- ▶ After starting the drive motor, check in particular the specified pressures, e.g., working pressure and case pressure.
- ▶ Perform a leak test without and with load prior to normal operation.
- ▶ If necessary, disconnect the pressure gage and plug the ports with the specified threaded plugs.

## 8.2 Running-in phase

### **NOTICE**

##### **Property damage due to insufficient viscosity!**

Elevated hydraulic fluid temperature may excessively reduce viscosity and damage the product!

- ▶ Monitor the operating temperature during the running-in phase, e.g. by measuring the leakage temperature.
- ▶ Reduce the loading (pressure, rotational speed) of the axial piston unit if unacceptable operating temperatures and/or viscosities occur.
- ▶ Excessively high operating temperatures indicate faults that have to be analyzed and eliminated.

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 over time. Volumetric and mechanical hydraulic efficiency is also greater until the running-in phase of about 10 operating hours is concluded.

To ensure that contamination in the hydraulic system does not damage the axial piston unit, Bosch Rexroth recommends the following after the running-in phase:

- ▶ After the running-in phase, have a hydraulic fluid sample analyzed for the required cleanliness level.
- ▶ Change the hydraulic fluid if the required cleanliness level is not reached. If a laboratory test is not carried out after the running-in phase, it is recommended to change the hydraulic fluid.

### **8.3 Recommissioning after standstill**

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

The following criteria may make recommissioning necessary:

- Air and/or water in the hydraulic system
  - Old hydraulic fluid
  - Other contamination
- 
- ▶ Before recommissioning, proceed as described in chapter 8.1 “Initial commissioning” on page 43.

## 9 Operation

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

## 10 Maintenance and repair

### **NOTICE**

#### **Overdue inspection and maintenance work!**

Risk of property damage!

- ▶ Perform the specified inspection and maintenance work at the intervals described in this manual.

### 10.1 Cleaning and care

### **NOTICE**

#### **Damage to seals and electrical system due to mechanical effects!**

The jet of a high-pressure cleaner may damage the seals and electrical system of the axial piston unit!

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

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

- ▶ Check whether all seals and plug-in connections are securely seated to ensure no moisture can penetrate into the axial piston unit during cleaning.
- ▶ Use only water and, if necessary, a mild cleaning agent to clean the axial piston unit. Never use solvents or corrosive cleaning agents.
- ▶ Remove major external contamination and keep clean sensitive and important components, such as solenoids, valves, displays and sensors.

## 10.2 Inspection

In order for the axial piston unit to be reliable and long-lasting, Bosch Rexroth recommends inspecting the hydraulic system and axial piston unit on a regular basis, and documenting and archiving the following operating conditions:

**Table 13: Inspection schedule**

| Task to be performed |                                                                                                                                                                                                                                                | Interval                                                      |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Hydraulic system     | Check hydraulic fluid level in the reservoir.                                                                                                                                                                                                  | Daily                                                         |
|                      | Check the operating temperature under comparable load condition at the drain port and in the reservoir.                                                                                                                                        | Weekly                                                        |
|                      | Conduct analysis of hydraulic fluid: Viscosity, aging and contamination                                                                                                                                                                        | Yearly or every 2000 operating hours (whichever occurs first) |
|                      | Check filter.<br>The replacement interval may vary depending on the degree of contamination of the hydraulic fluid.<br>We recommend using a contamination indicator.                                                                           | Yearly or every 1000 operating hours (whichever occurs first) |
| Axial piston unit    | Check axial piston unit for leakage.<br>Early detection of hydraulic fluid loss can help to find faults on the machine/system and rectify them.<br>This is why Bosch Rexroth recommends always keeping the axial piston unit and system clean. | Daily                                                         |
|                      | Check axial piston unit for unusual noise development.                                                                                                                                                                                         | Daily                                                         |
|                      | Check fastening elements for tight seating.<br>All fasteners have to be checked when the hydraulic system is switched off, depressurized and cooled down.                                                                                      | Monthly                                                       |

## 10.3 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 (whichever 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 to the service life of the bearings used. You can ask your local contact person about service life based on load cycle. You can find their contact information under [www.boschrexroth.com/addresses](http://www.boschrexroth.com/addresses). Based on these details, a maintenance interval should be determined by the system manufacturer for the replacement of the bearings and included in the maintenance schedule of the hydraulic system.

## 10.4 Repair

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

Repairs on the axial piston unit and its assembled parts should only be performed by service centers certified by Bosch Rexroth.

- Only use original spare parts from Rexroth to repair the Rexroth axial piston units, otherwise the functional reliability of the axial piston unit cannot be guaranteed and the warranty will be voided.

For questions regarding repairs, contact your proper Bosch Rexroth service partner or the service department of the factory that manufactured the axial piston unit; see chapter 10.5 “Spare parts” on page 49.

## 10.5 Spare parts



### Use of unsuitable spare parts!

Spare parts that do not meet the technical requirements specified by Bosch Rexroth can cause injury and property damage!

- Only use original spare parts from Rexroth to repair the Rexroth axial piston units, otherwise the functional reliability of the axial piston unit cannot be guaranteed and the warranty will be voided.

The spare parts lists for axial piston units are order-specific. When ordering spare parts, specify 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 proper Bosch Rexroth Service partner or the service department of the factory that manufactured the axial piston unit.

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Spare parts can be found online at [www.boschrexroth.com/eshop](http://www.boschrexroth.com/eshop)

For general inquiries, please contact your local contact person, you can find the address under [www.boschrexroth.com/adresses](http://www.boschrexroth.com/adresses)

# 11 Removal and replacement

## 11.1 Required tools

Removal can be performed using standard tools. No special tools are necessary.

## 11.2 Preparing for removal

1. Decommission the entire system as described in the instruction manual for the machine or system.
  - Relieve pressure in the hydraulic system according to the instructions of the machine or system manufacturer.
  - Make sure the relevant system components are depressurized and dead.
2. Secure the entire system against being re-energized.

## 11.3 Removal

Proceed as follows to remove the axial piston unit:

1. Make sure you have the appropriate tools and wear personal protective equipment.
2. Allow the axial piston unit to cool down until it can be removed without danger.
3. For below-reservoir installation, before removing the axial piston unit from the entire system, seal the connection to the reservoir or drain the reservoir.
4. Place a drip tray under the axial piston unit to collect any hydraulic fluid that may leak.
5. Disconnect the lines and collect the escaping hydraulic fluid in the drip tray.
6. Remove the axial piston unit. Use a suitable lifting device.
7. Completely drain the axial piston unit.
8. Plug all openings.

## 11.4 Preparing components for storage or further use

- Proceed as described in chapter 6.2 “Storing the axial piston unit” on page 24.

## 12 Disposal

Careless disposal of the axial piston unit, the hydraulic fluid and the packaging material can result in environmental pollution.

Observe the following when disposing of the axial piston unit:

1. Completely drain the axial piston unit.
2. Dispose of the axial piston unit and packaging material in accordance with the regulations in your country.
3. Dispose of the hydraulic fluid in accordance with the regulations of your country. Also observe the applicable safety data sheet for the hydraulic fluid.
4. Disassemble the axial piston unit into its constituent parts for proper recycling.
5. For example, separate into the following:
  - Castings
  - Steel
  - Aluminum
  - Non-ferrous metal
  - Electronic waste
  - Plastic
  - Seals

## 13 Extension and conversion

Do not convert the axial piston unit. This is also including a modification of the setting screws.

Changes to settings on the customer side should only be made using the product-specific setting instructions.



The warranty from Bosch Rexroth only applies to the product as delivered. The warranty will be voided if the unit is modified or extended.



Adjusting the setting screws will render the warranty void. If you need to change the settings, please contact your local contact person; you can find their contact information under [www.boschrexroth.com/adresses](http://www.boschrexroth.com/adresses)

# 14 Troubleshooting

Table 14 is intended to help you with troubleshooting. This table is not exhaustive. Issues may occur in practice that are not listed here.

Only authorized personnel may perform troubleshooting inside a safety area designated by the machine manufacturer.

## 14.1 How to proceed for troubleshooting

- ▶ Preferably perform the troubleshooting with reduced operating data (e.g. slowly swinging in or out and slow pressure increase).
- ▶ Use a systematic and targeted approach, even when pressed for time. Random, indiscriminate removal and changing of settings could make it impossible to determine the original cause of the fault.
- ▶ First get a general idea of how your product works in conjunction with the entire system.
- ▶ Try to find out whether or not the product was working properly in conjunction with the entire system before the fault occurred.
- ▶ Try to determine any changes to the entire system in which the product is installed:
  - Were there any changes to the product's application conditions or operating range?
  - Has maintenance work recently been carried out? Is there an inspection or maintenance log?
  - Have any changes (e.g. upgrades) or repairs been made to the overall system (machine/system, electronics, control) or to the product? If yes, which?
  - Has the hydraulic fluid been changed?
  - Has the product or machine been used as intended?
  - How does the malfunction appear?
- ▶ Try to get a clear idea of the cause of the fault. Directly ask the (machine) operator.
- ▶ Document the work carried out.
- ▶ If you cannot rectify the fault, get in touch with one of the contact addresses found at:  
[www.boschrexroth.com/addresses](http://www.boschrexroth.com/addresses).

## 14.2 Malfunction table

**Table 14: Axial piston unit malfunction table**

| Malfunction                  | Possible cause                                                                                                                                                                                                                                                             | Remedy                                                                                                                                      |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Unusual noises               | Insufficient air bleeding of the hydraulic system                                                                                                                                                                                                                          | Fill the axial piston unit, suction line for the hydraulic pump and the reservoir                                                           |
|                              |                                                                                                                                                                                                                                                                            | Completely air bleed the axial piston unit and hydraulic system                                                                             |
|                              |                                                                                                                                                                                                                                                                            | Check correct installation position                                                                                                         |
|                              | Insufficient suction conditions, for example, insufficient dimensioning of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, foreign particles in the suction line, impermissible filter in the suction line | Machine/system manufacturer: check the system, for example, optimize inlet conditions, use suitable hydraulic fluid                         |
|                              |                                                                                                                                                                                                                                                                            | Fill the suction line with hydraulic fluid                                                                                                  |
|                              |                                                                                                                                                                                                                                                                            | Remove foreign particles from the suction line                                                                                              |
|                              | Drive speed too high                                                                                                                                                                                                                                                       | Machine/system manufacturer: Reduce drive speed                                                                                             |
|                              | Wrong direction of rotation                                                                                                                                                                                                                                                | Machine/system manufacturer: Check correct direction of rotation; see chapter 7.4.1 "Preparation" on page 31                                |
|                              | Improper mounting of the axial piston unit                                                                                                                                                                                                                                 | Check the mounting of the axial piston unit according to the specifications of the machine/system manufacturer – observe tightening torques |
|                              | Improper mounting of assembled parts, hydraulic lines or improper installation of the coupling                                                                                                                                                                             | Mount assembled parts according to the information provided by the coupling fitting manufacturer                                            |
|                              | Valve and controller vibrations                                                                                                                                                                                                                                            | Optimize the adjustment of the axial piston unit and the pressure limitation in the hydraulic system                                        |
|                              | Mechanical damage to the axial piston unit (e.g. bearing damage)                                                                                                                                                                                                           | Replace axial piston unit                                                                                                                   |
|                              |                                                                                                                                                                                                                                                                            | Contact Bosch Rexroth Service                                                                                                               |
| Increased, unusual vibration | Bearings worn                                                                                                                                                                                                                                                              | Contact Bosch Rexroth Service                                                                                                               |

**Table 14: Axial piston unit malfunction table**

| <b>Malfunction</b>      | <b>Possible cause</b>                                                                                                                                                                                                                                                      | <b>Remedy</b>                                                                                                       |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| No or insufficient flow | Insufficient air bleeding of the hydraulic system                                                                                                                                                                                                                          | Fill the axial piston unit, suction line for the hydraulic pump and the reservoir                                   |
|                         |                                                                                                                                                                                                                                                                            | Completely air bleed the axial piston unit and hydraulic system                                                     |
|                         | Faulty mechanical drive (for example, defective coupling)                                                                                                                                                                                                                  | Contact machine/system manufacturer                                                                                 |
|                         | Drive speed too low                                                                                                                                                                                                                                                        | Contact machine/system manufacturer                                                                                 |
|                         | Insufficient suction conditions, for example, insufficient dimensioning of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, foreign particles in the suction line, impermissible filter in the suction line | Machine/system manufacturer: check the system, for example, optimize inlet conditions, use suitable hydraulic fluid |
|                         |                                                                                                                                                                                                                                                                            | Fill the suction line with hydraulic fluid                                                                          |
|                         |                                                                                                                                                                                                                                                                            | Remove foreign particles from the suction line                                                                      |
|                         | Hydraulic fluid not in optimal viscosity range                                                                                                                                                                                                                             | Machine/system manufacturer: Check temperature range and use suitable hydraulic fluid                               |
|                         | Insufficient pilot pressure or control pressure                                                                                                                                                                                                                            | Check pilot pressure or control pressure                                                                            |
|                         |                                                                                                                                                                                                                                                                            | Contact Bosch Rexroth Service                                                                                       |
|                         | Malfunction of the control device or controller of the axial piston unit                                                                                                                                                                                                   | Contact Bosch Rexroth Service                                                                                       |
|                         | Control of the control device defective                                                                                                                                                                                                                                    | Check control (contact machine/system manufacturer or Bosch Rexroth Service)                                        |
|                         | Wear or mechanical damage to the axial piston unit                                                                                                                                                                                                                         | Replace axial piston unit                                                                                           |
|                         |                                                                                                                                                                                                                                                                            | Contact Bosch Rexroth Service                                                                                       |

**Table 14: Axial piston unit malfunction table**

| <b>Malfunction</b>                           | <b>Possible cause</b>                                                                                                                                                                                                                                                      | <b>Remedy</b>                                                                                                       |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| No or insufficient pressure                  | Insufficient air bleeding of the hydraulic system                                                                                                                                                                                                                          | Fill the axial piston unit, suction line for the hydraulic pump and the reservoir                                   |
|                                              |                                                                                                                                                                                                                                                                            | Completely air bleed the axial piston unit and hydraulic system                                                     |
|                                              |                                                                                                                                                                                                                                                                            | Check correct installation position                                                                                 |
|                                              | Faulty mechanical drive (for example, defective coupling)                                                                                                                                                                                                                  | Contact machine/system manufacturer                                                                                 |
|                                              | Drive power too low                                                                                                                                                                                                                                                        | Contact machine/system manufacturer                                                                                 |
|                                              | Insufficient suction conditions, for example, insufficient dimensioning of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, foreign particles in the suction line, impermissible filter in the suction line | Machine/system manufacturer: check the system, for example, optimize inlet conditions, use suitable hydraulic fluid |
|                                              |                                                                                                                                                                                                                                                                            | Fill the suction line with hydraulic fluid                                                                          |
|                                              |                                                                                                                                                                                                                                                                            | Remove foreign particles from the suction line                                                                      |
|                                              | Hydraulic fluid not in optimal viscosity range                                                                                                                                                                                                                             | Machine/system manufacturer: Check temperature range and use suitable hydraulic fluid                               |
|                                              | Insufficient pilot pressure or control pressure                                                                                                                                                                                                                            | Check pilot pressure or control pressure                                                                            |
|                                              |                                                                                                                                                                                                                                                                            | Contact Bosch Rexroth Service                                                                                       |
|                                              | Malfunction of the control device or controller of the axial piston unit                                                                                                                                                                                                   | Contact Bosch Rexroth Service                                                                                       |
| Pressure/flow fluctuations/<br>instabilities | Control of the control device defective                                                                                                                                                                                                                                    | Check control (contact machine/system manufacturer or Bosch Rexroth Service)                                        |
|                                              | Wear or mechanical damage to the axial piston unit                                                                                                                                                                                                                         | Replace axial piston unit                                                                                           |
|                                              |                                                                                                                                                                                                                                                                            | Contact Bosch Rexroth Service                                                                                       |
|                                              | Output unit defective (e.g. hydraulic motor or cylinder)                                                                                                                                                                                                                   | Contact machine/system manufacturer                                                                                 |
|                                              | Insufficient air bleeding of the hydraulic system                                                                                                                                                                                                                          | Fill the axial piston unit, suction line for the hydraulic pump and the reservoir                                   |
|                                              |                                                                                                                                                                                                                                                                            | Completely air bleed the axial piston unit and hydraulic system                                                     |
|                                              |                                                                                                                                                                                                                                                                            | Check correct installation position                                                                                 |
|                                              | Insufficient suction conditions, for example, insufficient dimensioning of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, foreign particles in the suction line, impermissible filter in the suction line | Machine/system manufacturer: check the system, for example, optimize inlet conditions, use suitable hydraulic fluid |
|                                              |                                                                                                                                                                                                                                                                            | Fill the suction line with hydraulic fluid                                                                          |
|                                              |                                                                                                                                                                                                                                                                            | Remove foreign particles from the suction line                                                                      |
|                                              | Valve and controller vibrate                                                                                                                                                                                                                                               | Optimize the adjustment of the axial piston unit and the pressure limitation in the hydraulic system                |
|                                              | Unstable control signal                                                                                                                                                                                                                                                    | Contact machine/system manufacturer or Bosch Rexroth Service                                                        |
|                                              | Malfunction in the control devices or the controller                                                                                                                                                                                                                       | Contact Bosch Rexroth Service                                                                                       |

Table 14: Axial piston unit malfunction table

| Malfunction                                                 | Possible cause                                                                                                                                           | Remedy                                                                                                                                                        |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Excessively high temperature of hydraulic fluid and housing | Excessively high inlet temperature at the axial piston unit                                                                                              | Machine/system manufacturer: inspect system, e.g. malfunction in the cooler, insufficient hydraulic fluid in the reservoir                                    |
|                                                             | Wrong setting or malfunction in the pressure relief and pressure control valves (e.g. high-pressure relief valve, pressure cut-off, pressure controller) | Optimize the adjustment of the pressure limitation and pressure control valves of the axial piston unit and the pressure safeguarding in the hydraulic system |
|                                                             |                                                                                                                                                          | Contact Bosch Rexroth Service                                                                                                                                 |
|                                                             |                                                                                                                                                          | Contact machine/system manufacturer                                                                                                                           |
|                                                             | Axial piston unit worn                                                                                                                                   | Replace axial piston unit; contact Bosch Rexroth Service                                                                                                      |

## 15 Technical data

The permissible values of the technical data of your axial piston unit can be found in data sheets 92701 and 92711.

The data sheets can be found on the internet at  
[www.boschrexroth.com/mediadirectory](http://www.boschrexroth.com/mediadirectory)

Additional information can be found in the Mobile Hydraulics  
online product catalog: [www.boschrexroth.com/axial-piston-pumps](http://www.boschrexroth.com/axial-piston-pumps)  
Industrial Hydraulics: [www.boschrexroth.com/ics](http://www.boschrexroth.com/ics)

Order-related technical data for your axial piston unit can be found in the order confirmation.

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