

The Drive & Control Company

**Rexroth**  
Bosch Group

## Axial piston variable pump A4CSG

Series 3x

**Instruction manual**  
RE 92105-01-B/06.2017

Replaces: –.–  
English



Knowledge is POWER – Motion Force Control is our Business

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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 is valid for the following product:


- Axial piston variable pump A4CSG Series 3x (standard version).

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





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

- Read this documentation completely and in particular the chapter 2 “Safety instructions” on page 8 and chapter 3 “General instructions on damage to property and the product” 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 technical data relevant to the Axial piston variable pump A4CSG ordered.  | –   | Order confirmation   |
|  <b>Installation drawing</b><br>Contains the outer dimensions, all ports and the hydraulic circuit diagram for your Axial piston variable pump A4CSG.  | Please request the installation drawing from your contact at Bosch Rexroth. | Installation drawing |
|  <b>Axial piston variable pump A4CSG</b><br>Contains the permissible technical data.   | 92105   | Data sheet           |
|  <b>Mineral oil-based hydraulic fluids and related hydrocarbons</b><br>Describes the requirements on a mineral oil-based hydraulic fluid and related hydrocarbons for operation with Rexroth hydraulic components, and assists you in selecting a hydraulic fluid for your hydraulic system. | 90220   | 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           |

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## 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. To give you a better understanding they are explained in the sections below.

### 1.3.1 Safety instructions




This documentation includes safety instructions in chapter 2.6 “Product-specific safety instructions” on page 11 and in chapter 3 “Alphabetical index” on page 15 and before a sequence of actions or an instruction for action involving a risk of personal injury or damage to equipment. The described danger prevention measures must be observed.

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<br>▶ <List> |

- **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 the safety instructions are not complied with
- **Precautions:** states how the danger can be avoided



Table 2: Hazard classes as defined in ANSI Z535.6-2006

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

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

### 1.3.3 Designations

This documentation uses the following designations:

Table 4: Designations

| Designation     | Meaning  |
|-----------------|--|
| A4CSG           | Axial piston variable pumpClosed circuit                             |
| 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 A4CSG”, the designation “axial piston unit” will be 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> tmosphere <b>e</b> xplosible)   |
| DIN          | <b>D</b> eutsche <b>I</b> ndustrie <b>N</b> orm (German Institute for Standardization)  |
| EP           | <b>E</b> lectrohydraulic control with <b>P</b> roportional solenoid and 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   |
| RD           | <b>R</b> exroth document in the <b>D</b> eutsch (German) 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 according to the generally accepted rules of current technology. There is, however, still a danger of personal injury or property damage if this chapter and the safety instructions in this documentation are not complied with.

- ▶ Read this documentation completely and thoroughly before working with the axial piston unit.
- ▶ Keep this documentation 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 in the sense of 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 may 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 closed circuit.

- ▶ Observe the technical data, the application and operating conditions and the performance limits as specified in data sheet 92105 and in the order confirmation. Information about approved hydraulic fluids can be found in data sheet 92105.

The axial piston unit is only intended for professional use and not for private use. Intended use includes having read and understood the complete documentation, especially chapter 2 "Safety instructions" on page 8.

### 2.3 Improper use

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

Bosch Rexroth AG is not liable for damages resulting from improper use. The user shall bear all risks arising from improper use.

Similarly, the following foreseeable forms of misuse are deemed faulty usage:

- Use outside the operating parameters approved in the data sheet 92105 or in the order confirmation (unless customer-specific approval has been granted)
- The axial piston variable pump A4CSG is, except for momentary pressure reduction, not approved for motor/reversing operation.
- Use of non-approved fluids, for example, 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 (for example, sensors) generally cannot come into contact with water.
- Use of the axial piston unit under a continuous pressure differential between case to ambient pressure greater than 2 bar, whereby the ambient pressure must always be lower than the case pressure. Momentary ( $t < 0.1$  s) pressure peaks of up to 10 bar are permitted. Beyond this, the maximum case pressure specified on the data sheet cannot 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/EC
- 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 documentation require basic knowledge of mechanics, electrics, hydraulics and ATEX, as well as knowledge of the associated technical terms. For transporting and handling the product, additional knowledge is necessary with regard to working with lifting devices and their slings. 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 persons are those who can recognize possible dangers and take the appropriate safety measures due to their professional training, knowledge, and experience, as well as their understanding of the relevant regulations pertaining to the work to be done. Skilled personnel must follow the rules relevant to their field and have the necessary hydraulics expert knowledge.

Hydraulic expert knowledge includes:

- Reading and fully understanding hydraulic circuit diagrams,
- especially fully understanding the relationships with regard to safety devices
- and 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: <http://www.boschrexroth.com/training>.

## 2.5 General safety instructions

- Observe the applicable accident prevention and environmental protection regulations.
- Observe the safety regulations and provisions 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.
- Persons who install, operate, remove or maintain Rexroth products may not be under the influence of alcohol, drugs or medication that may affect their reaction time.
- Only use genuine Rexroth accessories and spare parts to ensure there is no hazard to persons due to 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 injury to personnel or property damage. For this reason, only use the product in safety-relevant applications if this use is expressly specified and permitted in the product documentation, for example in explosion protection applications or in safety-related parts of a control system (functional safety).
- You may only commission the product if it has been determined that the end product (for example, 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 (for example, 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 that these are properly implemented.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. When a direct current is applied, solenoids do not cause electromagnetic interference nor is their operation impaired by electromagnetic interference. Other behavior can result when a modulated direct current (e.g. PWM signal) is applied. Potential electromagnetic interference for persons (e.g. persons with a pacemaker) and other components must be tested by the machine manufacturer.

## 2.6 Product-specific safety instructions

The following safety instructions apply to chapters 6 to 14.

### **WARNING**

#### **Danger from excessively high pressure!**

Risk of death or injury, or property damage!

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

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

- ▶ Changes to the factory settings must only be made by Bosch Rexroth specialists.
- ▶ If the axial piston unit is equipped with a pressure cut-off and/or a pressure controller, this is not an adequate back-up against pressure overload.
- ▶ Set the external pressure relief valve so that the permissible maximum pressure cannot be exceeded, see data sheet 92105.
- ▶ Set the cracking pressure of the high-pressure relief valve to a value not lower than 30 bar above the setting of the pressure controller.

#### **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 injuries, for example, crushing or broken bones or damage to the product.

- ▶ Make sure that the forklift truck or lifting device has adequate lifting capacity.
- ▶ Never stand or put your hands under a suspended load.
- ▶ 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 work and health protection and transportation.

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

Danger to life or risk of injury, serious injuries when working on machines/systems not secured! Risk of property damage!

- ▶ Switch off the entire system and secure it against reconnection according to the parameters provided by the machine/system manufacturer.
- ▶ Make sure that all relevant components of the hydraulic system are depressurized. Follow the parameters given by the machine/system manufacturer.
- ▶ 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 and components as long as the hydraulic system is under pressure.

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## **WARNING**

### **Escaping oil mist!**

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

- ▶ Depressurize the relevant machine/system part 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 that any escaped 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 set up the relevant part of the machine/system so that it is free of electrical voltage before you install the product or when connecting and disconnecting connectors. Protect the machine/system against being re-energized.

### **Restriction of the 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 that 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) during normal application conditions.

- ▶ Always wear hearing protection when in the vicinity of the operating axial piston unit.

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

Risk of burning!

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

### **Improper routing of cables and lines!**

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, for example, tearing of lines and connectors.

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

### **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 observe 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 machine/system leakage!**

Risk of burns and risk of injury due to escaping oil jet!

- ▶ Depressurize the relevant machine/system part and repair the leak.
- ▶ Never attempt to block or seal the leak or oil 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 and provisions in your country.

All pieces of personal protective equipment must be intact.

## 3 General instructions on damage to property and the product

The following instructions apply to chapters 6 to 14.

### **NOTICE**

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

Product can get damaged!

- ▶ Do not expose the product to excessive 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 (for example, sensors or valves).
- ▶ Do not strike sealing surfaces (for example, at working ports).
- ▶ Leave the protective covers on the axial piston unit until you connect the lines.
- ▶ Disconnect all electrical connectors before electro-welding or painting operations.
- ▶ Make sure that the electronic components (for example, sensors) do not become electrostatically charged (for example, during painting operations).

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

Damage or destruction of product possible!

- ▶ 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. Air inclusions in the forward drive shaft bearing are to be prevented, especially with the installation position "drive shaft upwards".
- ▶ Check the hydraulic fluid level in the housing area regularly; if necessary, recommission. With above-reservoir installation, the housing area may drain via the drain line after longer periods of disuse (air enters via the shaft seal) or via the working line (gap leakage). This means the bearings are insufficiently lubricated when the system is turned on.

## NOTICE

### Mixing of hydraulic fluids!

Product can get damaged!

- ▶ Before installation, remove all fluids from the axial piston unit to prevent mixing with the hydraulic fluid used in the machine/system.
- ▶ Any mixing of hydraulic fluids from different manufacturers or different types from the same manufacturer is generally not permitted.

### Contamination of the 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 fully 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 must be installed in clean condition.
- ▶ Use only clean connections, hydraulic lines and assembled parts (e.g. measuring devices).
- ▶ No contamination may enter the ports when they are plugged.
- ▶ Before commissioning, make sure that all hydraulic connections are tight and that all of the seals and plug-in connections are installed correctly to ensure that they are leak proof and fluids and foreign particles are prevented from penetrating 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 get damaged!

- ▶ Plug all openings with the appropriate protection equipment 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 the high-pressure cleaner on sensitive components, for example, 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 result in environmental pollution.

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



## NOTICE

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

Product can get 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.

### **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 filling and draining the hydraulic fluid.
- ▶ Use an oil binding agent if hydraulic fluid is spilled.
- ▶ Observe the parameters in the safety data sheet for the hydraulic fluid and the specifications provided by the system manufacturer.

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

Nearby products can become damaged! Components which heat up (for example, 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 do not get damaged.

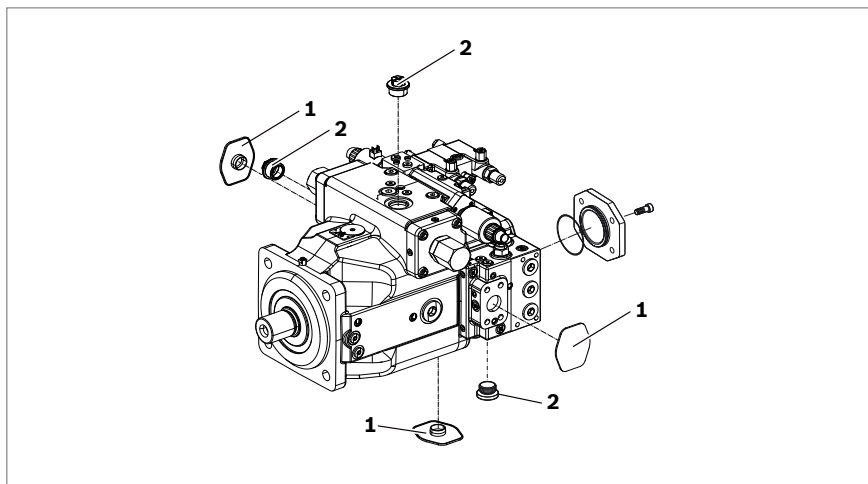
The warranty only applies to the delivered configuration.

The entitlement to warranty cover will be rendered void if the product is incorrectly installed, commissioned or operated, or if it is used or handled improperly.

### **3.1 Operator's obligations**

The operator has the obligation to check in the order confirmation that the axial piston unit supplied corresponds to the ordering details.

## 4 Scope of delivery



**Fig. 1: Axial piston unit**

The following is included in the scope of delivery:

- Axial piston unit as per order confirmation

The following parts are also assembled prior to delivery:

- Protective covers (1)
- Protective plug/threaded plug (2)
- For version with through drive, metallic protection cover and mounting bolts

## 5 About this product

### 5.1 Performance description

The Axial piston variable pump generates, controls and regulates a hydraulic fluid flow. It is designed for stationary applications.

Refer to data sheet 92105 and the order confirmation for the technical data, operating conditions and operating limits of the axial piston unit.

### 5.2 Product description

The A4CSG is a variable pump with axial piston rotary group in swashplate design for hydrostatic drives in closed circuits. The flow is proportional to the drive speed and displacement.

The flow can be changed steplessly by controlling the swashplate (cradle) (14). For axial piston units in swashplate design, the cylinder (11) with pistons (12) is to be aligned axially to the drive shaft (1).

**Closed circuit** In the closed circuit, the hydraulic fluid flows from the hydraulic pump to the consumer, e.g. hydraulic motor and from there directly back to the hydraulic pump. There is then a high-pressure side (7) and a low-pressure side (9), which can change according to loading. The integrated boost pump (8) feeds into the low pressure side and compensates for volumetric losses.

#### 5.2.1 Layout of the axial piston unit

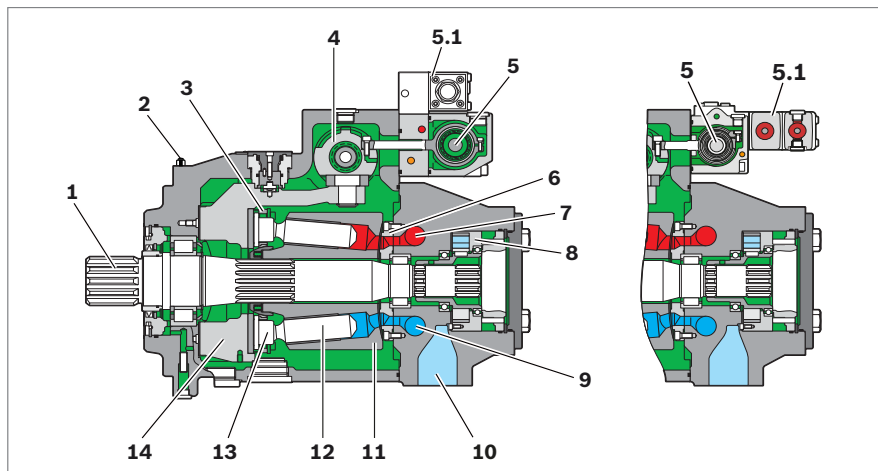


Fig. 2: Layout of A4CSG ; example NG 500 left, NG 355 right

- |   |  |                           |
|---|--|---------------------------|
| 1 Drive shaft   | 4 Stroking piston                      | 9 Low-pressure side       |
| 2 Ground terminal<br>(2 additional ground<br>terminals are located<br>on the solenoids) | 5 EP control module                    | 10 Suction port           |
| 3 Retaining plate   | 5.1 Pressure control                   | 11 Cylinder               |
|   | 6 Control plate<br>(distributor plate) | 12 Piston                 |
|   | 7 High-pressure side                   | 13 Slipper pad            |
|   | 8 Boost pump                           | 14 Swashplate<br>(cradle) |

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## 5.2.2 Functional description

**Pump** Torque and rotational speed are applied to the drive shaft (1) by a drive motor. The drive shaft is connected by splines to the cylinder (11) to set this in motion. With every revolution, the pistons (12) 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 (3). The pitch of the swashplate 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 high-pressure side (7) the hydraulic fluid is pushed out of the cylinder chamber and into the hydraulic system by the pistons. At the same time, hydraulic fluid flows into the growing piston chamber on the low-pressure side (9). In a closed circuit, supported by the return flow and boost pressure.

**Control** The swivel angle of the cradle (14) is infinitely variable. Controlling the swashplate swivel angle changes the piston stroke and, therefore, the displacement. Controlling the swashplate through the neutral position will change the direction of flow (making reversing operation possible). The swivel angle is controlled hydraulically via the stroke piston (4). The cradle is mounted in swivel bearings for easy motion and the neutral position is spring-centered. Increasing the swivel angle increases the displacement; reducing the angle results in a corresponding reduction in displacement.



Various control devices are available depending on requirements. Information about this can be found in data sheet 92105.

## 5.3 Product identification

### 5.3.1 Name plate of the axial piston unit

The axial piston unit can be identified by the name plate. The following example shows an A4CSG name plate:

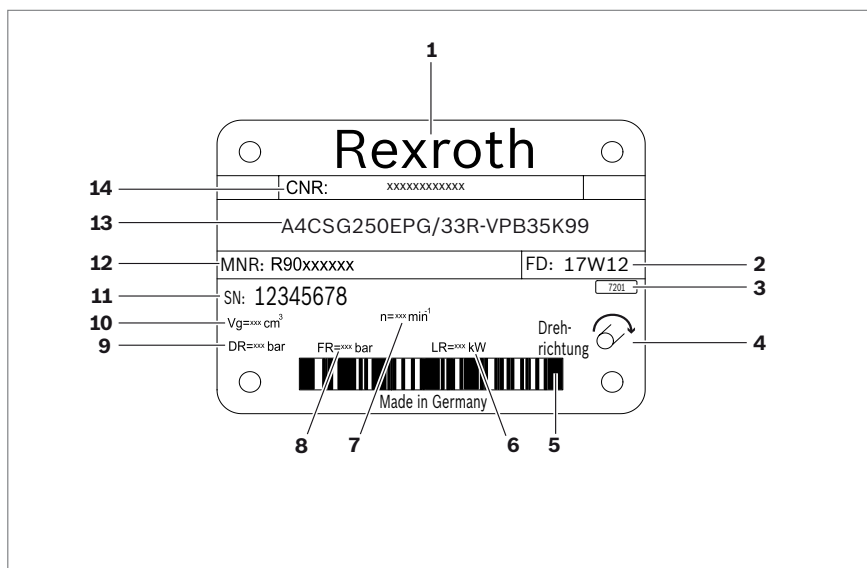


Fig. 3: Name plate A4CSG

- |  |  |
|--|--|
| <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> Minimum 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

### ! CAUTION

#### Risk of damage!

Striking or impact forces could damage the axial piston unit.

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

- ▶ Always observe the required ambient conditions for transport and storage, see chapter 6.2 "Validity of the documentation" on page 24.



Information on unpacking can be found in chapter 7.1 "Unpacking" on page 27.

### 6.1 Transporting the axial piston unit

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

- Manual transport (chapter not relevant for this axial piston unit)
- Transporting with a lifting device (eye bolt or lifting strap)

#### Dimensions and weights

Table 6: Dimensions and weights

| Size   |    | 250   | 355 | 500 |
|--------|----|---|-----|-----|
| Weight | kg | 250   | 245 | 350 |
| 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. The precise weight can be found on the name plate.

#### 6.1.1 Transporting by hand

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

**CAUTION!** Danger from heavy loads!

Health hazard from carrying axial piston units.

- ▶ Use suitable lifting, lowering and moving methods.
- ▶ Wear your personal protective equipment (e.g. safety goggles, safety gloves, suitable working clothes, safety shoes).
- ▶ Do not use sensitive assembled parts to transport the axial piston unit (for example, 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**

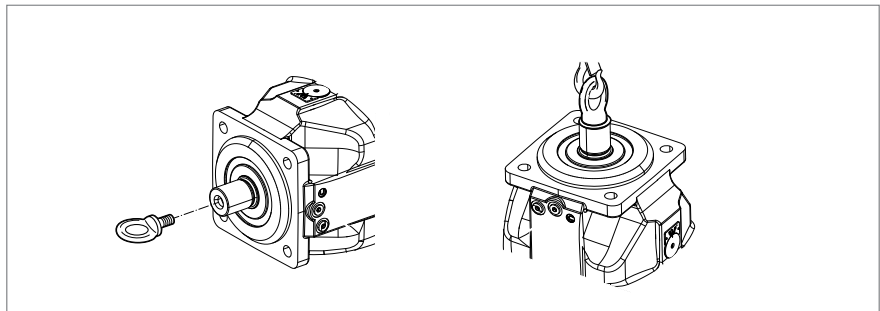
For transporting, the axial piston unit can be connected to a lifting device via an eye bolt or a lifting strap.

**Transport with eye bolt**

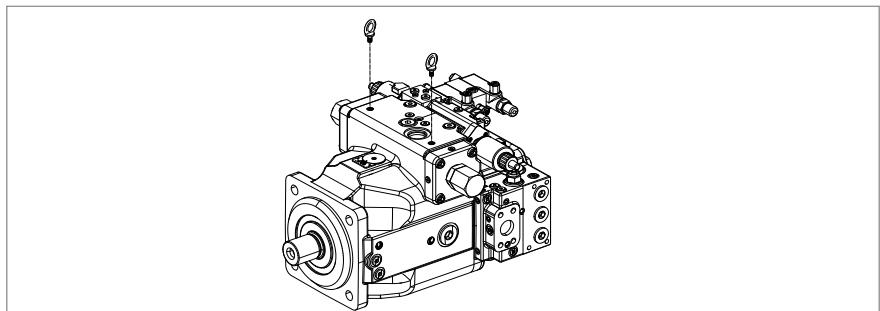
The axial piston unit can be transported suspended from an eye bolt screwed into the drive shaft as long as only outward (pulling) axial forces are applied.

- ▶ 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 stated in the installation drawing.
- ▶ Make sure that the eye bolt can bear the total weight of the axial piston unit plus 20%.

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



**Fig. 4: Mounting the eye bolt in the drive shaft for NG 250 to 355**



**Fig. 5: Mounting the eye bolt in the housing for NG 500 to 1000**

## Transport 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 injuries.

- ▶ 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 oscillations.
- ▶ Never stand or put your hands under a suspended load.
- ▶ Place the lifting strap around the axial piston unit in such a way that it neither passes over the assembled parts (e.g. valves, sensors) nor that the axial piston unit is hung from assembled parts.

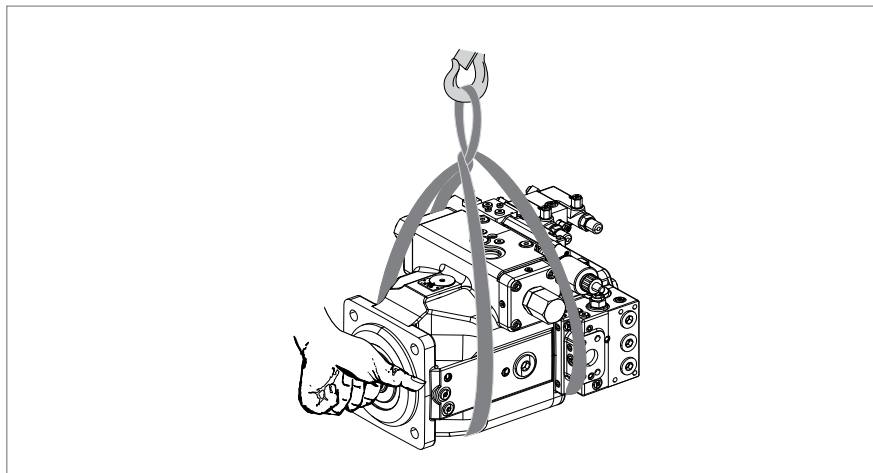


Fig. 6: Transport with the lifting strap

## 6.2 Storing the axial piston unit

### Requirements

- The storage areas must be free of corrosive materials and gases.
- To prevent damage to the seals, ozone-forming equipment (for example, mercury-vapor lamps, high voltage equipment, electric motors, sources of electrical sparks or electrical discharge) must not be operated in storage areas.
- The storage areas must be dry.  
Recommended relative humidity  $\leq 60\%$ .
- Ideal storage temperature:  $+5\text{ }^{\circ}\text{C}$  to  $+20\text{ }^{\circ}\text{C}$ .
- Minimum storage temperature:  $-40\text{ }^{\circ}\text{C}$  (exception: units with on-board electronics)
- Maximum storage temperature:  $+60\text{ }^{\circ}\text{C}$ .
- 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 assembled parts, for example, 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 are provided with corrosion protection packaging at the factory (corrosion protection film).  
Table 7 lists the maximum permissible storage times for an originally packed 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 an even temperature between +5 °C and +20 °C. Undamaged and sealed corrosion protection film. | Maximum 12 months             | Maximum 24 months                         |



Warranty is void if the requirements and storage conditions are not observed or after expiration of the maximum storage time (see Table 7).

Procedure after expiration of the maximum storage time:

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 leak-tightness.
3. If the storage time exceeds 24 months, the shaft seal must be replaced.



After expiration of the maximum storage time, we recommend that you have the axial piston unit inspected by your Bosch Rexroth service partner.

In the event of questions regarding repair and spare parts, contact your responsible Bosch Rexroth service partner or the service department of the manufacturer's plant for the axial piston unit, see chapter 10.4 "Repair" on page 54.

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



The following instructions only refer to axial piston units which are operated with a mineral oil-based hydraulic fluid. Other hydraulic fluids require preservation measures that are specifically designed for them. In such cases, consult Bosch Rexroth Service, see chapter 10.4 "Repair" on page 54 for the address.

Bosch Rexroth recommends the following procedure:

1. Clean the axial piston unit, see chapter 10.1 "Validity of the documentation" on page 49.
2. Empty the axial piston unit.
3. For storage periods up to 12 months: Coat the inside of the axial piston unit with mineral oil and fill with about 100 ml mineral oil.  
For storage periods up to 24 months: Fill the axial piston unit with corrosion protection VCI 329 (20 ml).  
Filling is performed via the drain port **T** or **R(L)**, see chapter 7.4 "Validity of the documentation", Fig. 12 on page 39.
4. Plug all ports so they are airtight.

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5. Moisten the unpainted areas of the axial piston unit with mineral oil or suitable, easily removable corrosion protection, for example, 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.

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## 7 Installation

Prior to installation, the following documents must be to hand:

- Installation drawing for the axial piston unit (can be obtained from your contact 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 92105 for the axial piston unit (contains the permissible technical data)

### 7.1 Unpacking

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

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

Improperly opening the packaging can result in parts falling out, which can become 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 material according to the national regulations in your country.

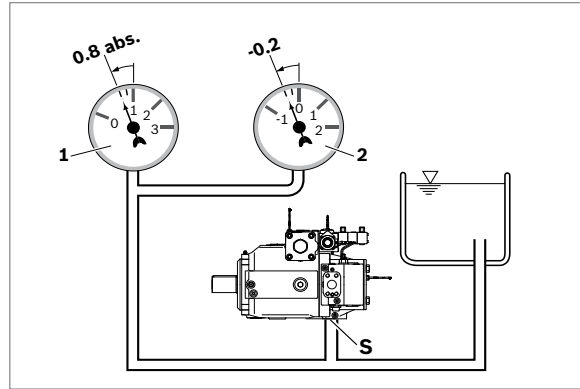
### 7.2 Installation conditions

The installation position and position of the axial piston unit essentially determine the procedures during installation and commissioning (such as when filling and air bleeding the axial piston unit).

- ▶ Fix the axial piston unit so that the expected forces and torques can be transferred without any danger. The machine/system manufacturer is responsible for dimensioning the fasteners.
- ▶ Observe the permissible radial forces on the drive shaft when driving with radial loading (belt drives). If necessary, the belt pulley must be stored separately.
- ▶ Make sure that the axial piston unit is air bled and filled with hydraulic fluid during commissioning and operation. Do this also after relatively long standstill periods, since the axial piston unit may drain through the hydraulic lines.
- ▶ The leakage in the housing area must be directed to the reservoir via the highest drain port. Use the line size which is appropriate for the port.
- ▶ A check valve in the drain line is only permissible on a case-by-case basis upon request. Please consult your responsible contact person at Bosch Rexroth.
- ▶ To achieve favorable noise values, decouple all connecting lines from all vibration-capable components (for example, reservoir) using elastic elements.
- ▶ Make sure that the suction, drain, and return lines flow into the reservoir below the minimum fluid level in all operating conditions. This will prevent air from being drawn in and foam from being formed.

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- Make sure that a minimum suction pressure of 0.8 bar absolute is present at port **S** during operation and after a cold start for all installation positions and installation locations of the axial piston pump; see Fig. 7. See data sheet 92105 for other pressure values.



**Fig. 7: Boost pump suction pressure**

- 1 Absolute pressure gauge
- 2 Standard pressure gauge (relative)



The suction conditions improve with below-reservoir installation.

- Make sure that the working environment at the installation site is completely free of dust and foreign substances. The axial piston unit must be installed in clean condition. 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 difficult-to-remove contamination. Cleaning agents must not enter the hydraulic system.

### 7.3 Installation position

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



Before installation, fill the pump housing in a horizontal position. Port **T** to the reservoir plugged. Filling options when installed with shaft end upward: Fill via **R(L)** and air bleed **T**, then plug port **R(L)**.



With installation positions 3 and 4, 8 and 9, it is to be expected that the control or regulation is influenced. Due to gravity, dead weight and case pressure, minor characteristic shifts and actuating time changes may occur.

#### 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 minimum fluid level of the reservoir.



Recommended installation position: 1 and 2.

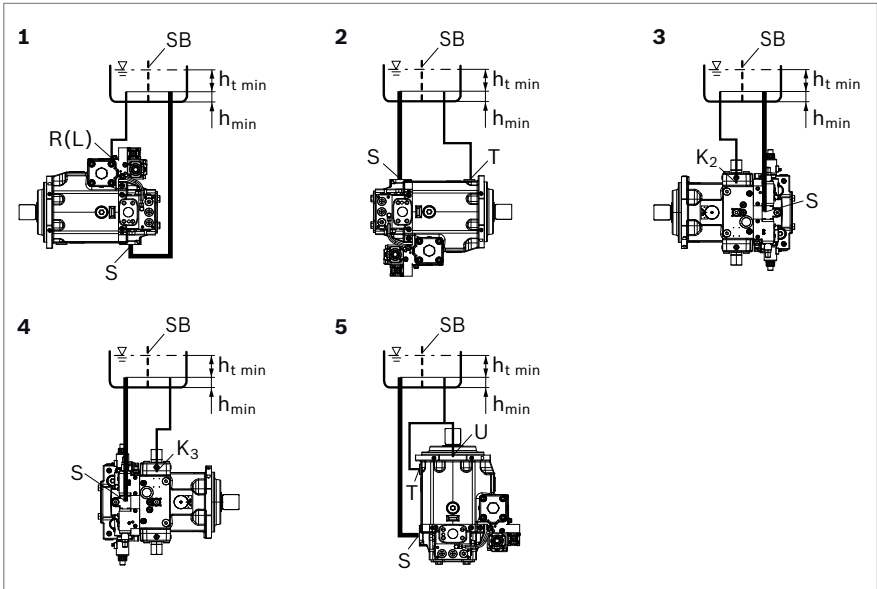


Fig. 8: Below-reservoir installation A4CSG with installation positions 1–5

|                                     |                       |                                |  |
|-------------------------------------|-----------------------|--------------------------------|--|
| <b>T, R(L),</b>                     | Highest drain port    | <b><math>h_{t\ min}</math></b> | Minimum required immersion depth (200 mm)              |
| <b>K<sub>2</sub>, K<sub>3</sub></b> | (leakage)             | <b><math>h_{min}</math></b>    | Minimum required distance to reservoir bottom (100 mm) |
| <b>S</b>                            | Suction port          |                                |  |
| <b>SB</b>                           | Baffle (baffle plate) |                                |  |

Table 8: Below-reservoir installation

| Installation position             | Filling/air bleeding the housing <sup>1)</sup> |
|-----------------------------------|--|
| 1 (drive shaft horizontal)        | R(L)   |
| 2 (drive shaft horizontal)        | Plug T; R(L)                                   |
| 3 (drive shaft horizontal)        | Plug K <sub>2</sub> ; R(L)                     |
| 4 (drive shaft horizontal)        | Plug K <sub>3</sub> ; R(L)                     |
| 5 (drive shaft vertically upward) | Plug T; R(L)                                   |

<sup>1)</sup> To air bleed the stroking chamber, use the highest port on the control.

7.3.2 Above-reservoir installation

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

## CAUTION

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

Adequate lubrication must be provided to avoid damage to the axial piston unit.

- ▶ Make sure that the housing is completely filled with hydraulic fluid during commissioning and during operation with the installation position "drive shaft upwards" (e.g. no air inclusions).
- ▶ Check the hydraulic fluid level in the housing area regularly; if necessary, recommission. With above-reservoir installation, the housing area may drain via the drain line after longer periods of disuse (air enters via the shaft seal) or via the working line (gap leakage). The bearings are thus insufficiently lubricated when recommissioning.
- ▶ Make sure that the suction line is always filled with hydraulic fluid during commissioning and operation.
- ▶ Make sure that the bearing flushing is working properly for above-tank installation and in all installation positions with "drive shaft upwards". To do this, check, for example, the flushing pressure or the minimum flushing flow, see data sheet 92105.



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

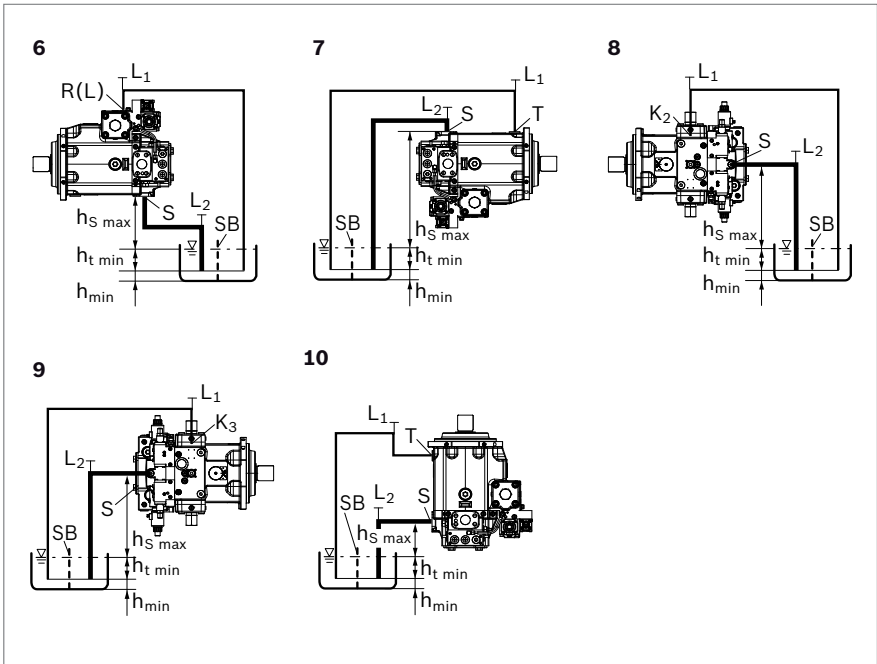


Fig. 9: Above-reservoir installation A4CSG with installation positions 6–10

|  |                              |                          |  |
|--|------------------------------|--------------------------|--|
| <b>L<sub>1</sub>, L<sub>2</sub></b>          | Filling / air bleeding       | <b>h<sub>t min</sub></b> | Minimum required immersion depth (200 mm)              |
| <b>T, R(L), K<sub>2</sub>, K<sub>3</sub></b> | Highest drain port (leakage) | <b>h<sub>min</sub></b>   | Minimum required distance to reservoir bottom (100 mm) |
| <b>S</b>                                     | Suction port                 | <b>h<sub>S max</sub></b> | Maximum permissible suction height (800 mm)            |
| <b>SB</b>                                    | Baffle (baffle plate)        |                          |  |

Table 9: Above-reservoir installation

| Installation position              | Filling/air bleeding the housing <sup>1)</sup> |
|------------------------------------|--|
| 6 (drive shaft horizontal)         | R (L)  |
| 7 (drive shaft horizontal)         | Plug T; R(L)                                   |
| 8 (drive shaft horizontal)         | Plug K <sub>2</sub> ; R(L)                     |
| 9 (drive shaft horizontal)         | Plug K <sub>3</sub> ; R(L)                     |
| 10 (drive shaft vertically upward) | Plug T; R(L)                                   |

<sup>1)</sup> To air bleed the stroking chamber, use the highest port on the control.

## 7.4 Installing the axial piston unit

### 7.4.1 Preparation

1. Check the specifications on the name plate of the axial piston unit to see if the correct type of variable pump is present.
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 Bosch Rexroth Service for clarification, see chapter 10.4 "Repair" on page 54 for the address.

3. Before installing, completely empty the axial piston unit to prevent mixing with the hydraulic fluid used in the machine/system.
4. Check the permissible 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.

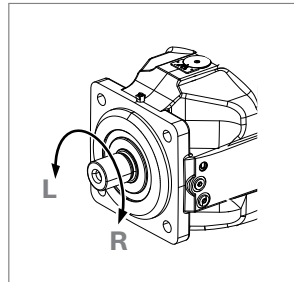


Fig. 10: Direction of rotation

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



The direction of rotation as specified 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 you can expect certain installation positions to affect the control device. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in response time.



- Torsional vibrations and speed variations may cause leakages on the shaft seal and increased rotary angular accelerations 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 a large part 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 subsequential 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 impermissible rotary angular accelerations. Depending on the frequency and temperature, they may result in leakage on 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 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 operational conditions, particularly at cold start. If this is not possible, separate drain lines must be laid, if necessary. (Please refer to chapter 8).

The type of installation to be 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
- with cardan shaft

#### 7.4.4 Installation with coupling

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

**NOTICE!** Danger from improper handling!  
Product can get damaged!

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

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



The drive shaft of the axial piston unit is equipped with a 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 coupling on the output shaft of the machine in accordance with the specifications provided by the coupling manufacturer.



The axial piston unit must not be tightened down 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 that there is no angular deviation.
8. Make sure that no impermissible axial and radial forces act on the drive shaft.
9. For bell housing installation, check the coupling axial play through the bell window according to 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 flexible couplings, check that the drive is free of resonance 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:

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

#### For attachment via gear wheel or helically-toothed shaft

No gearing forces higher than the permissible axial and radial forces are to act on the shaft, if necessary the gear wheel must be supported separately at the gearbox output.

#### 7.4.6 Installation with cardan shaft

To connect the axial piston unit to the drive motor via 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 impermissible 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. Position the cardan shaft on the output shaft of the drive motor.
3. Push the axial piston unit to the cardan shaft and position the cardan shaft on the drive shaft of the axial piston unit.
4. Bring the axial piston unit to the installation position and secure. If necessary, details on the required tools and tightening torques for the mounting bolts can be obtained from the system manufacturer.

#### 7.4.7 Completing installation

1. Remove any mounted transport screws.

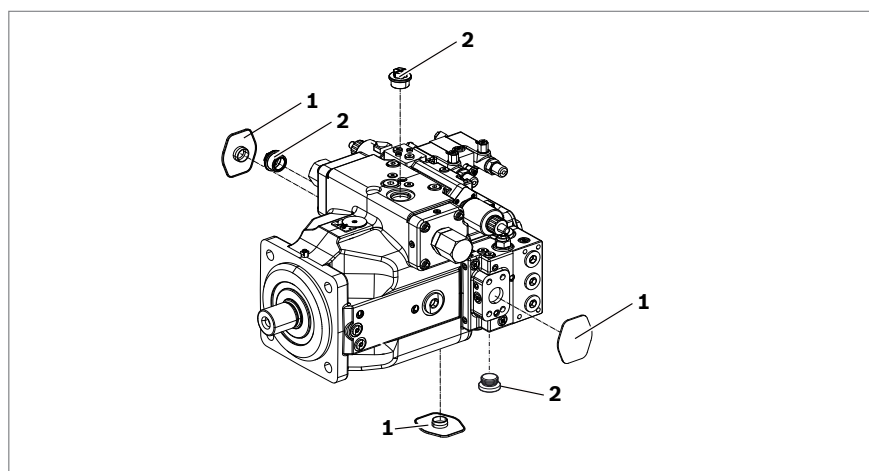
**CAUTION!** Operation with protective plugs!

Operating the axial piston unit with protective plugs may result in injuries 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 protective 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 manufacturer's plant for the axial piston unit.



**Fig. 11: Removing transport protection**

- 1** Protective covers                      **2** Protective plugs/threaded plugs



Ports intended for connecting lines are provided with protective plugs or threaded plugs, which serve as transport protection. All ports required for functional operation must be connected (see Table 10 “Ports A4CSG series 1x and 3x” on page 39). Failure to do so could lead to malfunctions or damage. If a port is not connected, it must be plugged with a threaded plug because protective plugs are not pressure-resistant.



The setting screws are protected against unintentional adjustment by caps. Adjusting the setting screw will void the warranty. If you need to change settings, contact your Bosch Rexroth service partner, for the address, see chapter 10.4 “Repair” on page 54.

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

## 7.4.8 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 that the necessary suction pressure is not undercut. 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, if these are fitted (regularly check the filter element's level of contamination)

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

The ports and fastening threads are designed for the maximum permissible pressures  $p_{max}$ , see Table 10 "Ports A4CSG series 1x and 3x" on page 39. The machine/system manufacturer must ensure that 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 are appropriate for the axial piston unit port (pressure level, size, system of units).

#### Notices on routing lines

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

- Lines and hoses must be installed without pre-tension pressure, so that no further mechanical forces are applied during operation that will reduce the service life of the axial piston unit and, if applicable, 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 that the pressure at the suction port does not drop below the minimum 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 regarding external air pressure.
- Pressure line
  - For the pressure lines, use only pipes, hoses and connecting elements rated for the working pressure range specified in the data sheet 92105 (see Table 10).

- Drain line
  - Always route the drain lines so that the housing is constantly filled with hydraulic fluid and to ensure that no air gets through the shaft seal even during extended standstill periods.
  - Under no operating circumstances may the case pressure exceed the maximum values specified for the axial piston unit in the data sheet 92105.
  - The drain line inflow in the reservoir must always be below the minimum fluid level (see chapter 7.3 “Installation position” on page 28).
- If the axial piston unit is equipped with installed screw fittings, these must not be unscrewed. Screw the stud end of the fitting directly into the installed fitting.

**Risk of confusion with threaded connections**

Axial piston units are employed in application areas that use the metric measuring system as well as the Anglo-American (imperial) and the Japanese measuring system (JIS – Japan Industrial Standard). Moreover, various kinds of seal are used. The system of units, the kind of seal and the size of female thread and stud ends (for example, 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 which is of a different measurement system, kind of seal and size with respect to 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

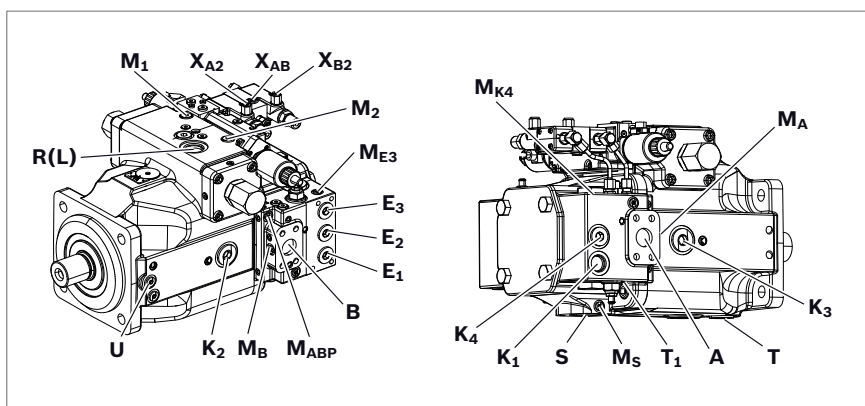


Fig. 12: Port overview A4CSG, EP control

Table 10: Ports A4CSG series 1x and 3x

| Ports <sup>1)</sup> |   | $p_{max}$ [bar] <sup>2)</sup> | State <sup>3)</sup> |
|---------------------|---|-------------------------------|---------------------|
| A, B                | Working port (high-pressure series)<br>Fastening thread | 400                           | O                   |
| S                   | Suction port fastening thread                           | 30                            | O                   |
| MS                  | Suction pressure measurement                            | 30                            | X                   |
| K1                  | Flushing port   | 5                             | O                   |
| K2, K3              | Flushing port   | 4                             | X <sup>4)</sup>     |
| MA, MB, MABP        | Working pressure measurement                            | 400                           | X                   |
| M1, M2              | Control pressure measurement                            | 400                           | X                   |
| E1                  | Filter, supply  | 40                            | X                   |
| E2                  | Filter, return  | 40                            | X                   |
| E3                  | Boost port (external)                                   | 40                            | X                   |
| ME3                 | Boost pressure measurement                              | 40                            | X                   |
| K4                  | Accumulator (external)                                  | 40                            | X                   |
| MK4                 | Flushing pressure measurement                           | 40                            | X                   |
| R(L)                | Fluid filling + air bleeding                            | 4                             | O <sup>4)</sup>     |
| T                   | Fluid drain   | 4                             | X <sup>4)</sup>     |
| T1                  | DB valve relief port                                    |                               | X <sup>4)</sup>     |
| U                   | Flushing port (bearing flushing)                        | 7                             | X                   |
| XA2, XB2, XAB       | Pilot pressure port for pressure controller             | 400                           | O                   |

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

<sup>2)</sup> Short-term pressure spikes 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, K1, K2 or K3 must be connected

## Tightening torques

The following tightening torques apply:

- Fittings:  
Observe the manufacturer's specifications regarding the tightening torques of the used fittings.
- Female threads in the axial piston unit:  
The maximum permissible tightening torques  $M_{G \max}$  are the maximum values of the female threads and must not be exceeded. For values, see Table 11.
- 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 11.
- Mounting bolts:  
For mounting bolts with metric ISO thread according to DIN 13 or thread according to ASME B1.1, we recommend checking the tightening torque in individual cases in accordance with VDI 2230.

**Table 11: Tightening torques for female threads and threaded plugs**

| Ports<br>Standard | Thread size | Maximum permissible<br>tightening torque of the<br>female threads $M_{G \max}$ | Required tightening torque of<br>the threaded plugs $M_v$ | WAF hexagon socket of the<br>threaded plug |
|-------------------|-------------|--|---|--|
| ISO 6149          | M8 x 1      | 10 Nm  | 7 Nm  | 4 mm                                       |
|                   | M10 x 1     | 30 Nm  | 15 Nm   | 5 mm                                       |
|                   | M12 x 1.5   | 50 Nm  | 25 Nm   | 6 mm                                       |
|                   | M14 x 1.5   | 80 Nm  | 45 Nm   | 6 mm                                       |
|                   | M16 x 1.5   | 100 Nm   | 55 Nm   | 8 mm                                       |
|                   | M18 x 1.5   | 140 Nm   | 70 Nm   | 8 mm                                       |
|                   | M20 x 1.5   | 170 Nm   | 80 Nm   | 10 mm                                      |
|                   | M22 x 1.5   | 210 Nm   | 100 Nm  | 10 mm                                      |
|                   | M27 x 2     | 330 Nm   | 170 Nm  | 12 mm                                      |
|                   | M30 x 2     | 420 Nm   | 215 Nm  | 17 mm                                      |
|                   | M33 x 2     | 540 Nm   | 310 Nm  | 17 mm                                      |
|                   | M42 x 2     | 720 Nm   | 330 Nm  | 22 mm                                      |
| DIN 3852          | M48 x 2     | 900 Nm   | 420 Nm  | 22 mm                                      |
|                   | M8 x 1      | 10 Nm  | 7 Nm <sup>1)</sup>  | 3 mm                                       |
|                   | M10 x 1     | 30 Nm  | 15 Nm <sup>2)</sup>                                       | 5 mm                                       |
|                   | M12 x 1.5   | 50 Nm  | 25 Nm <sup>2)</sup>                                       | 6 mm                                       |
|                   | M14 x 1.5   | 80 Nm  | 35 Nm <sup>1)</sup>                                       | 6 mm                                       |
|                   | M16 x 1.5   | 100 Nm   | 50 Nm <sup>1)</sup>                                       | 8 mm                                       |
|                   | M18 x 1.5   | 140 Nm   | 60 Nm <sup>1)</sup>                                       | 8 mm                                       |
|                   | M22 x 1.5   | 210 Nm   | 80 Nm <sup>1)</sup>                                       | 10 mm                                      |
|                   | M26 x 1.5   | 230 Nm   | 120 Nm <sup>1)</sup>                                      | 12 mm                                      |
|                   | M27 x 2     | 330 Nm   | 135 Nm <sup>1)</sup>                                      | 12 mm                                      |
|                   | M33 x 2     | 540 Nm   | 225 Nm <sup>1)</sup>                                      | 17 mm                                      |
|                   | M42 x 2     | 720 Nm   | 360 Nm <sup>1)</sup>                                      | 22 mm                                      |
|                   | M48 x 2     | 900 Nm   | 400 Nm <sup>1)</sup>                                      | 24 mm                                      |



**Table 11: Tightening torques for female threads and threaded plugs**

| Ports<br>Standard | Thread size     | Maximum permissible<br>tightening torque of the<br>female threads $M_{G \max}$ | Required tightening torque of<br>the threaded plugs $M_v$ | WAF hexagon socket of the<br>threaded plug |
|-------------------|-----------------|--|---|--|
| ISO 11926         | 5/16-24 UNF-2B  | 10 Nm  | 7 Nm  | 1/8 in                                     |
|                   | 3/8-24 UNF-2B   | 20 Nm  | 10 Nm   | 5/32 in                                    |
|                   | 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                                    |
|                   | 1 5/16-12 UN-2B | 540 Nm   | 270 Nm  | 5/8 in                                     |
|                   | 1 5/8-12 UN-2B  | 960 Nm   | 320 Nm  | 3/4 in                                     |
|                   | 1 7/8-12 UN-2B  | 1200 Nm  | 390 Nm  | 3/4 in                                     |

<sup>1)</sup> The tightening torques of the threaded plugs  $M_v$  are valid for the delivery condition “dry” and for installation related screw condition “lightly oiled”.

<sup>2)</sup> In the “lightly oiled” state,  $M_v$  is reduced to 10 Nm for M10 x 1 and 17 Nm for M12 x 1.5. For the delivery condition “dry” and for reduced  $M_v$ , 10 Nm for M10 x 1 and 17 Nm for M12 x 1.5, the maximum permissible pressure is 420 bar.

## Procedure

To connect the axial piston unit to the hydraulic system:

1. Remove the protective plugs or threaded plugs at the ports at which the connections are to be made according to the hydraulic circuit diagram.
2. Make sure that 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 43 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 whether all ports are connected or plugged with threaded plugs.
5. Tighten the fittings correctly (note tightening torques!). Mark all correctly tightened fittings, for example, 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 condition for safe working.



For relationship between direction of rotation and flow direction, please refer to data sheet 92105.

## 7.4.9 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.

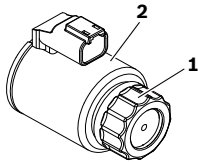
For axial piston units with electrical control and/or mounted sensors, please observe the specifications in data sheet 92105, such as:

- 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 sheet 92105. 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. This is not dependent on the connector version.

To do this, proceed as follows:

1. Loosen the mounting nut with rubber boot (1) on 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 line connectors:

Mounting bolt, M3 (1): 0.5 Nm

Union nut, M16 x 1.5 (2): 1.5-2.5 Nm

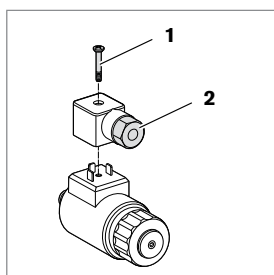


Fig. 13: HIRSCHMANN connector

## 7.5 Performing flushing cycle

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



The flushing cycle must be performed with an additional flushing unit. 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 or 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 must 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 that all electrical and hydraulic ports are connected or plugged.
- ▶ Only commission a completely installed, fully functioning product with original accessories from Bosch Rexroth.

### 8.1 Initial commissioning



During all work for commissioning the axial piston unit, observe the general safety instructions and intended use detailed in chapter 2 "Safety instructions" on page 8.

- ▶ Connect the pressure gauge for the working pressure, case pressure, boost 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 the commissioning process, monitor the temperature of the hydraulic fluid in the reservoir to ensure that it remains within the permissible temperature and 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 correct function.



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

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 90222. The titles of the data sheets can be found in Table 1 "Required and supplementary documentation" on page 5. You can find details on the permissible and optimal viscosity in data sheet 92105.

To ensure the functional reliability of the axial piston unit, cleanliness level 20/18/15 according to at least ISO 4406 is necessary for the hydraulic fluid. For permissible temperatures, see data sheet 92105.

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 hydraulic fluids on delivery do not normally conform to the requirements for our components.

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

2. Fill and air bleed the axial piston unit via the appropriate ports, see chapter 7.3 "Installation position" on page 28. The hydraulic lines of the system must also be filled.

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

Damage or destruction of product possible!

- When using a shut-off valve in the suction and/or drain line, make sure that 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, rotate the drive motor briefly at the lowest rotational speed (inching). Make sure that the direction of rotation of the axial piston unit conforms to the details on the name plate, see chapter 5.3 "Product identification", Fig. 3: Name plate A4CSG on page 21.
  5. Operate the axial piston pump at a lower rotational speed (starter speed for internal combustion engines or inching operation for electric motors) until the hydraulic system is completely filled and air bled. For checking purposes, drain the hydraulic fluid at the drain port and wait until it drains without bubbles.

### 8.1.2 Testing the hydraulic fluid supply

The axial piston unit must always have a sufficient supply of hydraulic fluid. It is therefore essential to check the hydraulic fluid supply via the boost pump at the start of commissioning and to ensure sufficient filling of the closed circuit.

When you test the hydraulic fluid supply, constantly monitor the 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 59.

To test the hydraulic fluid supply:

1. Allow the drive motor to run at the lowest speed (in accordance with data sheet (92105)). The axial piston unit must run without load, i.e. at the lowest permissible working pressure. 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 that the hydraulic system is sealed and can withstand the maximum 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 (92105) for the permissible value.
6. At maximum working pressure, check the case pressure at port **T** or **R(L)**. Refer to data sheet (92105) 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 (for example, lift instead of lower) and thus to corresponding danger 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, you must perform a functional test on 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, it must be ensured that 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, boost pressure, and case pressure.
- ▶ Perform a leak test and heat development test with and without load prior to normal operation.
- ▶ If necessary, disconnect the pressure gauge and plug the ports with the specified threaded plugs.

## 8.2 Running-in phase

### **NOTICE**

#### **Property damage by insufficient viscosity!**

An increased hydraulic fluid temperature may reduce the viscosity values by too much 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 impermissible operating temperatures and/or viscosities occur.
- ▶ Operating temperatures that are too high 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 with increasing operating hours. The volumetric and mechanical-hydraulic efficiency also increases 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, the following procedure is recommended after the running-in phase:

- ▶ After the running-in phase, have a hydraulic fluid sample analyzed for the required cleanliness level.
- ▶ Filter in the bypass until the required cleanliness level has been 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.

Among others, the following criteria may make recommissioning necessary:

- After a period of standstill longer than one hour (to ensure fluid immersion especially with above-reservoir installation)
  - Air and/or water in the hydraulic system
  - Old hydraulic fluid
  - Other contamination
- ▶ For recommissioning, proceed as described in chapter 8.1 “Initial commissioning” on page 44.

## 9 Operation

The 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. Only use the product within the performance range specified in the technical data, see data sheet 92105. The machine/system manufacturer is responsible for the proper project planning of the hydraulic system and its control.

### 9.1 Operating the optional auxiliary activation device



#### WARNING

##### **Risk of injury due to the working movement of a connected consumer!**

- Only operate the auxiliary activation device if it is ensured that it will not trigger any potentially dangerous working movements of the connected consumer!

#### NOTICE

##### **Property damage to the proportional solenoids!**

Property damage to the proportional solenoids!

There is a risk of damage to the proportional solenoids

- Do not actuate the auxiliary activation device with sharp-edged tools! There is a risk of damage to the proportional solenoids.

- The valves of the electro-hydraulic control device are fitted with an auxiliary activation device. This auxiliary activation device can be used to trigger the function of the valve when the proportional solenoid is not actuated.
- The auxiliary activation device is only designed for manual operation and for brief manual actuation; it must not be moved to a specific switch position by means of mechanical equipment for either a longer period of time or permanently.
- The auxiliary activation device is not suitable for frequently recurring manual actuation!
- The auxiliary activation device is located on the side of the proportional solenoid facing away from the valve.



## 10 Maintenance and repair

### **NOTICE**

#### **Inspection and maintenance work overdue!**

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 influences!**

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

- Do not point the high-pressure cleaner at sensitive components, for example, 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 that 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 sensitive and important components, such as solenoids, valves, displays and sensors, clean.

### 10.2 Inspection

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

**Table 12: Inspection schedule**

| Task to be performed |   | Interval  |
|----------------------|---|---|
| Hydraulic system     | Check level of hydraulic fluid 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) |

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| Task to be performed |   | Interval  |
|----------------------|---|---|
| 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. For this reason, Bosch Rexroth recommends that the axial piston unit and system are always kept in a clean condition. | Daily   |
|                      | Check axial piston unit for unusual noise development.  | Daily   |
|                      | Visual inspection for external integrity, housing damage.   | Daily   |
|                      | Check fastening elements for tight seating. All fasteners have to be checked when the hydraulic system is switched off, depressurized and cooled down.  | Monthly   |
|                      | Change the filter element in optionally mounted filters. The replacement interval may vary depending on the degree of contamination of the hydraulic fluid. We recommend using a contamination indicator.   | Half-yearly or every 500 operating hours (whichever occurs first) |

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## 10.3 Maintenance

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

### Changing hydraulic fluid

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.

### Maintenance interval

The service life of the axial piston unit is limited by the service life of the built-in bearings and of the shaft seal.

The maintenance interval for replacing the bearings and the shaft seal is to be observed.

Have the service performed by Bosch Rexroth Service upon reaching the operating hours listed in the following table or every four years, whichever comes first; for the address, see chapter 10.5 "Spare parts" on page 55.

If your application data differs from that shown here, request an individual calculation from your sales engineer.

Table 13: Maintenance interval

| Working pressure [bar] | Rotational speed n [rpm] | Operating hours [h] |
|------------------------|--------------------------|---------------------|
| 350                    | 1800                     | 800                 |
| 200                    | 1800                     | 6000                |

The following diagrams are suitable as an orientation for the service life:

### Size 250

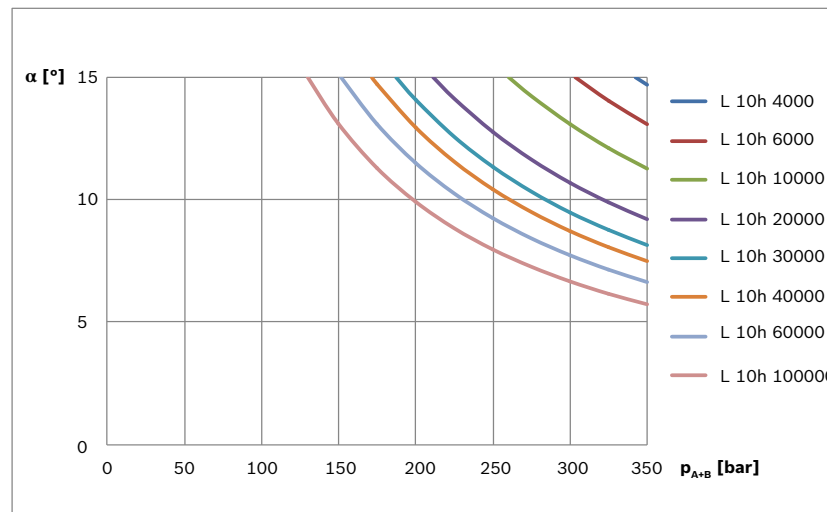


Fig. 14: Service life, size 250 for 1500 rpm

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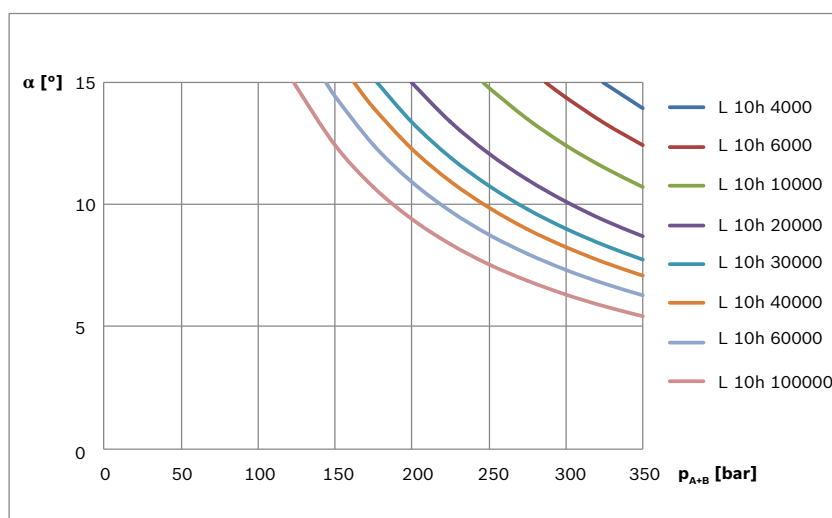


Fig. 15: Service life, size 250 for 1800 rpm

Size 355

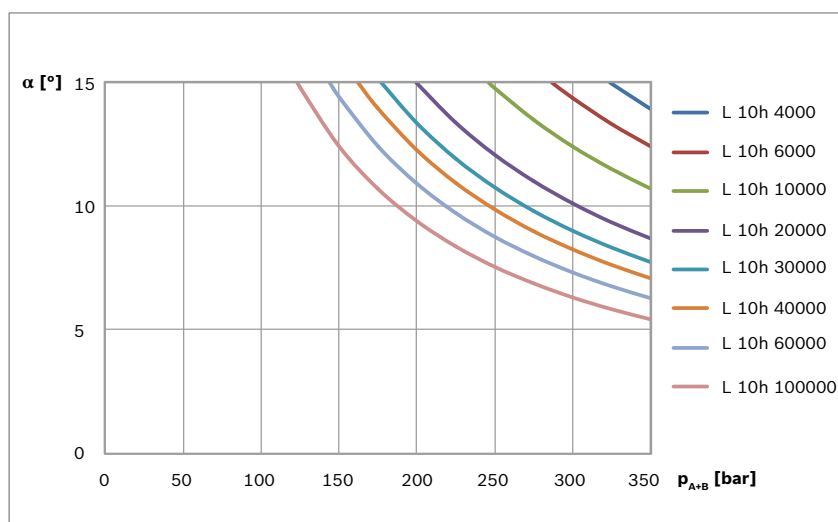


Fig. 16: Service life, size 355 for 1500 rpm

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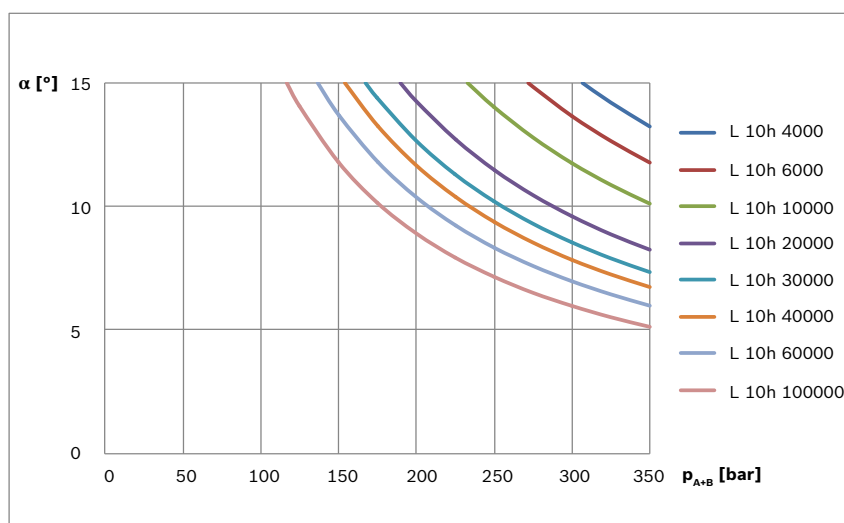


Fig. 17: Service life, size 355 for 1800 rpm

## Size 500

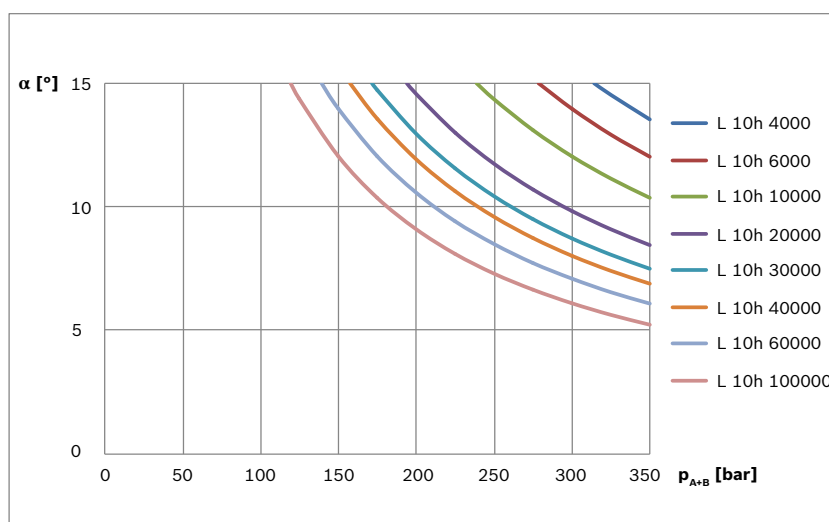
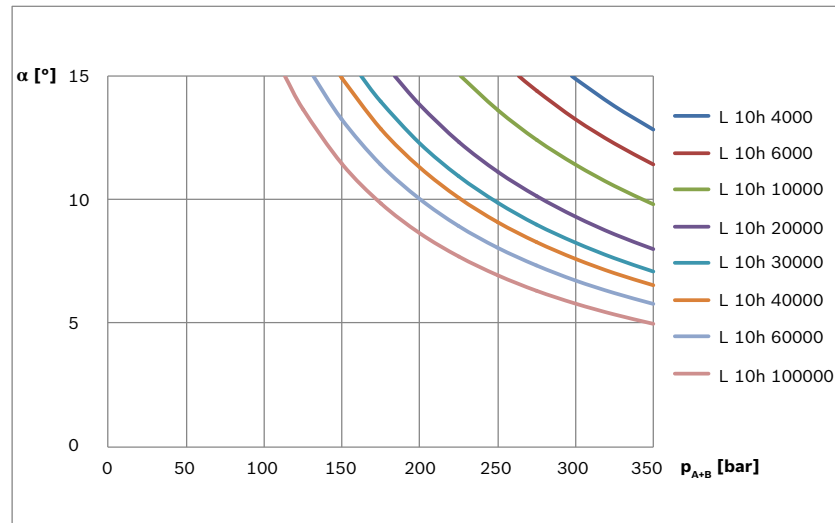


Fig. 18: Service life, size 500 for 1500 rpm



**Fig. 19: Service life, size 500 for 1800 rpm**

The following requirements apply:

- Viscosity  $\nu = 10 \text{ mm}^2/\text{s}$
- Cleanliness level 19/17/14 according to ISO 4406
- Constant load condition

**NOTICE!** Bearing service life!

The L10h value stated in the diagrams is not the guaranteed service life, but rather a time at which there is a 10 % probability of failure at the assumed load.



Maintenance work on the axial piston unit must only be performed by Bosch Rexroth Service; for the address, see chapter 10.5 "Spare parts" on page 55.

## 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 may only be performed by service centers certified by Bosch Rexroth.

- Use exclusively original spare parts from Rexroth to repair the Rexroth axial piston units, otherwise the functional reliability of the axial piston unit cannot be assured and the warranty is void.

In the event of questions regarding repairs, contact your responsible Bosch Rexroth service partner or the service department of the manufacturer's plant for the axial piston unit, see chapter 10.5 "Spare parts" on page 55.

## 10.5 Spare parts

### CAUTION

#### **Use of unsuitable spare parts!**

Spare parts which do not comply with the technical requirements as laid down by Bosch Rexroth can cause injury and property damage.

- Use exclusively original spare parts from Rexroth to repair the Rexroth axial piston units, otherwise the functional reliability of the axial piston unit cannot be assured and the warranty is void.

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

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

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spares.horb@boschrexroth.de

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

If you have general questions, please contact [svm.support@boschrexroth.de](mailto:svm.support@boschrexroth.de)

For addresses in our sales and service network, please refer to  
[www.boschrexroth.com/addresses](http://www.boschrexroth.com/addresses)

## 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 that the relevant system components are not under pressure or voltage.
2. Secure the complete system against being re-energized.

### 11.3 Performing 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 complete 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. Loosen 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 of hydraulic fluid.
8. Plug all openings.

### 11.4 Preparing the 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 points when disposing of the axial piston unit:

1. Completely drain the axial piston unit of hydraulic fluid.
2. Dispose of the axial piston unit and packaging material in accordance with the national regulations in your country.
3. Dispose of the hydraulic fluid according to the national regulations in your country. Also observe the applicable safety data sheet for the hydraulic fluid.
4. Disassemble the axial piston unit into its individual parts and properly recycle these parts.
5. Separate according to the following:
  - Castings
  - Steel
  - Aluminum
  - Non-ferrous metal
  - Electronic waste
  - Plastic
  - Seals

## 13 Extension and conversion

Do not modify the axial piston unit or its assembled parts. This also includes changing the wiring.

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 configuration as delivered. The warranty is void if the unit is modified or extended.



The setting screws are protected against unintentional adjustment by caps. Adjusting the setting screw will void the warranty. If you need to change settings, contact your Bosch Rexroth service partner, for the address, see chapter 10.5 "Spare parts" on page 55.

## 14 Troubleshooting

Table 14 may help you with troubleshooting. This table does not cover everything. 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 with troubleshooting

- ▶ Preferably perform the troubleshooting with reduced operating data (e.g., slowly swinging in or out and slow pressure increase).
- ▶ Proceed in a systematic and purposeful manner, even when pressed for time. Random and imprudent removal and changing of settings could result in the inability to ascertain the original cause of the fault.
- ▶ First obtain a general overview 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 (for example, 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 did 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, contact one of the contact addresses which can be 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, e.g. 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, suction filter too small or blocked | 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  | Check the filter system and change the filter as necessary  |
|                              |   | 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 32                                |
|                              | 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 or fitting manufacturer   |
|                              | Oscillate pressure limitation and pressure control valves of the axial piston unit (boost pressure-relief valve, high-pressure relief valve, pressure cut-off)  | Air bleed the axial piston unit and hydraulic system  |
|                              | Mechanical damage to the axial piston unit (for example, bearing damage)  | Contact Bosch Rexroth Service:<br>Optimize the settings of the pressure relief and pressure control valves                                  |
|                              |   | Replace axial piston unit   |
|                              |   | Contact Bosch Rexroth Service   |
| Increased, unusual vibration | Bearings worn   | Contact Bosch Rexroth Service   |

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

| Malfunction             | Possible cause  | Remedy  |
|-------------------------|---|---|
| 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, e.g. 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, suction filter too small or blocked | 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  |
|                         |   | Check the filter system and change the filter as necessary  |
|                         | Hydraulic fluid not in optimum viscosity range  | Machine/system manufacturer: check temperature range and use suitable hydraulic fluid                               |
|                         | Insufficient boost pressure   | Check boost pressure  |
|                         |   | Contact Bosch Rexroth Service   |
|                         | 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   |

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

| Malfunction                 | Possible cause  | Remedy  |
|-----------------------------|---|---|
| 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, e.g. 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, suction filter too small or blocked | 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 optimum viscosity range  | Check the filter system and change the filter as necessary  |
|                             |   | Machine/system manufacturer: check temperature range and use suitable hydraulic fluid                               |
|                             | Insufficient boost pressure   | Check boost pressure  |
|                             |   | Contact Bosch Rexroth Service   |
|                             | 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   |
|                             | Output unit defective (e.g. hydraulic motor or cylinder)  | Contact machine/system manufacturer   |

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

| Malfunction  | Possible cause  | Remedy  |
|--|---|---|
| Pressure/flow fluctuations/<br>instabilities         | Insufficient air bleeding of the hydraulic system   | Fill the axial piston unit, suction line for the hydraulic pump and the reservoir<br>Completely air bleed the axial piston unit and hydraulic system<br>Check correct installation position   |
|  | Insufficient suction conditions, e.g. 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, suction filter too small or blocked | Machine/system manufacturer: check the system, for example, optimize inlet conditions, use suitable hydraulic fluid<br>Fill the suction line with hydraulic fluid<br>Remove foreign particles from the suction line<br>Check the filter system and change the filter as necessary |
|  | Oscillate pressure limitation and pressure control valves of the axial piston unit (boost pressure-relief valve, high-pressure relief valve, pressure cut-off)  | Air bleed the axial piston unit and hydraulic system<br>Contact Bosch Rexroth Service   |
|  | Unstable control signal   | Contact machine/system manufacturer or Bosch Rexroth Service  |
|  | Malfunction in the control devices or the controller  | Contact Bosch Rexroth Service   |
|  | Excessive inlet temperature at the axial piston unit  | Machine/system manufacturer: inspect system, for example, malfunction in the cooler, insufficient hydraulic fluid in the reservoir  |
|  | Wrong setting or malfunction of the pressure relief and pressure control valves (e.g. high-pressure relief valve, pressure cut-off, pressure controller)  | Optimize the adjustment of the pressure relief and pressure control valves of the axial piston unit and the pressure safeguarding in the hydraulic system<br>Contact Bosch Rexroth Service<br>Contact machine/system manufacturer   |
| Excessive temperature of hydraulic fluid and housing | Flushing flow of the flushing valve too low   | Contact Bosch Rexroth Service   |
|  | 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 the data sheet 92105.

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

Additional information can be found in the online product catalog  
Mobile Hydraulics: [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.





## 16 Alphabetical index

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