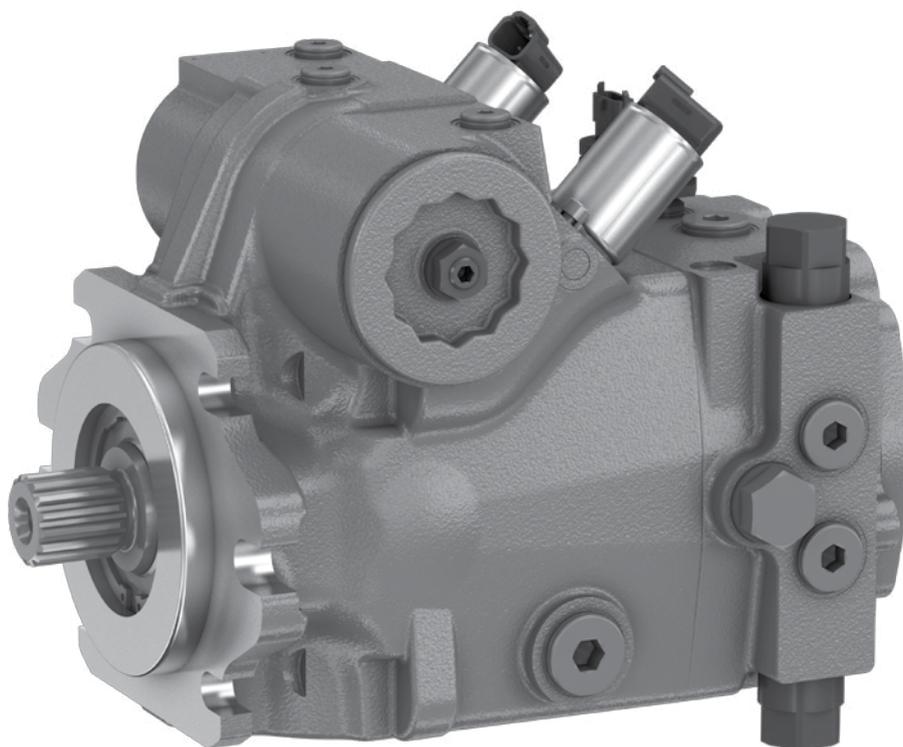


# Axial piston variable pump A4VG

Series 35

**Instruction manual**  
**RE 92035-01-B/04.2018**

Replaces: --  
English



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

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

The original instruction manual was created in the German language.

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# 1 About this documentation

## 1.1 Applicability

This documentation applies to the following products:

- Axial piston variable pump A4VG Series 35

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

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

- ▶ Read this documentation completely, in particular Chapter 2 “Safety instructions” on page 9 and Chapter 3 “General instructions regarding property and product damage” on page 16 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**

	<b>Title</b>	<b>Document number</b>	<b>Document type</b>
	<b>Order confirmation</b> Contains the order-related technical data for your axial piston variable pump A4VG.	–	Order confirmation
	<b>Installation drawing</b> Contains the outer dimensions, all ports and the hydraulic circuit diagram for your axial piston variable pump A4VG.	Please request the installation drawing from your contact at Bosch Rexroth.	Installation drawing
	<b>Axial piston variable pump A4VG</b> Contains the permissible technical data.	92035	Data sheet
	<b>Hydraulic fluids based on mineral oils and related hydrocarbons</b> Describes the requirements on a hydraulic fluid based on mineral oil and related hydrocarbons for operation with Rexroth hydraulic components, and assists you in selecting a hydraulic fluid for your system.	90220	Data sheet
	<b>Environmentally acceptable hydraulic fluids</b> Describes the requirements on an environmentally acceptable hydraulic fluid for operation with Rexroth hydraulic components and assists you in selecting a hydraulic fluid for your hydraulic system.	90221	Data sheet
	<b>Fire-resistant, water-free hydraulic fluids (HFDR/HFDU)</b> Describes the requirements on fire-resistant, anhydrous hydraulic fluids (HFDR/HFDU) for operation with Rexroth hydraulic components and assists you in selecting a hydraulic fluid for your hydraulic system.	90222	Data sheet
	<b>Axial piston units for operation with fire-resistant hydraulic fluids – anhydrous and hydrous (HFDR, HFDU, HFA, HFB, HFC)</b> Describes the requirements on fire-resistant, anhydrous and hydrous hydraulic fluids (HFDR, HFDU, HFA, HFB, HFC) and contains the technical data for operation with Rexroth hydraulic components.	90225	Data sheet

**Table 1: Required and supplementary documentation**

Title	Document number	Document type
 <b>Component class: 92003-CC-0011_ETPump</b> The component class specification explains what data is available, how this data was obtained, and what else should be observed.	92003-CC-0011_ETPump	Component class specification
 <b>BODAS-drive eDA application software</b> BODAS-drive eDA is a software solution integrated in the Rexroth SRC-eDA1/31 control unit for controlling the hydrostatic drive train in wheeled vehicles.	95315	Data sheet
<b>Information on the use of hydrostatic drives at low temperatures</b> 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> Contains additional information on storage and preservation.	90312	Data sheet

### 1.3 Representation of information

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

#### 1.3.1 Safety instructions

This documentation includes safety instructions in chapter 2.6 “Product-specific safety instructions” on page 12 and in chapter 3 “General instructions regarding property and product damage” on page 16 and before a sequence of actions or an instruction for action involving a risk of personal injury or damage to property. Always follow the instructions on avoiding the dangers associated with the use of this product.

Safety instructions are set out as follows:

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

- **Warning sign:** draws attention to the danger
- **Signal word:** identifies the degree of the danger
- **Type and source of danger:** indicates the type and source of the danger
- **Consequences:** describes what occurs if safety instructions are not complied with
- **Precautions:** states how the danger can be avoided

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

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

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

### 1.3.3 Designations

This documentation uses the following designations:

**Table 4: Designations**

Designation	Meaning
A4VG	Axial piston variable pump and closed circuit
Threaded plug	Metal screw, pressure-resistant
Protective plug	Made out of plastic, not pressure-resistant, only for transportation

As umbrella term for “axial piston variable pump A4VG” the designation “axial piston unit” will be used in the following.

### 1.3.4 Abbreviations

This manual uses the following abbreviations:

**Table 5: Abbreviations**

<b>Abbreviation</b>	<b>Meaning</b>
ATEX	EC directive on explosion protection ( <b>A</b> tmosphère <b>e</b> xplosible)
DIN	<b>D</b> eutsches Institut für <b>N</b> ormung (German Institute for Standardization)
ET	Electric control, direct-operated with two pressure reducing valves (PRV)
ISO	<b>I</b> nternational <b>O</b> rganization for <b>S</b> tandardization
RE	<b>R</b> exroth document in the <b>E</b> nglish language
VDI 2230	Standard for the systematic calculation of heavy-duty thread connections and cylindrical screw joints from the VDI ( <b>V</b> erein <b>D</b> eutscher Ingenieure - Association of German Engineers)

## 2 Safety instructions

### 2.1 About this chapter

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

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

### 2.2 Intended use

Axial piston units are hydraulic components, meaning that in their application area they are classified neither as complete nor as partly completed machinery as defined in the EC Machinery Directive (2006/42/EC). The component is exclusively intended to form partly completed machinery or complete machinery together with other components. The component 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 92035 and in the order confirmation. Information about approved hydraulic fluids can be found in data sheet 92035.

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

### 2.3 Improper use

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

Bosch Rexroth AG is not liable for damages resulting from improper use.

The user is solely responsible for any risks arising from improper use.

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

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

- Use of the axial piston unit under a continuous pressure differential between housing and ambient pressure greater than 2 bar, with the ambient pressure always lower than the case pressure. Momentary ( $t < 0.1$  s) pressure peaks of up to 10 bar are allowed, but no more than 1000 pressure peaks over the entire service life. Beyond this, the maximum permissible case pressure specified in the data sheet should not be exceeded.
- Use of the axial piston unit in explosive environments unless the component or machine/system has been certified as compliant with the ATEX directive 2014/34/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 manual require a basic understanding of mechanics, electricity and hydraulics, as well as familiarity with associated technical terms. For transporting and handling the product, additional familiarity with the use of lifting devices and lifting accessories is required. In order to ensure safe use, these activities should only be performed by skilled personnel or an instructed person under the direction and supervision of a skilled person.

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

Hydraulic expert knowledge includes:

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



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

## 2.5 General safety instructions

- Observe 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.
- Do not install, operate, remove or maintain Rexroth products if under the influence of alcohol, drugs or medication that may affect your reaction time.
- Only use genuine Rexroth accessories and spare parts to ensure there is no 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 personal injury or property damage. For this reason, only use the product in safety-relevant applications if this use is expressly indicated and approved in the product documentation, e.g. in explosion protection applications or in safety-related parts of a control system (functional safety).
- Only commission the product if it has been determined that the end product (e.g. machinery or system) in which the Rexroth products are installed complies with the country-specific provisions, safety regulations and standards for the application.
- Use tools appropriate for the work being performed and wear appropriate protective clothing to prevent punctures and cuts (e.g. when removing protective covers, disassembly).
- There is a risk of entanglement when operating the axial piston unit with a bare shaft end. Check whether or not your machine requires additional safety measures for your application. If necessary, make sure 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 maximum permissible pressure.

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

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

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

Risk of death or injury, or property damage!

Improper transportation may cause the axial piston unit to fall down and lead to injuries e.g. crushing or broken bones or damage to the product.

- ▶ Make sure that the load bearing capacity of the lifting device is sufficient to safely bear the weight of the axial piston unit.
- ▶ Never stand or 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 occupational health and safety, and transportation.

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

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

Risk of property damage!

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

## **WARNING**

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

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

- ▶ Depressurize the relevant machine/system component and repair the leak.
- ▶ Only perform welding work when the machine/system is depressurized.
- ▶ Keep open flames and ignition sources away from the axial piston unit.
- ▶ If axial piston units are located in the vicinity of ignition sources or powerful thermal radiators, a shield must be erected to ensure 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 disconnect the relevant part of the machine/system before installing the product or when inserting/removing connectors. Protect the machine/system against being reactivated.

### **Danger from unexpected machine movement!**

Risk of death or injury! Unintentional or careless actuation of the manual override of the solenoids can cause unexpected machine movements.

- ▶ Use the manual override only for functional testing or in the event of technical malfunctions.
- ▶ Using the manual override on a permanent basis (e.g. by wedging, blocking) is not permitted.
- ▶ The use of the manual override is only permitted with limited technical data (e.g. 0.25 × maximum data).
- ▶ Check whether or not your machine requires additional safety measures for your application to avoid unintentional actuation. If necessary, make sure that these are properly implemented.
- ▶ Wear suitable protective clothing.

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

Risk of injury or property damage!

Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. impure hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer meet 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.

## WARNING

### **Risk of pressurized hydraulic fluid leaking or flying components!**

Risk of death or injury! If connecting elements without sufficient high pressure resistance are used, they can cause rupturing and leakage of hydraulic fluid and/or flying components. The ports and fastening threads of the axial piston unit are designed for the specified maximum pressure.

- ▶ Only ever connect connecting elements and lines that match the ports of the axial piston unit and can resist the intended application conditions (e.g. pressure level, flow, hydraulic fluid, temperature) with the necessary safety factors.

## CAUTION

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

Risk of hearing damage or hearing loss!

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

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

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

Risk of burning!

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

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

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

- ▶ Always lay cables and lines 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, toxication 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.

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

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

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

**Danger from improper handling!**

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

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

## 2.7 Personal protective equipment

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

All pieces of personal protective equipment should be intact.

### 3 General instructions regarding property and product damage

The following notices apply to chapters 6 to 14.

#### **NOTICE**

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

Product can be 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 (e.g. sensors or valves).
- ▶ Do not strike sealing surfaces (e.g. working ports).
- ▶ Leave the protective covers on the axial piston unit until you connect the lines.
- ▶ Disconnect all electrical connectors before arc welding or painting.
- ▶ Make sure that the electronic components (e.g. sensors) do not build up electrostatic charges (e.g. during painting).

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

Product can be damaged or destroyed!

- ▶ Never operate the axial piston unit with insufficient hydraulic fluid. Specifically, make sure that the rotary group has sufficient lubrication.
- ▶ When commissioning a machine/system, make sure that the housing area and the working lines of the axial piston unit are filled with hydraulic fluid and remain filled during operation.
- ▶ Check the hydraulic fluid level in the housing area regularly and recommission, if necessary. For above-reservoir installation, the housing area may drain out through the drain line after prolonged standstill periods (air enters through the shaft seal) or through the working line (gap leakage). This means the bearings are insufficiently lubricated when the system is turned on.
- ▶ Make sure that the suction line is always filled with hydraulic fluid during commissioning and operation.

##### **Mixing of hydraulic fluids!**

Product can be damaged!

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

## **NOTICE**

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

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

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

### **Improper cleaning!**

Product can be damaged!

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

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

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

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

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

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

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

## **NOTICE**

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

Risk of environmental pollution and contamination of ground water!

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

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

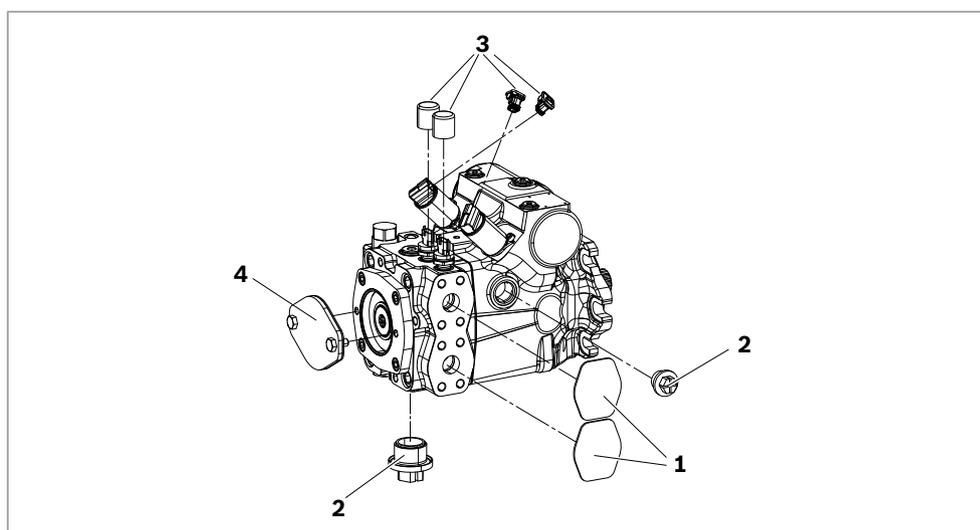
Nearby products can be damaged! Components that heat up (e.g. solenoids) can cause damage to nearby products if they are too close.

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

The warranty only applies to the machine as delivered.

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

## 4 Scope of delivery



**Fig. 1: Axial piston unit**

Scope of delivery includes the following:

- Axial piston unit as per order confirmation

The following parts come assembled on the unit:

- Protective covers **(1)**
- Protective plug/threaded plug **(2)**
- Protective covers for sensors and connectors **(3)**
- For version with through drive, metallic protective cover and mounting bolts **(4)**

## 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 mobile applications such as construction machinery. Refer to data sheet 92035 and the order confirmation for the technical data, operating conditions and operating limits of the axial piston unit.

### 5.2 Product description

The A4VG is a variable pump with an 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 smoothly changed using the control (cradle) (12). For axial piston units with swashplate design, the pistons are arranged axially relative to the drive shaft.

**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 a high-pressure side and a low-pressure side which alternate depending on which side is under load.

#### 5.2.1 Axial piston unit layout

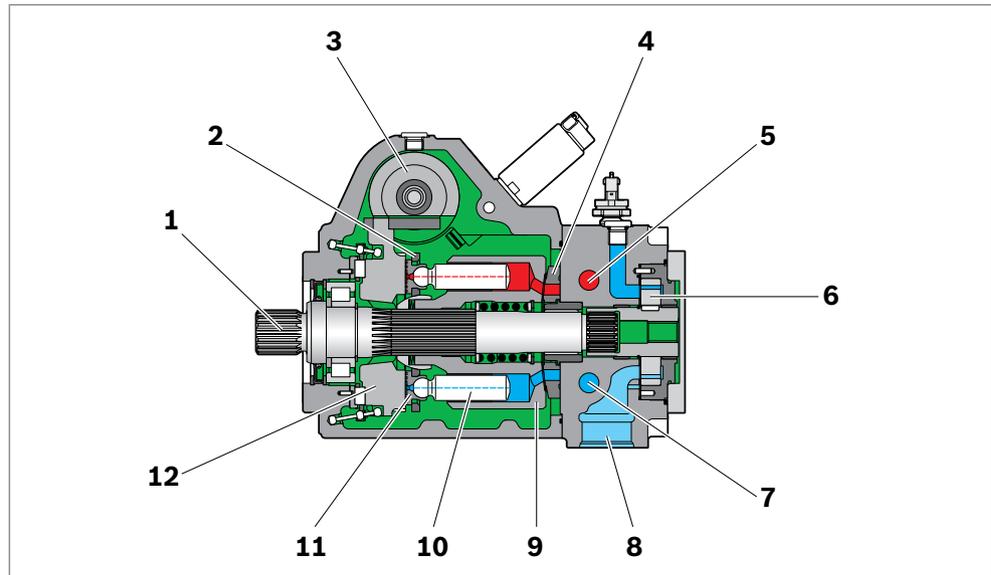


Fig. 2: Series 35 A4VG layout

1 Drive shaft	5 High-pressure side	10 Piston
2 Retaining plate	6 Boost pump	11 Slipper pad
3 Stroking piston	7 Low-pressure side	12 Cradle
4 Control plate (distributor plate)	8 Suction port	
	9 Cylinder	

## 5.2.2 Functional description

<b>Pump function</b>	<p>Torque and rotational speed are applied to the drive shaft <b>(1)</b> by a drive motor. The drive shaft is connected to the cylinder <b>(9)</b> by splines, causing the cylinder to rotate. With every revolution, the pistons <b>(10)</b> perform a stroke in the cylinder bores, the size of which depends on the pitch of the cradle <b>(12)</b>. The slipper pads <b>(11)</b> are held on with the pistons and guided along the glide surface of the cradle by the retaining plate <b>(2)</b>.</p> <p>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.</p> <p>Hydraulic fluid is fed into and out through two control slots in the control plate <b>(4)</b> according to displacement. On the high-pressure side <b>(5)</b>, 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 <b>(7)</b>. In a closed circuit, this is supported by the return flow and boost pressure.</p>
<b>High-pressure safeguarding</b>	<p>The two high-pressure relief valves protect the hydrostatic transmission (pump and motor) from overloading. They limit the maximum pressure in the respective high-pressure line and serve simultaneously as boost valves. High-pressure relief valves are not working valves and are only suitable for pressure peaks or high rates of pressure change.</p>
<b>Version with boost pump</b>	<p>The boost pump <b>(6)</b> continuously supplies a sufficient volume of fluid (boost volume) from a small reservoir to the low-pressure side of the closed circuit via a check valve to replenish the internal leakage of the variable pump and consumer. The boost pump is an internal gear pump which is driven directly via the drive shaft.</p>
<b>Version without boost pump (external boost pressure supply)</b>	<p>In order to replenish the internal leakage in the variable pump and consumers, port <b>G</b> must be connected to an external source of boost pressure.</p> <p>The boost-pressure relief valve is integrated.</p>
<b>Control</b>	<p>The swivel angle of the cradle <b>(12)</b> is infinitely variable. Adjusting the swivel angle changes the piston stroke and, with it, 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 by the stroking piston <b>(3)</b>. The cradle is mounted in swivel bearings for smooth operation and the neutral position is spring-centered. Increasing the swivel angle increases the displacement; reducing the angle results in a corresponding reduction in displacement.</p>



Various control devices are available depending on requirements. Information about them can be found in data sheet 92035.

### 5.3 Bypass function

For vehicles with hydrostatic travel drive, as long as there is no downstream mechanical interruption of the drive train (switch to idle/freewheeling), the flow can be altered using a bypass circuit in order to tow the vehicle out of the immediate danger zone. Turning the corresponding screw allows the hydraulic fluid to flow freely.



If necessary, Bosch Rexroth recommends always activating the bypass function on both pressure relief valves (avoiding a function in only one travel direction). The bypass function must be deactivated again before restarting the machine.

#### 5.3.1 Activating and deactivating the bypass function

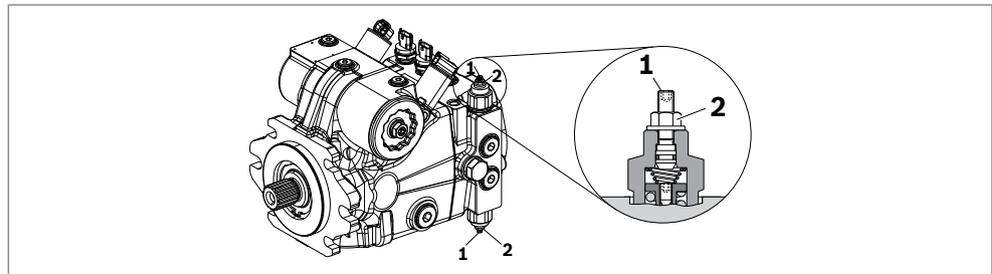


Fig. 3: Activating the bypass function

#### Activating the bypass function

To activate the bypass function:

1. Switch off the combustion engine.
2. Remove the plastic tamper-proof cap from the high-pressure relief valve with a suitable tool (e.g., pliers).
3. Loosen the lock nut (2) by turning it counterclockwise one half-turn with a hexagon head screw (AF 13).
4. Use a hexagon socket wrench (AF 4) to turn the screw (1) clockwise until the screw (1) is against the spring seat. This is indicated by the increased resistance. Then turn the screw (1) one half-turn into the spring seat.
5. Tighten the lock nut (2) clockwise to a torque of 22 Nm.



Removing the plastic tamper-proof cap will destroy it.

**Towing speed** The maximum towing speed depends on the gear ratio in the vehicle and must be calculated by the vehicle manufacturer. Do not exceed a corresponding flow of  $q_v = 30 \text{ l/min}$ .

**Towing distance** Only tow the vehicle out of the immediate danger zone.

**CAUTION!** Excessive heat generation and inadequate lubrication!

Risk of burning or property damage. High towing speeds and long towing distances lead to excessive heat generation and inadequate lubrication. This will overheat and damage the axial piston unit.

- ▶ Wear heat-resistant protective clothing, e.g. gloves.
- ▶ Only tow the vehicle out of the immediate danger zone.

**Deactivating the bypass function**

**NOTICE!** Draining of the hydraulic circuit!

Risk of damage! While towing with the bypass function activated, the closed hydraulic circuit drains itself. This can result in unintended functions when restarting the travel drive.

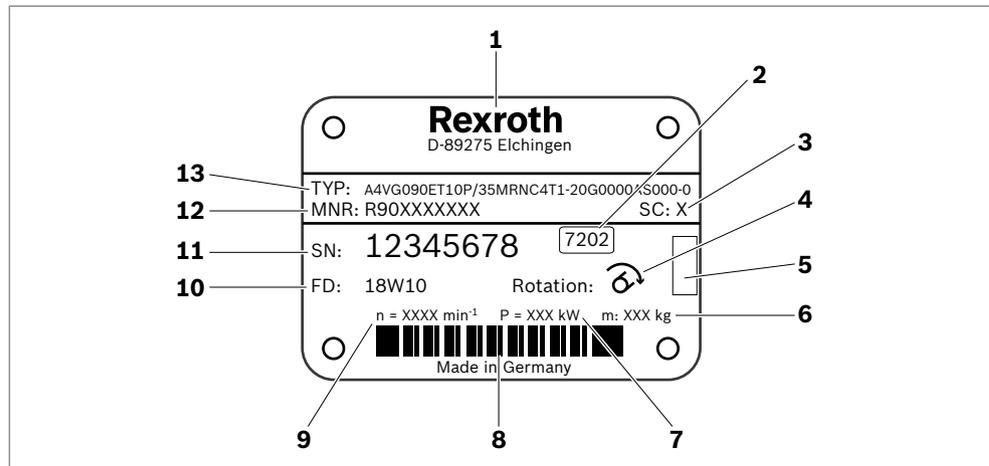
- ▶ Start the travel drive only after completely filling and air bleeding the hydraulic circuit (see Chapter 8.1 “Initial commissioning” on page 44).

To deactivate the bypass function:

1. Immediately following towing, switch off the bypass function.
2. Restore the function of the high-pressure relief valve. To do this, perform the steps under the “Activating the bypass function” in the reverse order: Loosen the lock nut **(2)** with a hexagon head screw (AF 13), then turn the screw **(1)** counterclockwise with a hexagon socket wrench (WAF 4) as far as it will go.
3. Retighten the lock nut **(2)**, turning clockwise to a torque of 22 Nm.
4. Place a tamper-proof cap on the screw **(1)** to protect the pressure relief valve against unauthorized adjustment.

## 5.4 Product identification

The axial piston unit can be identified by the name plate. The following example shows an A4VG name plate:



**Fig. 4: A4VG name plate**

- |  |  |
|--|--|
| <b>1</b> Manufacturer  | <b>8</b> Bar code                                  |
| <b>2</b> Internal factory designation                                    | <b>9</b> Rotational speed                          |
| <b>3</b> Sample category (optional)                                      | <b>10</b> Manufacturing date                       |
| <b>4</b> Direction of rotation (viewed on drive shaft) – here: clockwise | <b>11</b> Serial number                            |
| <b>5</b> Designated area for inspection stamp                            | <b>12</b> Material number of the axial piston unit |
| <b>6</b> Weight (optional)   | <b>13</b> Type code                                |
| <b>7</b> Power   |  |

## 6 Transport and storage

- ▶ Always observe the necessary ambient conditions for transport and storage, see Chapter 6.2 “Storing the axial piston unit” on page 28.



Information on unpacking can be found in Chapter 7.1 “Unpacking” on page 30.

### 6.1 Transporting the axial piston unit

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

- Transporting by hand (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		90
Weight	kg	49
Width	mm	Dimensions vary by equipment. The values applicable for your axial piston unit can be found in the installation drawing (request if necessary).
Height	mm	
Depth	mm	

Weight may vary by equipment.

#### 6.1.1 Transporting by hand

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

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

Health hazard from carrying axial piston units.

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

#### 6.1.2 Transporting with a lifting device

For transporting, the axial piston unit can be connected to a lifting device via an eye bolt in the drive shaft or in the housing. Alternatively, it can also be transported with a lifting strap.



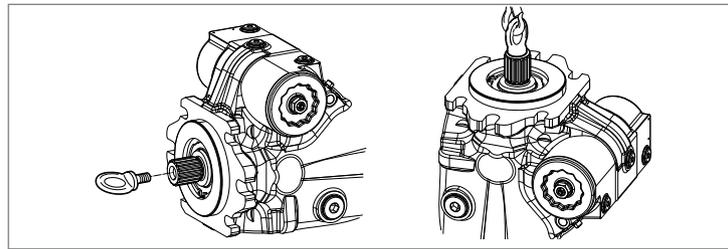
Only use the lifting strap if you are unable to achieve the required installation position by transporting with the eye bolt.

**Transporting with eye bolt in drive shaft**

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

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

You can lift the axial piston unit as shown in Fig. 5 with the eye bolt screwed into the drive shaft.

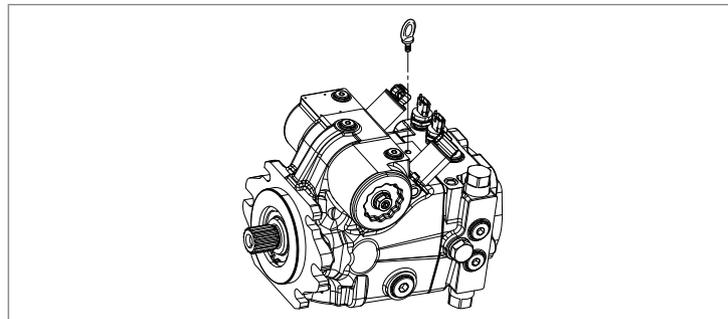


**Fig. 5: Installing the eye bolt**

**Transporting with eye bolt in housing (possible in standard version without swivel angle monitoring)**

- ▶ For all female threads, use a stud end from the same system of units and of the correct size (M8).
- ▶ Screw an eye bolt fully into the female thread in the housing.
- ▶ Make sure that each eye bolt can bear the total weight of the axial piston unit plus approx. 20%.

You can lift the axial piston unit as shown in Fig. 6 with the eye bolt screwed into the housing.

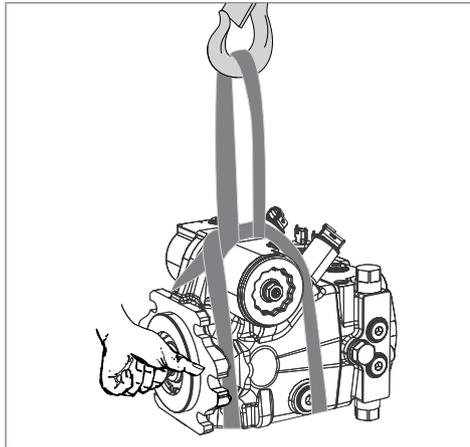


**Fig. 6: Mounting eye bolts in housing**

**Transport with lifting strap****WARNING!** Danger from suspended loads!

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

- ▶ Use the widest possible lifting strap.
  - ▶ Make sure that the axial piston unit is securely fixed with the lifting strap.
  - ▶ Only guide the axial piston unit by hand for fine positioning and to avoid swinging.
  - ▶ Never stand or put your hands under a suspended load.
- 
- ▶ Place the lifting strap around the axial piston unit in such a way that it does not pass over assembled parts (e.g., valves, piping) and that the axial piston unit is not suspended from assembled parts (see Fig. 7).



**Fig. 7: Transport with lifting strap**

## 6.2 Storing the axial piston unit

### Requirements

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

### After delivery

The axial piston units come in corrosion protection packaging (corrosion protection film).

Table 7 lists the maximum permissible storage times for an unpackaged axial piston unit as per data sheet 90312.

**Table 7: Storage time with factory corrosion protection**

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



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

What to do once the maximum storage time elapses:

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



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

For questions regarding repair and spare parts, contact your proper Bosch Rexroth service partner or the service department of the plant that manufactured the axial piston unit, see chapter 10.5 “Spare parts” on page 51.

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



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

Bosch Rexroth recommends the following procedure:

1. Clean the axial piston unit; see Chapter 10.1 “Cleaning and care” on page 49.
2. Drain the axial piston unit.
3. For storage times up to 12 months: Coat the inside of the axial piston unit with mineral oil and fill with about 100 mL of mineral oil.  
For storage times up to 24 months: Fill the axial piston unit with VCI 329 corrosion protection (20 ml).  
Fill through the drain port **T<sub>1</sub>** or **T<sub>2</sub>**; see Chapter 7.4 “Installing the axial piston unit”, Fig. 13 on page 40.
4. Plug all ports so they are airtight.
5. Coat unpainted areas of the axial piston unit with mineral oil or suitable, easily removable corrosion protection, e.g., acid-free grease.
6. Package the axial piston unit with desiccant in corrosion protection film so it is airtight.
7. Store the axial piston unit in a shock-proof manner; see “Requirements” on page 28 in this chapter.

## 7 Installation

Have the following documents on hand before installation:

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

### 7.1 Unpacking

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

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

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

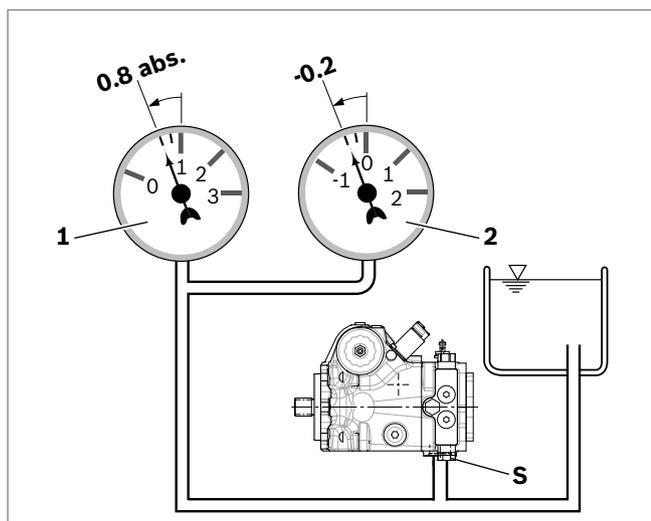
- ▶ Place the packaging on a level, load-bearing surface.
- ▶ Only open the packaging from the top.
  
- ▶ Remove the packaging from the axial piston unit.
- ▶ Check the axial piston unit for transport damage and completeness; see Chapter 4 “Scope of delivery” on page 19.
- ▶ Dispose of the packaging in accordance with the regulations in your country.

### 7.2 Installation conditions

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

- ▶ Install the axial piston unit so that the expected forces and torque can be transferred without any danger. The machine/system manufacturer is responsible for sizing the fasteners.
- ▶ Observe the maximum permissible radial forces on the drive shaft when transferring input/output drive with radial loading (belt drives). If necessary, store the belt pulley separately.
- ▶ Make sure that the axial piston unit is air bled and filled with hydraulic fluid during commissioning and operation. Also do this also after relatively long standstill periods, since the axial piston unit may drain out through the hydraulic lines.
- ▶ Direct the leakage in the housing area to the reservoir through the highest drain port. Use a line size appropriate for the port.
- ▶ Do not put a check valve in the drain line.
- ▶ To keep noise levels low, use elastic elements to isolate all connecting lines from all vibration-capable components (e.g., reservoir).

- ▶ 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.
- ▶ Make sure that a minimum suction pressure of 0.8 bar absolute is present at port "S" (0.5 bar absolute for cold start) during operation in all installation positions and installation locations for the axial piston pump, see Fig. 8. See data sheet for pressure values.



**Fig. 8: 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 should be clean when installed. Contamination of the hydraulic fluid can considerably affect the function and service life of the axial piston unit.
- ▶ Use fiber-free cloths for cleaning.
- ▶ Use suitable, mild cleaning agents to remove lubricants and other heavy contamination. Do not allow cleaning agents to enter into the hydraulic system.

### 7.3 Installation position

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



If filling the stroking chambers via  $X_1$  and  $X_2$  is not possible in the final installation position, then fill before installation, e.g., in installation position **2**.



To prevent unexpected actuation and damage, bleed all air out of the stroking chambers via the ports  $X_1$  or  $X_2$ , depending on the installation position.

### 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.

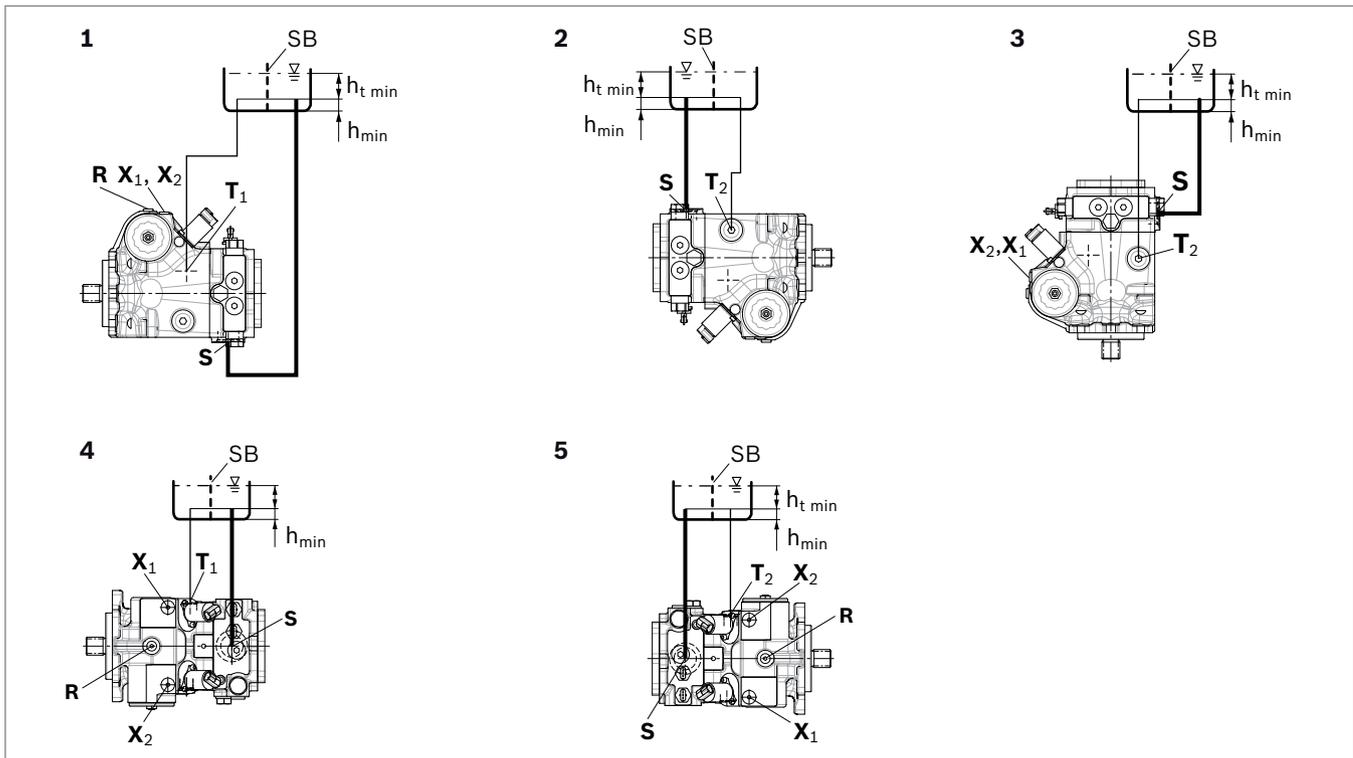


Fig. 9: A4VG below-reservoir installation with installation positions 1-5

<b>T<sub>1</sub>, T<sub>2</sub></b>	Highest drain port	<b>h<sub>t min</sub></b>	Minimum required immersion depth (200 mm)
<b>R</b>	Air bleed port	<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>X<sub>1</sub>, X<sub>2</sub></b>	Control pressure port	<b>SB</b>	Baffle (baffle plate)

Table 8: Below-reservoir installation

Installation position	Air bleeding the housing	Air bleeding the stroking chamber	Filling
1 (drive shaft horizontal)	R	X <sub>1</sub> , X <sub>2</sub>	S + T <sub>1</sub> + X <sub>1</sub> + X <sub>2</sub>
2 (drive shaft horizontal)	–	–	S + T <sub>2</sub>
3 (drive shaft down)	–	X <sub>2</sub> , X <sub>1</sub>	S + T <sub>2</sub> + X <sub>2</sub> + X <sub>1</sub>
4 (drive shaft horizontal)	–	X <sub>1</sub>	S + T <sub>1</sub> + X <sub>1</sub>
5 (drive shaft horizontal)	–	X <sub>2</sub>	S + T <sub>2</sub> + X <sub>2</sub>

### 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.



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.

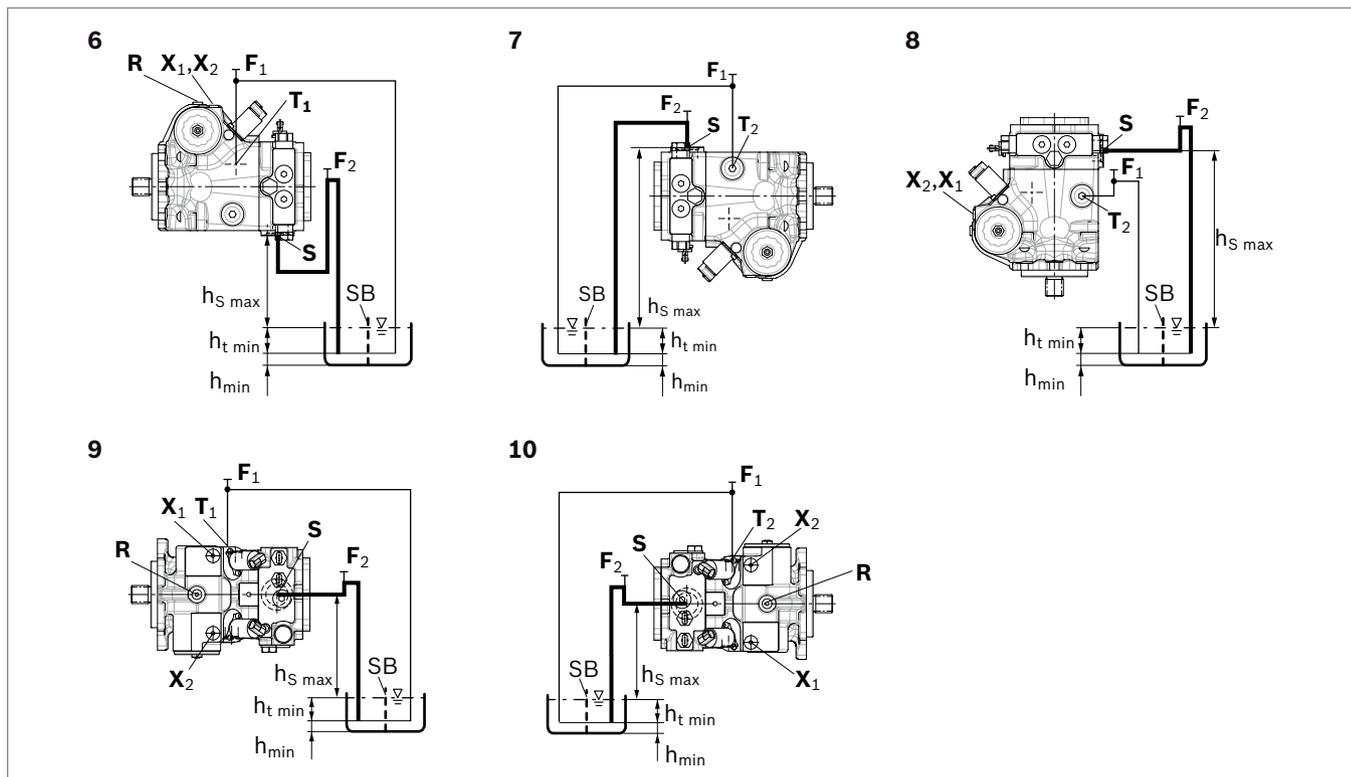


Fig. 10: A4VG above-reservoir installation with installation position 6–10

<b>T<sub>1</sub>, T<sub>2</sub></b>	Highest drain port	<b>h<sub>t min</sub></b>	Minimum required immersion depth (200 mm)
<b>F<sub>1</sub>, F<sub>2</sub></b>	Filling/air bleeding	<b>h<sub>min</sub></b>	Minimum required distance to reservoir bottom (100 mm)
<b>R</b>	Air bleed port	<b>h<sub>S max</sub></b>	Maximum permissible suction height (800 mm)
<b>S</b>	Suction port	<b>SB</b>	Baffle (baffle plate)
<b>X<sub>1</sub>, X<sub>2</sub></b>	Control pressure port		



Ports **F<sub>1</sub>** and **F<sub>2</sub>** are part of the external piping and must be provided by the customer to make filling and air bleeding easier.

Table 9: Above-reservoir installation

Installation position	Air bleeding the housing	Air bleeding the stroking chamber	Filling
6 (drive shaft horizontal)	<b>F<sub>2</sub> + R</b>	<b>X<sub>1</sub>, X<sub>2</sub></b>	<b>F<sub>1</sub> + F<sub>2</sub> + X<sub>1</sub> + X<sub>2</sub></b>
7 (drive shaft horizontal)	<b>F<sub>2</sub> (S) + F<sub>1</sub> (T<sub>2</sub>)</b>	–	<b>F<sub>2</sub> (S) + F<sub>1</sub> (T<sub>2</sub>)</b>
8 (drive shaft down)	<b>F<sub>2</sub> (S) + F<sub>1</sub> (T<sub>2</sub>)</b>	<b>X<sub>2</sub>, X<sub>1</sub></b>	<b>F<sub>2</sub> (S) + F<sub>1</sub> (T<sub>2</sub>) + X<sub>2</sub> + X<sub>1</sub></b>
9 (drive shaft horizontal)	<b>F<sub>2</sub> (S) + F<sub>1</sub> (T<sub>1</sub>)</b>	<b>X<sub>1</sub></b>	<b>F<sub>2</sub> (S) + F<sub>1</sub> (T<sub>1</sub>) + X<sub>1</sub></b>
10 (drive shaft horizontal)	<b>F<sub>2</sub> (S) + F<sub>1</sub> (T<sub>2</sub>)</b>	<b>X<sub>2</sub></b>	<b>F<sub>2</sub> (S) + F<sub>1</sub> (T<sub>2</sub>) + X<sub>2</sub></b>

## 7.4 Installing the axial piston unit

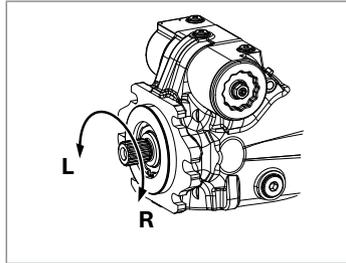
### 7.4.1 Preparation

1. Check the specifications on the name plate to see you have the correct axial piston.
2. Compare the material number and designation (type code) with the details in the order confirmation.



If the material number for the axial piston unit does not correspond to the one in the order confirmation, contact your local contact person for clarification, you can find the address under [www.boschrexroth.com/addresses](http://www.boschrexroth.com/addresses)

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



**Fig. 11: Direction of rotation**

- L** Counterclockwise  
**R** Clockwise



The direction of rotation as indicated on the name plate determines the direction of rotation of the axial piston unit as viewed on the drive shaft; see Chapter 5.4 “Product identification” on page 24. For information on the direction of rotation of the drive motor, please refer to the drive motor manufacturer's instruction manual.

### 7.4.2 Dimensions

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

### 7.4.3 General instructions

Follow these general instructions when installing the axial piston unit:

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

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

The type of installation used for the axial piston unit depends on the connecting elements to the drive side. The following descriptions explain the installation of the axial piston unit:

- With a clutch
- On a gearbox
- On a cardan shaft

#### 7.4.4 Installation with a clutch

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

**NOTICE!** Danger from improper handling!

Product can be damaged!

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

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



The drive shaft of the axial piston unit is equipped with a female thread. Use this female thread to pull the clutch element onto the drive shaft. The size of the female thread can be seen in the installation drawing.

2. Clamp the clutch hub onto the drive shaft or ensure permanent lubrication of the drive shaft. This prevents the formation of frictional corrosion and the associated wear.
3. Transport the axial piston unit to the installation location.
4. Remove dirt and foreign particles from the installation location.
5. Install the clutch on the output shaft of the drive motor in accordance with the specifications provided by the clutch manufacturer.



Do not fasten down the axial piston unit until the clutch 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 excessive axial and radial forces are acting on the drive shaft.
9. For bell housing installation, check the clutch 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 clutches, 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:

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

#### **For attachment via gear wheels or helical gear shaft**

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

#### 7.4.6 Installation with cardan shaft

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

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

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

- ▶ Observe the cardan shaft manufacturer's assembly instructions.
1. Position the axial piston unit close to the specified installation location. Allow enough space for the cardan shaft to fit through on both sides.
  2. 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 fasten it down. If necessary, details on the required tools and tightening torque for the mounting bolts can be obtained from the system manufacturer.

### 7.4.7 Completing installation

1. Remove any installed transport screws.

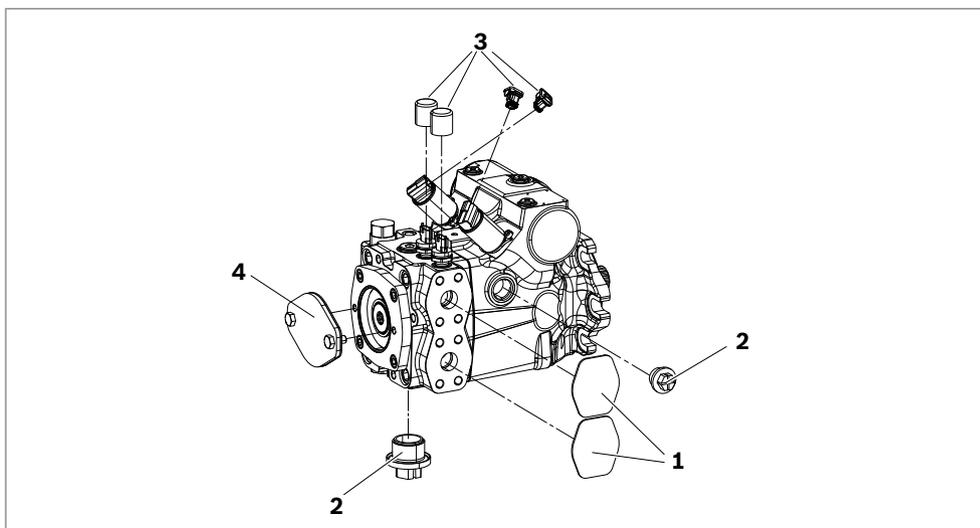
**CAUTION!** Operation with protective plugs!

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

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

2. Remove the transport protection.

The axial piston unit comes with protective covers (1), (3) 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 plant that manufactured the axial piston unit.



**Fig. 12: Removing transport protection**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1 Protective covers</li> <li>2 Protective plugs/threaded plugs</li> <li>3 Protective covers for sensors and connectors</li> </ol> | <ol style="list-style-type: none"> <li>4 For versions with through drive, metallic protective cover and mounting bolts</li> </ol> |
|--|---|



Ports intended for connecting lines come with protective plugs or threaded plugs, which serve as transport protection. Connect all ports required for functional operation (see Table 10 Ports A4VG series 35 on page 40). Failure to do so could lead to malfunctions or damage. If a port is not being used, plug it with a threaded plug since the protective plugs are not pressure-resistant.



Setting screws are protected against unauthorized adjustment by tamper-proof caps. Removal of the tamper-proof caps will void the warranty. If you need to change the settings, please contact your local contact person. You can find their contact information under [www.boschrexroth.com/adresses](http://www.boschrexroth.com/adresses)

3. For versions with through drive, install the auxiliary pump according to the pump manufacturer's instructions. The metallic protective cover (4) is not pressure-resistant and should not be used during operation.

#### 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 met at all times. This is influenced by:
  - the piping (e.g. suction cross-section, pipe diameter, length of suction line)
  - The position of the reservoir
  - The viscosity of the hydraulic fluid
  - Any filter element or check valve in the suction line (regularly check the filter element's level of contamination)

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

The ports and fastening threads are designed for the maximum permissible pressures  $p_{max}$ ; see Table 10 Ports A4VG series 35 on page 40. The machine/system manufacturer should 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 about routing lines**

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

- Lines and hoses should be installed without pretensioning so that no further mechanical forces are applied during operation that will reduce the service life of the axial piston unit and, possibly, the entire machine/system.
- Use suitable seals as sealing material.
- Suction line (pipe or hose)
  - The suction line should be as short and straight as possible.
  - Measure the line cross section of the suction line so 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 (e.g. when pre-filling).
  - Make sure the connections and connecting elements are airtight.
  - The hose should be pressure-resistant, including external air pressure.
- Pressure line
  - For the pressure lines, use only pipes, hoses and connecting elements rated for the working pressure range specified in data sheet 92035 (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.
  - The case pressure should never exceed the maximum limits specified for the axial piston unit in the data sheet.
  - The drain line inflow in the reservoir should always be below the minimum fluid level (see Chapter 7.3 “Installation position” on page 31).
- If the axial piston unit is equipped with installed screw fittings, do not remove them. Screw the stud end of the fitting directly into the installed fitting.

**Risk of confusion with threaded connections**

The axial piston units are used in application areas with metric as well as with the Anglo-American (inches) system of units. Various kinds of seals are also used. The system of units, the kind of seal and the size of female thread and stud ends (e.g., threaded plug) must all match.

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

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

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

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

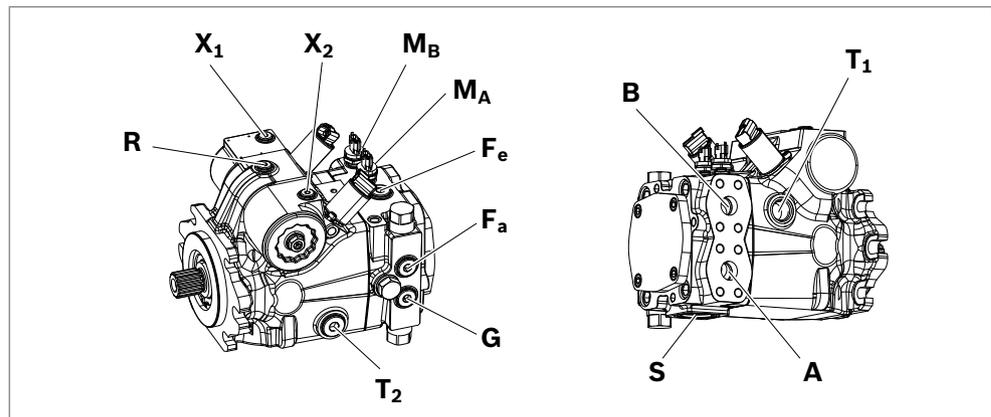
**Port overview**

Fig. 13: A4VG port overview

**Table 10: Ports A4VG series 35**

Ports <sup>1)</sup>		$p_{\max}$ [bar] <sup>2)</sup>	State <sup>3)</sup>
<b>A, B</b>	Working port	530	O
<b>S</b>	Suction port	5	O <sup>4)</sup>
<b>T<sub>1</sub></b>	Drain port	3	O <sup>5)</sup>
<b>T<sub>2</sub></b>	Drain port	3	X <sup>5)</sup>
<b>R</b>	Air bleed port	3	X
<b>X<sub>1</sub>, X<sub>2</sub></b>	Control pressure port	30	X
<b>G</b>	Boost pressure port inlet	30	X
<b>M<sub>A</sub>, M<sub>B</sub></b>	A, B measuring port pressure	530	X <sup>6)</sup>
<b>F<sub>a</sub></b>	Boost pressure port inlet	30	X <sup>7)</sup>
<b>F<sub>e</sub></b>	Boost pressure port outlet	30	X <sup>7)</sup>

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

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

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

<sup>4)</sup> Plugged for external boost pressure supply.

<sup>5)</sup> Depending on the installation position, **T<sub>1</sub>** or **T<sub>2</sub>** must be connected (see Chapter 7.3 "Installation position" on page 31)

<sup>6)</sup> Pressure sensor installed or **M<sub>A</sub>**, **M<sub>B</sub>** plugged.

<sup>7)</sup> Must be connected for filtration in the pressure line.

**Tightening torques**

The following tightening torques apply:

- **Fittings:**  
Observe the manufacturer's specifications regarding the tightening torques of the fittings used.
- **Female threads in the axial piston unit:** The maximum permissible tightening torques  $M_{G\max}$  are 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 DIN 13 metric ISO threads, we recommend checking the tightening torque individually in accordance with VDI 2230.

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

Ports		Maximum permissible tightening torque of female threads $M_{G\max}$	Required tightening torque of threaded plugs $M_V$	WAF hexagon socket of the threaded plugs
Standard	Thread size			
ISO 6149	M8 × 1	10 Nm	7 Nm	4 mm
	M10 × 1	30 Nm	15 Nm	5 mm
	M12 × 1.5	50 Nm	25 Nm	6 mm
	M14 × 1.5	80 Nm	45 Nm	6 mm
	M16 × 1.5	100 Nm	55 Nm	8 mm
	M18 × 1.5	140 Nm	70 Nm	8 mm
	M20 × 1.5	170 Nm	80 Nm	10 mm
	M22 × 1.5	210 Nm	100 Nm	10 mm
	M27 × 2	330 Nm	170 Nm	12 mm
	M30 × 2	420 Nm	215 Nm	17 mm
	M33 × 2	540 Nm	310 Nm	17 mm
	M42 × 2	720 Nm	330 Nm	22 mm
	M48 × 2	900 Nm	420 Nm	22 mm
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 for the threaded plugs apply when the plugs are dry or lightly oiled.

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

- Procedure** To connect the axial piston unit to the hydraulic system:
1. Remove the protective plugs or threaded plugs from the ports where the connections should be made according to the hydraulic circuit diagram.
  2. Make sure 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, e.g. with a permanent marker.
  6. Check all pipes and hose lines and every combination of connecting pieces, clutches or connecting points with hoses or pipes to ensure they are in safe working condition.



For relationship between direction of rotation and flow direction, please refer to data sheet 92035.

#### 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, observe the information in data sheet 92035, e.g.:

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

Exact details on the connector, type of protection and matching mating connector can also be found in data sheet 92035. 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 whether the connector protective covers (**3**) are off (see Fig. 12 “Removing transport protection” on page 37), and the connector and all seals are intact.

## 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 initial commissioning. To avoid internal contamination, do not include the axial piston unit in the flushing cycle.



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

## 8 Commissioning



To efficiently operate the axial piston unit, it is necessary to calibrate the electric control (ET), since each hydraulic component has manufacturing tolerances that can also affect the electronic control. More information can be found in the component class specification 92003-CC-0011\_ETPump; see Table 1 “Required and supplementary documentation” on page 5.

### **WARNING**

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

Danger to life or risk serious injury!

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

### **CAUTION**

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

Risk of injury and property damage!

- ▶ Make sure 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 commissioning work on the axial piston unit, observe the general safety instructions and intended use detailed in Chapter 2 “Safety instructions” on page 9.

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

### 8.1.1 Filling the axial piston unit

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



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

Use only a hydraulic fluid that meets the following requirements:

You can find details on the minimum requirements for hydraulic fluids in Bosch Rexroth data sheets 90220, 90221, 90222, and 90225. 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 92035.

To ensure the functional reliability of the axial piston unit, the hydraulic fluid must have a min. cleanliness level of 20/18/15 as defined in ISO 4406. At a hydraulic fluid viscosity of less than 10 mm<sup>2</sup>/s (e.g. due to high temperatures during short-term operation) at the drain port, a min. cleanliness level of 19/17/14 as defined in ISO 4406 is required. For permissible viscosities and temperatures, see data sheet 92035.

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

**NOTICE!** Contaminated hydraulic fluid!

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

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

2. Fill and air bleed the axial piston unit using the appropriate ports; see Chapter 7.3 “Installation position” on page 31. Also fill the hydraulic lines of the system.

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

Product can be damaged or destroyed!

- ▶ When using a shut-off valve in the suction and/or drain line, make sure 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 agrees with the details of the name plate, see chapter 5.4 “Product identification”, Fig. 4: A4VG name plate on page 24.

5. Operate the axial piston pump at a low rotational speed (starter speed for internal combustion engines or inching mode for electric motors) until the hydraulic system is completely filled and air bled. To verify, drain the hydraulic fluid at the drain port and wait until no bubbles are visible.

### 8.1.2 Testing the hydraulic fluid supply

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

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

For information on troubleshooting, see Chapter 14 “Troubleshooting” on page 55. To test the hydraulic fluid supply:

1. Allow the drive motor to run at the lowest rotational speed. The axial piston unit should be operated without load. Pay attention to leaks and noises.
2. Check the axial piston unit’s drain line during the test. There should be no bubbles in the drain fluid.
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 92035 for the permissible value.
6. At maximum working pressure, check the case drain pressure at port **T<sub>1</sub>** or **T<sub>2</sub>**. Refer to data sheet 92035 for the permissible value.

### 8.1.3 Performing a functional test

#### **WARNING**

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

Mixing up the ports will cause malfunctions (e.g. lift instead of lower) and could endanger persons and equipment!

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

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

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

- ▶ After starting the drive motor, check in particular the specified pressures, e.g. working pressure, boost pressure, and case pressure.
- ▶ Perform a leak test without and with 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 due to insufficient viscosity!**

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

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

The bearings and sliding surfaces are subject to a running-in phase. The increased friction at the start of the running-in phase results in increased heat development which decreases with increasing operating hours. Volumetric and mechanical-hydraulic efficiency are also greater until a running-in phase of about 10 operating hours has elapsed.

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

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

## 8.3 Recommissioning after standstill

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

The following criteria may make recommissioning necessary:

- Air and/or water in the hydraulic system
  - Old hydraulic fluid
  - Other contamination
- ▶ Before recommissioning, proceed as described in Chapter 8.1 “Initial commissioning” on page 44.

## 9 Operation

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

## 10 Maintenance and repair

### **NOTICE**

#### **Overdue inspections and maintenance work!**

Risk of property damage!

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

### 10.1 Cleaning and care

### **NOTICE**

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

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

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

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

- ▶ Check whether all seals and plug-in connections are securely seated to ensure 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 clean sensitive and important components, such as solenoids, valves, displays and sensors.

## 10.2 Inspection

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

**Table 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)
Axial piston unit	Check axial piston unit for leakage. Early detection of hydraulic fluid loss can help to find faults on the machine/system and rectify them. This is why Bosch Rexroth recommends always keeping the axial piston unit and system clean.	Daily
	Check axial piston unit for unusual noise development.	Daily
	Check fastening elements for tight seating. All fasteners have to be checked when the hydraulic system is switched off, depressurized and cooled down.	Monthly

## 10.3 Maintenance

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

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

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

## 10.4 Repair

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

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

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

For questions regarding repairs, contact your proper Bosch Rexroth service partner or the service department of the plant that manufactured the axial piston unit; see Chapter 10.5 “Spare parts” on page 51.

## 10.5 Spare parts



### Use of unsuitable spare parts!

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

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

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

Address all questions regarding spare parts to your proper Bosch Rexroth Service partner or the service department of the plant that manufactured the axial piston unit.

Bosch Rexroth AG  
 Glockeraustraße 4  
 89275 Elchingen, Germany  
 Hotline +49 9352 405060

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

For general inquiries, please contact your local contact person. You can find their contact information at [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 entire system against being reactivated.

## 11.3 Removal

Proceed as follows to remove the axial piston unit:

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

## 11.4 Preparing the components for storage or further use

- ▶ Proceed as described in Chapter 6.2 “Storing the axial piston unit” on page 28.

## 12 Disposal

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

Observe the following when disposing of the axial piston unit:

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

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 delivered product configuration. The warranty will be voided if the unit is modified or extended.



Setting screws are protected against unauthorized adjustment by tamper-proof caps. Removal of the tamper-proof cap will void the warranty. If you need to change the settings, please contact your local contact person, you can find the address under [www.boschrexroth.com/adresses](http://www.boschrexroth.com/adresses)

# 14 Troubleshooting

Table 13 is intended to help you with troubleshooting. This table is not exhaustive. Issues may occur in practice that are not listed here.

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

## 14.1 How to proceed for troubleshooting

- ▶ Perform troubleshooting if possible with reduced operating data (e.g. slowly swinging in or out and slow pressure increase).
- ▶ Use a systematic and targeted approach, even when pressed for time. Random and indiscriminate removal and changing of settings could result in the inability to determine the original cause of the fault.
- ▶ First get a general idea of how your product works in conjunction with the entire system.
- ▶ Try to find out whether or not the product was working properly in conjunction with the entire system before the fault occurred.
- ▶ Try to determine any changes to the entire system in which the product is installed:
  - Were there any changes to the product's application conditions or operating range?
  - Has maintenance work recently been performed? Is there an inspection or maintenance log?
  - Have any changes (e.g. upgrades) or repairs been made to the overall system (machine/system, electrics, 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, get in touch with one of the contact addresses found at: [www.boschrexroth.com/addresses](http://www.boschrexroth.com/addresses).

## 14.2 Malfunction table

**Table 13: 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, etc.	Machine/system manufacturer: Check the system, e.g. 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
	Drive speed too high	Machine/system manufacturer: Reduce drive speed
	Wrong direction of rotation	Machine/system manufacturer: Check correct direction of rotation; see Chapter 7.4.1 "Preparation" on page 34
	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 clutch	Fasten assembled parts according to the information provided by the clutch or fitting manufacturer	
Oscillate pressure limiting and control valves in the axial piston unit (boost-pressure relief valve, high-pressure relief valve, pressure reducing valve)	Air bleed the axial piston unit and hydraulic system	
	Contact Bosch Rexroth Service: Optimize the setting of the pressure limitation and pressure control valve	
Mechanical damage to the axial piston unit (e.g. bearing damage)	Replace axial piston unit	
	Contact Bosch Rexroth Service	
Increased, unusual vibration	Bearings worn	Contact Bosch Rexroth Service

**Table 13: Axial piston unit malfunction table**

<b>Malfunction</b>	<b>Possible cause</b>	<b>Remedy</b>	
No or insufficient flow	Insufficient air bleeding of the hydraulic system	Fill the axial piston unit, suction line for the hydraulic pump and the reservoir Completely air bleed the axial piston unit and hydraulic system	
	Faulty mechanical drive (e.g. defective clutch)	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, etc.		Machine/system manufacturer: Check the system, e.g. 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	

**Table 13: Axial piston unit malfunction table**

<b>Malfunction</b>	<b>Possible cause</b>	<b>Remedy</b>
No or insufficient pressure	Insufficient air bleeding of the hydraulic system	Fill the axial piston unit, suction line for the hydraulic pump and the reservoir
		Completely air bleed the axial piston unit and hydraulic system
		Check correct installation position
	Faulty mechanical drive (e.g. 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, etc.	Machine/system manufacturer: Check the system, e.g. 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	Machine/system manufacturer: Check temperature range and use suitable hydraulic fluid
		Check boost pressure
Insufficient boost pressure	Contact Bosch Rexroth Service	
	Check pilot pressure or control pressure	
Insufficient 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 13: Axial piston unit malfunction table**

<b>Malfunction</b>	<b>Possible cause</b>	<b>Remedy</b>
Pressure/flow fluctuations/ instabilities	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, etc.	Machine/system manufacturer: Check the system, e.g. optimize inlet conditions, use suitable hydraulic fluid
		Fill the suction line with hydraulic fluid
Remove foreign particles from the suction line		
Oscillate pressure limiting and control valves in the axial piston unit (boost-pressure relief valve, high-pressure relief valve, pressure reducing valve)	Air bleed the axial piston unit and hydraulic system	Contact Bosch Rexroth Service
		Contact machine/system manufacturer or Bosch Rexroth Service
	Unstable control signal	Contact Bosch Rexroth Service
		Contact Bosch Rexroth Service
Excessive temperature of hydraulic fluid and housing	Excessive inlet temperature at the axial piston unit	Machine/system manufacturer: Check system, e.g. malfunction in the cooler, insufficient hydraulic fluid in the reservoir
		Optimize the adjustment of the pressure limitation and pressure control valves of the axial piston unit and the pressure safeguarding in the hydraulic system
	Wrong setting or malfunction of the pressure relief and pressure control valves (e.g., high-pressure relief valve, pressure controller, pressure reducing valve)	Contact Bosch Rexroth Service
		Contact machine/system manufacturer
	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 technical data for your axial piston unit can be found on the data sheet 92035.

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

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

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

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**Bosch Rexroth AG**

Glockeraustraße 4

89275 Elchingen

Germany

Phone: +49 7308 82-0

[info.ma@boschrexroth.de](mailto:info.ma@boschrexroth.de)

[www.boschrexroth.com](http://www.boschrexroth.com)

**Your local contact person can be found at:**

[www.boschrexroth.com/addresses](http://www.boschrexroth.com/addresses)