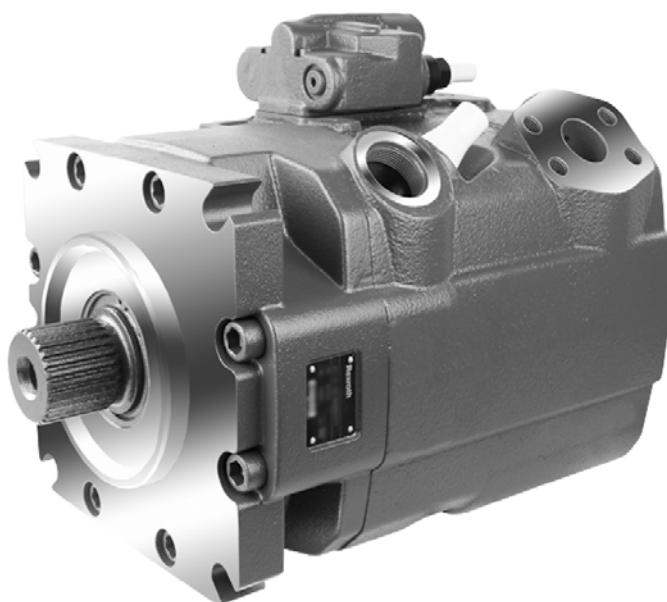


Axial piston variable pump A11VO/A11VLO

Series 40

Instruction manual
RE 92510-01-B/10.2014

Replaces: –.–
English



The data specified above only serve to describe the product. No statement about a specific characteristic or suitability for a certain application can be derived from this 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.

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

The original instruction manual was created in German.

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1 About this documentation

1.1 Validity of the documentation

This documentation is valid for the following product:

- Axial piston variable pump A11VO/A11VLO series 40

This documentation is intended for machine/system manufacturers, fitters and service technicians.

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

- Read this documentation completely and in particular the chapter 2 “Safety instructions” on page 8 and chapter 3 “General instructions on damage to equipment and product” on page 13 before you start work with the axial piston unit.

1.2 Required and supplementary documentation







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

Table 1: Required and supplementary documentation

	Title	Document number	Document type
	Order confirmation Contains the order-related technical data of your axial piston variable pump A11VO/A11VLO.	–	Order confirmation
	Installation drawing Contains the outer dimensions, all connections and the hydraulic schematic for your axial piston variable pump A11VO/A11VLO.	Please request the installation drawing via your contact person at Bosch Rexroth.	Installation drawing
	Axial piston variable pump A11VO/A11VLO Series 40 Contains the permissible technical data.	92510	Data sheet
	Mineral-oil based hydraulic fluids and related hydrocarbons Describes the requirements for a mineral-oil based hydraulic fluid and related hydrocarbons for operation with Rexroth hydraulic components, and assists you in selecting a hydraulic fluid for your hydraulic system.	90220	Data sheet
	Information for the use of hydrostatic drives at low temperatures Contains additional information on the use of Rexroth axial piston units at low temperatures.	90300-03-B	Manual
	Storage and preservation of axial piston units Contains additional information on storage and preservation.	90312	Data sheet

1.3 Display of information

Standardized safety instructions, symbols, terms and abbreviations are used throughout this documentation so that you can work quickly and safely with your product. To give you a better understanding, these are explained in the sections below.

1.3.1 Safety instructions




This manual includes safety instructions in chapter 2.6 “Product-specific safety instructions” on page 10 and in chapter 3 “General instructions on damage to equipment and product” on page 13 and before a sequence of actions or an instruction involving a risk of personal injury or damage to equipment. The measures described to avert danger must be observed.

Safety instructions are set out as follows:

 SIGNAL WORD
Type and source of danger! Consequences of non-compliance ► Measures to avert danger

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


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

Warning sign, signal word	Meaning
 DANGER	Identifies a dangerous situation that will result in death or serious injuries if it is not avoided.
 WARNING	Identifies a dangerous situation that may result in death or serious injuries if it is not avoided.
 CAUTION	Identifies a dangerous situation that may result in minor to moderate injuries if it is not avoided.
NOTICE	Property damage: The product or the environment may be damaged.

1.3.2 Symbols

The following symbols indicate information that is not directly relevant to safety but increases understanding of the manual.

Table 3: Meaning of the symbols

Symbol	Meaning
	If this information is disregarded, the product cannot be used or operated to its optimum potential.
►	Single, independent step
1.	Numbered instruction:
2.	The numbers indicate that the steps must be completed one after the other.
3.	

1.3.3 Designations

This documentation uses the following designations:

Table 4: Designations

Designation	Meaning
A11VO	Axial piston variable pump without charge pump, open circuit, use in mobile applications
A11VLO	Axial piston variable pump with charge pump, open circuit, use in mobile applications
Threaded plug	Metal screw, pressure-resistant
Protective plug	Made out of plastic, not pressure-resistant, only for transportation

As a generic term for “axial piston variable pump A11VO/A11VLO” the designation “axial piston unit” will be used in the following.

1.3.4 Abbreviations

This manual uses the following abbreviations:

Table 5: Abbreviations

Abbreviation	Meaning
ATEX	EU directive on explosion protection (A tmosphère e xplosible)
DIN	D eutsches I nstitut für N ormung (German Institute for Standardization)
ISO	I nternational O rganization for S tandardization
JIS	J apan I ndustrial S tandard
RE	R exroth document in the E nglish language
VDI 2230	Directive for the systematic calculation of high duty bolted joints and joints with one cylindrical bolt from the VDI (V erein D eutscher I ngenieur e - Association of German Engineers)

2 Safety instructions

2.1 About this chapter

The axial piston unit has been manufactured according to the generally accepted rules of current technology. There is, however, still a danger of personal injury or damage to equipment if this chapter and the safety instructions in this documentation are not complied with.

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

2.2 Intended use

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

The product is intended for the following use:

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

- ▶ Observe the technical data, the application and operating conditions and the performance limits as specified in data sheet 92510 and in the order confirmation. Information about approved hydraulic fluids can be found in data sheet 92510.

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

2.3 Improper use

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

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

The following foreseeable forms of misuse shall also be considered to be improper (this list does not claim to be exhaustive):

- Use outside the operating parameters approved in the data sheet or in the order confirmation (unless customer-specific approval has been granted and confirmed in writing)
- Use of non-approved fluids, e.g. water or polyurethane components
- Modification of the factory settings by non-authorized personnel
- Use of add/on parts (e.g. mountable filter, control unit, valves) not in combination with the specified Rexroth components

- Using the axial piston unit under water at a depth of more than 10 meters without necessary additional measures, e.g., pressure equalization
- Using the axial piston unit when the ambient pressure is greater than the interior pressure (case pressure)
- Using the axial piston unit in explosive environments unless the component or machine/system has been certified as compliant with the ATEX directive 94/9/EC
- Use of the axial piston unit in an aggressive atmosphere
- Use of the axial piston unit in aircraft or space craft

2.4 Personnel qualifications

The activities described in this documentation require basic mechanical, electrical and hydraulics expertise, as well as knowledge of the associated technical terms. For transporting and handling the product, additional knowledge is necessary with regard to working with lifting gear and the corresponding attachment equipment. In order to ensure safe use, these activities may therefore only be performed by an appropriately qualified person or an instructed person under the direction and supervision of a qualified person.

Qualified personnel are those who can recognize possible hazards and institute the appropriate safety measures due to their professional training, knowledge, and experience, as well as their understanding of the relevant conditions pertaining to the work to be done. Qualified personnel must observe the rules relevant to the specialist field and have the necessary hydraulics expertise.

Hydraulic expertise includes:

- Reading and fully understanding hydraulic diagrams,
- Specifically, fully understanding the relationships with regard to safety devices, and
- Understanding how hydraulic components work and are put together



Bosch Rexroth offers training support for specialist fields. An overview of the training contents can be found on the Internet at:

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 technical order and condition.
- Observe all notes on the product.
- Persons who install, operate, remove or maintain Rexroth products must not consume any alcohol, drugs or pharmaceuticals that may affect their ability to respond.
- Only use genuine Rexroth accessories and spare parts to ensure there is no risk to personnel from unsuitable spare parts.
- Adhere to the technical data and ambient conditions specified in the product documentation.
- If unsuitable products are installed or used in applications that are relevant for safety, unexpected operating conditions may occur in the application, which could result in injury to personnel or damage to equipment. For this reason, only use

the product in a safety-related application if this use is expressly specified and permitted in the product documentation, for example in explosion protection applications or in safety-related parts of a control system (functional safety).

- You may only commission the product if it has been determined that the end product (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.

2.6 Product-specific safety instructions

The following safety instructions apply for chapters 6 to 14.



WARNING

Danger from excessively high pressure!

Danger to life or risk of injury, damage to equipment!

An inappropriate change in the factory pressure settings can result in a pressure increase beyond the permissible maximum pressure.

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

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

Danger from suspended loads!

Danger to life or risk of injury, damage to equipment!

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 capacity of the lifting gear is sufficient to safely bear the weight of the pump.
- ▶ Never step or reach under a suspended load.
- ▶ Ensure a stable position during transportation.
- ▶ Use your personal protective equipment (e.g., safety glasses, safety gloves, suitable working clothes, safety shoes).
- ▶ Use suitable lifting gear for transportation.
- ▶ Observe the prescribed position of the lifting strap.
- ▶ Observe the national laws and regulations on work and health protection and transportation.

WARNING

Pressurized machine/system!

Danger to life or risk of injury, serious injuries when working on machines/systems not shut down! Damage to equipment!

- ▶ Protect the overall system against being re-energized according to the instructions of the machine or system manufacturer.
- ▶ Make sure that all relevant components of the hydraulic system are depressurized. Follow the machine/system manufacturer's specifications.
- ▶ Do not disconnect any line connections, ports and components while the hydraulic system is pressurized.
- ▶ Turn off all power-transmitting components and ports (electric, pneumatic, hydraulic, mechanical) in line with the manufacturer's specifications and secure them against being turned back on.

Escaping oil mist!

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

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

Electrical voltage!

Risk of injury due to electric shock or damage to equipment!

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

Restriction of the control function!

Risk of injury or damage to equipment!

Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get blocked in position as a result of contamination (e.g. impure hydraulic fluid, abrasion, or residual dirt from components). As a result, the flow of hydraulic fluid and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtering) cannot rule out errors, but can only help minimize risks.

- ▶ Check whether your application requires that remedial measures be taken on your machine in order to bring the driven consumer into a safe position (e.g. safe stop).
- ▶ If necessary, make sure that these are properly implemented.

CAUTION

High noise levels during operation!

Danger of hearing damage, deafness!

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

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

Hot surfaces on the axial piston unit!

Risk of burns!

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

Improper routing of cables and lines!

Tripping danger and damage to equipment!

- ▶ Lay cables and lines so that they cannot be damaged and nobody can trip over them.

Contact with hydraulic fluid!

Health hazard/risk of health impairment, e.g., eye injuries, skin damage, poisoning on inhalation!

- ▶ Avoid contact with hydraulic fluids.
- ▶ When working with hydraulic fluids, strictly observe the safety instructions provided by the lubricant manufacturer.
- ▶ Use your personal protective equipment (e.g., safety glasses, safety gloves, suitable working clothes, safety shoes).
- ▶ If hydraulic fluid should, nevertheless, come into contact with your eyes, get into your bloodstream or be swallowed, consult a doctor immediately.

Escaping hydraulic fluid due to machine/system leakage!

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

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

2.7 Personal protective equipment

The personal protective equipment is the responsibility of the user of the axial piston unit. Observe the safety regulations and provisions in your country.

All components of the personal protective equipment must be intact.

3 General instructions on damage to equipment and product

The following instructions apply to chapters 6 to 14.

NOTICE

Danger from improper handling!

Product can be damaged!

- ▶ Do not expose the product to a non-permitted mechanical load.
- ▶ Never use the product as a handle or step.
- ▶ 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 fittings.
- ▶ Do not strike fittings (e.g., sensors or valves).
- ▶ Do not strike sealing surfaces (e.g. working ports).
- ▶ Leave the protective covers on the axial piston unit until shortly before the lines are connected.
- ▶ Disconnect all electrical connectors before performing electro-welding or painting operations.
- ▶ Make certain that the electronic components (e.g., sensors) do not become electrostatically charged (e.g., during painting operations).

Damage to equipment due to improper lubrication!

Product can be damaged or destroyed!

- ▶ Never operate the axial piston unit with insufficient hydraulic fluid. In particular, make sure that the rotary group has sufficient lubrication.
- ▶ When commissioning a machine/system, make sure that the case interior and the service lines of the axial piston unit are filled with hydraulic fluid and remain filled during operation. Air inclusions in the forward drive shaft bearing are to be prevented, especially with the installation position "drive shaft upwards".
- ▶ Check the hydraulic fluid level in the motor housing regularly; if necessary, recommission. With above-reservoir installation, the motor housing may drain via the drain line after longer standstill periods (air enters via the shaft seal) or via the service line (gap leakage). When switched on, the bearings are thus insufficiently lubricated.
- ▶ Make sure that the suction line is always filled with hydraulic fluid during commissioning and operation.
- ▶ With above-reservoir installation, an axial piston unit must be moved to full swivel angle after no more than three seconds during commissioning and recommissioning. Make sure that the axial piston unit really does suck in hydraulic fluid and build up pressure.

NOTICE

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.
- ▶ Any mixing of hydraulic fluids from different manufacturers or different types from the same manufacturer is not generally permitted.

Contamination of the hydraulic fluid!

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

- ▶ Make sure that the working environment at the installation site is fully free of dust and foreign substances in order to prevent foreign particles, such as welding beads or metal cuttings, from getting into the hydraulic lines and causing product wear or malfunctions. The axial piston unit must be installed in a clean condition.
- ▶ Use only clean connections, hydraulic lines and attachments (e.g. measuring equipment).
- ▶ No contaminants may enter the ports when they are sealed.
- ▶ Before commissioning, make sure that all hydraulic connections are tight and that all of the connection seals and plugs are installed correctly to ensure that they are leak proof and fluids and contaminants are prevented from penetrating the product.
- ▶ Use a suitable filter system to filter hydraulic fluid during filling to minimize solid impurities and water in the hydraulic system.

Improper cleaning!

Product can be damaged!

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

Environmental pollution due to incorrect disposal!

Careless disposal of the axial piston unit and its fittings, the hydraulic fluid and the packaging material can lead to pollution of the environment!

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

NOTICE

Escaping or spilling hydraulic fluid!

Environmental pollution and contamination of groundwater!

- ▶ Always place a drip tray under the axial piston unit when filling and draining the hydraulic fluid.
- ▶ Use an oil binding agent if hydraulic fluid is spilt.
- ▶ Observe the information in the safety data sheet for the hydraulic fluid and the specifications provided by the system manufacturer.

The warranty only applies to the delivered configuration.

The warranty entitlement is rendered void if the product is incorrectly installed, commissioned or operated, as well as in cases of improper use and/or handling.

4 Scope of delivery

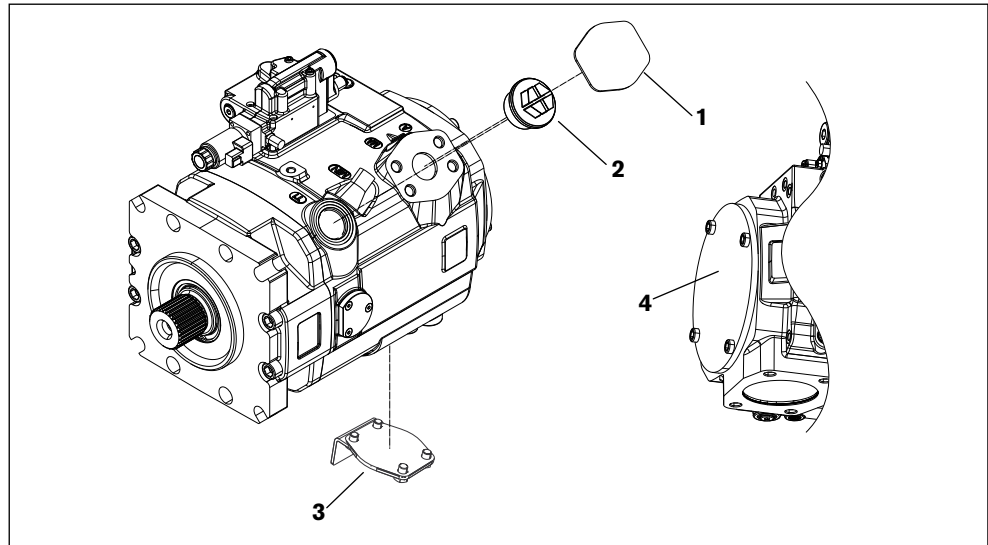


Fig. 1: Axial piston unit

Included in the scope of delivery are:

- Axial piston unit as per order confirmation

The following parts are also fitted prior to delivery:

- Protective covers (**1**)
- Protective plugs/threaded plugs (**2**)
- Steel flange covers (**3**) (the flange cover on the suction port provides a secure stand and protection for the $V_{g \max}$ stop)
- 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. The A11VO/A11VLO is designed for mobile applications such as construction machinery.

Refer to data sheet 92510 and the order confirmation for the technical data, operating conditions and operating limits of the axial piston unit.

5.2 Product description

The A11VO/A11VLO is a variable pump with axial piston rotary group of swashplate design for hydrostatic drives in open circuits. The flow is proportional to the drive speed and the displacement. The flow can be steplessly changed by controlling the swashplate (cradle) (11). For axial piston units with swashplate design, the pistons (9) are arranged axially relative to the drive shaft.

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

5.2.1 Layout of the axial piston unit

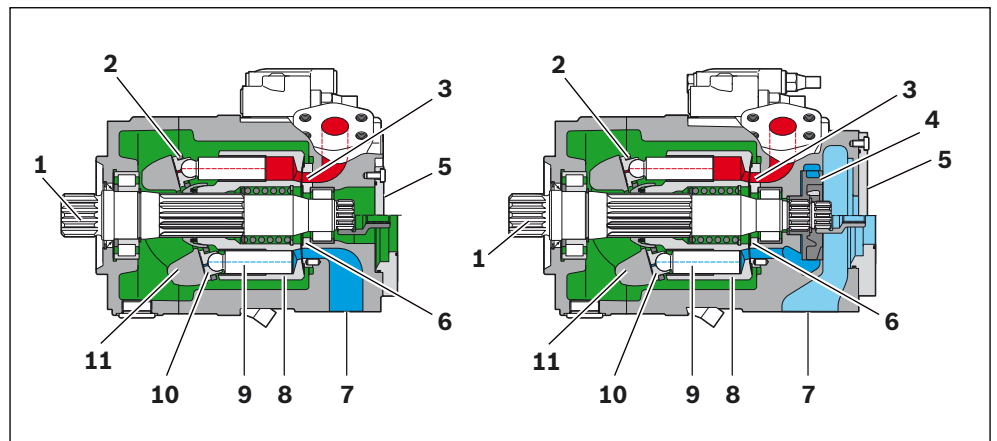


Fig. 2: Left-hand illustration: layout of the A11VO; right-hand illustration: A11VLO

- | | | |
|----------------------|----------------------|------------------------|
| 1 Drive shaft | 5 Port plate | 8 Cylinder |
| 2 Retainer plate | 6 Control plate | 9 Piston |
| 3 High-pressure side | (distribution plate) | 10 Slipper pad |
| 4 Charge pump | 7 Suction side | 11 Swashplate (Cradle) |
| (impeller) | | |

5.2.2 Functional description

Pump Torque and rotational speed are applied to the drive shaft (1) by a drive motor. The cylinder (8) is picked up and turned by the splines of the drive shaft. With every revolution, the pistons (9) execute a stroke in the cylinder bores, the size of which depends on the pitch of the swashplate (11). The slipper pads (10) are held on with the pistons and guided along the glide surface of the swashplate by the retaining plate (2). The swashplate setting during a rotation causes each piston to move over the bottom and top dead centers and back to its initial position. Here, hydraulic fluid is fed in and drained out through the two control slots in the control plate (6) according to the stroke displacement. On the suction side (7) hydraulic fluid flows into the piston chamber as the piston recedes. At the same time, on the high-pressure side (3) the fluid is pushed out of the cylinder chamber into the hydraulic system by the pistons.

Control The swivel angle of the cradle (11) is steplessly variable. Adjusting the swashplate swivel angle controls the piston stroke and, therefore, the displacement. The swivel angle is changed hydraulically by means of the stroke piston. The swashplate is mounted in swivel bearings for easy motion, and it is kept in balance by the opposing piston (not illustrated). Increasing the swivel angle increases the displacement; reducing the angle results in a corresponding reduction in displacement.



Various control devices are available depending on requirements. Information about this can be found in data sheet 92510.

Charge pump (optional) The axial piston unit A11VLO is equipped with a charge pump (4). The charge pump (impeller) is a circulating pump with which the pump is filled and can be operated at higher speeds. This also simplifies cold starting at low temperatures and high viscosity of the hydraulic fluid. Externally increasing the inlet pressure is therefore unnecessary in most cases. Charging the reservoir with compressed air is not permissible.

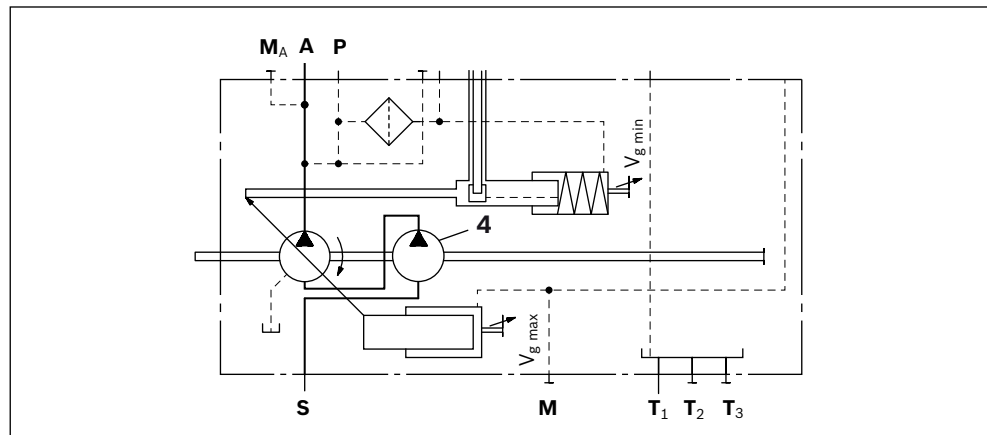


Fig. 3: Circuit diagram A11VLO with charge pump

5.3 Product identification

The axial piston unit can be identified from the name plate. The following example shows an **A11VO** name plate:

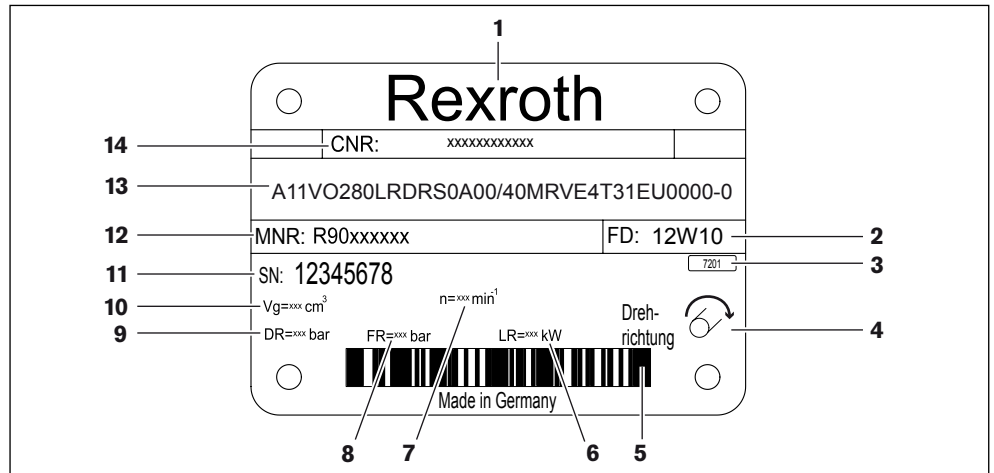


Fig. 4: Name plate A11VO Series 40

- | | |
|--|--|
| 1 Manufacturer | 8 Flow setting (optional) |
| 2 Production date | 9 Pressure control setting (optional) |
| 3 Internal plant designation | 10 Displacement |
| 4 Direction of rotation (viewed from drive shaft) – here: clockwise | 11 Serial number |
| 5 Barcode | 12 Material number of the axial piston unit |
| 6 Power setting (optional) | 13 Ordering code |
| 7 Speed | 14 Customer material number |

6 Transport and storage

- Always observe the required ambient conditions for transport and storage, see chapter 6.2 “Storing the axial piston unit” on page 22.



Notes on unpacking can be found in chapter 7.1 “Unpacking” on page 25.

6.1 Transporting the axial piston unit

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

- Transport by hand (chapter not relevant for this axial piston unit)
- Transporting with lifting device (eye bolt or lifting strap)

Dimensions and weights

Table 6: Dimensions and weights (without through drive) A11VO

Size		110	145	175	210	280
Weight	kg	64	79	97	111	143
Width	mm	The dimensions vary with the unit type. The values applicable for your axial piston unit can be found in the installation drawing (request if necessary).				
Height	mm					
Depth	mm					

Table 7: Dimensions and weights (without through drive) A11VLO

Size		145	175	210	280
Weight	kg	92	110	125	148
Width	mm	The dimensions vary with the unit type. The values applicable for your axial piston unit can be found in the installation drawing (request if necessary).			
Height	mm				
Depth	mm				

The weight specifications may vary depending on the unit type.

6.1.1 Transporting by hand

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

CAUTION! Danger from heavy loads!

There is a danger of health damage when carrying axial piston units.

- Use suitable lifting, placement and relocation equipment.
- Use your personal protective equipment (e.g., safety glasses, safety gloves, suitable working clothes, safety shoes).
- Do not transport the axial piston unit at sensitive attachment 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 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 with transport using the eye bolts.

Transport 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 threaded holes, use a threaded plug 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 threaded size is stated in the installation drawing.
- ▶ Make sure that the eye bolt can bear the total weight of the axial piston unit plus 20%.

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

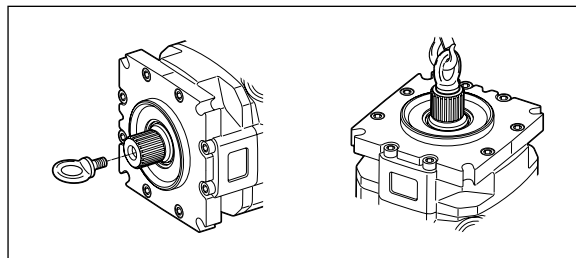


Fig. 5: Mounting eye bolt in drive shaft

Transport with eye bolt in housing (only possible for sizes 175, 210 and 280)

- ▶ For all threaded holes, use a threaded plug from the same system of units and of the correct size.
- ▶ Screw an eye bolt fully into the threaded hole in the housing.
- ▶ Make sure that each eye bolt can bear the total weight of the axial piston unit plus approx. 20%.

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

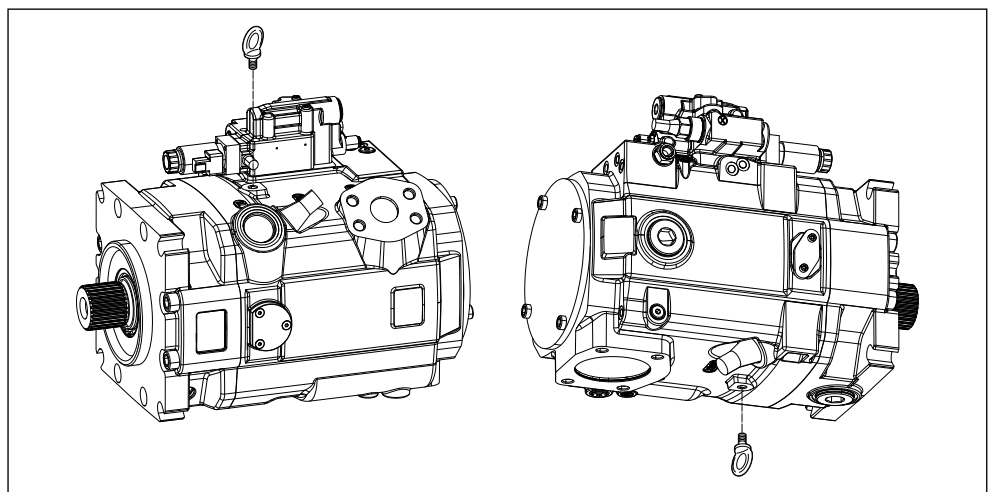


Fig. 6: Fixing eye bolt in case, top or bottom

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

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

- ▶ Use the widest possible lifting strap.
- ▶ Make sure that the axial piston unit is securely fixated with the lifting strap.
- ▶ Only guide the axial piston unit by hand for fine positioning and to avoid oscillations.
- ▶ Never step or reach under a suspended load.
- ▶ Place the lifting strap around the axial piston unit in such a way that it neither passes over the attachment parts (e.g. valves) nor that the axial piston unit is hung from attachment parts (see Fig. 7).

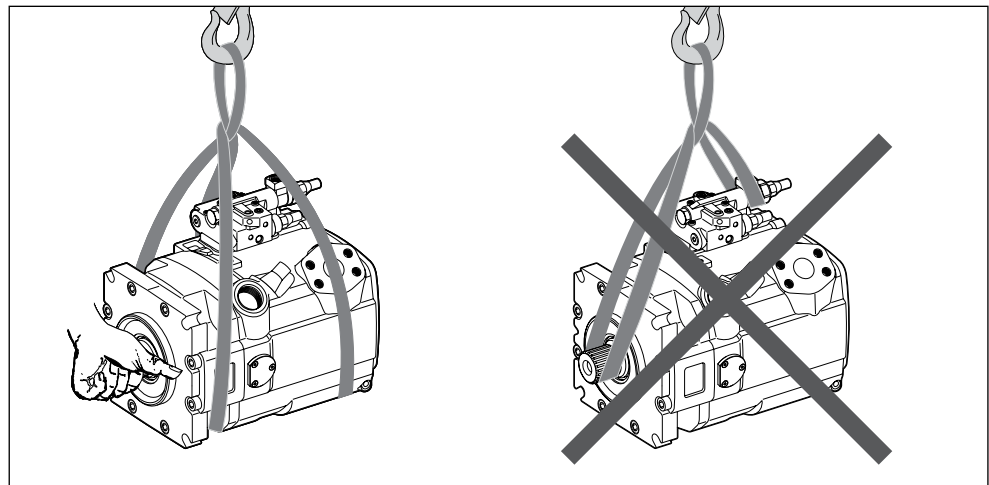


Fig. 7: Transportation with lifting strap

6.2 Storing the axial piston unit

Requirement

- The storage areas must be free of corrosive materials and gases.
- To prevent damage to the seals, ozone-forming equipment (e.g. mercury-vapor lamps, high voltage equipment, electric motors, sources of electrical sparks or electrical discharge) must not be operated in storage areas.
- The storage areas must be dry.
- Ideal storage temperature: +5 °C to +20 °C.
- Minimum storage temperature: -50 °C (exception: units with on-board electronics).
- Maximum storage temperature: +60 °C.
- Avoid significant exposure to light (e.g. bright windows or direct fluorescent lighting).
- Do not stack axial piston units and store them shock-proof.
- Do not store the axial piston unit on the drive shaft or fitting, e.g. sensors or valves.
- For further storage conditions, see Table 8.
- ▶ Check the axial piston unit monthly to ensure proper storage.

After delivery

The axial piston units are provided ex-works with corrosion protection packaging (corrosion protection film).

Table 2 lists the maximum permissible storage times for an originally packed axial piston unit as per data sheet 90312.

Table 8: Storage time with factory corrosion protection

Storage conditions	Standard corrosion protection	Long-term corrosion protection
Closed, dry room, uniform temperature between +5 °C and +20 °C. Undamaged and closed corrosion protection film.	Maximum 12 months	Maximum 24 months



Entitlement to warranty will be rendered void if the requirements and storage conditions are not adhered to or after expiration of the maximum storage time (see Table 8).

Procedure after expiry of the maximum storage time:

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



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

In the event of questions regarding repair and spare parts, contact your responsible Bosch Rexroth Service partner or the service department of the manufacture's plant for the axial piston unit, see chapter 10.5 "Spare parts" on page 48.

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



The following instructions only refer to axial piston units which are operated with a mineral-oil based hydraulic fluid. Other hydraulic fluids require preservation methods that are specifically designed for them. In such cases, consult Bosch Rexroth Service, see chapter 10.5 "Spare parts" on page 48 for address.

Bosch Rexroth recommends the following procedure:

1. Clean the axial piston unit, see chapter 10.1 "Cleaning and care" on page 46.
2. Empty the axial piston unit.
3. For storage periods up to 12 months: Moisten the inside of the axial piston unit with mineral oil and fill with approx. 100 ml mineral oil.
For storage periods up to 24 months: Fill the axial piston unit with corrosion protection VCI 329 (20 ml).
The filling is carried out via the drain port **T₁**, **T₂** or **T₃**, see chapter 7.4 "Installing the axial piston unit", Fig. 14 to Fig. 16 on page 37.
4. Seal all ports so they are airtight.
5. Moisten the unpainted areas of the axial piston unit with mineral oil or with a suitable, easily removable corrosion protection agent, e.g. acid-free grease.
6. Package the axial piston unit airproof together with desiccant in corrosion protection film.
7. Store the axial piston unit so that it is protected against jolts, see "Requirement" on page 22 in this chapter.

7 Installation

Prior to installation, the following documents must be available:

- Installation drawing for axial piston unit (can be obtained from your responsible contact person at 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 of the axial piston unit (contains the allowable values of technical data)

7.1 Unpacking

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

CAUTION! Danger from parts falling out!

If the packaging is not opened correctly, parts may fall out and damage the parts or even cause injuries!

- ▶ Place the packaging on a flat and solid 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 16.
- ▶ Dispose of the packaging material according to the national regulations in your country.

7.2 Installation conditions

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

- ▶ Fix the axial piston unit so that the expected forces and torques can be transferred without any danger. The machine/system manufacturer is responsible for dimensioning the fasteners.
- ▶ Observe the permissible radial forces on the drive shaft when driving with radial loading (belt drives). If necessary, the belt disc must be separately mounted.
- ▶ Make certain that the axial piston unit is air bled and filled with hydraulic fluid during commissioning and operation. This is also to be observed following relatively long standstill periods as the axial piston unit may empty via the hydraulic lines.
- ▶ The case drain fluid in the case interior must be directed to the reservoir via the highest case drain port. Use the line size which is appropriate for the port.
- ▶ Avoid using a check valve in the drain line. Exception: Above-reservoir installation, drive shaft upward. A check valve in the drain line (cracking pressure 0.5 bar) can prevent draining via the drain line. Please not the correct flow direction.
- ▶ To achieve favorable noise values, decouple all connecting lines from all vibration-capable components (e.g. reservoir) using elastic elements.

- ▶ Make sure that the suction, reservoir and return lines lead into the reservoir below the minimum fluid level in all operating conditions. This will prevent air from being drawn in, which could result in the formation of foam.
- ▶ Make sure that a minimum suction pressure of 0.8 bar absolute (without charge pump) or 0.7 bar absolute (with charge pump) absolute is present at port “S” during operation, in all installation positions and installation locations for the axial piston pump, see Fig. 8. See data sheet for pressure values.

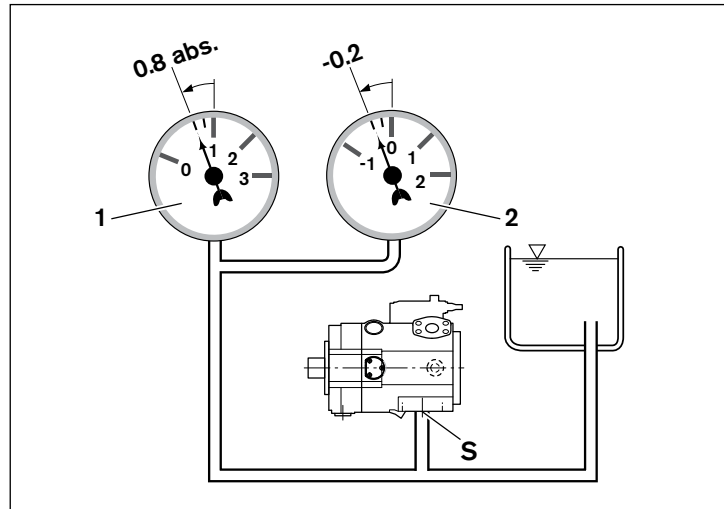


Fig. 8: Suction pressure

- 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 fully free of dust and foreign substances. The axial piston unit must be installed in a clean condition. Contamination of the hydraulic fluid can have a considerable impact on the function and service life of the axial piston unit.
- ▶ Use lint-free cloths for cleaning.
- ▶ Use suitable mild detergents to remove lubricants and other difficult-to-remove contamination. Cleaning agents must not enter the hydraulic system.

7.3 Installation position

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

7.3.1 Below-reservoir installation (standard)

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



Recommended installation position: 1 and 2.

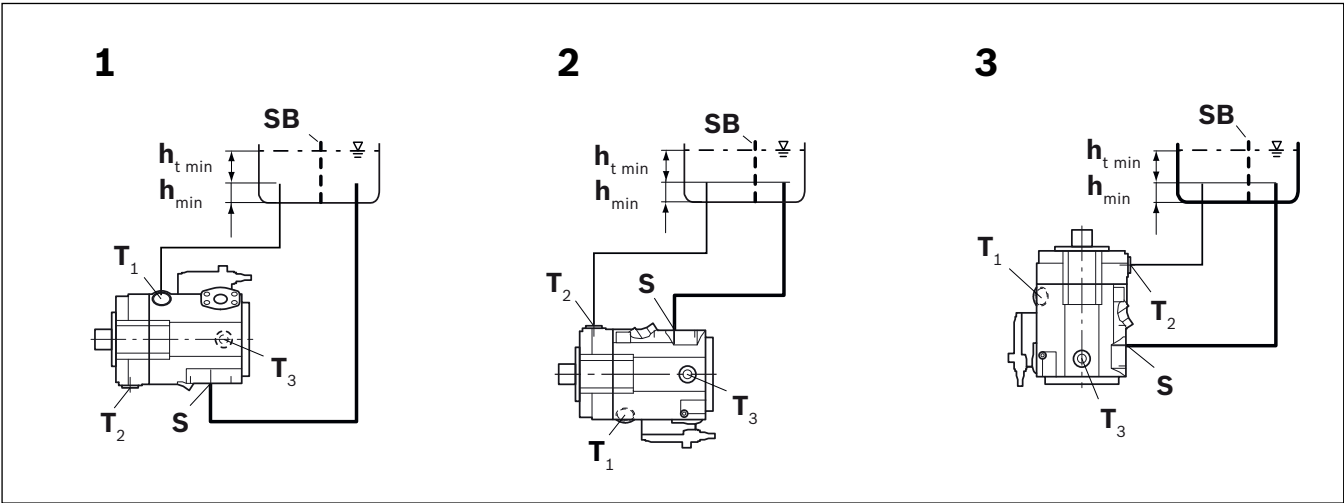


Fig. 9: Below-reservoir installation A11VO/A11VLO with installation position 1–3

T₁, T₂,	Highest drain port	h_{t min}	Minimum required immersion depth
T₃	(leakage)		(200 mm)
S	Suction port	h_{min}	Minimum required spacing to
SB	Baffle (baffle plate)		reservoir base (100 mm)

Table 9: Below-reservoir installation

Installation position	Air bleeding	Filling
1 (drive shaft, horizontal)	T ₁	S + T ₁
2 (drive shaft, horizontal)	T ₂	S + T ₂
3 (drive shaft vertically downward)	T ₂	S + T ₂

7.3.2
Above-reservoir installation

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



To prevent the axial piston unit from draining, a height difference $h_{ES\ min}$ of at least 25 mm at port T_2 is required in installation position 6.



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.



The above-reservoir installation is not permitted for units with charge pump (A11VLO).



Recommendation for installation position 6 (drive shaft upward): A check valve in the drain line (cracking pressure 0.5 bar) can prevent draining of the case interior.

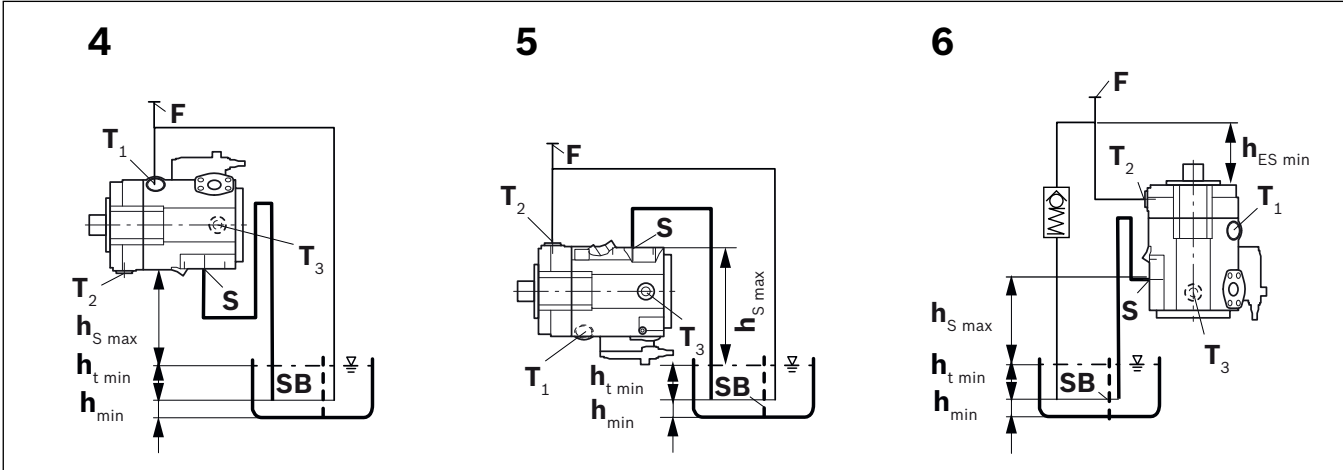


Fig. 10: Above-reservoir installation A11VO with installation position 4–6

F	Filling/air bleeding	h_{min}	Minimum required spacing to reservoir base (100 mm)
T_1, T_2, T_3	Highest drain port (case drain fluid)	$h_{ES\ min}$	Minimum required height needed to protect the axial piston unit from draining (25 mm)
S	Suction port	$h_{S\ max}$	Maximum permissible suction height (800 mm)
SB	Baffle (baffle plate)		
$h_{t\ min}$	Minimum required immersion depth (200 mm)		

Table 10: Above-reservoir installation

Installation position	Air bleeding	Filling
4 (drive shaft, horizontal)	F	T_1 (F)
5 (drive shaft, horizontal)	F	T_2 (F)
6 (drive shaft vertically downward)	F	T_2 (F)

7.3.3 Inside-reservoir installation

NOTICE

Risk of damage with inside-reservoir installation!

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

- Remove all plastic parts before installing the axial piston unit in the reservoir. Make certain that no pieces of these parts remain in the reservoir.
- Remove the protective plug from the suction port **S** and open at least one **T** port.

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

If the minimum fluid level is equal to or below the upper edge of the pump, see chapter 7.3.2 "Above-reservoir installation" on page 28.



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



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

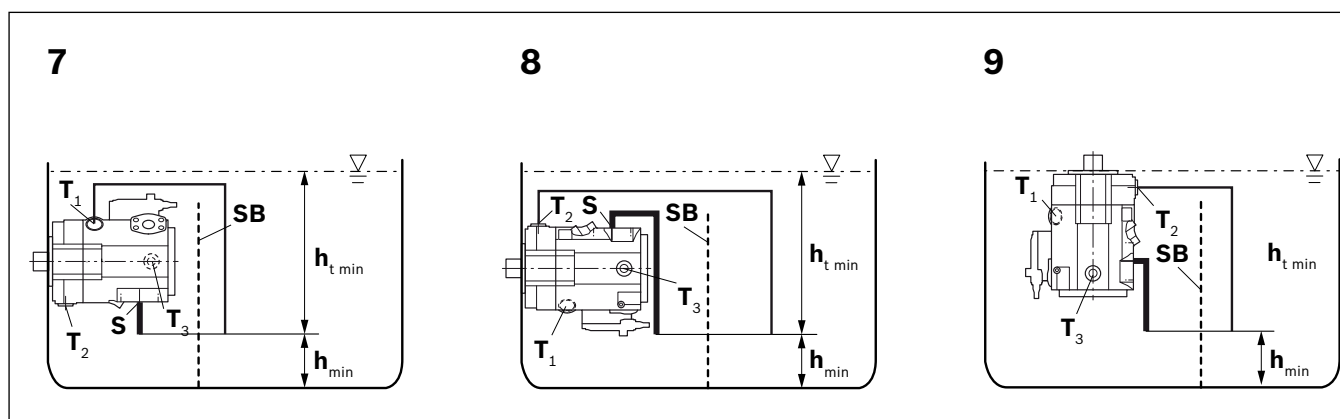


Fig. 11: Inside-reservoir installation A11VO/A11VLO with installation position 7–9

T₁, T₂, Highest drain port
T₃ (leakage)
S Suction port
SB Baffle (baffle plate)

h_{t min} Minimum required immersion depth
 (200 mm)
h_{min} Minimum required spacing to
 reservoir base (100 mm)

Table 11: Inside-reservoir installation

Installation position	Air bleeding	Filling
7 (drive shaft, horizontal)	via the highest open port T ₁	automatically via the open port T ₁ and S, by position below the hydraulic fluid level
8 (drive shaft, horizontal)	via the highest open port T ₂	automatically via the open port T ₂ and S, by position below the hydraulic fluid level
9 (drive shaft vertically downward)	via the highest open port T ₂	automatically via the open port T ₂ and S, by position below the hydraulic fluid level

7.4 Installing the axial piston unit

7.4.1 Preparation

- 1. Compare the material number and designation (ordering code) with the details in the order confirmation.



If the material number for the axial piston unit does not correspond to the one in the order confirmation, contact Bosch Rexroth Service for clarification, see chapter 10.5 “Spare parts” on page 48 for address.

- 2. Before installation, completely empty the axial piston unit to prevent mixing with the hydraulic fluid used in the machine/system.

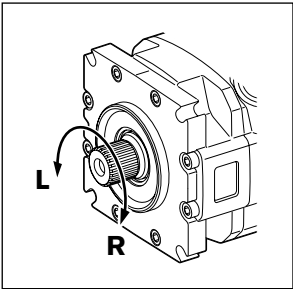


Fig. 12: Direction of rotation

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

- 3. 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 output/input shaft of the machine/system.



The direction of rotation as specified on the name plate determines the direction of rotation of the axial piston unit as viewed on the drive shaft, see chapter 5.3 “Product identification” on page 19.

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

Please keep in mind the following general notes for installation of the axial piston unit:

- Note that you can expect certain installation positions to affect the control device. Gravity, dead weight and case pressure can cause minor shifts in control characteristic curves and changes in response time.
- Torsional vibrations and speed variations may cause leakages on the shaft seal and increased rotary angle accelerations of the rotary group of the axial piston unit. At risk are diesel drives with a small number of cylinders and low flywheel mass and toothed belt or V-belt drives. Belts can lose a large part of its tension after just a short time.

An automatic tensioning device can lessen the speed variations and vibrations and thus avoid consequential damage.

– When using toothed belts or v-belts to transfer the input or output drive, always use an automatic tensioning device.

- On the input or output drive of an axial piston unit, a cardan shaft may cause vibrations and impermissible rotary angle accelerations. Depending on the frequency and temperature, they may result in leakage on the shaft seal and damage to the rotary group.
- For combinations comprising several units, make sure that the respective case pressure is not exceeded. In the event of pressure differences at the drain ports of the units, the shared drain line must be changed so that the minimum permissible case pressure of all connected units is not exceeded in any situation. If this is not possible, separate drain lines must be laid if necessary.

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

- with a coupling
- on a gearbox

7.4.4 Installation with coupling

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

NOTICE! Danger from improper handling!

Product can be damaged!

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

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



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

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



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

6. Fix 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 certain that no impermissible axial and radial forces act on the drive shaft.
9. For bell housing installation, check the coupling axial play through the bell window according to the manufacturer's instructions.
10. Details on the required tools and tightening torques for the mounting bolts are available from the machine/system manufacturer.
11. When using flexible couplings, check that the drive is free of resonance after completing the installation.

7.4.5 Installation on a gearbox

The installation layout for the axial piston unit on a gearbox is described below.

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

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

For attachment via gear wheel or helically-toothed shaft

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

7.4.6 Installation with cardan shaft

To connect the axial piston unit to the drive motor via a cardan shaft:

1. Position the axial piston unit close to the specified installation point. It should allow enough space for the cardan shaft to fit through on both sides.
2. Position the cardan shaft on the output shaft of the drive motor.
3. Push the axial piston unit to the cardan shaft and position the cardan shaft on the drive shaft of the axial piston unit.
4. Bring the axial piston unit to the installation position and secure. If necessary, details on the required tools and tightening torques for the mounting bolts can be obtained from the system manufacturer.

7.4.7 Completing installation

1. Remove any mounted transport screws.

CAUTION! Operation with protective plugs!

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

- Before commissioning, remove all protective plugs and replace them with suitable, pressure-proof, metal threaded plugs.

2. Remove the transport protection.

The axial piston unit is delivered with protective covers (**1**) and protective plugs (**2**). They are not pressure-resistant, therefore they 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 responsible Bosch Rexroth Service partner or the service department of the manufacture's plant for the axial piston unit.

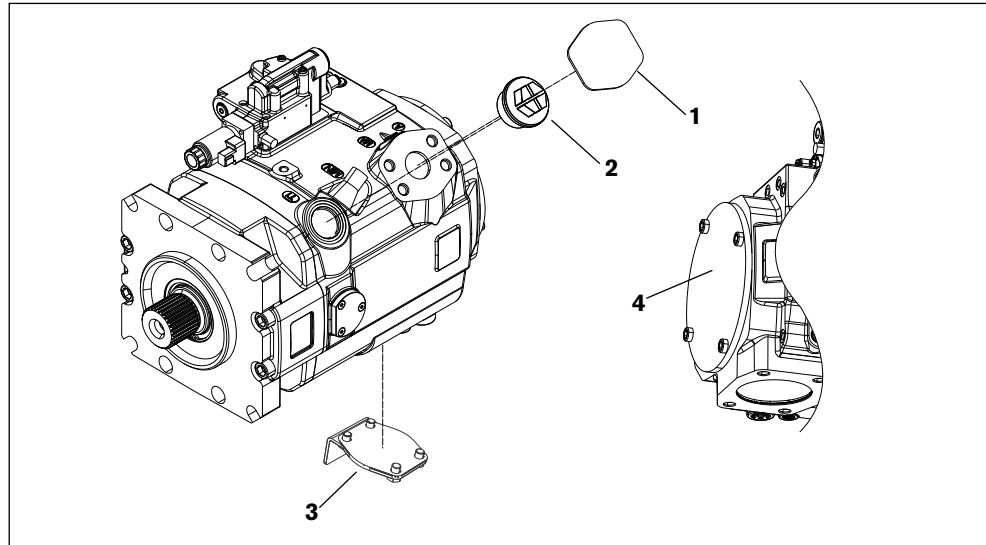


Fig. 13: Removing transport protection

- | | |
|--|--|
| <p>1 Protective covers</p> <p>2 Protective plugs/threaded plugs</p> <p>3 Steel flange covers (the flange cover on the suction port provides a secure stand and protection for the $V_{g\ max}$ stop)</p> | <p>4 On version with through drive, metallic protective cover and mounting bolts at the through drive</p> |
|--|--|



Ports intended for connecting lines are covered by protective plugs or threaded plugs, which serve as transport protection. All ports required for functional operation must be connected (see Table 12 “Ports A11VO/A11VLO Series 40” on page 38). Failure to comply with this could lead to malfunctions or damage. If a port is not connected, it must be plugged with a threaded plug because protective plugs are not pressure-resistant.



Setting screws are protected against unauthorized resetting by means of protective caps. Removal of the protective caps will void the warranty. If you need a modification of the setting, please contact your responsible Bosch Rexroth Service (for address, see chapter 10.5 “Spare parts” on page 48).

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

7.4.8 Hydraulically connecting the axial piston unit

NOTICE

Insufficient suction pressure!

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

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

The machine/system manufacturer is responsible for dimensioning the lines. The axial piston unit must be connected to the rest of the hydraulic system in accordance with the hydraulic circuit diagram of the machine/system manufacturer. The ports and fixing threads are designed for the peak pressure specified in the data sheet. The machine/system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.



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

Notes on routing the lines

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

- Lines and hoses must be installed without pre-charge pressure, so that no further mechanical forces are applied during operation that will reduce the service life of the axial piston unit and, if applicable, the entire machine/system.
- Use suitable seals as sealing material.
- Suction line (pipe or hose)
 - The suction line should be as short and straight as possible.
 - Measure the line cross section of the suction line so that the pressure at the suction port does not drop below the minimum permissible pressure. Make sure that the maximum suction pressure is not exceeded (e.g. when pre-filling).
 - Make sure the connections and connecting elements are airtight.
 - The hose must be pressure-resistant, also for external air pressure.
- Pressure line
 - For the pressure lines, use only pipes, hoses and connecting elements rated for the operating pressure range specified in data sheet 92510 (see Table 12).

- Drain line
 - Always route the drain lines so that the case is constantly filled with hydraulic fluid and to ensure that no air gets through the shaft seal even during extended standstill periods.
 - In no operating condition may the case internal pressure exceed the maximum values specified for the axial piston unit in the data sheet.
 - The drain line joint in the reservoir must always be below the minimum fluid level under all conditions (see chapter 7.3 “Installation position” on page 27).
- If the axial piston unit is equipped with installed screw fittings, these must not be unscrewed. Screw the threaded plug of the fitting directly into the installed screw fitting.

Risk of mix-ups with threaded connections

Axial piston units are employed in regions using the metric measuring system, in regions using the Anglo-American (imperial) measuring system and in regions using the Japanese measuring system (JIS – **J**apan **I**ndustrial **S**tandard). Moreover, various kinds of seal are used.

The system of units, the kind of seal and the size of female thread and threaded plugs (e.g., locking screw) must all match.

Due to the limited options for visually detecting differences, there is a risk of mix-ups.

WARNING! Leaking or popped-out threaded plugs!

If a threaded plug which is of a different measurement system, kind of seal and size with respect to the female thread is pressurized, the threaded plug may loosen itself or even be ejected from the hole in a projectile-like manner. This can result in serious injury and damage to equipment. Hydraulic fluid can be discharged from this leakage point.

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

Port overview

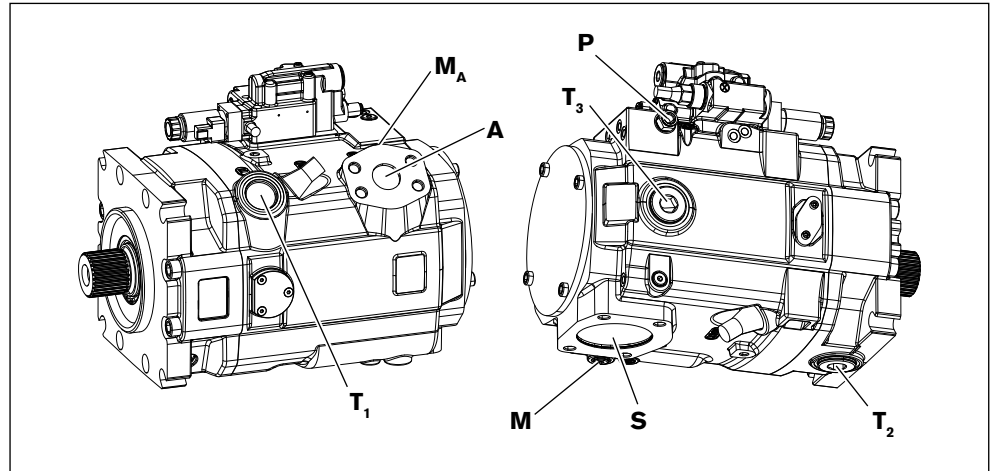


Fig. 14: Port overview A11VLO with E2DR control, clockwise rotation

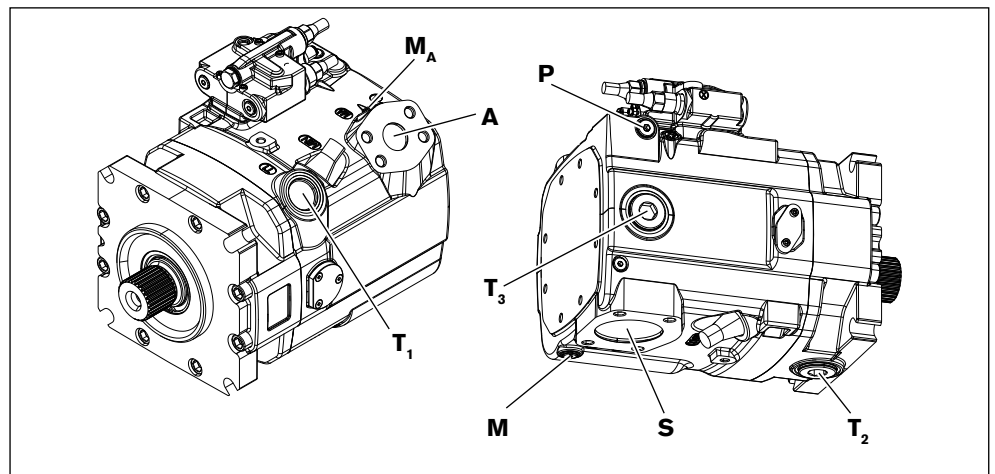


Fig. 15: Port overview A11VO with LRDRS0 control, clockwise rotation

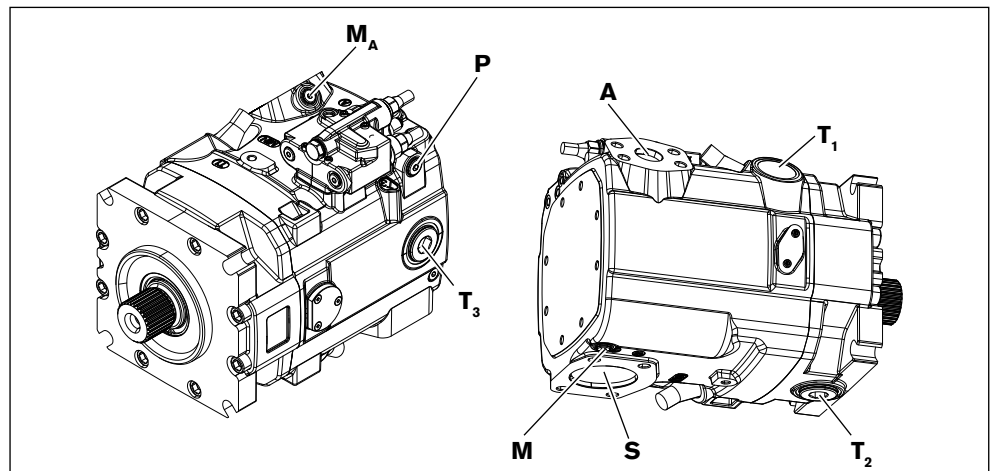


Fig. 16: Port overview A11VO with LRDRS0 control, counter-clockwise rotation

Table 12: Ports A11VO/A11VLO Series 40

Ports ¹⁾		p_{\max} [bar] ²⁾	Status
A	Working port	420	O
S	Suction port (without charge pump)	30	O
S	Suction port (with charge pump)	2	O
T ₁	Drain port	10	O ³⁾
T ₂	Drain port	10	X ³⁾
T ₃	Drain port	10	X ³⁾
CR	Pilot signal (CR only)	420	O
PR	Pilot signal (PR only)	420	O
H3, H4	Pilot signal (only on H3, H4)	100	O
X	Pilot signal	420	O
M	Measuring, control pressure	420	X
M _A	Measuring, pressure A	420	X
P	External control pressure (ordering code digit 8 version B or C = with external control pressure supply)	50	O
	Port P without function (External control pressure 8 version A = without external control pressure supply)	420	X

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

²⁾ Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring equipment and fittings.

³⁾ Depending on the installation position T₁, T₂ or T₃ must be connected (see chapter 7.3 "Installation position" on page 27)

O = Must be connected (plugged on delivery)

X = Plugged (in normal operation)

Tightening torques The following tightening torques apply:

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

Table 13: Tightening torques for female threads and threaded plugs

Connections		Maximum permissible tightening torque of the threaded holes $M_{G \max}$	Required tightening torque of the threaded plugs M_V	WAF hexagon socket for the threaded plugs
Standard	Threaded size			
ISO 6149	M14 x 1,5	80 Nm	45 Nm	6 mm
	M18 x 1,5	140 Nm	70 Nm	8 mm
	M33 x 2	540 Nm	310 Nm	17 mm
	M42 x 2	720 Nm	330 Nm	22 mm

Procedure

To connect the axial piston unit to the hydraulic system:

1. Remove the protective plugs and threaded plugs at the ports at which the connections are to be made according to the hydraulic circuit diagram.
2. Make certain 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. (Note chapter 7.5 “Performing flushing cycle” on page 40 when you flush out the complete 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. With inside-reservoir installation, the axial piston unit case must be filled before fitting the lines and filling the reservoir with hydraulic fluid.
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, couplings or connecting points with hoses or pipes to ensure they are in condition for safe working.

7.4.9 Electrically connecting the axial piston unit**NOTICE****Short circuit in event of penetrating hydraulic fluid!**

Fluid can penetrate the product and cause a short circuit!

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

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

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

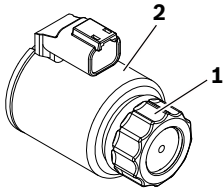
For axial piston units with electrical control and/or mounted sensors, please comply with the details given in data sheet 92510, e.g.:

- the permissible voltage range
- the permissible current
- the correct connection
- the recommended electrical control units

Exact details on the connector, type of protection and matching mating connector can also be found in data sheet 92510. The mating connector is not included in scope of delivery.

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

Changing connector orientation



If necessary, you can change the connector orientation by turning the solenoid. This is dependent on the connector version.

To do this, proceed as follows:

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

7.5 Performing flushing cycle

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



The flushing cycle must be performed with an additional flushing unit. Follow the instructions of the flushing unit's manufacturer for the exact procedure during the flushing cycle.

8 Commissioning

WARNING

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

Danger to life, risk of injury or serious injuries!

- ▶ Pay attention to and rectify potential danger sources before operating the axial piston unit.
- ▶ Nobody may stand in the danger zone of the machine/system.
- ▶ The emergency stop button for the machine/system must be within the operator's reach.
- ▶ Always follow the instructions of the machine/system manufacturer during commissioning.

CAUTION

Commissioning of an incorrectly installed product!

Risk of injury and damage to equipment!

- ▶ Make sure that all electrical and hydraulic ports are connected or plugged.
- ▶ Only commission a completely installed fault-free product with original accessories from Bosch Rexroth.

8.1 Initial commissioning



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

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



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

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

Details of minimum requirements for hydraulic fluids can be found in Bosch Rexroth data sheets 90220. The titles of the data sheet can be found in Table 2 "Required and supplementary documentation" on page 5. You can find details of permissible and optimal viscosity in data sheet 92510.

To ensure the functional reliability of the axial piston unit, cleanliness level 20/18/15 according to ISO 4406 at least is necessary for the hydraulic fluid. At very high hydraulic fluid temperatures (+90 °C to maximum +115 °C), a cleanliness level of at least 19/17/14 according to ISO 4406 is necessary. For permissible temperatures, see data sheet 92510.

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

NOTICE! Contaminated hydraulic fluid!

The cleanliness levels of hydraulic fluids on delivery do not normally conform to the requirements for our components.

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

2. Fill and air bleed the axial piston unit via the appropriate ports, see chapter 7.3 "Installation position" on page 27. The hydraulic lines of the system must also be filled.

NOTICE! Damage to equipment due to improper lubrication!

Product can be damaged or destroyed!

- When using a shut-off valve in the suction and/or drain line, make sure that the input 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 5.3 "Product identification", Fig. 4: Name plate A11VO Series 40 on page 19.
5. Operate the axial piston pump at a lower speed (starter speed for internal combustion engines or inching operation for electric motors) until the hydraulic system is completely filled and bled. To inspect, drain the hydraulic fluid at the drain port and wait until it drains without bubbles.

8.1.2 Testing the hydraulic fluid supply

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

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

For information on troubleshooting, see chapter 14 “Troubleshooting” on page 51.

To test the hydraulic fluid supply:

1. Allow the drive motor to run at the slowest speed. The axial piston unit must be operated without load. Pay attention to leakage and noise.
2. Check the axial piston unit's drain line during the test. The case drain fluid should not contain any bubbles.
3. Increase the load and check whether the operating pressure rises as expected.
4. Carry out 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 92510 for the permissible value.
6. At maximum pressure, check the case drain pressure at port **T₁**, **T₂** or **T₃**. Refer to data sheet 92510 for the permissible value.

8.1.3 Performing functional test

WARNING

Incorrectly connected axial piston unit!

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

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

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

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

- After starting the drive motor, check in particular the specified pressures, e.g. system pressure and case pressure.
- If necessary, disconnect the gauge and plug the ports with threaded plugs.

8.2 Running-in phase

NOTICE

Damage to equipment by insufficient viscosity!

An increased hydraulic fluid temperature may reduce the viscosity values by too much and damage the product!

- ▶ Monitor the operating temperature during the running-in phase, e.g. by measuring the case drain temperature.
- ▶ Reduce the loading (pressure, rpm) of the axial piston unit if impermissible operating temperatures and/or viscosities occur.
- ▶ Operating temperatures that are too high indicate faults that have to be analyzed and cleared.

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

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

- ▶ After the running-in phase, have a hydraulic fluid specimen 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, Bosch Rexroth recommends the hydraulic fluid be changed.

8.3 Recommissioning after standstill

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

Among others, the following criteria may make recommissioning necessary:

- 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 41.

9 Operation

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

10 Maintenance and repair

NOTICE

Inspection and maintenance work carried out too late!

Damage to equipment!

- ▶ Carry out 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 by mechanical effects!

The water jet of a power washer may damage the seals and electrical system of the axial piston unit!

- ▶ Do not point the power washer 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 plugs of the plug connections are securely seated to ensure that no moisture can penetrate into the axial piston unit during cleaning.
- ▶ Use only water and, if necessary, a mild detergent to clean the axial piston unit. Never use solvents or aggressive cleaning agents.
- ▶ Remove external coarse dirt and keep sensitive and important components, such as solenoids, valves and sensors, clean.

10.2 Inspection

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

Table 14: Inspection schedule

Task to be carried out		Interval
Hydraulic system	Check level of hydraulic fluid in the reservoir.	Daily
	Check the operating temperature at a comparable load condition at the drain port and in the reservoir.	Weekly
	Conduct analysis of hydraulic fluid: viscosity, aging and dirt 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 to rectify them. For this reason, Bosch Rexroth recommends that the axial piston unit and system are always kept in a clean condition.	Daily
	Check axial piston unit for unusual noise development.	Daily
	Check fixing elements for tight seating. All fasteners have to be checked when the hydraulic system is switched off, depressurized and cooled down.	Monthly
	Change the optionally fitted filter in the pressure line of the boost pump. The change interval may vary depending on the degree of contamination of the hydraulic fluid. We recommend using a contamination indicator.	Yearly or every 1000 operating hours (whichever occurs first)

10.3 Maintenance

The axial piston unit is low maintenance when used properly.

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

The service life of the axial piston unit is limited by the service life of the bearings fitted. The service life on the basis of the load cycle can be requested from the responsible Bosch Rexroth Service partner, see chapter 10.5 "Spare parts" on page 48 for address. Based on these details, a maintenance period is to be determined by the system manufacturer for the replacement of the bearings and included in the maintenance schedule of the hydraulic system.

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

- Use exclusively original spare parts from Rexroth to repair the Rexroth axial piston units, otherwise the functional reliability of the axial piston unit cannot be assured and you lose your claim under warranty.

In the event of questions regarding repair, contact your responsible Bosch Rexroth Service partner or the service department of the manufacture's plant for the axial piston unit, see chapter 10.5 "Spare parts" for further information.

10.5 Spare parts

CAUTION

Use of unsuitable spare parts!

Spare parts, which do not comply with the requirements as laid down by Bosch Rexroth can cause damage to persons and equipment!

- Use exclusively original spare parts from Rexroth to repair the Rexroth axial piston units, otherwise the functional reliability of the axial piston unit cannot be assured and you lose your claim under warranty.

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

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

Bosch Rexroth AG
An den Kelterwiesen 14
72160 Horb a.N., Germany
Hotline +49 9352 405060
spares.horb@boschrexroth.de

Spare parts can be found on the Internet at www.boschrexroth.com/spc

If you have general questions, please contact svm.support@boschrexroth.de

For the addresses of foreign subsidiaries, please refer to
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 certain that the relevant system components are not under pressure or voltage.
2. Protect the entire system against being re-energized.

11.3 Removal

Proceed as follows to remove the axial piston unit:

1. Check whether the hydraulic system is depressurized.
2. Allow the axial piston unit to cool down until it can be removed without danger.
3. For below-reservoir installation, before removing the axial piston unit from the complete system, seal the connection to the reservoir or drain the reservoir.
4. Place a drip tray under the axial piston unit to collect any hydraulic fluid that may leak.
5. Loosen the lines and collect the escaping hydraulic fluid in the drip tray.
6. Remove the axial piston unit. Use a suitable lifting device.
7. Completely empty 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 22.

12 Disposal

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

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

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

13 Extension and conversion

Do not modify the axial piston unit or its fittings. This includes also the change of the setting screws or the wiring.



The Bosch Rexroth warranty only applies to the delivered configuration. In case of conversion or extension, the entitlement under warranty will be rendered void.



Setting screws are protected against unauthorized resetting by means of protective caps. Removal of the protective caps will void the warranty. If you need a modification of the setting, please contact your responsible Bosch Rexroth Service (for address, see chapter 10.5 “Spare parts” on page 48).

14 Troubleshooting

Table 15 may help you when troubleshooting. The table makes no claim for completeness.

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

14.1 How to proceed with troubleshooting

- ▶ Always act systematically and in a targeted way, even under pressure of time. Random and imprudent removal and a readjustment of settings could result in the inability to ascertain the original failure cause.
- ▶ First obtain a general overview of how your product works in conjunction with the overall system.
- ▶ Try to find out whether the product was working properly in conjunction with the entire system before the problem occurred.
- ▶ Try to determine any changes to the entire system in which the product is installed.
 - Have there been any changes to the product's operating conditions or operating range?
 - Has maintenance work recently been carried out? Is there an inspection or maintenance log?
 - Have any changes (e.g. upgrades) or repairs been made to the overall system (machine/system, electrics, control) or to the product? If so, what were they?
 - Has the hydraulic fluid been changed?
 - Has the product or machine been used as intended?
 - How did the malfunction appear?
- ▶ Try to get a clear idea of the cause of the fault. Directly ask the (machine) operator.
- ▶ Document the work carried out.
- ▶ If you cannot rectify the fault, contact one of the contact addresses which can be found at:
www.boschrexroth.com/addresses.

14.2 Malfunction table

Table 15: Axial piston unit malfunction table

Malfunction	Possible cause	Remedy
Unusual noises	Insufficient bleeding of the hydraulic system	Axial piston unit, suction line for the hydraulic pump and filling the reservoir
		Completely air bleed 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, contaminants in the suction line, impermissible filter in the suction line	Machine/system manufacturer: check the system, e.g. optimize inlet conditions, use suitable hydraulic fluid
		Fill the suction line with hydraulic fluid
		Remove contaminants from the suction line
	Drive speed too high	Machine/system manufacturer: reduce drive speed
	Wrong direction of rotation	Machine/system manufacturer: check correct direction of rotation, see chapter 7.4.1 "Preparation" on page 30
	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 the accessory parts, hydraulic lines or wrong installation of the coupling	Fix attachment parts according to the information provided by the coupling or fitting manufacturer
	Valve and controller vibrations	Optimize the adjustment of the axial piston unit and the pressure safeguarding in the hydraulic system
	Mechanical damage to the axial piston unit (e.g. bearing damage)	Replace axial piston units
		Contact Bosch Rexroth Service

Table 15: Axial piston unit malfunction table

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

Table 15: Axial piston unit malfunction table

Malfunction	Possible cause	Remedy
No or insufficient pressure	Insufficient bleeding of the hydraulic system	Axial piston unit, suction line for the hydraulic pump and filling the reservoir
		Completely air bleed axial piston unit and hydraulic system
		Check correct installation position
	Faulty mechanical drive (e.g. defective coupling)	Contact machine/system manufacturer
	Input 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, contaminants in the suction line, impermissible filter in the suction line	Machine/system manufacturer: check the system, e.g. optimize inlet conditions, use suitable hydraulic fluid
		Fill the suction line with hydraulic fluid
		Remove contaminants from the suction line
	Hydraulic fluid not in optimum viscosity range	Machine/system manufacturer: check temperature range and use suitable hydraulic fluid
	Insufficient pilot pressure or control pressure	Check pilot pressure or control pressure
		Contact Bosch Rexroth Service
	Malfunction of the control device or controller of the axial piston unit	Contact Bosch Rexroth Service
	Control of the control device defective	Check control (machine/system manufacturer or contact Bosch Rexroth-Service)
Pressure/flow fluctuations resp. instabilities	Wear or mechanical damage to the axial piston unit	Replace axial piston units
		Contact Bosch Rexroth Service
	Output unit defective (e.g. hydraulic motor or cylinder)	Contact machine/system manufacturer
	Insufficient bleeding of the hydraulic system	Axial piston unit, suction line for the hydraulic pump and filling the reservoir
		Completely air bleed 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, contaminants in the suction line, impermissible filter in the suction line	Machine/system manufacturer: check the system, e.g. optimize inlet conditions, use suitable hydraulic fluid
		Fill the suction line with hydraulic fluid
		Remove contaminants from the suction line
	Valve and controller vibrations	Optimize the adjustment of the axial piston unit and the pressure safeguarding in the hydraulic system
	Unstable control signal	Contact machine/system manufacturer resp. Bosch Rexroth-Service
	Malfunction of the control devices or the controller	Contact Bosch Rexroth Service

Table 15: Axial piston unit malfunction table

Malfunction	Possible cause	Remedy
Excessive temperature of hydraulic fluid and housing	Excessive inlet temperature at the axial piston unit	Machine/system manufacturer: inspect system, e.g. malfunction of the cooler, insufficient hydraulic fluid in the reservoir
	Wrong setting or malfunction of the pressure relief and the pressure control valve (e.g. pressure controller)	Optimize the adjustment of the pressure relief and pressure control valves of the axial piston unit and the pressure safeguarding in the hydraulic system
		Contact Bosch Rexroth Service
		Contact machine/system manufacturer
	Wear of axial piston unit	Exchange axial piston unit, contact Bosch Rexroth Service

15 Technical data

The permissible values of the technical data of your axial piston unit can be found in the data sheet 92510.

The data sheets can be found on the internet at
www.boschrexroth.com/various/utilities/mediadirectory

You can find further information about A11VO/A11VLO Series 40 in the mobile hydraulics online product catalog: www.boschrexroth.com/axialkolbenpumpen

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

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www.boschrexroth.com/addresses