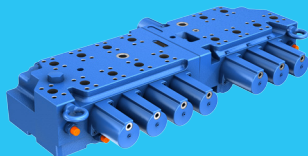


Control blocks for mobile applications

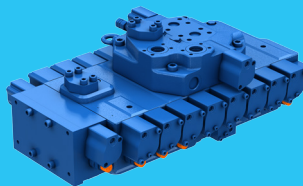
M1



M8



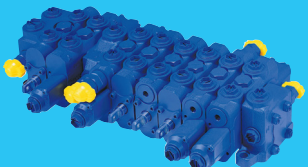
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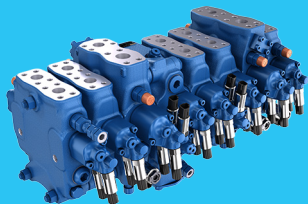
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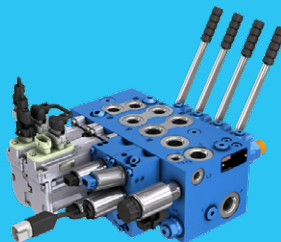
SM



RCS



M4



SP



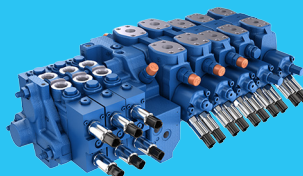
M6



M7



RS



SX



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

The original instruction manual was created in the German language.

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1 About this documentation

1.1 Validity of the documentation

This documentation is valid for the following products:

- M1
- M4
- M6
- M7
- M8
- M9
- MO
- RCS
- ROM8
- RS
- SM
- SP
- SX

This documentation applies to all control blocks of the named series, regardless of their manufacturing date up to a new revision of this document.

This documentation is intended for machine manufacturers.

This documentation contains important information on safe and proper transport, installation and disassembly, commissioning, operation, maintenance and servicing of the product.

- ▶ Read this documentation completely and in particular the chapters entitled 2 "Safety instructions" page 9 and 3 "General instructions on property damage and product damage" on page 15 before you start work with the control block.

1.2 Required and supplementary documentation


- ▶ Only commission the product if the documentation marked with the book symbol  is available, understood and complied with.

Table 1: Required and supplementary documentation










Title	Document number	Document type
 Technical data sheet Contains the permissible technical data. Please bear in mind that different technical data sheets apply depending on the series:		Data sheet
Open-center control block MO-16, 22, 32	64354	
Open-center control block MO-40	64370	
Open-center control block MO-52	64373	
Open-center control block M1	64263	
Open-center control block M8	64294	
Open-center control block M9	64303	
Open-center control block ROM8	66162	
Open-center control block SM	64122	
Closed-center control block RCS30	64155	
Closed-center control block RCS35	64157	
Load-sensing control block M4-12	64276	
Load-sensing control block M4-15	64283	
Load-sensing control block M4-22	64279	
Load-sensing control block SP-08	64139	

Table 1: Required and supplementary documentation

Title	Document number	Document type
Flow sharing control block M6-15	64321	
Flow sharing control block M6-22	64322	
Flow sharing control block M7-20	64293	
Flow sharing control block M7-22	64295	
Flow sharing control block M7-25	64297	
Flow sharing control block RS12	64133	
Flow sharing control block RS14	64136	
Flow sharing control block RS15	64134	
Flow sharing control block RS20	64137	
Flow sharing control block SX 10	64132	
Flow sharing control block SX 12	64128	
Flow sharing control block SX 14	64125	
 CAN-controlled pilot module CPM-1x CANopen standard communication	64820-B	Instruction manual
 CAN-controlled pilot module CPM-1x CANopen special communication	64819-B	Instruction manual
 Spool position sensor PSM	95190-B	Instruction manual
 Order confirmation Contains the order-related technical data of the control block.		Order confirmation
 Offer drawing Contains the outer dimensions, all connections and the hydraulic circuit diagram of the control block.		Offer drawing
 Hydraulic fluids based on mineral oils and related hydrocarbons Describes the requirements for hydraulic fluids on mineral oil basis and related hydrocarbons for operation with Rexroth hydraulic components and provides support for selection of suitable hydraulic fluids for the hydraulic system.	90220	Data sheet
 Environmentally acceptable hydraulic fluids Describes the requirements for environmentally acceptable hydraulic fluids on mineral oil basis and related hydrocarbons for operation with Rexroth hydraulic components, and provides support for selection of suitable hydraulic fluids for the hydraulic system.	90221	Data sheet
 Reliability parameters MTTF_D for the functional safety according to ISO 13849 MTTF _D values for control blocks	90290	Data sheet



The related documentation can be obtained where necessary from Rexroth via www.boschrexroth.com/mobile-hydraulics-catalog.

1.3 Representation of information

Uniform safety instructions, symbols, terms and abbreviations are used throughout this documentation to ensure safe and proper use of the product. For clarification, they are explained in the sections below.

1.3.1 Safety instructions




This documentation includes safety instructions in chapters 2.6 "Product-specific safety instructions" on page 11 and 3 "General instructions on property damage and product damage" on page 15, as well as prior to a sequence of actions or instructions with risk of injury or property damage. Always follow the measures for danger prevention associated with the use of this product.

Safety instructions are set out as follows:

 SIGNAL WORD
<p>Type and source of danger</p> <p>Consequences of noncompliance</p> <ul style="list-style-type: none"> ▶ Danger prevention measure

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


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

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

1.3.2 Symbols

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

Table 3: Meaning of symbols

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

1.3.3 Designations

This documentation uses the following designations:

Table 4: Designations

Designation	Meaning
Mono block	A control block that has been cast from a single piece. Optionally, other directional valves can be mounted to extend the functions.
Control block in sandwich plate design	A control block that has been assembled from one or several directional valves.
Directional valve	A control block segment with 1 spool axis; also referred to below as a "valve section".
Control spool	Main spool
Actuation	Type of control spool actuation

1.3.4 Abbreviations

This documentation uses the following abbreviations:

Table 5: Abbreviations

Abbreviation	Meaning
ATEX	EC directive on explosion protection (A tmosphère e xplosible)
DIN	D eutsche I ndustrie N orm (German Institute for Standardization)
ISO	I nternational O rganization for S tandardization

2 Safety instructions

2.1 About this chapter

The product has been manufactured in accordance with 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 product.
- ▶ Keep the documentation in a location where it is accessible to all users at all times.
- ▶ Always include the required documentation when passing the product on to third parties.

2.2 Intended use

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

The control blocks have been developed to control various hydraulic consumers on mobile and standalone working machines.

Deviating use is only permitted following consultation with Bosch Rexroth.

The product can be employed as a safety-relevant part of a control system. It does not however include a safety function as it is unable to provide or realize such a function independently. If the product is to be employed to realize safety functions, additional measures are to be defined by the system manufacturer or system planner in either the control system or the safety-relevant part of the control system. Parameters in this respect can be found in standards governing functional safety such as ISO 13849, IEC 62061 or specific technical guidelines.

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

Intended use includes having completely read and understood this documentation and particularly 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 forms of faulty usage are also considered improper (this list is not exhaustive):

- Use outside the operating parameters approved in the data sheet or in the order confirmation (except for customer-specific approvals)
- Use of non-approved fluids, e.g. water or polyurethane components
- Changes to factory settings by unauthorized persons.
- Use of assembled parts (e.g. control unit, valves) not in combination with the specified Rexroth components
- Use of the control block in explosive environments unless the component or machine/system has been certified as being compliant with ATEX directive 2014/34/EU

2.4 Personnel qualifications

The activities described in this documentation require a basic understanding of mechanics, electricity and hydraulics, as well as familiarity with associated technical terms. For transporting and handling the product, knowledge regarding the use of lifting gear and lifting devices is required. The term skilled personnel refers to persons who possess the professional training, knowledge and experience, as well as the understanding of the regulations relevant to the work to be done that are necessary to recognize possible dangers and take the appropriate safety measures. Skilled personnel must follow the rules relevant to their field and have the necessary hydraulic 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
- Knowledge regarding the function and interaction of hydraulic components.



Bosch Rexroth offers you measures supporting training in specific areas. For an overview of the training contents, visit our website under: www.boschrexroth.com/training.

2.5 General safety instructions

- Observe applicable accident prevention specifications and environmental protection regulations.
- Observe the safety regulations of the country in which the product is used/operated.
- Use Rexroth products only when they are in good working order.
- Observe all notices on the product.
- Do not install, operate, remove or maintain Rexroth products if under the influence of alcohol, drugs or medication that may affect your reaction time.
- Only use genuine Rexroth accessories and spare parts to ensure there is no hazard to persons caused by 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 specified and permitted in the product documentation, for example in explosion protection areas 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 corresponds to 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).

2.6 Product-specific safety instructions

The following safety instructions apply for chapters 6 to 14.

WARNING

Danger due to suspended loads!

Danger to life, risk of injury or property damage!

In the event of inappropriate transport, the control block might fall down and lead to injury, e.g. bruises or fractures and/or damage to the product.

- ▶ Ensure that the load bearing capacity of the lifting device is dimensioned sufficiently in order to safely carry the weight of the control block.
- ▶ Never step or grip under suspended loads.
- ▶ Ensure a stable transport position.
- ▶ Use your personal protective equipment (e.g. safety goggles, safety gloves, suitable working clothes, safety shoes).
- ▶ Use suitable lifting devices for transport.
- ▶ Observe the prescribed position of the lifting strap.
- ▶ Observe the national laws and specifications of occupational safety and health and transport.

 **WARNING****System/machine under pressure!**

Danger to life or risk of injury, severe bodily injury when working on machines which have not been put to a standstill! Property damage!

- ▶ Switch off the relevant machine/system part and secure it against reactivation according to the parameters by the machine/system manufacturer.
- ▶ Ensure that all relevant components of the hydraulic system are depressurized. For this purpose, observe the parameters indicated by the machine/system manufacturer.
- ▶ Please note that the hydraulic system might still be pressurized even after separation from the actual pressure supply.
- ▶ Do not disconnect any line connections, ports or components as long as the hydraulic system is under pressure.

Escaping hydraulic fluid mist!

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

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

Electrical voltage!

Danger to life or risk of injury due to electric shock or property damage!

- ▶ Always disconnect the voltage supply to the relevant machine/system part before installing the product and/or connecting or disconnecting the connector.
- ▶ Protect the machine/system against being re-energized.

Limitation of the control function!

Risk of injury or property damage!

Under certain circumstances, moving parts in control equipment (e.g. control spool) can get stuck in an undefined position due to contamination (e.g. impure hydraulic fluid, abrasion or residual dirt from components). As a result, the activated consumer does no longer respond correctly to the operator's specifications.

- ▶ Secure the machine against rolling away and accidental movements according to the specifications of the machine manufacturer.
- ▶ Comply with the prescribed cleanliness level of the hydraulic fluid in accordance with the data sheet.

Faulty power supply!

Danger to life or risk of injury due to uncontrolled valve settings! These settings can lead to unexpected behavior of the control block.

- ▶ Always connect the ground connection of the control block with the corresponding grounding system of your installation.
- ▶ Only use a power supply unit with a secure disconnection facility. Observe the country-specific specifications.

 **WARNING****Danger caused by pressurized, leaking hydraulic fluid!**

Danger to life or risk of injury due to leaking hydraulic fluid streams! Leakage at the control block can lead to hydraulic fluid escaping under high pressure.

- ▶ 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.

 **CAUTION****Risk of injury due to sharp edges and rough surfaces!**

Risk of injury when working with and transporting the control block, e.g. due to sharp edges on the valve housing, on threads or assembled parts.

- ▶ Wear appropriate personal protective equipment (e.g. safety shoes, safety goggles, safety gloves and suitable working clothes).

Danger of bruising and knocks for limbs!

In the gap between the actuation element and the valve housing, there is a risk of injury

- ▶ Do not move any limbs into the gap between the actuation element/hand lever and the valve housing.

High noise development during operation!

Danger of hearing damage or hearing loss!

Among others, the noise emission of control blocks depends on the working pressure and the installation conditions. The sound pressure level may rise to above 70 dBA under specific application conditions.

- ▶ Always wear hearing protection when you are in the vicinity of the running control block.

Hot surfaces on the control block!

Risk of burning!

- ▶ Allow the control block to cool down sufficiently before touching it.
- ▶ Protect yourself with heat-resistant protective clothing, e.g. gloves.

Inappropriate routing of cables and lines!

Risk of stumbling and property damage! Due to incorrect routing of lines and cables, both a risk of stumbling as well as damage to parts and components can occur, e.g. due to lines and connectors being torn off.

- ▶ Always install cables and lines in a way that nobody can fall over them, that they are not bend or twisted, do not chafe on edges and are not guided through ducts with sharp edges without sufficient protection.

 **CAUTION****Contact with hydraulic fluid!**

Danger to health / damage to health, e.g. eye injury, skin damage, toxication in the event of inhalation!

- ▶ Avoid any contact with hydraulic fluids.
- ▶ When handling hydraulic fluids, the safety instructions of the lubricant manufacturer need to be observed at all times.
- ▶ Use your personal protective equipment (e.g. safety goggles, safety gloves, suitable working clothes, safety shoes).
- ▶ Immediately seek medical attention, however, if hydraulic fluid gets into your eyes or blood circuit or if you swallow it accidentally.

Escaping hydraulic fluid through leaking 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! When using the control block as climbing aid, there is a danger of slipping on wet and/or fluid-afflicted surfaces.

- ▶ Never use the control block as handle or step.
- ▶ Check how to safely get on top of the machine/system.

2.7 Personal protective equipment

The personal protective equipment is the responsibility of the user of the control block. Observe the safety regulations in your country.

All pieces of personal protective equipment should be intact.

3 General instructions on property damage and product damage

The following safety instructions apply for chapters 6 to 14.

NOTICE

Danger from improper handling!

Product can be damaged!

- ▶ Do not expose the product to any mechanical, hydraulic or electric loads under any circumstances.
- ▶ Never use the product as handle or step.
- ▶ Do not put/place any objects on the product.
- ▶ Do not use sensitive assembled parts (e.g. actuation elements, sensors, solenoids, or valves) for transporting the control block.
- ▶ Carefully place the control block onto the contact surface to prevent it from being damaged and secure it against falling.
- ▶ Do not set/place the control block onto the actuation elements.
- ▶ Do not hit sensitive assembled parts (e.g. sensors, solenoids or actuation elements).
- ▶ Do not hit sealing surfaces (e.g. on the work connections).
- ▶ Leave the protective covers on the control block until you connect the lines.
- ▶ Disconnect all electric connectors before any painting operations.
- ▶ Ensure that the electronic components (e.g. sensors) are not electro-statically charged (e.g. during painting operations).

Risk of property damage due to inadequate lubrication!

Product can be damaged or destroyed!

- ▶ Always commission the control block with sufficient hydraulic fluid.
- ▶ When commissioning a machine/system, make sure that the housing area and the suction and working lines of the control block are filled with hydraulic fluid and keep them filled during operation.

Ingress of fluids and foreign particles due to lacking sealings and locks!

Loss of the protection class and danger of short circuit!

- ▶ Before the assembly, ensure that all sealings and locks of the plug-in connection are tight.

NOTICE

Mixing hydraulic fluids!

Product can be damaged!

- ▶ Before installation, remove all fluids from the control block to prevent mixing with the hydraulic fluid that is used in the machine.
- ▶ Observe the viscosity and cleanliness level specified in the data sheet for hydraulic fluids.
- ▶ Mixture of different hydraulic fluids may damage the control block due to chemical reactions and changes in properties.
- ▶ Ensure that the different hydraulic fluids are compatible according to manufacturer's specifications.

Contamination of hydraulic fluid!

The cleanliness of the hydraulic fluid has a considerable impact on the service life of the product. Contaminations of the hydraulic fluid may lead to premature wear and malfunctions!

- ▶ Always ensure a work environment in the assembly location that is free from dust and foreign substances to prevent foreign particles, e.g. welding beads or metal cuttings, from entering the hydraulic lines and lead to wear and malfunctions in the product. The control block must be installed in a clean condition.
- ▶ Only use clean ports, hydraulic lines and assembled parts (e.g. measuring devices).
- ▶ When plugging the ports, no contamination may ingress.
- ▶ Before commissioning, ensure that all hydraulic connections are tight and that all seals and plugs of the plug-in connection are correctly installed and undamaged to prevent fluids and foreign particles from ingressing the product.
- ▶ Filter the hydraulic fluids when filling the system with a suitable filter system to minimize the solid particle contamination and water in the hydraulic system.

Improper cleaning

Product can be damaged!

- ▶ Plug all openings with appropriate protective equipment to prevent cleaning agents from entering the control block.
- ▶ Never use solvents or aggressive cleaning agents. Clean the control block using only water and a mild cleaning agent if necessary.
- ▶ Do not direct the high-pressure cleaner to sensitive components, e.g. rubber parts (bellows), electric connections (solenoids, sensors) and actuation elements.
- ▶ Use fibre-free cleaning cloths for cleaning.

NOTICE

Environmental pollution due to incorrect disposal!

Careless disposal of the control block and its assembled parts, the hydraulic fluid and the packaging material can cause environmental pollution!

- ▶ Dispose of the control block, 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 of the hydraulic fluid.

Danger due to chemical or aggressive environmental conditions!

Product can be damaged! If the control block 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, a loss of function. Leaks may lead to a leakage of hydraulic fluid.

- ▶ Take appropriate measures to protect the control block from chemical or corrosive environmental conditions.

Leakage or spilling of hydraulic fluid!

Environmental pollution and contamination of the ground water!

- ▶ When filling and draining hydraulic fluid, always place a drip tray under the control block.
- ▶ Use a suitable binding agent if hydraulic fluid is spilled.
- ▶ Observe the parameters in the safety data sheet for the hydraulic fluid and the specifications provided by the machine/system manufacturer.

Danger due to heat development in components!

Adjacent products may be damaged! Due to a heat development in components (e.g. solenoids), adjacent products may be damaged during assembly if no sufficient safety distance is complied with.

- ▶ When installing the control block, check the safety distances to nearby products to ensure that they are not damaged.

The warranty exclusively applies to the delivered configuration.

The warranty claim becomes void with

- Faulty installation, commissioning and operation,
- Improper use,
- Removal of the tamper-proof caps and seals (e.g. with pressure settings),
- Control of the settings at the factory,
- Conversions and additional installations,
- Opening of the valve,
- Improper handling,
- Use of non-original spare parts by Rexroth.

4 Scope of delivery

Included in the scope of delivery:

- Control block as per order confirmation

The following parts are also assembled prior to delivery according to version:

- Protective covers
- Protective plugs/threaded plugs
- Attachment point for transportation, e.g. an eye bolt

5 About these products

5.1 Performance description

Refer to the data sheet and the order confirmation for the technical data, operating conditions, and operating limits of the control blocks.

For the assignments of control blocks to data sheets, refer to chapter 1.2 "Required and supplementary documentation" on page 5.

5.2 Product description

For a description of the layout and function of the control blocks and instructions on the project planning of individual control blocks, refer to the data sheet.

For the assignments of control blocks to data sheets, refer to Table 1 "Required and supplementary documentation" on page 5.

5.3 Product identification

The control block is to be identified on the name plate.



The parameters on the name plate apply to the control block as delivered. If modifications have been made to the control block compared to the delivery state, the name plate information may not apply to your present control block.

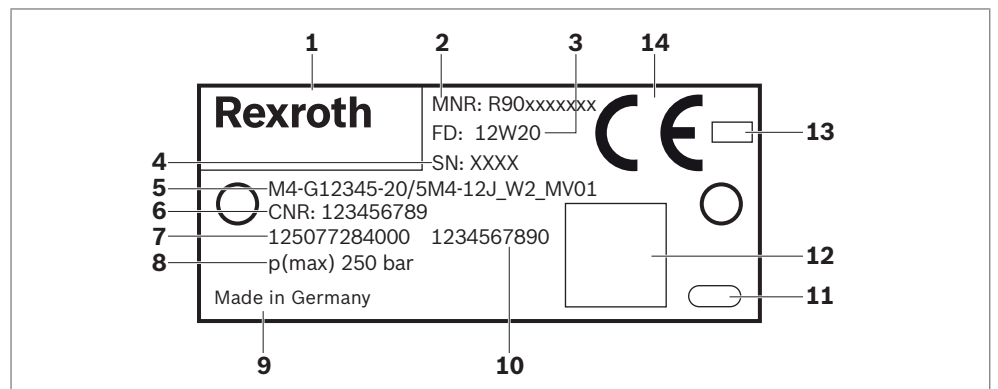


Fig. 1: Name plate example M4

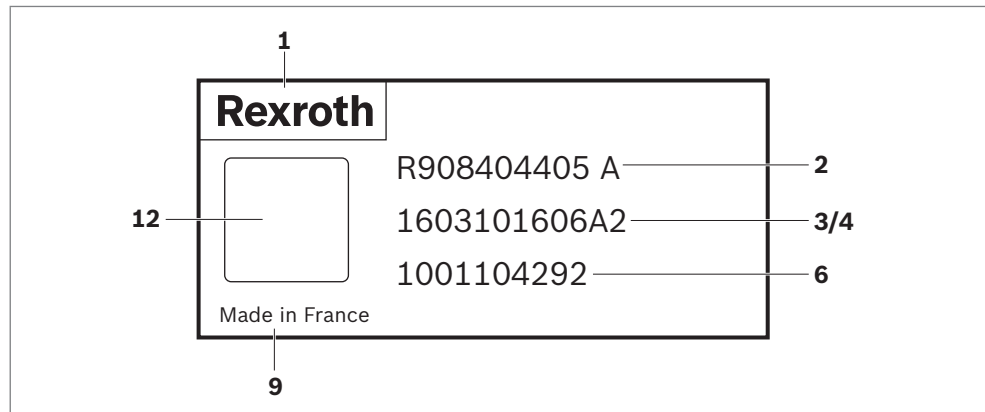


Fig. 2: Name plate example SX

- | | |
|--|---|
| 1 Word mark (manufacturer) | 9 Designation of origin |
| 2 Control block material number | 10 Rexroth supplier number at the customer (optional) |
| 3 Manufacturing date | 11 Area/plant number |
| 4 Serial number | 12 Data Matrix code |
| 5 Type designation (material short text) | 13 Identification number (4 digits) of the notified body |
| 6 Customer material number (optional) | 14 CE conformity sign (optional) |
| 7 Customer, production, repair order or project number (optional) | |
| 8 Performance parameters (optional) | |

- ▶ Make sure that the name plates in place are not damaged.
- ▶ By comparing the material number of the control block on the respective name plate to the parameters in the offer drawing, check that this instruction manual refers to the product in question.
If in doubt, please contact Bosch Rexroth.



The information on the above name plate may vary depending on order-specific requirements. For instance, on customer-specific name plates, the customer logo may replace the Rexroth logo.
Any other labeling on the product is just for Bosch Rexroth-internal purposes.

6 Transport and storage

- ▶ Always observe the required ambient conditions for transport and storage, see Chapter 6.2 "Storing the control block" on page 23.



Deviations lead to early aging of components and shortening of service life. Notices on unpacking can be found in chapter 7.1 "Unpacking" on page 25.

6.1 Transporting the control block

The following optional means of transport can be applied depending on the weight and duration of transport:

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

The dimensions and weights vary by equipment. The values that apply to your control block can be found in the offer drawing and the data sheet.

6.1.1 Transport by hand

Up to a specific maximum weight, control blocks can be transported by hand for a short distance. Observe the national regulations in your country.

CAUTION! Danger due to heavy loads!

When carrying control blocks, there is a danger of health damage.

- ▶ Only manually transport the control block for a short period of time. Observe the national regulations in your country for manual transport.
- ▶ Always use appropriate lifting, lowering and moving techniques.
- ▶ Use your personal protective equipment (e.g. safety goggles, safety gloves, suitable working clothes, safety shoes).

- ▶ Do not use sensitive assembled parts (e.g. sensors or valves) for transporting the control block.
- ▶ Carefully place the control block to prevent it from being damaged.

6.1.2 Transport with lifting devices

For transportation, the control block can be attached to the lifting device via the attachment points on the housing or via a lifting strap.

Transporting with eye bolt

Possible attachment points are:

- The fastening threads of the connection flanges
- Mounted eye bolts according to DIN 580.

- ▶ If necessary, screw an eye bolt fully into the attachment point. The thread size is indicated in the installation drawing.
- ▶ Make sure that the eye bolt can bear the total weight of the control block plus 20%.

Transport with lifting strap

WARNING! Danger due to suspended loads!

During transportation with lifting strap, the control block can tip out of the strap and cause injuries.

- ▶ Use the widest possible lifting strap.
 - ▶ Make sure that the control block is securely fixed with the lifting strap.
 - ▶ Only guide the control block by hand for fine positioning and to avoid vibrations.
 - ▶ Never step or grip under suspended loads.
-
- ▶ Place the lifting strap around the control block such that it does not pass over the assembled parts (e.g. valves) or that the control block is hung on assembled parts.

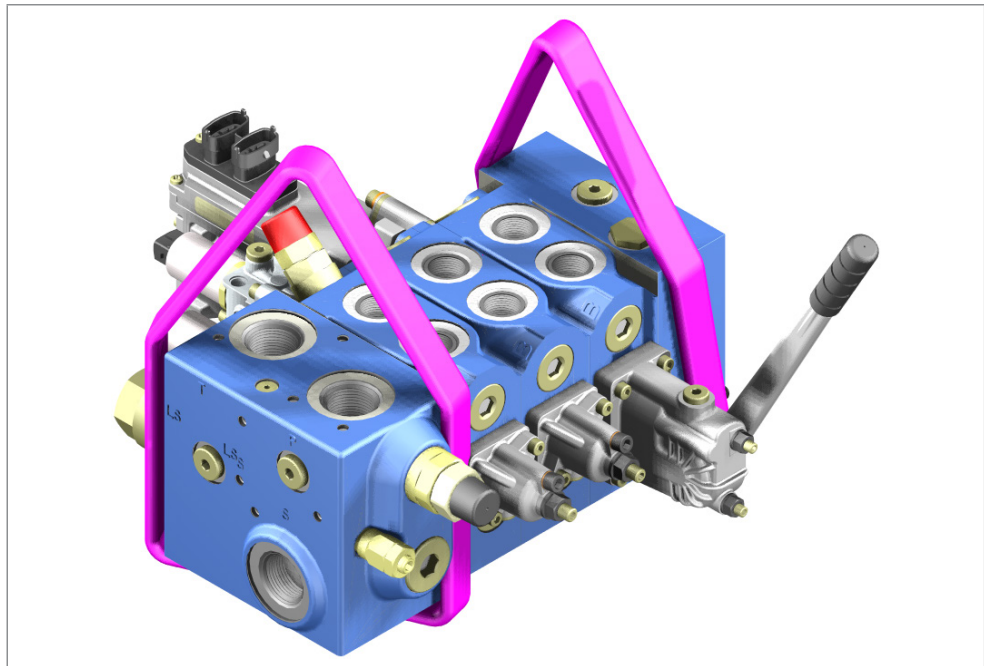


Fig. 3: Transport with lifting strap

6.2 Storing the control block

Requirements

- The storage areas must be free from corrosive materials, vapors and gases.
 - To prevent damage to the seals, the operation of ozone-forming devices (e.g. mercury-vapor lamps, copiers, printers, high voltage equipment, electric motors, sources of electrical sparks or electrical discharge) is to be avoided in storage areas.
 - The storage areas must be dry and free from dust.
 - Ideal storage temperature: +5 °C to +20 °C.
 - Minimum storage temperature: –20 °C
 - Max. storage temperature: +40 °C
 - UV protection: 100%
Avoid significant exposure to light (e.g. bright windows or direct fluorescent lighting).
 - Relative humidity (no condensation): max. 65 %.
 - Do not stack control blocks and store them protected against collisions.
 - Do not store the control block on sensitive assembled parts, e.g. actuation elements, sensors, solenoids, or valves.
 - Do not remove protective covers and protective plugs.
- Check the professional storage of the control block on a monthly basis.



The maximum permissible storage time is two years.

After delivery

By default, control blocks are protected against corrosion with priming (single-coat lacquer) or with a galvanized coating at the factory. Mineral oil in plugged valves provides internal corrosion protection. Non-painted or coating surfaces on the control block not provided with a galvanized coating (e.g. flange surfaces) are not protected against corrosion. Delayed commissioning, long freight and storage times or a prolonged decommissioning of Rexroth control blocks leads to rust formation. Take additional corrosion protection measures to prevent this.



Warranty entitlement will be rendered void if the requirements and storage conditions are not adhered to or after expiration of the maximum storage time.

Recommended procedure after longer storage times:

- 1.** Check the entire control block for damage and corrosion prior to installation.
- 2.** Perform a test run to check the control block for proper function and leak-tightness.
- 3.** External seals of control blocks that have been stored for longer than 12 months are to be checked for damage before installation and may need to be replaced.
- 4.** If the storage time of two years is exceeded, external seals must be replaced.



After expiration of the maximum storage time, we recommend having the control block checked by your Bosch Rexroth service partner.

If you have any questions regarding repair and spare parts, contact your responsible Bosch Rexroth service partner or the service department of the control block manufacturer's plant, see Chapter 10.5 "Spare parts" on page 42.

After removal If a removed control block is to be stored, it must be preserved against corrosion for the duration of storage.



The following instructions only refer to control blocks which are operated with a hydraulic fluid on a mineral oil basis. Other hydraulic fluids require other specific preservation measures. In this case, please contact Bosch Rexroth. For the address, see chapter 10.5 "Spare parts" on page 42.

Bosch Rexroth recommends the following procedure:

- 1.** Clean the control block.
- 2.** Drain the control block.
- 3.** Plug all ports so they are airtight.
- 4.** Moisten the unpainted flange surfaces and external seals of the control block with mineral oil.
- 5.** Protect sensitive assembled parts (e.g. actuation elements, sensors, solenoids or valves) with appropriate measures as in the delivery state.
- 6.** Package the control block with a suitable desiccant in corrosion protection film so that it is airtight.
- 7.** Store the control block in a non-explosive area protected against collisions, see the Section entitled "Requirements" on page 23 in this chapter.
- 8.** If necessary, return the control block for repair to Bosch Rexroth-Service.

7 Installation

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

- Offer drawing (installation drawing) for the control block (can be obtained from your contact at Bosch Rexroth)
- Hydraulic circuit diagram for the control block (can be found in the offer drawing)
- Hydraulic circuit diagram for the machine (available from the machine manufacturer)
- Order confirmation (contains the order-related technical data for your control block)
- Control block data sheet (contains the permissible technical data)

7.1 Unpacking

CAUTION! Danger due to falling parts!

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

- ▶ Place the packaging on a level underground with sufficient load-bearing capacity.
- ▶ Only open the packaging from the top or at the provided location.

1. Remove the packaging from the control block.
2. Check the control block for transport damage and completeness, see chapter 4 "Scope of delivery" on page 18.
3. Dispose of the packaging in accordance with the regulations in your country.
4. Return any reusable packaging to the corresponding sending Bosch Rexroth plant.

7.2 Painting the control block

Perform the following steps if the control block is to be painted before installation:

- ▶ First protect the hydraulic ports by completely screwing on plastic threaded plugs to avoid application of paint.
- ▶ Screws have to be inserted into the fastening threads to prevent ingress of paint.
- ▶ Carefully mask the flange surfaces of the control blocks and the port plates and end plates before painting to prevent paint and dirt from entering.
- ▶ Prevent any paint being applied to the contacts of the electrical connections and make sure that the connectors are not damaged.
- ▶ Protect assembled parts (e.g. actuation elements, sensors, solenoids) to avoid application of paint.
- ▶ Protect plastic and rubber parts from paint being applied.
- ▶ When removing the protective plastic threaded plugs after painting, make sure that no paint chips enter the control block.
- ▶ Protect name plates against application of paint using a film that can be peeled off after painting.

7.3 Installation conditions

The installation location and installation position of the check valve essentially determine how to proceed during the installation and commissioning (such as when air bleeding the control block).

- ▶ Fasten the control block so that the expected forces and torques can be transferred without any danger. The machine manufacturer is responsible for dimensioning the mounting elements and threaded connections.
- ▶ Make sure that the control block is air bled and filled with hydraulic fluid at commissioning and during operation. Do not hydraulically empty the control block during a standstill period.
- ▶ Make sure that the working environment at the installation site is completely free of dust and foreign substances. The control block must be installed in a clean condition. Contamination of the hydraulic fluid can have a seriously negative effect on the function and service life of the control block.

7.4 Installation position

Unless otherwise stated in the technical documentation, the installation position of the control block is arbitrary.

7.5 Installing the control block

7.5.1 Required tools

Installation can be performed with standard tools. No special tools are necessary. Also observe the manuals provided by the manufacturers of the other hydraulic components when selecting the required tools.

7.5.2 Preparation

1. Check the parameters on the name plate to see if the control block is correct.
2. Compare the material number and designation (type code) with the parameters in the order confirmation.



If the material number for the control block does not correspond to the one in the order confirmation, contact Bosch Rexroth Service for clarification, see Chapter 10.5 "Spare parts" on page 42.

3. Before installation, empty the control block to prevent mixing with the hydraulic fluid used in the machine.

7.5.3 Dimensions

The offer drawing contains the dimensions for all the ports on the control block.

7.5.4 Fastening the control block

The control block has mounting holes or threads that are shown in the offer drawing and data sheet. The bore pattern required for assembly (dimensions and tolerances) with mounting holes at the machine can be found in the offer drawing or the data sheet. The tightening torques are to be selected according to the standard values for the respective bore sizes and bolt property classes.

The control spool can jam if the tightening torque is too high. In such a case the mounting torque must be reduced accordingly. Pay attention to sufficient residual clamping force of the screws.

1. Observe the requirements for the contact surface in the offer drawing.
2. Check the evenness of the flange surface in the machine (tolerance: 0.5 mm).
3. Always fasten the control block at all the fastening points that are intended for this purpose using screws or – depending on the type of mounting – using hexagon nuts according to one of the property classes stated in Table 6 as per EN ISO 4762 or EN ISO 4014.
4. Tighten the screws with the specific tightening torque given in the standard. The tightening torques indicated in Table 6 represent guide values only which have been obtained from VDI 2230 (90% utilization of the minimum yield strength, frictional value 0.14). The actually required tightening torques depend on various factors, e.g. screw material and coating, operation forces, material of the tensioned components. Generally, it is herewith referred to the parameters provided by the system supplier.

Bosch Rexroth recommends a screw connection with the following parameters:

Table 6: Mounting bolts

Series	Dimension	Property class	Tightening torque [Nm]	Screw-in depth [mm]
M1-16	M8	8.8 / 10.9	27 / 40	¹⁾
M1-25	M10	8.8 / 10.9	54 / 79	10
M1-32	M12	8.8 / 10.9	93 / 37	¹⁾
M4-12	M10	8.8 / 10.9	41 / 60	12 ... 15
M4-15	M10	8.8 / 10.9	54 / 79	10
M4-22	M16	8.8 / 10.9	230 / 338	¹⁾
M6-15	M10	8.8 / 10.9	54 / 79	10
M6-22	M12	8.8 / 10.9	93 / 137	12
M7-20	M12	8.8 / 10.9	93 / 137	12
M7-22	M16	8.8 / 10.9	230 / 338	16
M7-22	M16	8.8 / 10.9	230 / 338	20 ... 24
M8-16	M16	8.8 / 10.9	230 / 338	16
M8-18	M16	8.8 / 10.9	230 / 338	16
M8-22	M16	8.8 / 10.9	230 / 338	16
M8-25	M16	8.8 / 10.9	230 / 338	16
M8-32	M20	8.8 / 10.9	464 / 661	20
M8-35	M16	8.8 / 10.9	230 / 338	¹⁾
M9-20	M16	8.8 / 10.9	230 / 338	16
M9-25	M16	8.8 / 10.9	230 / 338	16
MO-10	M10	8.8 / 10.9	54 / 79	¹⁾
MO-16	M8	8.8 / 10.9	27 / 40	¹⁾
MO-22	M10	8.8 / 10.9	54 / 79	¹⁾
MO-32	M12	8.8 / 10.9	93 / 137	¹⁾
MO-40	M16	8.8 / 10.9	230 / 338	¹⁾
MO-52	M20	8.8 / 10.9	464 / 661	20
RCS30	M16	8.8 / 10.9	230 / 338	25
RCS35	M20	8.8 / 10.9	464 / 661	30

Series	Dimension	Property class	Tightening torque [Nm]	Screw-in depth [mm]
ROM8	M8	8.8 / 10.9	27 / 40	¹⁾
RS12	M8	8.8 / 10.9	27 / 40	12
RS14	M10	8.8 / 10.9	54 / 79	¹⁾
RS15	M10	8.8 / 10.9	54 / 79	18
RS20	M12	8.8 / 10.9	93 / 137	12...15
SM 12	M8	8.8 / 10.9	27 / 40	10 ¹⁾
SP-08	M8	8.8 / 10.9	25 / 30	10 ... 14 ¹⁾
SX 10	M8	8.8 / 10.9	27 / 40	¹⁾
SX 12	M10	8.8 / 10.9	54 / 79	¹⁾
SX 14	M10	8.8 / 10.9	54 / 79	¹⁾

¹⁾ Through bore in housing; the screw-in depth depends on nut thread material.

7.5.5 Completion of assembly

1. Remove any attached transportation aids.

CAUTION! Operation with protective plastic plugs!

Operating the control block with protective plugs may result in injury or damage to the control block.

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

2. Remove the transport protection.

If necessary, the control block may be delivered with protective covers and protective plugs. They are not pressure-resistant and have to be removed prior to connection. Use a suitable tool for this to prevent damage to the sealing and functional surfaces. If sealing or functional surfaces are damaged, contact your Bosch Rexroth service partner or the service department of the manufacturer's plant for the control block.



Ports intended for connecting lines come with protective plugs or threaded plugs, which serve as transport protection. All ports required for the function must be connected. Failure to do so could lead to malfunctions or damage. If a port is not being used, it is to be plugged with a threaded plug since the protective plugs are not pressure-resistant.

7.5.6 Connecting the control block mechanically

Connection of actuation elements including tolerances is illustrated in the offer drawing. The tightening torques are to be selected according to the actuation elements. There must not occur any radial forces during actuation!

- At commissioning, make sure that the tongue is in the zero position (control spool in the central position).

7.5.7 Connecting the control block hydraulically**CAUTION****Dangerous movements of the hydraulic consumers!**

Risk of injury due to incorrect pin assignments or mixed up cable connectors because of inadvertent consumer movement!

- ▶ Make sure that all the pipes and/or hoses have been attached to the correct control block port and have not been mixed up under any circumstances.
- ▶ After completing connection work, check that the cable connectors are correctly assigned to the respective control block solenoids.

NOTICE**Damage due to improper installation!**

Hydraulic lines and hoses which are installed under tension create additional mechanical forces during operation which reduce the service life of the control block and the entire machine.

- ▶ Install hydraulic lines and hoses without mechanical stress.

The machine manufacturer is responsible for dimensioning the lines. The control block must be connected to the rest of the hydraulic system in accordance with the hydraulic circuit diagram of the machine manufacturer.

The ports and fastening threads are designed for the maximum pressure specified in the data sheet. The machine 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.



Only connect hydraulic lines that are appropriate for the control block port (pressure level, size, system of units).

Notice on routing of lines

Observe the following notices when routing hydraulic 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 control block and possibly of the entire machine.
- Remove any resinification that has been created due to improper storage.
- Use suitable seals as sealing material.
 - Observe the sealing capability of the hydraulic fluid used.
 - Use the provided seal at each hydraulic port.
 - Pay attention to cleanliness and integrity of the connections.
- Make sure the connections and connecting elements are airtight.
- Pressure lines
 - For the pressure lines, use only pipes, hoses and connecting elements rated for the working pressure range specified in the data sheet. These must also be pressure resistant against the external air pressure.
- Drain line
 - Always route the drain lines in a way that the control block is always filled with hydraulic fluid and even during extended standstill periods cannot be emptied hydraulically.

Risk of confusion with threaded connections The control blocks are used in application areas with metric as well as with the Anglo-American (inch) system of units. Both the system of units as well as the size of the female thread and stud end (e.g. threaded plug) must match. There is a risk of confusion due to the limited ways of visually telling them apart. Observe the parameters contained in the offer drawing. Unless otherwise stated, in general the SI units apply.

WARNING! Leaky or bursting stud ends!

If a stud end which is of a different measurement system and size with respect to the female thread is pressurized, the threaded plug may loosen itself or even be ejected from the stud end 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 (offer drawing) to determine the required stud end for each fitting.
- ▶ Ensure that, during the assembly of fittings, mounting and threaded plugs, the items are not confused.
- ▶ For all female threads, use a stud end from the same system of units and of the correct size.

Port overview For an overview of line connections, refer to the respective data sheet and the offer drawing.

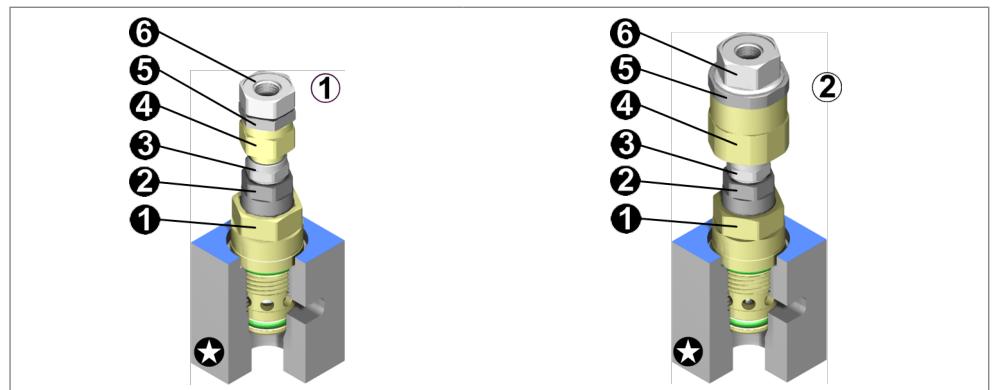
Tightening torques Observe the parameters in the standards or the manufacturer's specifications for the stud ends, fittings and threaded plugs on hydraulic ports. Apart from this, be aware that tightening torques can also depend on the permissible pressure and temperature range and the application conditions.

Procedure To connect the control block to the hydraulic system:

1. Remove the protective plugs or threaded plugs from the ports where the connections should be made according to the hydraulic circuit diagram.
2. Make sure the sealing surfaces of the hydraulic ports and functional surfaces are not damaged.
3. Use only clean hydraulic lines or flush them before installation.
4. Connect the lines according to the offer drawing supplied with the machine diagram. Check whether all ports are piped up or plugged with threaded plugs.
5. Properly tighten the fittings (observe tightening torques!). Mark all properly tightened fittings, e.g. with a permanent marker.
6. Check all pipes and hose lines and every combination of connecting pieces, couplings or connecting points with hoses or pipes to ensure they are in safe working condition.

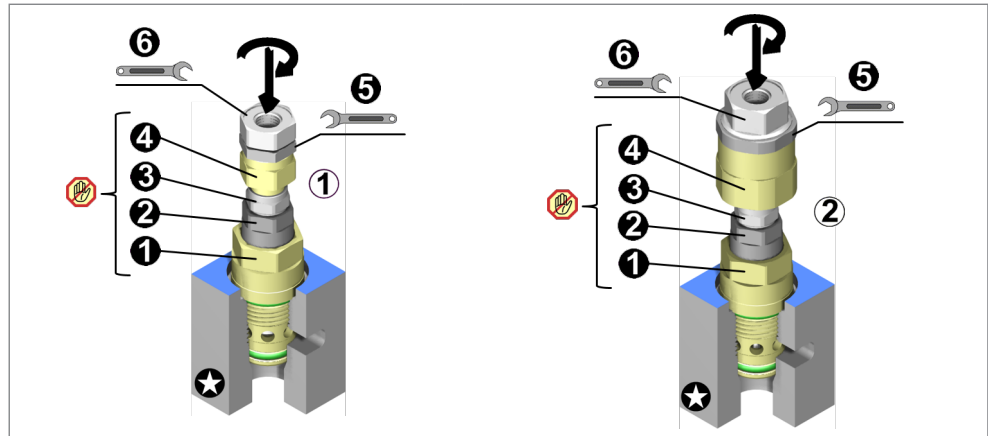
7.5.8 Connecting the pressure relief/feed valve with pressure sequencing stage or pressure cut-off stage hydraulically

Item	Designation
★	Control block
①	Pressure relief/feed valve with pressure sequencing stage
②	Pressure relief/feed valve with pressure cut-off stage
①	Valve housing
②	Inner valve support
③	Lock nut
④	Einstellspindel
⑤	Lock nut
⑥	Adjustment screw with hydraulic port



The pressure relief/feed valve consists of the visible components ① to ⑥. To avoid an unintentional change of the pressure setting, the screw connections to each other must not be adjusted!

- Procedure** To connect the pressure relief/feed valve to the hydraulic system:
1. Remove the protective plug or screw plug from the adjustment screw ⑥.
 2. Make sure that the sealing surfaces of the fitting are not damaged
 3. Turn the screw fitting clockwise into the thread of the adjustment screw ⑥.
When doing so, counter the lock nut ⑤ and the adjustment screw ⑥ with an open-end wrench.
 4. Tighten the screw fitting correctly (observe tightening torque!).



7.5.9 Connecting the control block electrically**NOTICE****Negative effect on function due to incorrect plug-in connections!**

Only the plug-in connections specified in the data sheet/offer drawing may be used for electrical connection.

- ▶ Observe the installation specifications of the manufacturer of the plug-in connection.
- ▶ Before commissioning, check to see whether the voltage in the power supply matches the parameters in the offer drawing and whether the total current to be expected is less than or the same as the load capacity of the power supply.
- ▶ Do not connect live plug-in connections. The assembly process may only be repeated 10 times.

The machine manufacturer is responsible for rating the electric control.

Electrically controlled control blocks must be connected in accordance with the electrical circuit diagram of the machine.

For control blocks with electrical control and/or mounted sensors, please comply with the parameters given in the data sheet and the offer drawing, e.g.:

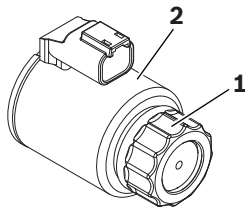
- Permissible voltage range
- Permissible current
- Correct pin assignment

Exact parameters on the correct assignment of the connector, the type of protection and the appropriate mating connector can also be found in the data sheet and the offer drawing. The mating connector is not included in the scope of delivery.

Procedure

To connect the control block to the machine's electronics:

- 1.** Switch the plug-in connections on the control block to a deenergized state.
- 2.** Before establishing the connection, check the connector and all seals for damage.
- 3.** Connect the control block electrically (12 or 24 V).

Changing connector position

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

To do this, proceed as follows:

- 1.** Undo the mounting nut (**1**) of the solenoid using a suitable tool. To do this, turn the mounting nut (**1**) one turn counter-clockwise.
- 2.** Turn the solenoid body (**2**) to the desired position.
- 3.** Re-tighten the mounting nut. Tightening torque of the mounting nut: 4+1 Nm.

8 Commissioning

WARNING

Danger while working in the danger zone of a machine!

Danger to life, risk of injury or serious injury!

- ▶ Pay attention to potential danger sources and eliminate them before commissioning the control block.
- ▶ Make sure that no one is in the danger zone of the machine.
- ▶ The emergency stop button for the machine must be within the operator's reach.
- ▶ Always observe the instructions of the machine manufacturer during commissioning.

CAUTION

Commissioning an improperly installed product!

Mixing up the ports or cable connectors will cause unexpected functions and/or irreparable damage to the control block and could endanger people and equipment!

- ▶ Make sure that all the electrical connections and hydraulic ports are connected or plugged correctly.
- ▶ Before the functional test, check whether the piping specified in the hydraulic circuit diagram has been installed.
- ▶ Make sure that the cable connectors are correctly assigned to the respective electrical components.
- ▶ Only commission a completely installed product.

Risk of injury due to entrapped air!

In operation, air that is entrapped in the control block can cause components to oscillate, strike the end stops hard and suffer damage. Unexpected movement of actuators may cause serious injury.

- ▶ Before commissioning, it must be ensured that any air that is entrapped in the control block is completely removed. This can take place in all the switching positions because of throughflow with a low hydraulic fluid flow $q \leq 20\% q_{\text{pump}}$, for example. In the case of control blocks without self-air bleeding, it may be necessary to air bleed the cover using the air bleed screw.
- ▶ Always observe the parameters for the air bleed in the instruction manual of the machine.

8.1 Before initial commissioning

- ▶ Ensure that the machine interfaces as well as the installation conditions guarantee safe operation of the Rexroth control block. If in doubt, please contact Bosch Rexroth.
- ▶ Using the instruction manual for the machine in which the Rexroth control block is to be installed, visually check whether commissioning of the hydraulic system can cause uncontrolled hazardous movements. Also observe the hazard analysis/risk assessment of the machine.
- ▶ Take appropriate precautions for anticipated hazards e.g. make sure that the cylinder piston rod can extend without any danger.
- ▶ Secure a load that is to be lifted with a lifting device / load handling attachment.
- ▶ Check whether it is possible to use the machine's electric control to switch the control block solenoids manually during commissioning. If it is only possible to carry out manual switching under difficult conditions or if it is completely impossible, you should prepare an external control to carry out the internal functional test of the hydraulic system.
- ▶ Work out a sequence program for the commissioning and archive this in the technical documentation as an annex to the instruction manual.
- ▶ Divide the functional circuit diagram into partial circuits which can be commissioned in stages.
- ▶ Read the functional circuit diagram and clarify any ambiguous statements or representations.
- ▶ Specify the switching position in which the directional valves are to be switched or how the directional valves are to be set.
- ▶ Attach the necessary mandatory, prohibition and information signs and check whether the meaning of these signs is explained in the instruction manual.
- ▶ Proceed with commissioning in the following order:
 - Pump circuit
 - Parts of the control: For example, pressure cut-off and switching, free circulation, pressure reduction, etc.
- ▶ Make sure that all connection pipes and hoses are connected or that the connections are plugged with threaded plugs.
- ▶ Make sure that the union nuts on the pipe fittings and flanges are tightened to the correct standards.
- ▶ Set the pressure valves, flow control valves, pump controller, signal sensors, pressure switches, position switches and thermostats to the switching positions and setting values in the sequence program.

8.2 Initial commissioning

Bosch Rexroth defines initial commissioning as the initial testing and release of the product.

It is recommended that points **1** up to and including **7** are adopted for the series production of the hydraulic system.

- ▶ Allow the control block to acclimatize for a few hours before commissioning so that no condensation water can form inside the housing.
- ▶ Make sure that all electrical and hydraulic connections and ports are occupied or plugged. Only commission a completely installed control block.
- ▶ Avoid temperature shocks. The temperature difference between the control block and the hydraulic fluid must not exceed 20 °C. Otherwise, there is a risk of a jammed spool. At temperatures below 0 °C, the control block must be run until it is warm. In this respect, please also refer to chapter 9.1 on page 38.
- ▶ Use only a hydraulic fluid that corresponds to the following requirements: You can find information about permissible hydraulic fluids in the respective data sheet of the product, see Table 1 "Required and supplementary documentation" on page 5.
- ▶ During commissioning, monitor the temperature of the hydraulic fluid in the reservoir to ensure that it lies within permissible viscosity limits.

To commission the control block for the first time, proceed as follows:

1. Completely fill the control block and the pilot circuit, if present, with permissible hydraulic fluid (see data sheet).
2. Ensure the hydraulic supply for the control block.
3. If present, ensure the electrical supply for the control block.
4. Check the electrical connection of the control block.

Before carrying out initial commissioning or recommissioning, have a qualified electrician or somebody being supervised by a qualified electrician check that the electrical connection is correct.



Observe the instruction manual of the machine in which the control block is installed.

5. Air bleeding the control block.
 - Actuate the check valve a few times in each direction of actuation under working pressure and at reduced speed before operating the control block. This presses out any air remaining in the control block. This avoids mechanical damage due to inadmissibly high acceleration of the hydraulic fluid and the control spool and extends the service life of the control block.

– If automatic air bleeding of the cover does not result in adequate venting, you can carry out air bleeding using the air bleed screws that may be present (series-dependent).

Procedure:

ATTENTION! When undoing the air bleed screw, hydraulic fluid can escape!

- ▶ Undo the air bleed screw on the cover by about two thread rotations such that the air can escape via the thread and the seal of the air bleed screw.
- ▶ Switch the valve several times to air bleed the cover completely.
- ▶ Fasten the air bleed screw taking into account the applicable tightening torque.

– Also observe the parameters for air bleeding in the instruction manual of the machine.

6. Perform a leak test.

Check that no hydraulic fluid leaks from the control block or the ports during operation. In case of hydraulic fluid leakage, refer to Table 8 "Malfunction table" on page 47.

7. Perform a functional test.

The functional test must be performed according to the parameters provided the machine manufacturer see machine instruction manual. Applicable for each case: Always increase the pressure slowly, if a leakage occurs stop the functional test immediately!

8. Check the control block hydraulic fluid temperature after it has been running in continuous operation for several hours. Check whether the measured temperature is within the product-specific limits. If the temperature is outside of the specified limits, the Bosch Rexroth warranty is invalidated.

9. After the initial commissioning, have a hydraulic fluid sample analyzed for the required cleanliness level. Change the hydraulic fluid if the required cleanliness level is not reached. If no laboratory test is performed after initial commissioning, then: Change the hydraulic fluid.

8.3 Recommissioning after standstill

Recommissioning is necessary if the control block has been out of service for longer than 12 months.

- ▶ For recommissioning, proceed as described in chapter 8.2 "Initial commissioning" on page 36.



Observe the instructions on (re)commissioning after standstill in the machine's instruction manual.

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 power range specified in the technical data. The machine manufacturer is responsible for the proper project planning of the hydraulic system and its control.

- ▶ Avoid temperature shocks. A temperature difference of more than 20 °C between the control block and the hydraulic fluid must not occur. Otherwise, there is a risk of a jammed spool. At temperatures below 0 °C, the control block must be run until it is warm.

9.1 Notices on the application of control blocks at low temperatures

- Boundary conditions**
- Minimum ambient temperature: –40 °C
 - Hydraulic fluid temperature
 - Warm-up phase with low loading as of –40 °C
 - Operation with low loading as of –20 °C
 - Operation with loading as of 0 °C
- General instructions**
- For applications below an ambient temperature of –20 °C, non-standard seals are used. Different application limits are specified in the control block's Technical Customer Documents (TKU).
 - Avoid moisture in the area surrounding the control blocks, since possible moisture on the moving seals may freeze the seal to the control spool when at a standstill. When moving the control spool, it is not possible to rule out the seal ring being destroyed.
 - The limit viscosities specified in the data sheets for the control blocks must be complied with by selecting a suitable hydraulic fluid across the entire operating time both in winter and in summer with warmer temperatures.
 - The values below apply to limiting conditions:

$v_{\max} = 2000 \text{ mm}^2/\text{s}$

(Momentarily on cold starting, $\vartheta_{\min} = -40 \text{ °C}$)

$v_{\min} = 10 \text{ mm}^2/\text{s}$

(Momentarily at max. permissible temperature of $\vartheta_{\max} = 80 \text{ °C}/100 \text{ °C}$)

Note that the max. hydraulic fluid temperature of 80 °C (100 °C with FKM) must not be exceeded, not even locally, e.g. at the pressure reducing valve.
 - When installing new components in a cold machine, they must first be filled at higher temperatures so that sufficient lubrication is assured in all areas.

Notice on the electronics

- Control units, amplifiers, sensors, encoders, solenoids
 - Minimum storage temperature: –50 °C
 - Installation and complete function as of –40 °C
- Devices with displays (unless specified in more detail)
 - Minimum storage temperature: –20 °C
 - Installation and complete function as of –20 °C
- With switching and proportional solenoids, it may be expected that hysteresis can increase or switching times can be extended due to increasing operating fluid viscosity at reducing temperatures.

Procedure

- 1.** Heat all components to at least –40 °C.
- 2.** Start the drive motor
- 3.** Run the pump to its operating temperature according to the specification (see data sheet 90300-03-B)
- 4.** Warm-up phase of the open hydraulic system
 - Pump starts up with diesel engine and should be run for at least 10 minutes at the diesel engine's idle speed to guarantee self-lubrication.
 - The pump must be in pressure-reduced closed-circuit (max. of 50 bar and max. of 50% delivery rate).
 - Loading the open circuit, e.g. using a separate preload valve, generates a circulation pressure of about 50 bar at the pump. Keep maintaining these operating conditions until a hydraulic fluid temperature of 0 °C is reached in the system. While doing this, the diesel engine speed must not be increased.
 - After this, slowly actuate all of the machine functions several times at the lowest load to heat up the machine as evenly as possible. When doing this, monitor the reservoir temperature, which drops again as a result of the cold hydraulic fluid that flows back.
- 5.** For operation at low temperatures, it is recommend that you provide flushing from the pump to the control block and to the reservoir to maintain the temperature difference between the hydraulic fluid and the control valve within permissible limits.
Depending on the version, such flushing can also be already integrated in the control block.
- 6.** The system flushes the covers in hydraulically pilot operated valves with reservoir oil via flushing channels.
- 7.** After running the pump to its operating temperature, slowly actuate all the consumers without loading to replace the cold oil in the consumers with warm oil.
- 8.** Flushing should continue during operation to keep consumers that are only used occasionally at the operating temperature.
- 9.** Continuous flushing is necessary in all the components to avoid temperature shocks. The temperature difference between the operating fluid and the individual components may be a maximum of 20 °C.
- 10.** Our control blocks can be fully loaded from a circuit temperature of ≥ 0 °C in the machine onwards.

10 Maintenance and repair

NOTICE

Overdue inspection and maintenance work!

Property damage!

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

10.1 Cleaning and care

NOTICE

Damage to the hydraulic system and the seals!

The jet of a high-pressure cleaner can damage the seals and electrical system of the control block!

- ▶ Do not point high-pressure cleaners at sensitive components like electrical connections and components.

For cleaning and care of the control block, observe the following:

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

10.2 Inspection

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

Table 7: Inspection schedule

Work to be performed on the control block	Interval
Check operating temperature	Weekly
Hydraulic fluid analysis: Viscosity, aging and contamination	Annually or every 2000 operating hours
Inspect the control block for external leakage (visual inspection).	Daily
Inspect the control block for unusual noise development.	Daily
Check mounting elements for tight seating. All mounting elements must be checked when the control block is depressurized, deenergized and has cooled down.	Monthly

10.3 Maintenance

The control block is low maintenance when used as intended.

The service life of the control block is heavily dependent on the quality of the hydraulic fluid. This is why 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.



Observe the following general rules:

From a hydraulic fluid temperature of $> 70\text{ °C}$ the aging speed doubles with every 10 °C of temperature increase.

The maximum permissible degree of contamination of the hydraulic fluid can be seen in the data sheet in Chapter "Technical data".

Please also observe the parameters on hydraulic fluid in the machine's instruction manual.

10.4 Repair

Bosch Rexroth offers a comprehensive range of services for the repair of Rexroth control blocks.

Repairs on the control block must only be performed by service centers certified by Bosch Rexroth or the machine manufacturer.

If you have any questions about repairs, contact your responsible Bosch Rexroth service partner or the service department of the control block manufacturer's plant, see Chapter 10.5 "Spare parts" on page 42.

10.5 Spare parts

CAUTION

Use of unsuitable spare parts!

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

- ▶ Use only original spare parts from Rexroth to repair Rexroth control blocks; otherwise, the function of the control block cannot be assured and you lose your entitlement under warranty.

Spare parts lists are available from your responsible Bosch Rexroth service partner.

When ordering spare parts, quote the material and serial number of the control block as well as the material numbers of the spare parts.

Address all queries about spare parts to your responsible Bosch Rexroth Service partner or the service department of the manufacturer's plant for the control block.

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Addresses of our country representatives can be found at
<https://addresses.boschrexroth.com>

11 Removal and replacement

11.1 Required tools

- Suitable tools for mounting as specified on the offer drawing
- Collecting pan to collect any leaking hydraulic fluid.

11.2 Preparing for removal

1. Take the entire machine out of service as described in the instruction manual for the machine.
 - Relieve pressure in the hydraulic system according to the parameters provided by the machine manufacturer.
 - Make sure the relevant system components are depressurized and deenergized.
2. Secure the overall system according to the parameters provided by the manufacturer.

11.3 Removal of the control block from the machine

To remove the control block, proceed as follows:

1. Make sure you have the appropriate tools and wear personal protective equipment.
2. Allow the control block to cool down until it can be removed without danger.
3. Make sure that no hydraulic fluid can escape from the system accidentally due to the control block being removed.
4. Place a clean collecting pan under the control block to collect any hydraulic fluid residue that may leak.
5. Loosen the lines and collect the escaping hydraulic fluid residue in the collecting pan.
6. Remove the control block in accordance with the parameters provided by the machine manufacturer.
7. Place the product on a clean surface with sufficient load-bearing capacity.
8. Drain the control block completely.
9. Plug all openings.

11.4 Preparing the components for storage or further use

- ▶ Proceed as described in chapter 6.2 "Storing the control block", section "After removal" on page 24.

12 Disposal

CAUTION

Spring-loaded components!

Risk of injury due to ejected components during disassembly of the valve into its individual parts!

- ▶ Loosen screwed-in and spring-loaded components slowly and keep secured until the compression spring is relieved.

Careless disposal of the control block, the hydraulic fluid and the packaging material can result in environmental pollution.

For the disposal of the control block, observe the following points:

- 1.** Drain the control block completely.
- 2.** Dispose of the control block and the packaging material in accordance with the national regulations of your country.
- 3.** Dispose of the hydraulic fluid in accordance with the regulations of your country.
- 4.** Disassemble the control block into its individual parts and recycle them.
- 5.** For example, separate the parts into:
 - Metals
 - Electronic waste
 - Plastic

13 Extension and conversion

Conversions and changes to the settings on the control block are not permissible.



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



Changing the settings will void the warranty. If you need to change settings, contact your Bosch Rexroth service partner (for the address, see Chapter 10.5 "Spare parts" on page 42).

Optional accessories

Available accessories can be found in the respective data sheet.

Accessories are available from your Rexroth specialist dealer. Addresses of our country representatives can be found under

<https://addresses.boschrexroth.com>

14 Troubleshooting

Table 8 is intended to support 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

- ▶ Use a systematic and targeted approach, even when pressed for time. Random and imprudent removal and changing of settings could result in the inability to ascertain the original error cause.
- ▶ First, make yourself familiar with the function of the control block in conjunction with the entire system.
- ▶ Find out whether or not the control block rendered the required function in the entire system before the fault occurred.
- ▶ Collect the changes to the entire system in which the control block is installed:
 - Have there been any changes to the application conditions or operating range of the product?
 - 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, electrics, control) or to the product? If yes: What changes?
 - Has the hydraulic fluid been changed?
 - Has the product or machine been used as intended?
 - How does the malfunction appear?
- ▶ Try to get a clear idea of the cause of the fault. Directly ask the (machine) operator.
- ▶ Document the work carried out.
- ▶ If the fault cannot be corrected, please refer to one of the contact addresses at: <https://addresses.boschrexroth.com> or in chapter 10.5 "Spare part".

14.2 Malfunction table

Within the permissible operating conditions, no malfunctions occur at the control block.

Table 8: Malfunction table

Malfunction	Possible cause	Remedy
Hydraulic fluid is escaping on the control block or the valve section	The control block is leaking	Tighten the mounting bolts to the specified tightening torque.
	The threaded plugs are leaking	Tighten the threaded plugs to the specified tightening torque; possibly renew the copper seal rings. With O-ring seals: Do not tighten the threaded plug, renew the seals and tighten the threaded plug to the specified torque. If leaks remain: Check the sealing surfaces/seals for damage. If necessary, renew the threaded plug.
	Control block housing or valve section is leaking	Remove the control block or the valve section and replace with a new one.
	The ports leading to the actuator (the screw neck, the fittings) are leaking.	Check seals, replace fittings if necessary. Check tightening torques, see the parameters provided by the manufacturer of the fitting.
	The valve housing on the secondary valve/ threaded plug is leaking	If necessary, renew the secondary valve/threaded plug.
	The seals of assembled parts are leaking	Renew the seals; refer to the spare parts list.
Hydraulic fluid leaks from the supply lines on the control block.	The system pressure is too high	Comply with the pressure limit
	Pipe or hose lines damaged	Replace pipe or hose lines
	Pipelines or hose lines are loose	Tighten the threaded joints and the fittings in accordance with the installation instructions that apply to the fittings. You can obtain the corresponding installation instructions from the machine manufacturer.
	The seals are leaking	Renew the seals; refer to the spare parts list.
Hydraulic fluid is leaking between the valve sections	The port thread is damaged	Remove the control block or the valve section and replace with a new one.
	The seals on the flange surface are damaged	Renew the seals; refer to the spare parts list.
	Deposition of dirt during the installation of the control block	Remove the control block, clean the flange surface.
	The control block housing on the flange surface is leaking	Renew the damage valve section.
	Tightening torque of tie rod is too low	Check the tightening torques, refer to the spare parts list.
Residual oil from installation/testing of the control block	Remove the oil and contaminants from the control block; when doing this, do not use any cleaning agents that can adversely affect plastics or whose properties can change, can adversely affect metals or react with them or leave residues.	

Table 8: Malfunction table

Malfunction	Possible cause	Remedy
Working movement is irregular	Air in the hydraulic fluid	Air bleed hydraulic system, see page 36.
	Dirt or foreign particles in the hydraulic fluid or the control block	Filter the hydraulic fluid or replace it. Clean the interior of the control block.
	The viscosity of the hydraulic fluid is too low	Reduce the temperature of the hydraulic fluid.
	The viscosity of the hydraulic fluid is too high	Increase the temperature of the hydraulic fluid.
	The flow is too low.	Make sure that the flow is adequate.
No function	Control block connected incorrectly	Correct the hydraulic and/or electrical connections. Repair the actuation
	Control spool faulty	Check the tightening torques of the tie rods, refer to the spare parts list.
Version: mechanical actuation Impossible to deflect control spool mechanically	Tie rods were tightened at a tightening torque that was too high/at different tightening torques	Undo the nuts of the tie rods and tighten them to the specified tightening torque.
	Oil temperature is too high or the temperature difference between the hydraulic fluid and the control block is too great. This means that sticking occurs due to the different thermal expansion of the control spool and the control block.	Check the cooler function, the oil supply and the pump pressure in the neutral position. Avoid a temperature shock; for information on this topic, refer to the "Technical data sheet".
	Any dirt or foreign particles that enter at installation of the ports leading to the actuator jam the control spool.	Try to switch the valve several times by actuating the hand lever or the pilot control. Carry out a visual inspection of the ports to the actuator and remove the foreign particles using a solenoids and a tweezers. If foreign particles are jammed, renew the valve housing.
Control spool not operating or goes back too slowly	Control spool is jammed	In the case of a malfunction, see "Not possible to deflect control spool mechanically" above
	Control spool is held by flow force caused by high oil flow	Reduce the oil flow from the consumer to the reservoir.
Version: Electrohydraulic actuation Control spool does not react to electrical control at all or only reacts on a delayed basis	No solenoid current at all or it is too low, wrong operating point (solenoid current not adapted correctly to oil flow)	Check voltage supply and Q/I operating point, see "Technical data sheet". Check plug-in connection.
	Pilot control valve or solenoid valve not functioning	Renew the pilot control valve or the solenoid valve.
	Undersupply (pump pressure is too low). Provide the minimum pump pressure, see "Technical data sheet".	Undersupply (pump pressure is too low). Provide the minimum pump pressure, see "Technical data sheet".
	Pilot oil supply is jammed	Remove the pilot oil supply and replace it with a new one.
	Pilot control valves are contaminated	Renew the pilot control valve.
Version: hydraulic actuation	Undersupply (pump pressure is too low).	Provide the minimum pump pressure, see "Technical data sheet".
	No pilot pressure present	Check the pilot oil supply
With valves in parallel operation: No pressure or no oil flow on the consumer when the control spool is deflected, major delay in pressure build-up	Oil flow flows to consumer at minimum pressure due to undersupply	Increase the pump oil flow by raising the rotational speed or using a bigger pump or reduce the amount of flow to the consumer using a quantity regulator.

Table 8: Malfunction table

Malfunction	Possible cause	Remedy
Neutral circulation pressure is too high	No load-sensing unloading (applies to M4, M6, M7, SP, SX only)	
	Control spool not in neutral position	With tongue: Check the projection, see "Technical data sheet". Pressure in the control covers is too high (check actuation).
	Return flow pressure is too high	Disconnect the return flow from the common return line; use a separate return line or increase the size of the line cross section.
	Inlet pressure compensator is jammed	Renew the inlet plate.
Movement on consumer despite neutral position	Control spool is not in neutral position	Pressure in the control covers is too high (check actuation).
	Secondary pressure relief valve leaking or set too low	Check the setting pressure on the secondary pressure relief valve.
	The control spool leakage is too great	Refer to the data sheet for the leakage values Install a leak-free lowering brake valve.
No detent function	Restoring force in the direction of actuation is too great compared to the detent force (spring)	Remove the detent and clean it.
	Detent unit is worn	Renew the detent unit.
Detent release force is too high	Control spool is jammed	See "Not possible to deflect control spool" under "Control spool is jammed" at the top of this table.
	Detent unit is damaged	Renew the detent unit.
	Detent force is too high	Clean the detent unit and grease it. If this is not successful, renew the detent unit.

In case of malfunctions caused by contamination, it is essential to check and possibly improve the quality of the hydraulic fluid through appropriate measures, such as purging, exchange or additional installation of filters in addition to carrying out repairs.

15 Technical data

The permissible values of the technical data of the control blocks can be found in the corresponding data sheet. For the assignments of control blocks to data sheets, refer to Table 1 "Required and supplementary documentation" on page 5.

The data sheets can be found online under
www.boschrexroth.com/various/utilities/mediadirectory

Additional information can be found in the online product catalogue
Mobile hydraulics: www.boschrexroth.com/mobile-hydraulics-catalog

The order-related technical data of your control block can be found in the order confirmation.

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