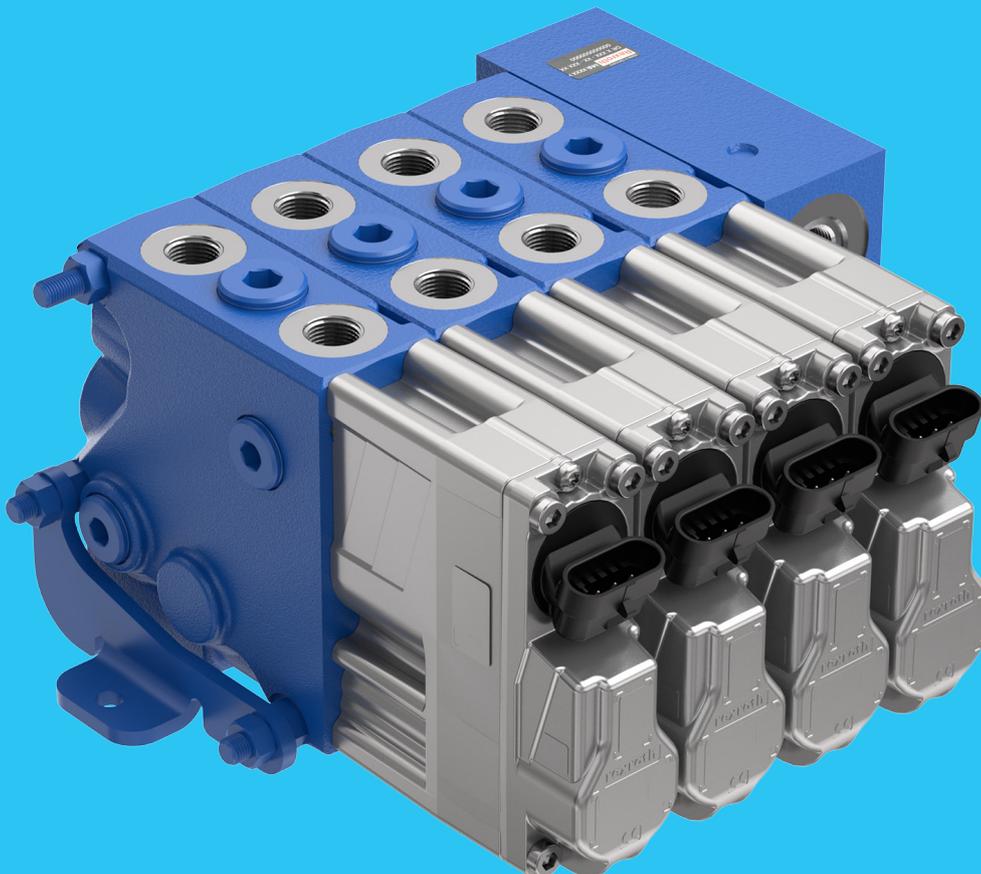


Load-sensing control block SB11

for mobile applications



© Bosch Rexroth AG 2022. All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

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

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

The original instruction manual was created in German.

Contents

1	About this documentation	5
1.1	Validity of the documentation.....	5
1.2	Required and supplementary documentation	5
1.3	Representation of information	6
1.3.1	Safety instructions	6
1.3.2	Symbols	7
1.3.3	Designations	7
1.3.4	Abbreviations	8
2	Safety instructions	9
2.1	About this chapter.....	9
2.2	Intended use	9
2.3	Improper use	10
2.4	Personnel qualifications	10
2.5	General safety instructions.....	10
2.6	Product-specific safety instructions	11
2.7	Personal protective equipment.....	13
3	General instructions on property damage and product damage.....	14
4	Scope of delivery.....	17
5	About these products	18
5.1	Performance description	18
5.2	Product identification	18
5.3	Product description.....	19
5.3.1	Definition of control block segments.....	19
5.3.2	Types of actuation	20
5.3.3	Definition of control block segment sides	20
5.3.4	Port designations	21
5.3.5	Flange figure.....	21
5.3.6	Connecting plate for fixed pump (C2 and C4)	22
5.3.7	Connecting plate for variable pump (C6)	24
5.3.8	Hitch control valve EHR11-EHS4.....	26
5.3.9	Control valve SB11-EHS4	28
5.3.10	Intermediate plate	29
5.3.11	Intermediate plate with RfB.....	30
5.3.12	End plate (E1).....	30
5.3.13	End plate (E6).....	31
5.4	Control block versions.....	32
5.4.1	Examples of control blocks with connecting plate and end plate	32
5.4.2	Examples of control blocks with connecting plate and end valve	32
5.5	Combination options.....	33
5.5.1	Control block for variable pump.....	33
5.5.2	Control block for fixed pump.....	34
6	Transport and storage	35
6.1	Transporting the control block/control block segment	35
6.1.1	Transport by hand	35
6.1.2	Transport with lifting devices	35
6.2	Storage of control block/control block segment.....	36

7	Installation.....	38
7.1	Unpacking	38
7.2	Assembly of control block segments to form a control block.....	38
7.3	Painting the control block/control block segment	38
7.4	Installation conditions.....	39
7.5	Installation position	39
7.6	Assembly of the control block/control block segment	39
7.6.1	Preparation	39
7.6.2	Fastening of the control block/control block segment	39
7.6.3	Completion of installation	40
7.6.4	Mechanical connection of the control block/control block segment	40
7.6.5	Hydraulic connection of the control block/control block segment.....	41
7.6.6	Customer-specific coupling connection	42
7.6.7	Tightening torques for hydraulic ports.....	43
7.6.8	Electric connection of the control block/control block segment.....	44
8	Commissioning.....	45
8.1	Before initial commissioning	45
8.2	Initial commissioning	46
8.3	Air bleeding.....	47
8.3.1	Air bleeding at control block/control block segment	47
8.3.2	Bleeding SB control valves with EHS.....	47
8.3.3	Bleeding EHR hitch control valves with EHS.....	48
8.4	Recommissioning after standstill.....	49
9	Operation	50
9.1	Software description	50
10	Maintenance and repair.....	51
10.1	Cleaning and care	51
10.2	Inspection and maintenance.....	51
10.3	Repair	51
10.4	Spare parts	52
11	Removal and replacement	53
11.1	Required tools.....	53
11.2	Preparing for removal	53
11.3	Removal of control block/control block segment from machine	53
11.4	Preparing the components for storage or further use	53
12	Disposal	54
13	Extension and conversion.....	55
14	Troubleshooting	56
14.1	How to proceed for troubleshooting.....	56
14.2	Malfunction table	57
15	Technical data	58
16	Alphabetical index	59

1 About this documentation

1.1 Validity of the documentation

This documentation applies to load-sensing control blocks SB11 of Bosch Rexroth including the following control block segments:

- Connecting plate, intermediate plate and end plate
- Control valves SB11-EHS4
- Hitch control valves EHR11-EHS4

This documentation applies for all mentioned control blocks and control block segments independent from their manufacturing date until new revision of this document.

This documentation is intended for machine/system manufacturers as well as authorized specialists and dealers.

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

- ▶ Read this documentation completely and in particular the chapters 2 "Safety instructions" on page 9 and 3 "General instructions on property damage and product damage" on page 14 before starting to work with the control block/control block segment.

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 version: Load-sensing control block SB11 Load-sensing directional valves in sandwich plate design SB11-EHS4 Plates SB11 Hitch control valves EHR11-EHS4	66177 66176 66181 66126	Data sheet
 Load-sensing control block SB11 Contains all information required for directional valve installation	66177-10-R	Assembly instructions
 Pilot module EHS4 Safety-relevant project planning notes according to ISO 25119	66157-01-B	Manual
 Pilot module EHS4 Technical customer documentation (TKU)	66157-02-B	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

Table 1: Required and supplementary documentation

Title	Document number	Document type
 Hydraulic fluids based on mineral oils and related hydrocarbons Describes the requirements for mineral oil-based hydraulic fluids 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



For further documentation on installation and repair, refer to Table 16 on page 52 or consult your Bosch Rexroth Sales.

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 14, 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
Type and source of danger Consequences of non-compliance ► Danger prevention measures

- **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 the consequences of non-compliance
- **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 notices that are not safety-relevant but increase 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.	
	Black circle with white number: Auxiliary marking for a better understanding.
	White circle with black number: Position or assembly group with reference to the parts list and to the graphics within a chapter.
	White circle with black letters: Assembly group with reference to the parts list and to the graphics within a chapter.

1.3.3 Designations

This documentation uses the following designations:

Table 4: Designations

Designation	Meaning
SB11-EHS4	Control valve with CAN bus-controlled electro-hydraulic actuating unit
EHR11-EHS4	Control valve with CAN bus-controlled electro-hydraulic actuating unit for electrohydraulic hitch control
Control valve	Directional valve type SB
Hitch control valve	Directional valve type EHR
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
AP	Connecting plate
CAN	Controller Area Network
PRV	Pressure relief valve
DIN	German Industrial Standard
DMV	Pressure reducing valve
EHR	Electrohydraulic hitch control
EHS	Electro-hydraulic actuating unit
EVR	End valve (with LS signaling direction from left to right)
EP	End plate
IPC	Individual pressure compensator
ISO	International Organization for Standardization (Internationale Normierungsorganisation)
RV	Check valve
SPV	Check valve
SVR	Directional valve (with LS signaling direction from left to right)
ZP	Intermediate plate

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 danger 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 this 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/control block segments are hydraulic components, meaning that in their application area they are classified neither as complete nor as partly completed machinery as defined in the EC Machinery Directive 2006/42/EC. 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 for which it is intended and the safety of the entire system has been established in accordance with the machinery directive.

The control blocks/control block segments have been developed for applications in the working hydraulics of agricultural machinery. Deviating use is only permitted following consultation with Bosch Rexroth.

- ▶ Observe the technical data, the application and operating conditions and the performance 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 damage 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 and in the order confirmation (unless specifically approved by the customer)
- Use of non-approved fluids, e.g. water or polyurethane components
- Application of the control block/control block segment in potentially explosive environments

2.4 Personnel qualifications

The activities described in this documentation require a basic understanding of mechanics, electrics and hydraulics, as well as familiarity with associated technical terms. For transporting and handling the product, knowledge regarding the use of lifting devices and lifting accessories is required. 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 and
- 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 and environmental protection regulations.
- Observe the safety regulations of the country in which the product is used/operated.
- For Germany, the following applies: Hydraulic machinery/systems are "facilities for handling substances hazardous to water in accordance with the German Federal Water Act (WHG)". Sections 1 and 19 WHG (§19g, 19i, 19l) in particular must be complied with in this respect.
- Use Rexroth products only when they are in good working order.
- Do not install, operate, disassemble 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 from unsuitable spare parts.
- Observe the technical data and ambient conditions specified in the product documentation.

- If unsuitable products are installed or used in safety-relevant applications, unexpected operating conditions may occur in the application, which could result in personal injury or property damage. For this reason, only use the product in safety-relevant applications if this use is expressly indicated and approved in the product documentation, e.g. in 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/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.

2.6 Product-specific safety instructions

The following safety instructions apply for chapters 6 to 14.

WARNING

Danger due to suspended loads!

Risk of death or injury, or property damage!

In the event of inappropriate transport, the control block/control block segment may be dropped and cause injury, e.g. bruises or fractures and/or damage to the product.

- ▶ Make sure that the lifting capacity of the lifting device is sufficient to safely bear the weight of the control block/control block segment.
- ▶ 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 regulations on occupational health and safety, and transportation.

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 entire system and secure it against reactivation according to the parameters provided 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.

 **WARNING****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.
- ▶ Keep open flames and ignition sources away from the control block/control block segment.
- ▶ If control blocks/control block segments 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 reactivation.

Malfunction of control functions due to contamination!

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.

- ▶ Comply with the prescribed cleanliness level of the hydraulic fluid in accordance with the data sheet.

Danger caused by pressurized, leaking hydraulic fluid!

Risk of death or injury due to leaking hydraulic fluid streams! Leakage at the control block/control block segment 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 from sharp edges and rough surfaces!**

When working on and transporting the control block/control block segment, there is a risk of injury, e.g. due to sharp edges at the valve housing, threads or at assembled parts.

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

Crushing and impact hazard 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.

Hot surfaces at control block/control block segment!

Risk of getting burnt!

- ▶ Allow the control block/control block segment to cool down sufficiently before touching it. Be aware that the EHS actuating unit can be up to 15 °C warmer than the control block segment.
- ▶ Wear heat-resistant, protective clothing, e.g. gloves.

Contact with hydraulic fluid!

Risk of adverse health effects, e.g. eye injury, skin irritation, toxication from 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.

Danger from improper handling!

Slip hazard! When using the control block/control block segment as climbing aid, there is a danger of slipping on wet and/or fluid-afflicted surfaces.

- ▶ Do not use the control block/control block segment 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/control block segment. Observe the safety regulations in your country. All pieces of personal protective equipment must 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.
- ▶ During transport, do not lift the control block/control block segment at sensitive attachments (e.g. actuation elements, sensors, solenoids, or valves).
- ▶ Carefully place the control block/control block segment onto the contact surface and secure it against falling to prevent damage.
- ▶ Do not put/place any objects on the product.
- ▶ Do not set/place the control block/control block segment on actuation elements.
- ▶ Do not hit sensitive assembled parts (e.g. sensors, solenoids or actuation elements).
- ▶ Sealing surfaces must not be damaged.
- ▶ Do not remove the transport protection until actual assembly at the control block/control block segment.
- ▶ Make sure the electronic components (e.g. sensors) do not build up electrostatic charges (e.g. during painting operation).

Risk of property damage due to inadequate lubrication!

Product can be damaged or destroyed!

- ▶ When commissioning the control block/control block segment, always ensure that there is enough hydraulic fluid in the system.
- ▶ When commissioning a machine/system, make sure that the housing area and the working lines of the control block/control block segment are filled with hydraulic fluid and remain filled during operation.

Fluids and foreign particles enter due to missing seals and plugs!

Loss of protection class and danger of short circuit! The connector only satisfies the type of protection in the plugged and locked state!

- ▶ Prior to installation as well as during cleaning and painting operation, make sure that all seals and plug-in connections are tight.

NOTICE

Mixing hydraulic fluids!

Product can be damaged!

- ▶ Observe the viscosity and cleanliness level specified in the data sheet for hydraulic fluids.
- ▶ Mixture of different hydraulic fluids can lead to damage at the control block/control block segment 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. Contamination of the hydraulic fluid may lead to 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 from getting into the hydraulic lines and causing product wear and malfunctions. The control block/control block segment 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 must 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 entering the product.

Improper cleaning!

Product can be damaged!

- ▶ Plug all openings with suitable protective devices to prevent cleaning agents from entering the product.
- ▶ Never use solvents or aggressive cleaning agents. Use only water and, if necessary, a mild cleaning agent to clean the product.
- ▶ Do not point high-pressure cleaners at sensitive components, e.g. rubber parts, electrical connections (solenoids and sensors), and actuation elements.
- ▶ Use fiber-free cleaning cloths for cleaning.

Environmental pollution due to improper disposal!

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

- ▶ Dispose of the control block/control block segment, hydraulic fluid, and packaging in accordance with the national regulations in your country.
- ▶ Dispose of the hydraulic fluid in accordance with the applicable safety data sheet for the hydraulic fluid.

NOTICE

Danger from chemical or corrosive environmental conditions!

Product can be damaged! If the control block/control block segment is exposed to chemical or aggressive environmental conditions, corrosion and even malfunctions may occur. Leaks may lead to leakage of hydraulic fluid.

- ▶ Take suitable measures for protection of the control block/control block segment against chemical and aggressive environmental conditions.

Escaping hydraulic fluid!

Risk of environmental pollution and contamination of ground water!

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

Danger from hot components!

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

- ▶ When installing the control block/control block segment, check the distances to nearby products to prevent any damage.

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,
- Unauthorized conversions and additional installations,
- Opening of the directional valve,
- Improper handling,
- Use of non-original spare parts by Rexroth.

4 Scope of delivery

Included in the scope of delivery:

- Control blockIn control block segment according to order confirmation

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

- Protective covers
- Protective plugs/threaded plugs

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 directional valves.

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

5.2 Product identification

The product can be identified from the name plate.



The details on the name plate apply to the product as delivered. If modifications have been made to the product in comparison to the delivery state, the name plate information may not apply to the present product.

- ▶ Make sure that the name plates in place are not damaged.
- ▶ Compare the material number of the product on the respective name plate with the details on the offer drawing to verify that this instruction manual refers to the product in question.

If in doubt, please contact Bosch Rexroth.

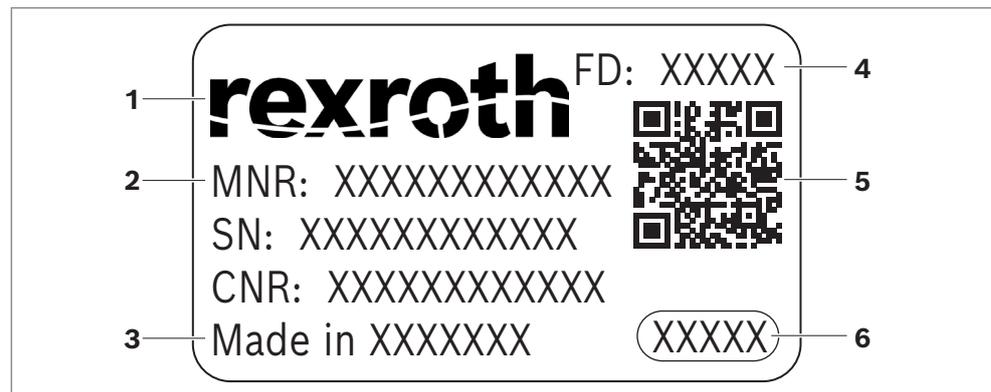


Fig. 1: Name plate (example)

- | | |
|-----------------------------------|---|
| 1 Word mark (manufacturer) | 4 Manufacturing date
JJ w WW = Year w calendar week |
| 2 Material number | 5 Data Matrix code |
| 3 Designation of origin | 6 Range/serial number |



The information on the above name plate may vary depending on order-specific requirements.

Any other labeling on the product is just for Bosch Rexroth-internal purposes.

5.3 Product description

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

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

5.3.1 Definition of control block segments

Control block	Control blocks are parts of hydraulic systems for control of actuators like tractor attachments. The control block includes various control block segments in sandwich plate design. The control block segments have various functions and are structured as follows:
Port Connecting	The connecting plate is equipped with the LS signal output (port Yo..). The connecting plates are usually fitted with tie rod screws to slide on the block segments. The flange surface is always fitted with O-rings in the flange surface (flange surface O-ring side). Connecting plates with inlet port (P..) are further distinguished as follows. <ul style="list-style-type: none"> • Connecting plate for fixed pump • Connecting plate for variable pump
Hitch control valve EHR11	The EHR control valve serves for electrohydraulic hitch control and is controlled via CAN bus in a circuit with electronic control unit and sensors.
Control valve SB11	The SB11 control valve serves for control of various actuators and is controlled via CAN bus. The control valve SB11 in the version as end valve with LS signaling direction from left to right (EVR) closes the control block.
Intermediate plate	The intermediate plate does not have any hydraulic functions and serves as spacer.
End plate	The control block is completed by the end plate which can also have other functions. The flange surface is never fitted with O-rings in the flange surface (flange surface O-ring opposite side).



The SB11 control block segments shown below are described by means of dummies. For a precise overview of all available combinations, refer to the respective data sheet.

For the precise position and designation of external ports, refer to the data sheet or the offer drawing.

5.3.2 Types of actuation

CAN bus control: The CAN bus pilot signal is generated in a control unit according to a fixed protocol. By means of the directional valve on-board electronics, the CAN bus pilot signal is converted in a spool deflection at the directional valve.

5.3.3 Definition of control block segment sides

Independent from the LS direction, the flange surface O-ring side always receives the side designation ⑥.

Depending on the arrangement of the tie rod bores and the flange surface O-ring side ⑥, the block segment sides are designated from ①...⑥.

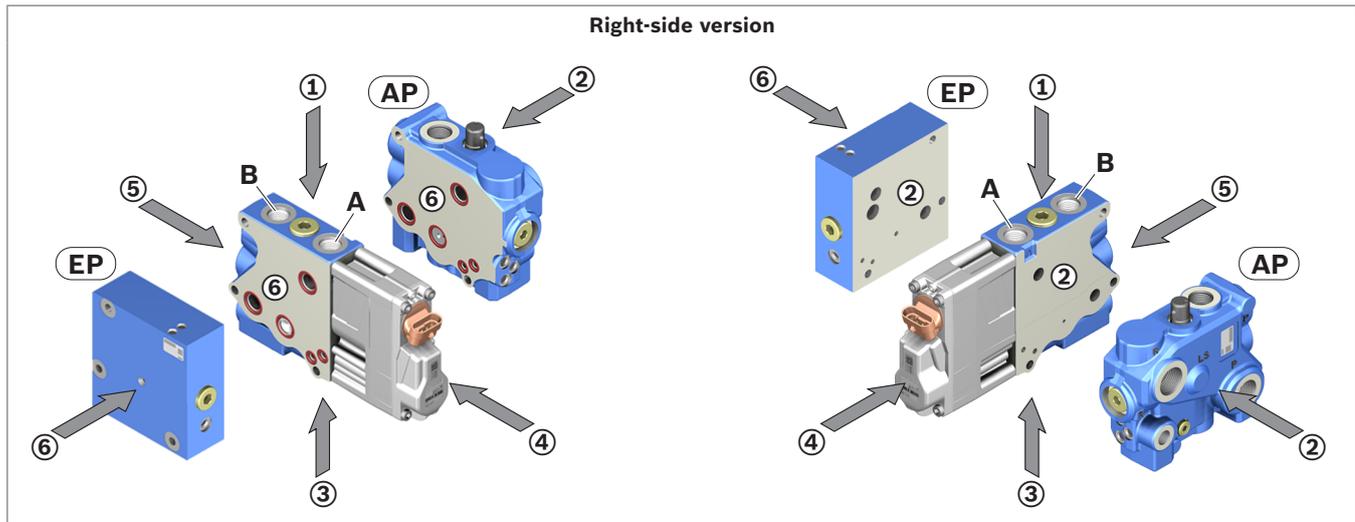


Fig. 2: Definition of control block segment sides

- | | |
|---------|--|
| Side ①: | Consumer port side |
| Side ②: | Flange surface O-ring opposite side or AP outer side |
| Side ③: | Lower side |
| Side ④: | Front face side A (EHS side) |
| Side ⑤: | Front face side B |
| Side ⑥: | Flange surface O-ring side and/or EP outer side |

5.3.4 Port designations

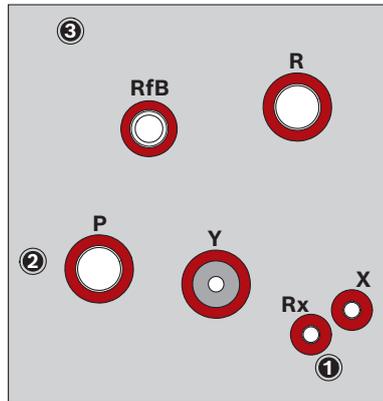


The port designation consists of a letter (e.g. **P**, **R**, **Y**) and the side designation (**1** to **6**), see chapter 5.3.3. **(P1)** e.g. refers to the inlet port on the consumer port side (top).

Table 6: Ports

Denomination	Port for
(P)	Pump port
(A), (B)	Consumer port
(R)	Return flow reservoir
(X)	Pilot oil supply
(Rx)	Pilot oil return
(Y)	LS signal
(a)	CAN bus pilot signal
(b)	Pressure sensor signal
(d)	Manual auxiliary actuation
(N)	Pressure transmission
(Yin)	LS signal input
(Yo)	LS signal output
 (BL)	Block fastening thread

5.3.5 Flange figure

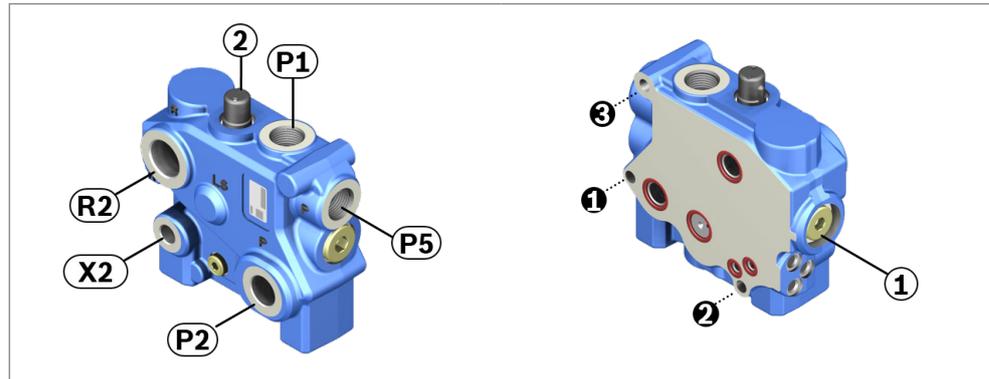


Denomination	Port for	Information
(P)	Inlet	
(R)	Return flow reservoir	
(RfB)	EHR11 pressure limitation return flow	optional
(Y)	LS signal	
(Rx)	Pilot oil return	
(X)	Pilot oil supply	
1, 2, 3	Tie rod thread or tie rod bore continuous	

5.3.6 Connecting plate for fixed pump (C2 and C4)

Table 7: Internal functions

Position	Designation	Information
①	Pressure compensator	
②	LS pressure relief valve	optional
③	Primary pressure relief valve	optional
④	Shuttle valve	optional



Application AP C2/C4 is used for an SB11 block for the open circuit (fixed pump). The inlet and return lines of the flow are directed via AP C2/C4. AP C4 is identical with AP C2, but with an additional N port for the pressure transmission.

Internal function **Pressure compensator ①**: Controls the inlet flow to the connected SB11 valves according to the block-internal LS signal.

LS pressure relief valve ②: Limits the pressure at the inlet port **P** and indirectly also the pressure in the block-internal **P** line by means of the pressure compensator.

Primary pressure relief valve ③: Limits the pressure at the inlet port **P** and indirectly also the pressure in the block-internal **P** line.

NOTICE! The primary pressure relief valve with its short response time and low flow is applied for limitation of the pressure peaks in the supplied flow.

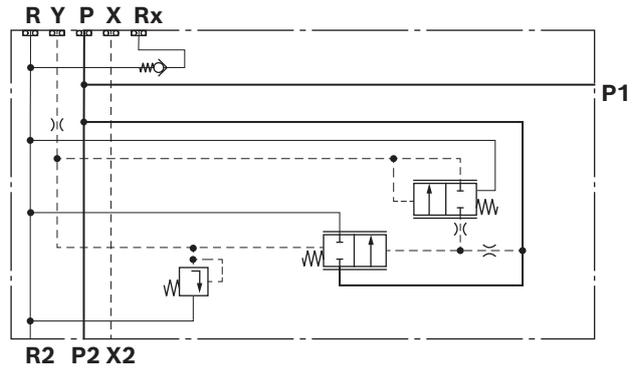
LS signal input \overline{Vin} : For linking an external LS signal via a shuttle valve to the internal LS chain.

Operation / control AP C2/C4 does not have a manual operating element or external control.

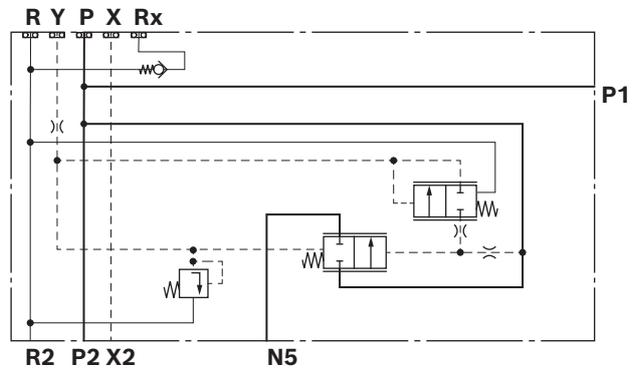


Unloading of the secondary pressure relief valve in the EHR11-EHS via AP C2/C4 is not possible for design reasons (return flow **RfB**).

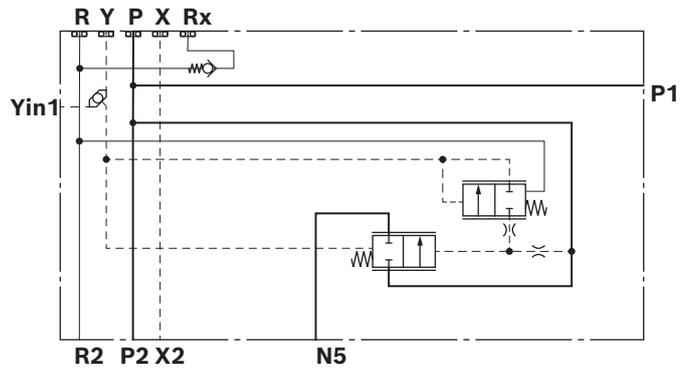
Fluid plan Connecting plate C2



Connecting plate C4



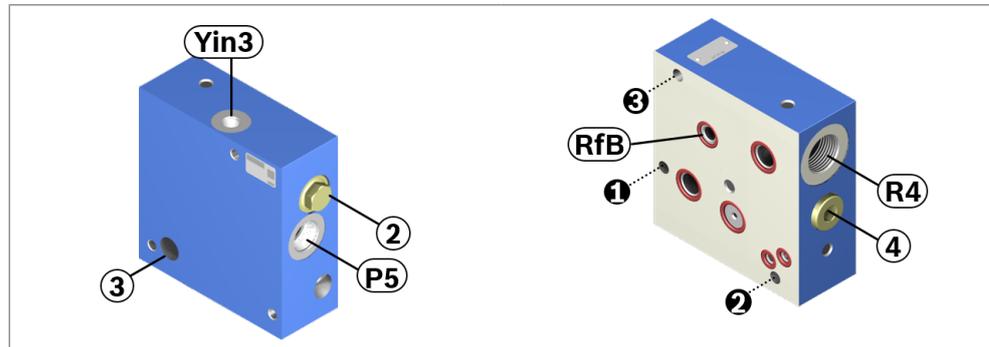
Connecting plate C4 with Yin



5.3.7 Connecting plate for variable pump (C6)

Table 8: Internal functions

Position	Designation	Information
①	Shuttle valve with spring pretension	optional
②	Pressure relief valve	optional
③	Rx-R check valve	optional
④	Pressure reducing valve	optional
⑤	Pressure reducing valve control coil	optional
⑥	Threaded plug	optional



Application AP C6 is used in an SB11 block for the closed circuit (variable displacement pump). The inlet and return lines of the flow are directed via AP C6.

Internal function Shuttle valve with spring pretension ①: Discharges the higher LS pressure from the block-internal channel Y and (Yin) to port (Yo2). The spring pretension prevents pressure build-up in (Yin) if port (Yin) is not occupied.

Pressure relief valve ②: Limits the pressure at port (P) and indirectly also the pressure in the block-internal P line.

NOTICE! The pressure relief valve with its short response time and low flow is applied for limitation of the pressure peaks in the supplied flow.

Rx-R check valve ③: Protects the block-internal EHS pilot oil return line Rx against pressure peaks from block-internal return flow R.

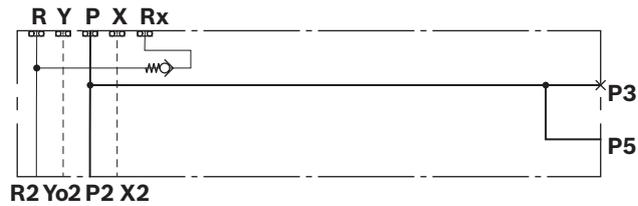
Pressure reducing valve ④: Limits the pressure in the block-internal EHS pilot oil line X and supplies this line with the flow from the block-internal line P.

Pressure reducing valve control coil ⑤: Electrical activation and deactivation of the pressure reduction function.

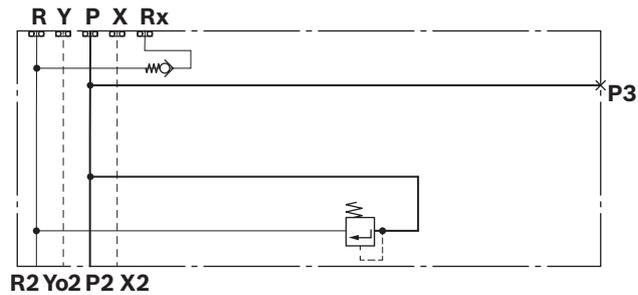
Optional return flow RfB: For unloading the secondary pressure relief valve in the EHR11-EHS.

Operation / control AP **C6** without control coil (pressure reducing valve) is not equipped with manual operating elements or external control functions.
 The version with control coil (pressure reducing valve), the pressure reduction function can be activated by energizing the control coil.
 This way, the pressure in the block-internal EHS pilot oil line **X** is increased to the pressure value of the pressure reduction function.
 If the control coil is not energized, the block-internal EHS pilot oil line **X** is unloaded to the return flow.

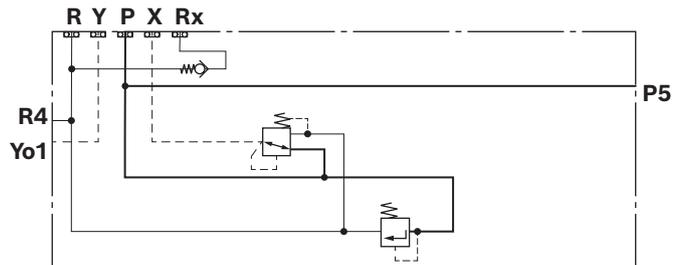
Fluid plan Connecting plate C6



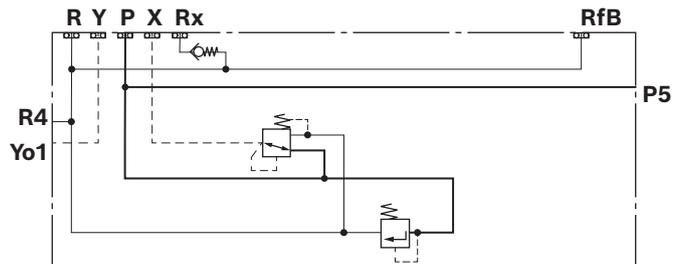
Connecting plate C6 with pressure relief valve



Connecting plate C6 with pressure relief valve and pressure reducing valve



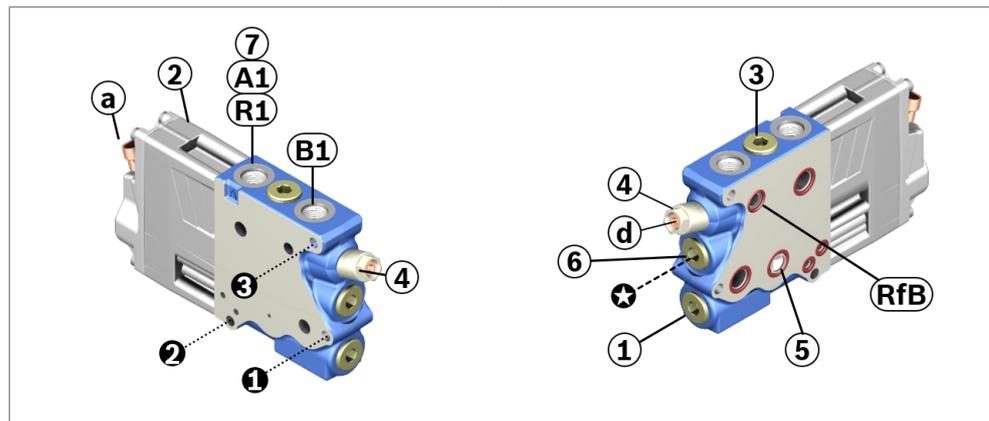
Connecting plate C6 with pressure relief valve, pressure reducing valve and RfB



5.3.8 Hitch control valve EHR11-EHS4

Table 9: Internal functions

Position	Designation	Information
★	Valve axis	
①	Individual pressure compensator with check valve function	
②	Electro-hydraulic actuating unit EHS4	
③	Check valve	
④	Secondary pressure relief valve	optionally with manual auxiliary actuation d
⑤	Shuttle valve	
⑥	Spring assembly	
⑦	Threaded plug	Ⓜ internal



CAUTION! The threaded plugs ①, ③ and ⑥ must not be removed! The threaded bores are not designed for connection fittings.

Internal function Individual pressure compensator ①: Controls the valve-internal inlet flow of the block-internal channel **P**. The integrated check valve function prevents the return flow to the block-internal channel **P**.

Electro-hydraulic actuating unit EHS4 ②: Control is realized at port **a** via CAN bus pilot signal. The received CAN bus pilot signals are converted to respective deflection of the control spool.

- Controls the inlet flow to working port **B1** and return via the return flow port
- With internal return flow:
Controls the inlet flow and return flow via working port **B1**.
Port **A1** is plugged by threaded plug ⑦.

Check valve ③: Prevents valve-internal return flow in working port **B1**.

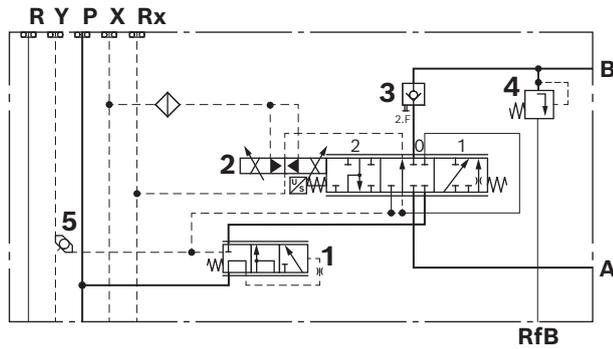
Secondary pressure relief valve ④: Limits the operating pressure in working port **(B1)**.

The secondary pressure relief valve is unloaded via the additional return flow (**RfB**) in the flange surface.

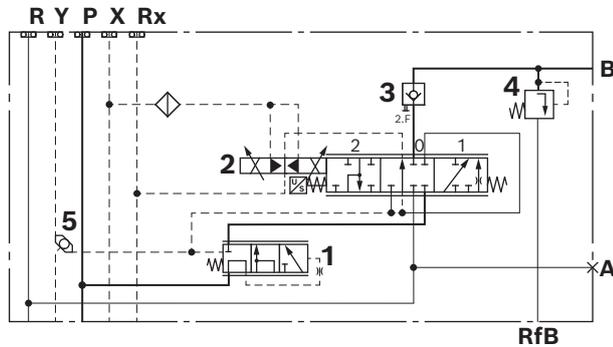
Shuttle valve ⑤: Directs the higher LS pressure through the control block/control block segment.

Operation / control Control is realized via CAN bus pilot signal **(a)**.
Secondary pressure relief valve ④ optionally with manual auxiliary actuation **(d)**.

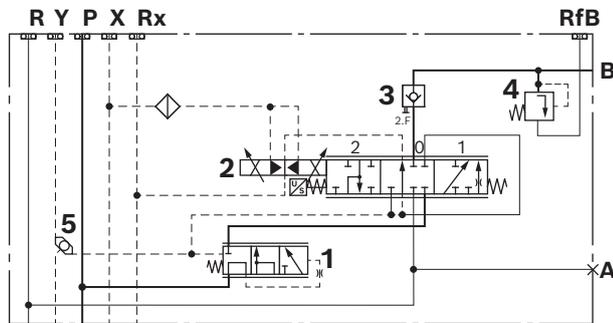
Fluid plan RfB on the O-ring opposite side, external consumer return



RfB on O-ring opposite side, internal consumer return



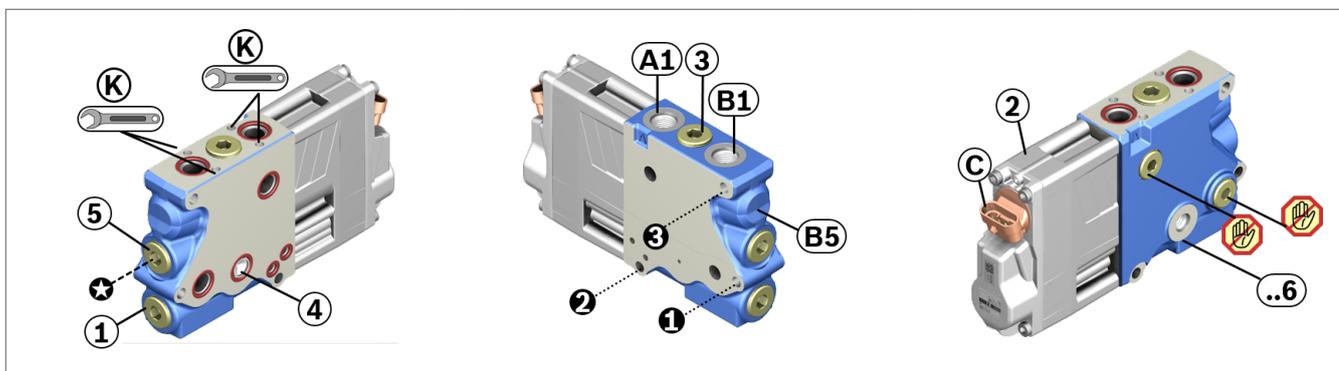
RfB on the O-ring side (for unloading RfB via end plate), internal consumer return



5.3.9 Control valve SB11-EHS4

Table 10: Internal functions

Position	Designation	Information
★	Valve axis	
①	Individual pressure compensator with check valve function	
②	Electro-hydraulic actuating unit EHS4	
③	Check valve	optional
③	Check valve with thermal pressure relief valve	optional
④	Shuttle valve	
⑤	Threaded plug	



CAUTION! The treaded plugs on the EVR closing side (⑥) and the threaded plugs ① and ⑤ must not be removed! The threaded bores are not designed for connection fittings.



At versions with working port (B5), working port (B1) is plugged with a threaded plug.

Internal function Individual pressure compensator ①: Controls the valve-internal inlet flow of the block-internal channel P. The integrated check valve function prevents the return flow to the block-internal channel P.

Electro-hydraulic actuating unit EHS4 ②: Control is realized at port (a) via CAN bus pilot signal. The received CAN bus pilot signals are converted to respective deflection of the control spool.

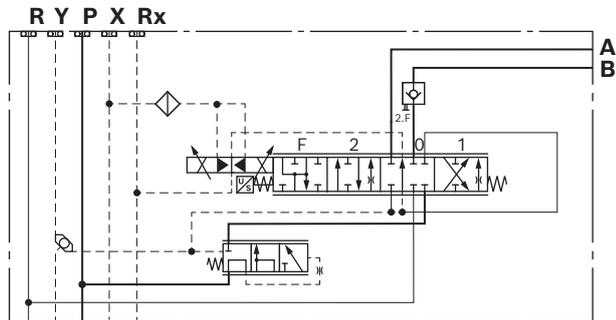
Check valve ③: Prevents valve-internal return flow in working port (B1).

Thermal pressure relief valve in check valve ③: The thermal pressure relief valve is integrated into the check valve and is opened in case of an inadmissible temperature-related pressure increase in the working port. The discharged volume is very low.

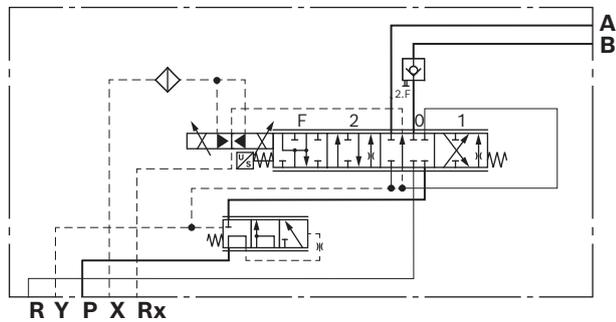
Shuttle valve ④: Directs the higher LS pressure through the control block/control block segment.

Operation / control Control is realized via CAN bus pilot signal ^a.

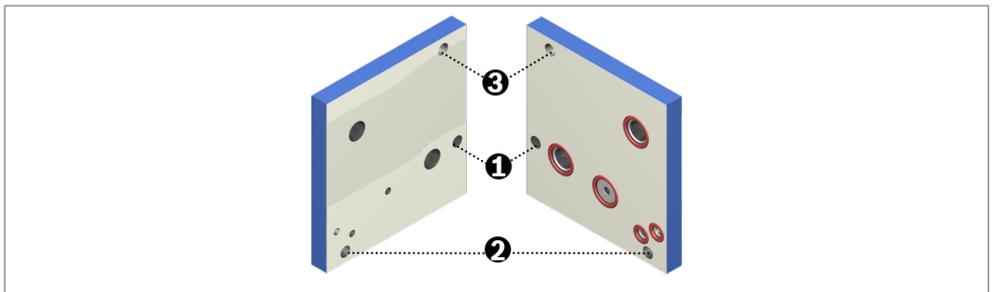
Fluid plan SB11 EHS4 standard valve (SVR)



SB11-EHS4 end valve (EVR)



5.3.10 Intermediate plate

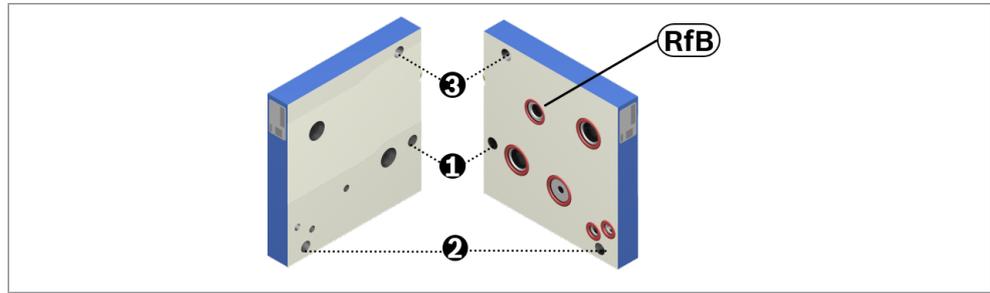


Application The intermediate plate does not have any internal function and serves as spacer.

Fluid plan Intermediate plate without RfB

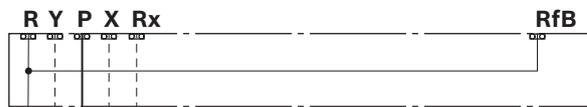


5.3.11 Intermediate plate with RfB



Application The intermediate plate serves as a spacer and unloads the secondary pressure relief valve in the EHR11-EHS (RfB).

Fluid plan Intermediate plate with RfB on the O-ring side



5.3.12 End plate (E1)

Table 11: Internal functions

Position	Designation	Information
①	Connection Y → R	

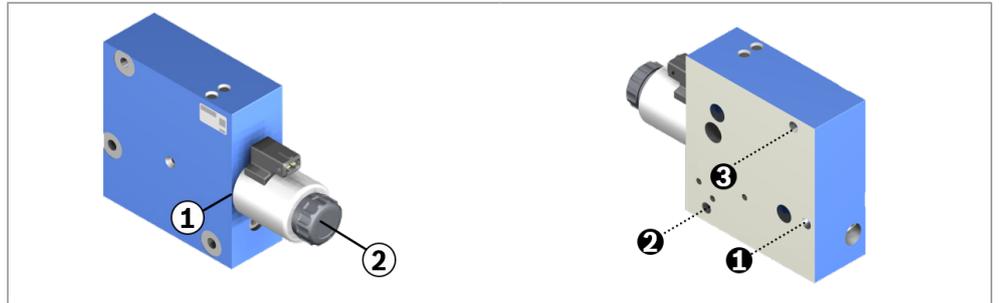


Fluid plan End plate E1



5.3.13 End plate (E6)**Table 12: Internal functions**

Position	Designation	Information
①	Pressure reducing valve	optional
②	Switching coil pressure reducing valve	optional



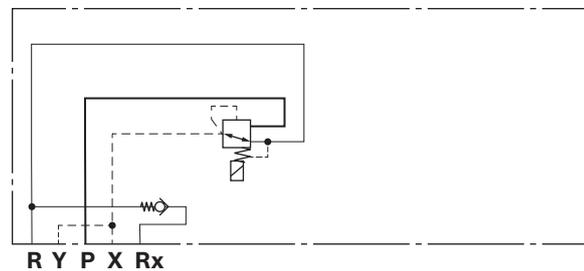
Application End plate **E6** is only installed together with connecting plate **C2** or **C4**.

Internal function **Pressure reducing valve ①**: Limits the pressure in the block-internal EHS pilot oil line **X** and supplies this line with the flow from the block-internal line **P**.

Pressure reducing valve control coil ②: Electrical activation and deactivation of the pressure reduction function.

Operation / control The **E6** end plate without control coil (pressure reducing valve) is not equipped with manual operating elements or external control functions. The version with control coil (pressure reducing valve), the pressure reduction function can be activated by energizing the control coil. This way, the pressure in the block-internal EHS pilot oil line **X** is increased to the pressure value of the pressure reduction function. If the control coil is not energized, the block-internal EHS pilot oil line **X** is unloaded to the return flow.

Fluid plan **End plate E6 with pressure reducing valve**

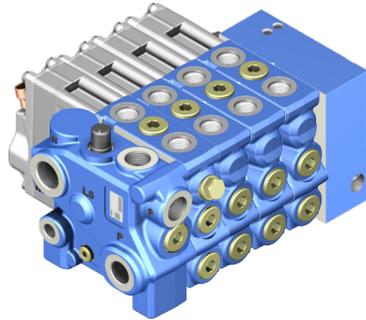


5.4 Control block versions

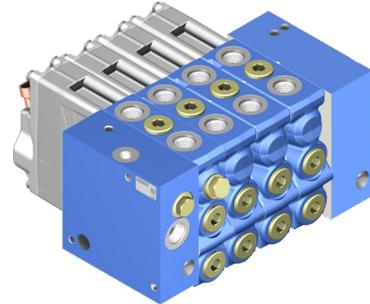
The flange surfaces between control block segment are uniform and standardized to enable combination of various control block segments.

5.4.1 Examples of control blocks with connecting plate and end plate

SB11 EHS4 control block for fixed pump



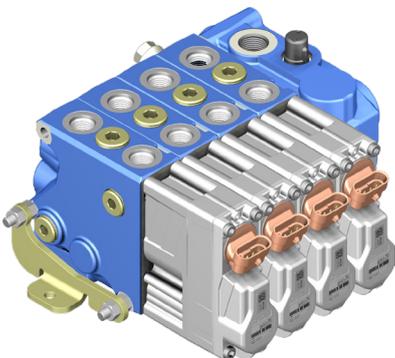
SB11 EHS4 control block for variable displacement pump



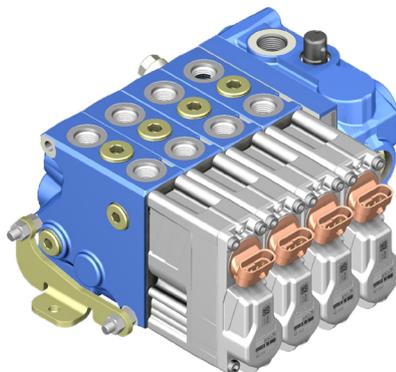
The inlet and return lines of the flow can be directed via the **C6** connecting plate.

5.4.2 Examples of control blocks with connecting plate and end valve

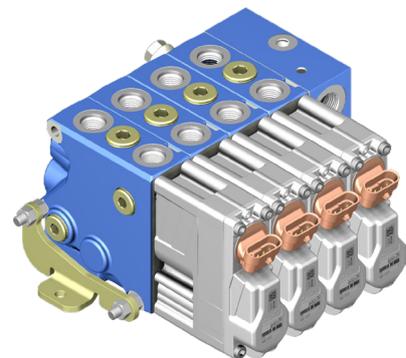
SB11 EHS4 control block for fixed pump



SB11 EHS4 control block for fixed pump, with secondary pressure relief valve unloading (RfB) via intermediate plate



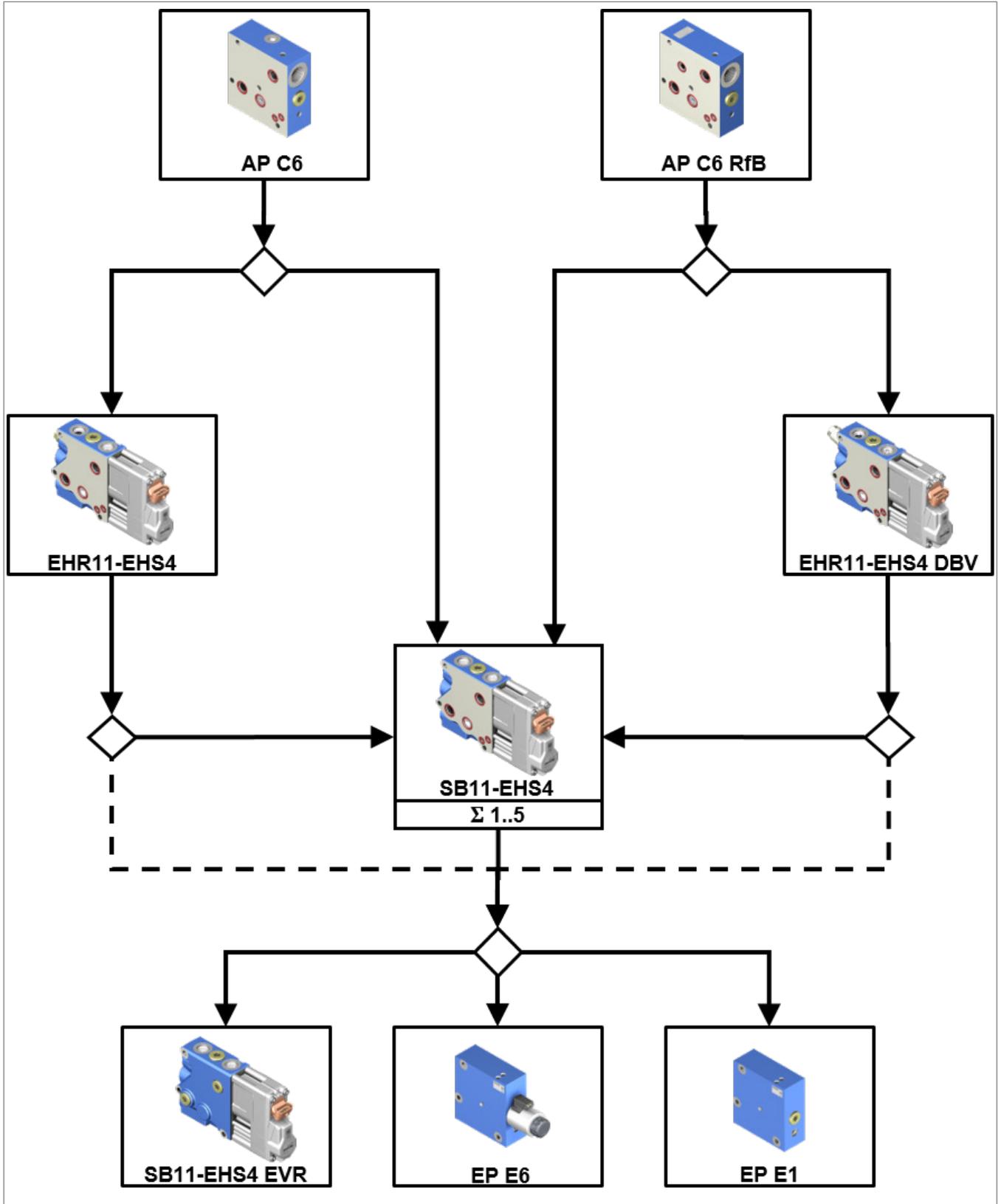
SB11 EHS4 control block for variable displacement pump



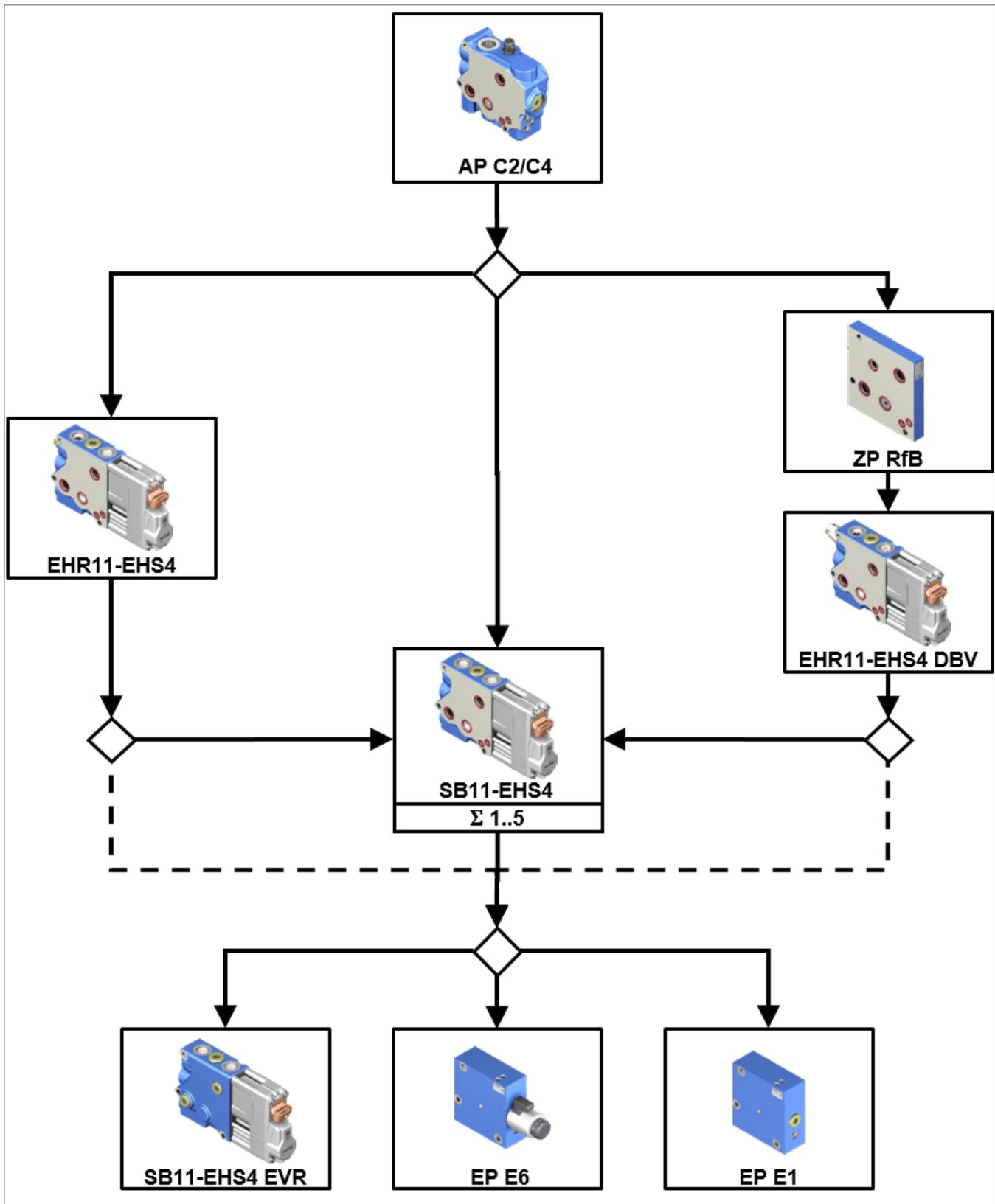
For detailed of the individual control block segments, refer to chapter 5.5 "Combination options" on page 33.

5.5 Combination options

5.5.1 Control block for variable pump



5.5.2 Control block for fixed pump



6 Transport and storage

- ▶ Always observe the required ambient conditions for transport and storage; see chapter 6.2 "Storage of control block/control block segment" on page 36.



Deviations lead to early aging of components and shortening of service life. Information on unpacking can be found in chapter 7.1 "Unpacking" on page 38.

6.1 Transporting the control block/control block segment

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

- Transport by hand
- Transport with lifting device (lifting strap)

The dimensions and weights vary by equipment. The values applicable for the control block/control block segment 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/control block segments can be transported by hand for a short distance. Observe the national regulations in your country.

CAUTION! Risk of injury due to heavy loads!

When carrying control blocks/control block segments, there is a risk of injury.

- ▶ Only transport the control block/one control block segment by hand 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).

- ▶ During transport, do not lift the control block/control block segment at sensitive attachments (e.g. EHS actuating unit, sensors, solenoid coils).
- ▶ Carefully place the control block/control block segment on the surface to prevent any damage.

6.1.2 Transport with lifting devices

For transport, the control block/control block segment can be attached to the lifting device by means of a lifting strap.

- ▶ Make sure that the lifting device is sufficiently dimensioned for transport of the control block/control block segment.
- ▶ Place the lifting strap around the control block/control block segment in such a way that it does not pass over assembled parts (e.g. valves) and that the control block/control block segment is not suspended at attachments.

6.2 Storage of control block/control block segment

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 and/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/control block segments and store them protected against collisions.
 - Do not store the control block/control block segment on sensitive attachments, e.g. actuation elements, sensors, solenoids, or valves.
 - Do not remove protective covers and protective plugs.
- Check the control block/control block segment monthly to ensure proper storage.



The maximum permissible storage time is two years.

After delivery

Delayed commissioning, long freight and storage times or a prolonged shutdown of Rexroth control blocks/control block segments leads to corrosion. 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/control block segment for damage and corrosion prior to installation.
2. Perform a test run to check the control block/control block segment for proper function and leak-tightness.
3. External seals of control blocks/control block segments 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/control block segment inspected by the responsible Bosch Rexroth service partner.

In case of any questions regarding repair and spare parts, please contact the responsible Bosch Rexroth service partner or the service department of the control block/control block segment manufacturer's plant, see chapter 10.4 "Spare parts" on page 52.

After removal

If a control block/control block segment is to be stored after disassembly, preservation for corrosion protection has to be ensured for the full time of storage.



The following instructions only refer to control blocks/control block segments which are operated with a mineral oil-based hydraulic fluid. Other hydraulic fluids require other specific preservation measures. In this case, please contact Bosch Rexroth. For the address, see chapter 10.4 "Spare parts" on page 52.

Bosch Rexroth recommends the following procedure:

- 1.** Clean the control block/control block segment.
- 2.** Plug all ports.
- 3.** Apply mineral oil on the unpainted flange surfaces and external seals of the control block/control block segment.
- 4.** Protect sensitive attachments (e.g. actuation elements, sensors, solenoids or valves) with appropriate measures.
- 5.** When packaging the control block/control block segment, apply appropriate measures for corrosion protection.
- 6.** During storage, protect the control block/control block segment against shocks. For further conditions, refer to section "Requirements" on page 36 in this chapter.
- 7.** If necessary, return the control block/control block segment for repair to Bosch Rexroth.

7 Installation

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

- Offer drawing (installation drawing) of the control block/control block segment (can be obtained from your contact at Bosch Rexroth)
- Hydraulic circuit diagram of the control block/control block segment (can be found in the offer drawing)
- Hydraulic circuit diagram of the machine (available from the machine/system manufacturer)
- Data sheet of the control block/control block segment (contains 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.

1. Remove any packaging from the product.
2. Check the control block/control block segment for transport damage and completeness, see chapter 4 "Scope of delivery" on page 17.
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 Assembly of control block segments to form a control block



Assembly of directional valve sections and plates to form a control block is described in the related documentation 66170-10-R.

7.3 Painting the control block/control block segment

For painting of the control block/control block segment before assembly, proceed as follows:

- ▶ Apply protective plastic plugs at the hydraulic ports for protection against ingress of paints.
- ▶ Screws have to be inserted into the fastening threads to prevent ingress of paint.
- ▶ Protect flange surfaces of control blocks/control block segments against paint.
- ▶ Prevent any paint being applied to the contacts of the electrical connections and make sure that the connectors are not damaged.
- ▶ Prevent fluids from entering the connector of the actuating unit. The connector only meets the type of protection in the plugged and locked state.
- ▶ When removing the protective plastic plugs after painting, make sure that no paint chips enter the control block/control block segment.
- ▶ Protect name plates against application of paint using a film that can be peeled off after painting.

7.4 Installation conditions

The procedures during installation and commissioning are mainly determined by the installation position (e.g. for air bleeding at the control block/control block segment).

- ▶ Secure the control block/control block segment in such a way that safe transmission of the forces and torques to be expected is guaranteed.
The machine/system manufacturer is responsible for dimensioning of fastening elements and threaded connections.
- ▶ Make sure that air bleeding is carried out at the control block/control block segment before commissioning and operation and that it is filled with hydraulic fluid. The hydraulic fluid in the control block/control block segment must not be discharged during the standstill period.

7.5 Installation position

Select the installation position in compliance with the specifications in the respective data sheet.

7.6 Assembly of the control block/control block segment

7.6.1 Preparation

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



If the material number of the control block/control block segment does not correspond to the one in the order confirmation, contact the Bosch Rexroth service for clarification, see chapter 10.4 "Spare parts" on page 52.

7.6.2 Fastening of the control block/control block segment

- The control block/control block segment is equipped with the mounting holes or threads illustrated 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 control block is attached to the port and end plate in the machine.
When an end valve is used, the control block is secured in the machine by an additional mounting angle.
- The number of mounting points depends on the number of directional valves and the vibration load in the machine to be expected.
- Use cylindrical metric screws (M)
 - Maximum surface roughness RZ max. 63.
- Evenness of the surface 0.1 mm.

- Installation**
1. Observe the requirements for the contact surface in the offer drawing.
 2. Always fasten the control block/control block segment at all intended mounting points.
 3. Tighten the mounting bolts clockwise using a torque wrench in accordance with Table 13.

Table 13: Tightening torques

Screw	Tightening torque	Minimum screw-in depth of the thread	Through bore diameter \varnothing
M8 – 8.8	20+4 Nm	15 mm	8.3 mm
M8 – 10.9	30+6 Nm		

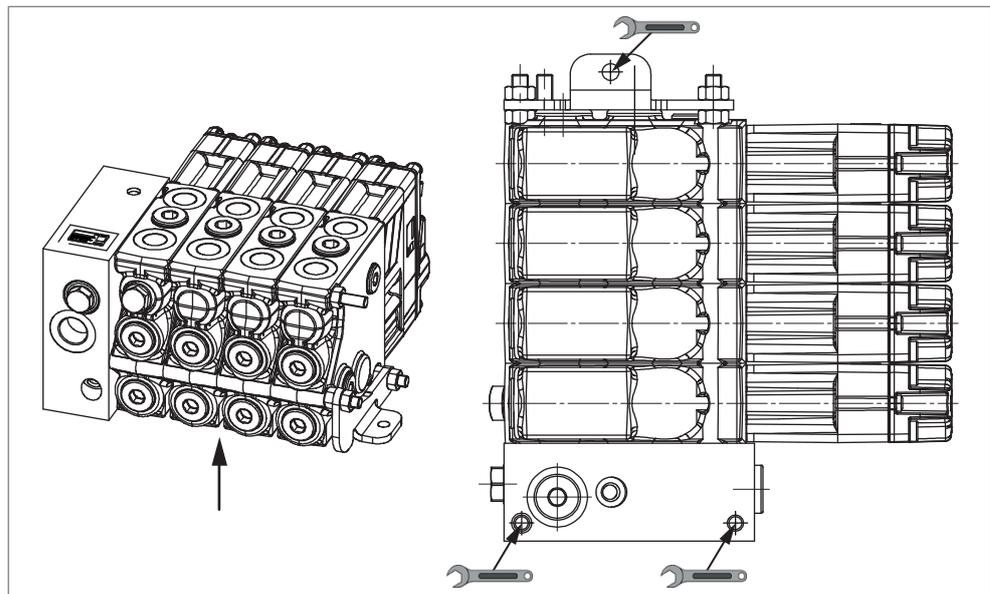


Fig. 3: Control block mounting, example with AP and EVR with mounting bracket

7.6.3 Completion of installation

- Remove the transport protection.
If necessary, the control block/control block segment may be delivered with protective covers and protective plugs. They are not pressure-resistant and have to be removed prior to connection.

7.6.4 Mechanical connection of the control block/control block segment

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!

7.6.5 Hydraulic connection of the control block/control block segment**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 ports and have not been mixed up under any circumstances.
- ▶ After connection is completed, make sure that the cable connectors are correctly assigned to the respective solenoid.

NOTICE**Damage due to improper installation!**

When installing hydraulic lines and hoses under mechanical stress, they are exposed to additional mechanical forces during operation which reduce the service life of the control block/control block segment and the entire machine.

- ▶ Assemble hydraulic lines and hoses without mechanical stress.

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

The ports and fastening threads are designed for the maximum pressure specified in the data sheet. The machine/system manufacturer is required to 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 suitable for the port of the control block/control block segment (pressure level, size, system of units).

Information 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/control block segment and possibly of the entire machine.
- Only use original Rexroth seals.
- When routing the lines, always ensure that the control block/control block segment is filled with hydraulic fluid and not discharged even during long standstill periods.

Port overview

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

Fitting for hydraulic connections

- Fittings with seal:
 - O-ring ISO 6149-1
 - Flat sealing DIN 3852-1 or DIN 3852-2
- Lightly grease the fitting and tighten clockwise.

- Procedure** To connect the control block/control block segment to the hydraulic system:
1. Remove the protective plugs and/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!).

7.6.6 Customer-specific coupling connection

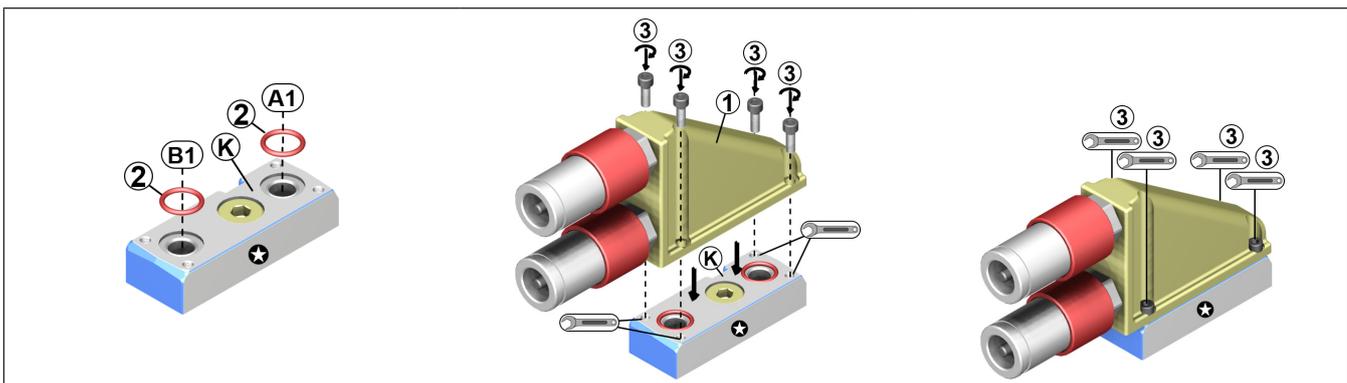
Item	Designation	Use	Information	Number
★	Directional valve			
①	Coupling housing			
②	O-ring	Port A and B	24.5 × 2.15	2
③	Socket-head screw		M6	4



The coupling connections are customer-specific and deviate from the illustration.

Installation of customer-specific coupling flange:

1. Insert the O-rings ② into directional valve ports (A1) and (B1).
2. Align coupling housing ① with flange surface to the directional valve ★.
3. Align coupling housing ① and the mounting holes with the coupling fastening threads (K) in directional valve ★.
4. Tighten the coupling housing ① with the four socket-head screws ③ at the coupling port (K) of directional valve ★.
5. Tighten socket-head screws ③. Tightening torque $M_A = 11+1 \text{ Nm}$.



7.6.7 Tightening torques for hydraulic ports

Observe the specifications in the standards or the manufacturer's specifications for the threaded plugs, stud end, fittings, and threaded plugs at hydraulic ports. Also note that the tightening torques may also depend on the permissible pressure and temperature range and the application conditions.

Table 14: Recommended tightening torques for stud ends

Metric thread size	Tightening torque
M12 × 1.5	25+3 Nm
M14 × 1.5	45+5 Nm
M16 × 1.5	55+6 Nm
M18 × 1.5	70+7 Nm
M22 × 1.5	125+13 Nm
M27 × 2	180+20 Nm
M33 × 2	310+30 Nm
M42 × 2	450+45 Nm

Table 15: Recommended tightening torques for threaded plugs

Metric thread size	Tightening torque
M10 × 1	11+3.7 Nm
M12 × 1.5	16+5.3 Nm
M14 × 1.5	23.5+8 Nm
M16 × 1.5	29+10 Nm
M18 × 1.5	38+13 Nm
M20 × 1.5	46+15 Nm
M22 × 1.5	67+22 Nm
M24 × 1.5	86+29 Nm
M26 × 1.5	103+34 Nm
M27 × 2	103+34 Nm
M30 × 2	170+57 Nm
M33 × 2	200+67 Nm
M36 × 2	245+82 Nm
M38 × 2	245+82 Nm
M39 × 2	310+103 Nm
M42 × 2	380+127 Nm

7.6.8 Electric connection of the control block/control block segment

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/system manufacturer is responsible for electric control layout.

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

For control blocks/control block segments with electrical control and/or mounted sensors, please comply with the details 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/control block segment to the machine electronics, proceed as follows:

1. De-energize the plug-in connections at the control block/control block segment.
2. Before establishing the connection, check the connector and all seals for damage.
3. Establish the electrical connection of the control block/control block segment.

8 Commissioning

CAUTION

Commissioning an incorrectly installed product!

Mixing up the ports or cable connectors will cause unexpected functions and/or irreparable damage to the control block/control block segment and can cause a risk for personnel and equipment!

- ▶ Make sure that all the electrical connections and hydraulic ports are connected or plugged correctly.
- ▶ Make sure that the cable connectors are correctly assigned to the respective electrical components.

Risk of injury due to jammed spool!

The temperature difference between the control block/control block segment and the hydraulic fluid must not exceed 20 °C. Otherwise, there is a risk of a jammed spool.

- ▶ Avoid temperature shocks.
- ▶ Adjust the temperatures as necessary.

NOTICE

Risk of damage due to entrapped air!

Air bubbles in the housing can considerably compromise the damping function of the directional valve components required for stable function. This means that vibration may occur at moving components (e.g. control spools or pressure compensators) causing heavy impacts at the mechanical limit stops due to high vibration amplitudes.

In this respect, damage or even destruction of components is to be expected.

- ▶ Before commissioning, it must be ensured that any air entrapped in the control block/control block segment is completely removed. This may be realized by application of a low hydraulic fluid flow of $q \leq 20$ l/min in all spool positions.
- ▶ Always observe the parameters for the air bleed in the instruction manual of the machine.

8.1 Before initial commissioning

- ▶ Make sure that the tie rod screws of the control block are tightened with the required tightening torque.
- ▶ The control block/control block segments must be installed in the vehicle in compliance with the vehicle specifications. Make sure that the mounting bolts are tightened with the required tightening torque.
- ▶ Any electrical connections at the control block/control block segment must be established according to the electrical circuit diagram of the vehicle.
- ▶ The hydraulic connection fittings must be tightened with the specified tightening torque.
- ▶ The control block/control block segments must be filled with hydraulic fluid to the maximum level.

- ▶ Supply and control connections must be established according to the fluid plan of the vehicle.
- ▶ Only use hydraulic fluid in compliance with the data sheet:
 - Permissible hydraulic fluid
 - Hydraulic fluid temperature range
 - Viscosity range
 - Maximum admissible degree of contamination of hydraulic fluid



The control block/control block segments must be within a temperature range of 20 to 80 °C.

The temperature of the hydraulic fluid must be in a temperature range of 20 to 80 °C. The temperature difference between the control block/control block segment and the hydraulic fluid must not exceed 20 °C.

8.2 Initial commissioning

For initial commissioning of the control block/control block segment, proceed as follows:

1. Reduce the first flow to a minimum to prevent a pressure surge.
2. Slowly increase the flow.
3. Maintain a flow of $q_{\text{Pump}} \leq 20$ l/min to the control block/control block segment.
4. Apply air bleeding at the control block/control block segment, see chapter 8.3 on page 47.
 - Bosch Rexroth recommends separate air bleeding at the individual directional valves.
 - Also observe the parameters for air bleeding in the instruction manual of the machine.
5. Perform a leak test.

Make sure that there is no hydraulic fluid leakage at the control block/control block segment and at the ports during operation. In case of hydraulic fluid leakage, refer to Table 17 "Malfunction table" on page 57.
6. Perform a functional test.

The functional test must be carried out according to machine/system manufacturer specifications.
7. Check the pressure setting
Check the maximum pressure at the pressure relief valve of the connecting plate and at the EHR control valve. For malfunctions, see chapter 14 "Troubleshooting" on page 56.

8.3 Air bleeding

8.3.1 Air bleeding at control block/control block segment

NOTICE! Short circuits may only be established at working ports at the same directional valve. Rinsing of the hydraulic lines in the housing is only possible by establishing short circuits.

- ▶ Start air bleeding with the directional valve with the maximum distance to port **P**.
 - Control valves SB with EHS see chapter 8.3.2
 - Hitch control valves EHR with EHS see chapter 8.3.3

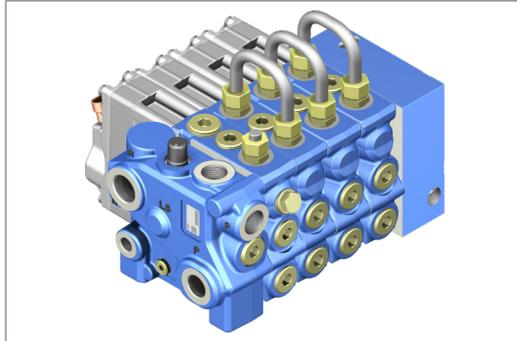


Fig. 4: Control block examples with threaded port and hydraulic line

8.3.2 Bleeding SB control valves with EHS

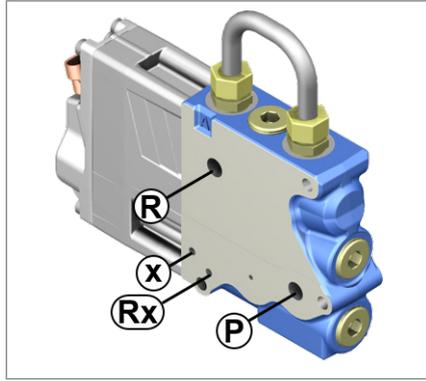


The hydraulic fluid flow via ports **P** and **R** must be applied. The two consumer ports **A1** and **B1** must be connected, e.g. by means of a hydraulic line.

NOTICE! Air inside the actuating unit can lead to vibrations at the control spool in control position and an actuating time exceeding the programmed diagnosis limit. The effect this exceeded time depends on the vehicle.

NOTICE! In the installation positions permissible with restrictions, increased air bleeding expenditure is to be expected. In order to completely bleed the control spaces, step 3 of the air bleeding procedure must be repeated several times.

1. Move the control spool from the **0** or neutral position into the fine control range and establish a small flow ($q < 20$ l/min) through the directional valve for at least 20 seconds. This process must be carried out for the spool positions **1** and **2**.
2. Repeat this process several times. Only when it is ensured that no more air is present in the directional valve housing may the control valve be switched with the maximum permissible flow.
3. Switch the control valve at least 20 times with a frequency of 2 Hz between 100% lifting (spool position **1**) and float (spool position **F**). Control valves without release position are switched between 100% lifting (spool position **1**) and 100% lowering (spool position **2**).



8.3.3 Bleeding EHR hitch control valves with EHS

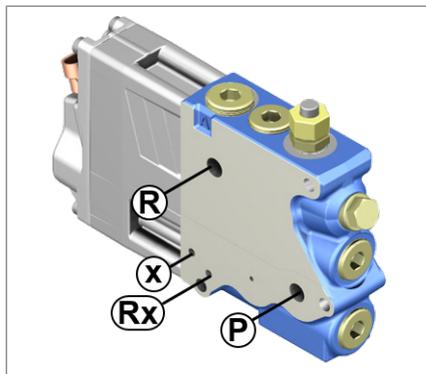


The hydraulic fluid flow via ports **P** and **R** must be applied. Hitch control valves with EHS are bled with connected cylinder.

NOTICE! Air inside the actuating unit can lead to vibrations at the control spool in control position and an actuating time exceeding the programmed diagnosis limit. The effect this exceeded time depends on the vehicle.

NOTICE! In the installation positions permissible with restrictions, increased air bleeding expenditure is to be expected. In order to completely bleed the control spaces, step 3 of the air bleeding procedure must be repeated several times.

1. Move the control spool from the **0** or neutral position into the fine control range and lift the hitch completely with a small flow ($q < 20$ l/min). Then lower the hitch completely.
2. Repeat this process several times. Only when it is ensured that there is no more air in the directional valve housing may the hitch control valve be switched with the maximum permissible flow.
3. Switch the hitch control valve at least 20 times with a frequency of 2 Hz between 100% lifting (spool position **1**) and d 100% lowering (spool position **2**).



8.4 Recommissioning after standstill

Recommissioning is necessary if the control block/control block segments

- have been decommissioned for more than 12 months
 - have been disassembled
 - have been repaired
 - hydraulic fluid has been drained and/or changed.
- For recommissioning, proceed as described in chapter 8.2 "Initial commissioning" on page 46.

9 Operation

Use the product only within the performance range specified in the technical data. The machine/system manufacturer is responsible for proper project planning of the hydraulic system and its control.

9.1 Software description

Communication and diagnosis with the electro-hydraulic actuating unit can be realized with the EHS tool for reading and writing of parameters via the RS232 interface or via the CAN interface by means of conventional tools like VECTOR CANoe.



The features of the EHS software like parameterizability, diagnosis functions and monitoring limits are available on request from the manual “Safety-relevant project planning notes” RE 66157-01-B as well as from the “Technical customer information” RE 66157-02-B.

10 Maintenance and repair

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/control block segment!

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

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

- ▶ Check whether all the seals and fittings on the plug-in connections are securely connected to ensure that no moisture can penetrate into the control block/control block segment during cleaning.
- ▶ Use only water and, if necessary, a mild cleaning agent to clean the control block/control block segment. 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 and maintenance

During inspection and maintenance, the following points have to be checked:

- Compliance with operating conditions
- Compliance of requirements for hydraulic fluids according to technical data sheet
- Manifold mounting, ports and leak-tightness

The interval depends on the machine and its application condition.

10.3 Repair

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

Repairs at the control block/control block segment may only be performed by service centers certified by Bosch Rexroth or the machine/system manufacturer.

In case of any questions regarding repair, please contact the responsible Bosch Rexroth service partner or the service department of the control block/control block segment manufacturer's plant, see chapter 10.4 "Spare parts" on page 52.

For detailed instructions on installation, assembly and removal of block segments and repair, please refer to the following documentations:

Table 16: Related documentation

Valve type	Document number	
	Assembly	Repairing the valve
SB11-EHS4, EHR11-EHS4	66177-10-R	66177-20-R
Plates		66177-50-R*

*in preparation

10.4 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!

- ▶ Only use original spare parts from Rexroth to repair the Rexroth control block/control block segment. Otherwise, the functional reliability of the control block/control block segment cannot be guaranteed and the warranty will be voided.

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/control block segment 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 control block/control block segment manufacturer.

Bosch Rexroth AG
Robert-Bosch-Straße 2
71701 Schwieberdingen, Germany
Service phone +49 (0) 9352 40 50 60
Aftermarket@boschrexroth.de
www.boschrexroth.com/spc

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 operation as described in the instruction manual for the machine.
 - Relieve pressure in the hydraulic system according to the instructions of the machine/system manufacturer.
 - Make sure the relevant system components are depressurized and de-energized.
2. Secure the overall system according to the parameters provided by the manufacturer.

11.3 Removal of control block/control block segment from machine

For disassembly of the control block/control block segment, proceed as follows:

1. Remove the control block/control block segment in accordance with the specifications of the machine/system manufacturer.
2. Place the product on a clean surface with sufficient load-bearing capacity.
3. Plug all openings.

11.4 Preparing the components for storage or further use

- ▶ Proceed as described in chapter 6.2 "Storage of control block/control block segment", section "After removal" on page 37.

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/control block segment, the hydraulic fluid and the packaging material may lead to environmental pollution!

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

1. Drain the control block/control block segment completely.
2. Dispose of the control block/control block segment 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/control block segment into its individual parts and recycle them.
5. For example, separate the parts into:
 - Metals
 - Electronic waste
 - Plastic

13 Extension and conversion

For specific applications, retrofittingIn conversion of the control block/control block segment can be required. The EHS electrohydraulic actuating unit is excluded from this and must not be opened or converted. The warranty exclusively applies to the delivered configuration. After a conversion or an extension, the warranty becomes void.

- ▶ Please contact Bosch Rexroth for coordination.



Possible retrofitting or conversion of the control block/control block segment is described in the specific data sheet.

Before retrofitting or upgrading, it has to be ensured that the modification does not cause any impairment or malfunction.

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 on the Internet at

<https://addresses.boschrexroth.com>.

14 Troubleshooting

Table 17 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

- ▶ Work systematically and in a targeted manner, even when pressed for time. Random, indiscriminate removal and changing of settings could make it impossible to determine the original cause of the fault.
- ▶ First, get a general overview of how the control block/control block segment works in conjunction with the entire system.
- ▶ Find out whether or not the control block/control block segment was working as required in the entire system before the fault occurred.
- ▶ Try to determine any changes to the entire system in which the control block/control block segment 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?
- ▶ 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 10.4 "Spare parts".

14.2 Malfunction table

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

Table 17: Malfunction table

Fault number	Origin and/or location of the fault	Remedy
Fault		
F1 Hydraulic fluid leaks from the control block segment	Damaged sealing element	Replace sealing element
	Control block segment housing damaged	Replace the control block segment
F2 Hydraulic fluid is leaking at the supply line and/or port to the control block segment	Sealing element damaged	Replace sealing element
	Pipe or hose lines damaged	Replace pipe or hose lines
	Loose pipe or hose lines	Tighten the fittings
	Control block segment housing damaged	Replace the control block segment
F3 Hydraulic fluid is leaking between the control block segments	Dirt or foreign particles	Clean the flange surface
	Sealing element damaged	Replace sealing element
	Loose tie rod screws	Check the tightening torques
	Damaged flange surface	Replace the control block segment
F4 Fluctuations in pressure and flow	Pressure oscillations in the system	Ventilate the control block segments
		Ventilate the hydraulic system
	Dirt or foreign particles in the control block segment	Clean the inside of the control block segments
		Ensure prescribed cleanliness of hydraulic fluids
F5 Excessive temperature at the control block segment	Excessive ambient temperature	System-related/remedy by external measure
	Hydraulic fluid temperature too high	Lower hydraulic fluid temperature
	Excessive flow	Reduce flow
F10 No function	Control block segments connected incorrectly	Correct hydraulic ports
	Electric components connected incorrectly	Correct electrical connections
	No hydraulic fluid	Ensure hydraulic fluid supply
	Dirt or foreign particles in the control block segment	Clean the inside of the control block segments
		Ensure prescribed cleanliness of hydraulic fluids

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, replacement 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/control block segments can be found in the corresponding data sheet. For the assignment of the control blocks/control block segments to the data sheets, refer to Table 1 "Required and supplementary documentation" on page 5.



The data sheets can be found in the online product catalog under www.boschrexroth.com/p-SB11

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

16 Alphabetical index

A		P	
Abbreviations.....	8	Performance description.....	18
Accessories.....	55	Personnel qualifications.....	10
Air bleeding.....	47	Product description	19
Assembly	38		
Completion	40	R	
Preparation	39	Recommissioning	
		After standstill	49
C		Removal.....	53
Combination options	33	Performing	53
Commissioning.....	45	Preparation	53
Initial	46	Repair.....	51
Connection		Required documentation	5
electric.....	44		
hydraulic	41	S	
Mechanical.....	40	Safety instructions.....	9
Conversion	55	General	10
		Product-specific	11
D		Signal word.....	6
Designations.....	7	Scope of delivery	17
Disposal	54	Spare parts.....	52
		Storage.....	36
F		Storage time.....	36
Functional test.....	46	Symbols	7
H		T	
Hydraulic fluid	46	Technical data.....	58
Disposal.....	54	Tools.....	53
		Transport.....	35
I		By hand.....	35
Identification	18	with lifting devices.....	35
Inspection	51	Troubleshooting.....	56
Installation conditions.....	39	Malfunction table	57
Installation position.....	39		
Intended use	9	U	
		Unpacking.....	38
L			
Lifting devices	35	W	
		Warranty.....	16, 36
M		Weight	35
Maintenance	51		
Malfunction table	57		
O			
Operation	50		

Bosch Rexroth AG

Robert-Bosch-Straße 2
71701 Schwieberdingen
Germany
Phone: +49 711 811-8481
info.ma@boschrexroth.de
www.boschrexroth.com

Your local contact person can be found at:

<https://addresses.boschrexroth.com>