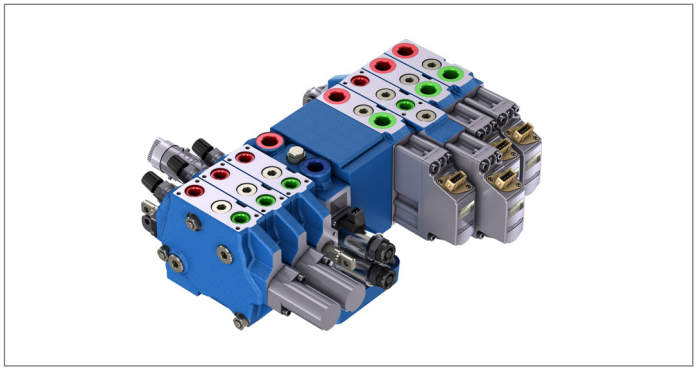
RE 66170/2021-07-08
Replaces: 12.2018

rexroth
A Bosch Company

Load-sensing control block in sandwich plate design SB24/34



- Directional valves
  - SB24-M
  - SB24-EHS, SB34-EHS
- Hitch control valves
  - EHR24-EM2
  - EHR24-EHS
- Maximum working pressure 250 bar
- Flow 80 to 170 l/min

Features

- Load-sensing system
- Flow control independent on load pressure
- Flexible block configurations on the basis of uniform hydraulic valve interfaces
- Type of actuation: directional valves
  - Mechanical
  - Electrohydraulic with on-board electronics (EHS)
- Type of actuation: hitch control valves
  - Electromagnetically proportional
  - Electrohydraulic with on-board electronics (EHS)
- Connecting and end plate for open-center and closed-center systems

Fields of application

- Tractors
- Agricultural machinery

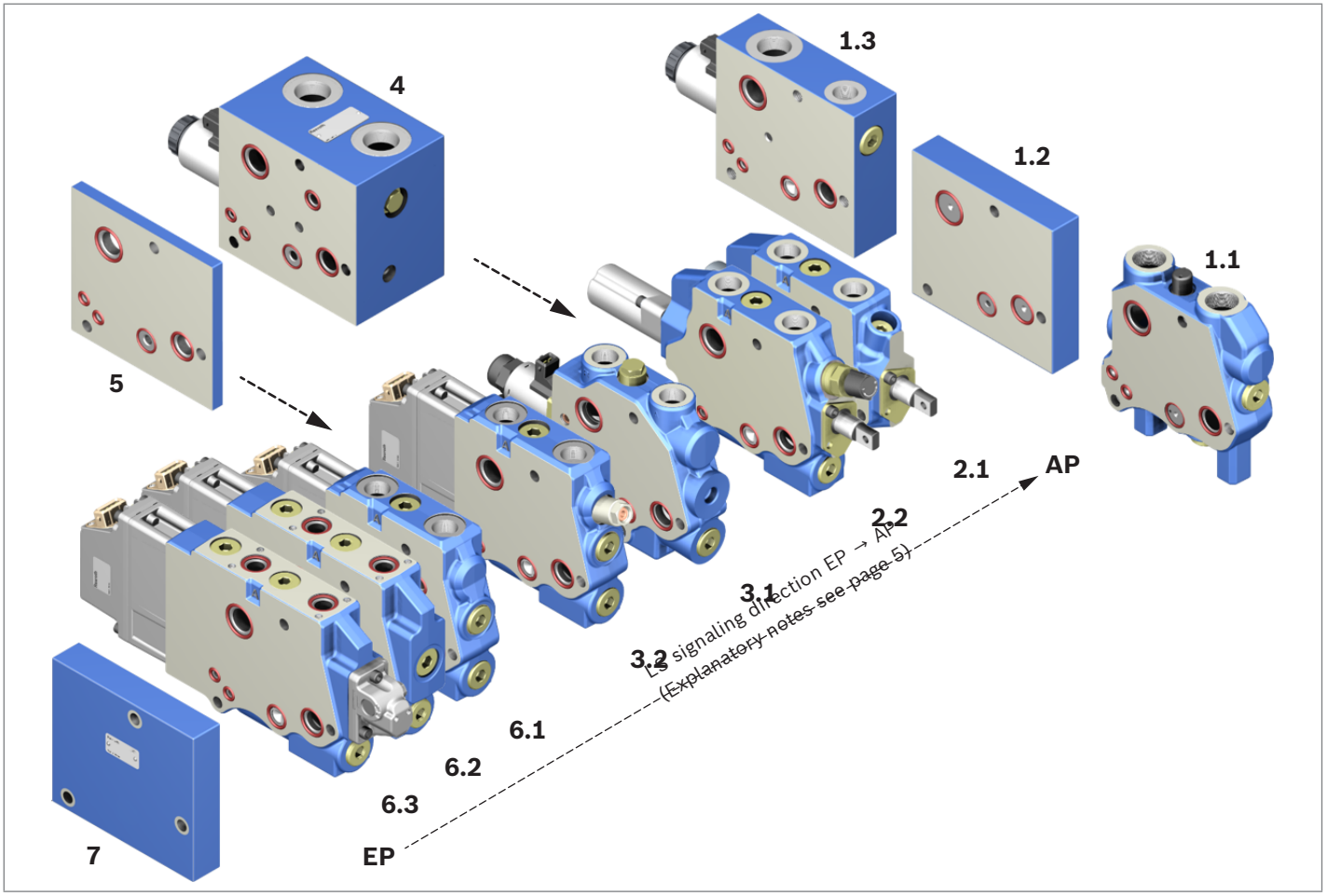
Contents

Modular system

The directional valves and plates of the SBx4 product family form a modular system and can be used in control blocks with nearly any composition due to the uniform flange figure and the identical width of all valve section variants. The consumer ports **A** and **B** have a uniform position and orientation for all valve variants.

Further information
- For directional valves SB24/34-EHS series 1X, see data sheet 66171
- For directional valves SB24/34-EHS series 2X, see data sheet 66174
- For directional valves SB24-M, see data sheet 66172
- For hitch control valves EHR, see data sheet 66126
- For connecting and end plates, see data sheet 66173

▼ **Modular system SB24/34**



The control block may consist of:
- Connecting plate (**1**)
  - Connecting plate **C2** for fixed pumps (**1.1**)
  - Connecting plate **C3** for blocks with ZAP (**1.2**)
  - Connecting plate **C6** for variable displacement pumps, with integrated pilot oil preparation option (**1.3**)
- Mechanical directional valves SB24-M
  - SB24-M without pressure compensator (without individual load compensation), with check valve option (**B**), Flow: 80, 100, 120 l/min (**2.1**)
  - SB24-M with pressure compensator, check valve option (**B**), flow: 80, 100, 120 l/min (**2.2**)
  - With mechanical or hydraulic detent unit option
  - Spool linkage / detent locking optionally on consumer port side **A** or **B**

- Hitch control valves EHR24
  - EHR24-EM2, electromagnetic (PWM), Flow: 80 l/min, (**3.1**)
  - EHR24-EHS, electrohydraulic (CAN bus), Flow: 120 l/min, optional: single or double acting (**3.2**)
- Central connecting plate (**4**)
- Intermediate plate (**5**), optional, in different widths
- Electrohydraulic directional valves
  - SB24-EHS, check valve (**B**), Flow: 100, 120 l/min (**6.1**)
  - SB34-EHS, check valves (**A**, **B**), Flow: 120, 140, 170 l/min (**6.2**)
  - SB34-EHS, check valves (**A**, **B**), manual auxiliary actuation, flow: 120, 140, 170 l/min (**6.3**)
- End plate (**7**)

Definitions

- Connecting plate (**AP**)
  - With O-rings in the flange surface
  - Usually with port threads (at least $\mathbf{Y}_{out}$ port)
- End plate (**EP**)
  - With O-rings in the flange surface
  - Usually without port threads
- Directional valve sections
  - Standard valve (**SVL**) with flange surfaces on both sides
  - End valve (**EVL**) with flange surface on one side
  - Connection valve (**CVL**) with flange surface on one side incl. O-rings and LS shuttle valve in the flange surface as well as an LS port to the variable displacement pump

An end valve EVL can be used instead of a separate end plate (without hydraulic function).
In the case of blocks with central connecting plate (ZAP), a connection valve can replace a separate connecting plate (without hydraulic function).

Notice
The **P**- and **R** channels of CVL and EVL are plugged with threaded plugs on the unmachined valve side. These ports must not be opened and/or used for the connection of additional functions!

Example configuration of a control block

Mechanically operated directional valves SB24-M can generally be combined with EHS directional valves. Please consult our technical sales department to ensure functionality.

1 Connecting plate with LS port (AP)
2 Directional valve SB24-EHS
- Electrohydraulically operated (CAN)
- Double-acting
- 3-way pressure compensator
- Check valve in **B**

3 Directional valve SB34-EHS
- Electrohydraulically operated (CAN)
- Double-acting, with manual auxiliary actuation
- 2-way pressure compensator, 2-position pressure compensator
- Check valve with T-PRV in **A** and **B**

4 Intermediate plate (ZP)
5 Hitch control valve EHR24-EHS
- Electrohydraulically operated (CAN)
- Single-acting
- 2-way pressure compensator
- Secondary pressure relief valve

6 Central connecting plate (ZAP)
- Pilot oil preparation
- Pilot oil switch-on
- Primary pressure limitation

7 Hitch control valve EHR24-EM2
- Electrically proportionally operated
- Single-acting
- 2-way pressure compensator
- Secondary pressure relief valve
- With pilot oil duct

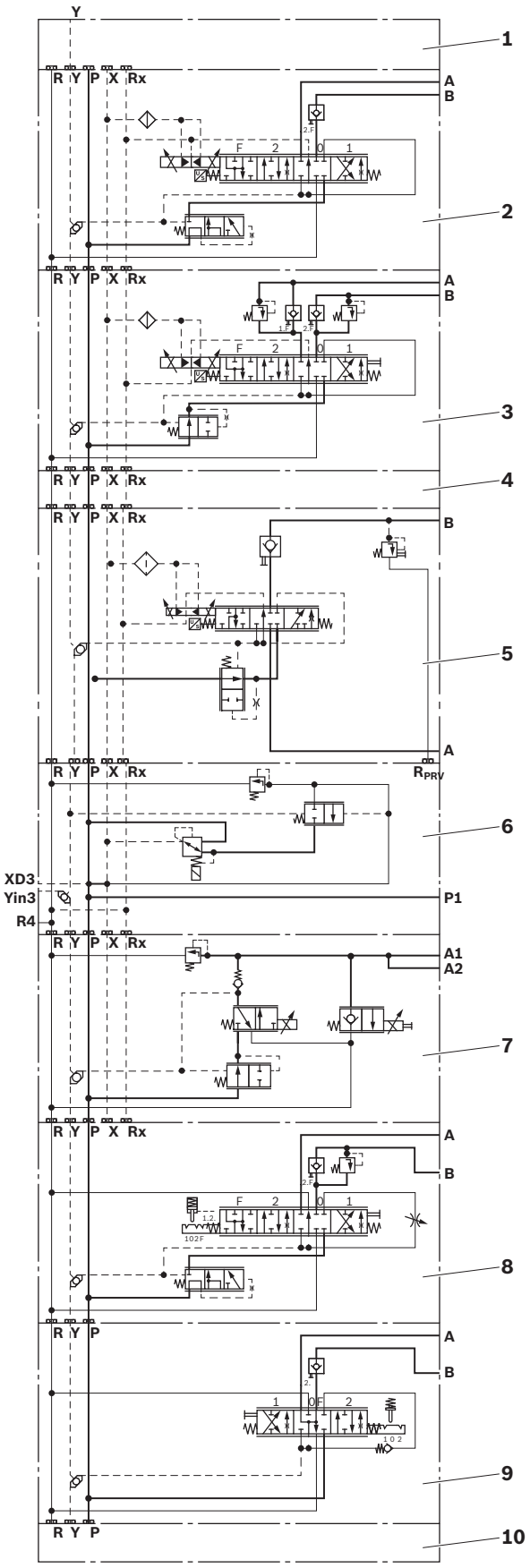
8 Directional valve SB24-M
- 4-position control spool, double-acting
- Control spool operation on **B** side
- 3-way pressure compensator
- With flow adjuster
- Hydraulic detent locking (kick-out)
- Check valve with T-PRV in **B**

9 Directional valve SB24-M
- 3-position control spool for motor applications
- Control spool operation on **A** side
- Without individual pressure compensator
- Mechanical detent locking
- Check valve in **B**

10 End plate (EP)

Notice
EHR24 valves should be installed as close as possible to the LS port.

Ports	
P	Pump port
A, B	Consumer port
X	Pilot oil supply
Rx	Pilot oil return flow
Y	LS signal
R	Return flow reservoir

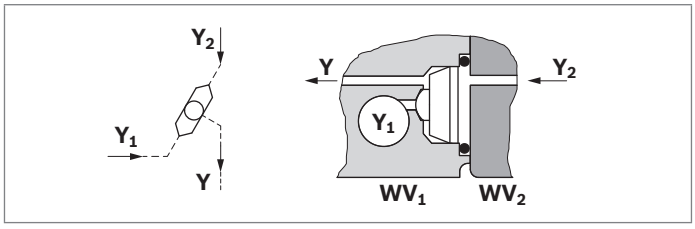


Functional description and interfaces

Load-sensing principle

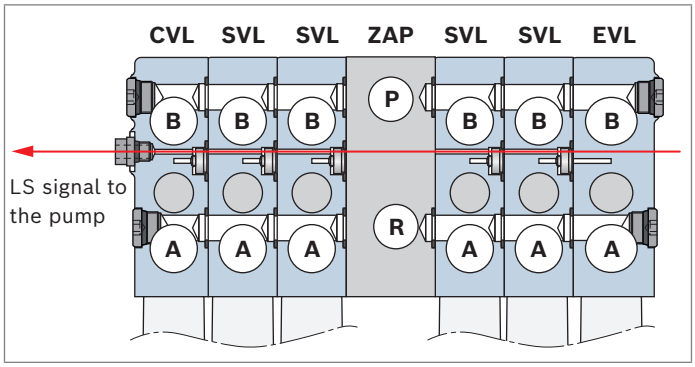
Load-sensing, i.e. the variable load pressure is sensed and forwarded to a pressure compensator and/or a pump controller. To this end, each directional valve notifies its load pressure to the valve that follows via the LS channel. Its shuttle valve compares the two load pressures and signals the higher one in the direction of the connecting plate and/or the connection valve.
In this way, the highest load pressure of all directional valves of the control block is signaled to the variable displacement pump and/or to the inlet pressure compensator in the connecting plate via the LS output of the control block.

▼ **LS signaling direction "left"**



This principle offers the following advantages compared to (conventional) systems with open center control.

▼ **Block configuration SB24 with central connecting plate, connection valve and end valve**



Flow control independent on load

The pressure drop Δp at the variable metering orifice of the directional valve is kept constant. In this way, load fluctuations are compensated, and flow and/or cylinder velocity are kept constant. This is applicable to valves without individual pressure compensator (2- or 3-way), however only for the cylinder with the highest load pressure, which is picked up by shuttle valves.

Energy efficiency

Energy losses are minimized in the fine control range on the basis of the load-sensing principle, since the system is adjusted to the highest LS pressure and not to the primary system pressure.

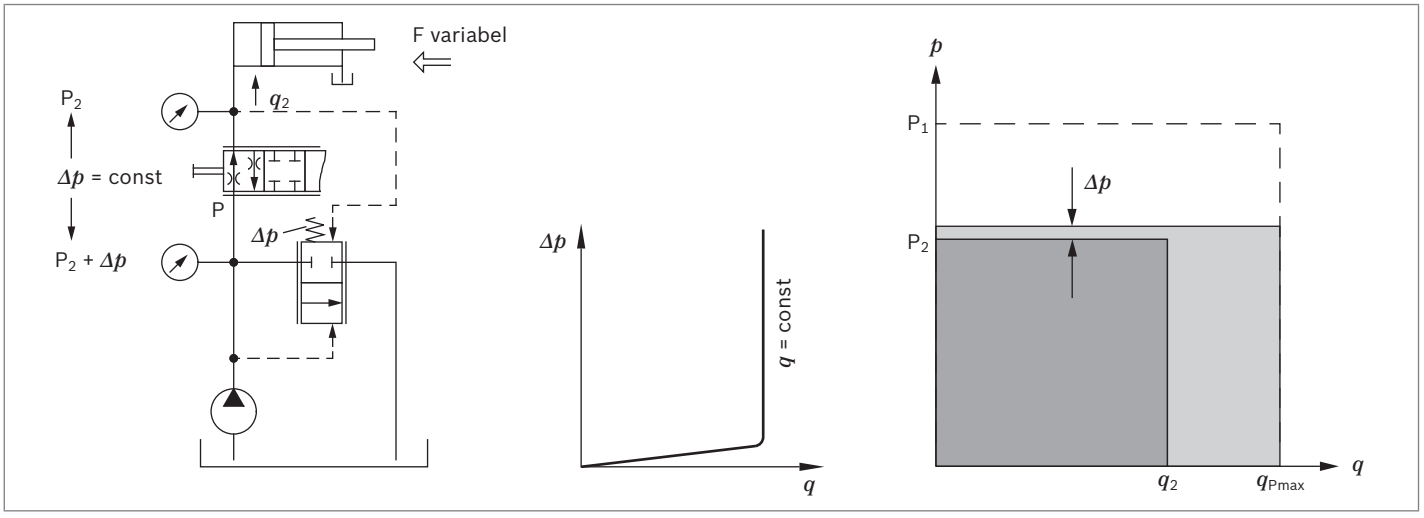
Actuating force on the control spool

Due to the constant pressure drop at the metering orifice, the actuation forces of LS systems are equal throughout the entire spool stroke.

LS system with fixed pump

Excessive flow is not discharged via the maximum pressure valve but via a parallel pressure compensator. It does not only open at p_1, but already at a sensed load pressure of p_2 plus the spring pre-charge pressure which determines the pressure difference Δp at the metering orifice. This assembly corresponds to a 3-way flow control valve and does not only ensure better power balance but also load-independent flow to the consumer.

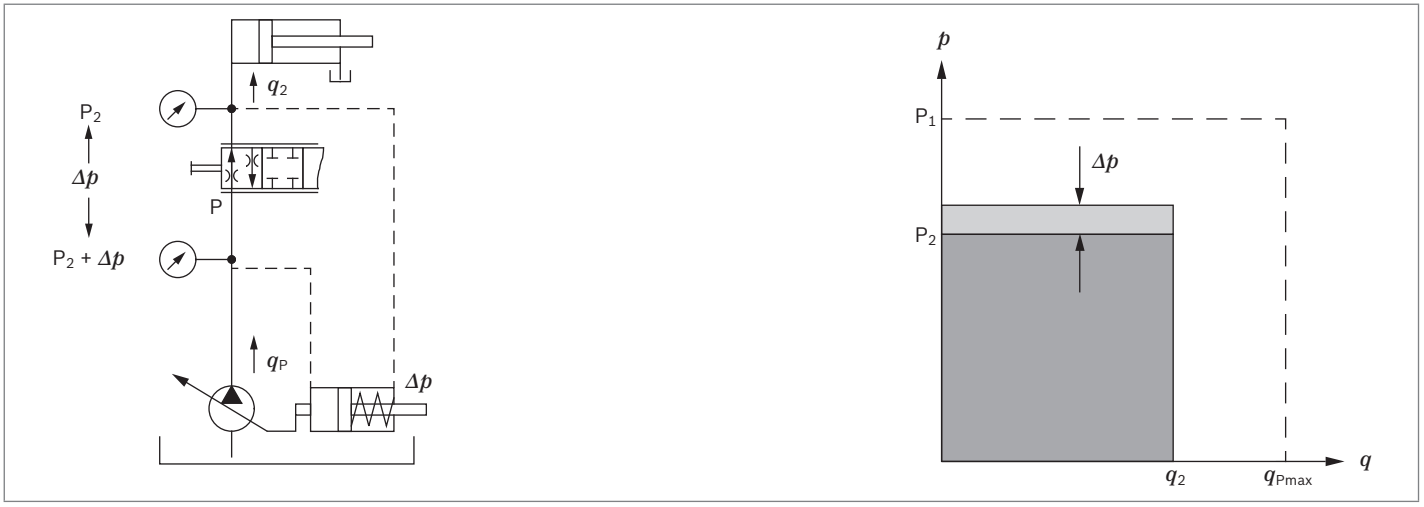
▼ **LS system with fixed pump**



LS system with variable pump

The pump controller controls the flow according to the opening cross-section of the throttle. This adjustment is made for the sensed load pressure, i.e. neither excessive pressure nor excessive flow is generated. Only the pressure difference Δp above the metering orifice, determined by the pump controller, generates some power dissipation. This system requires a variable displacement pump with appropriate controller.

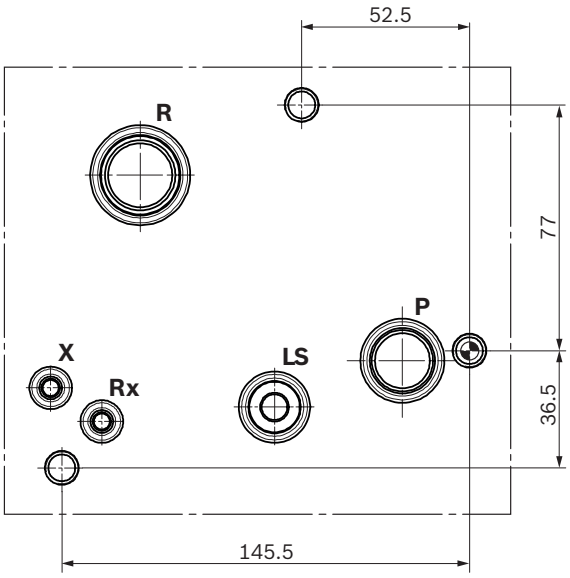
▼ **LS system with variable pump**



Control block installation

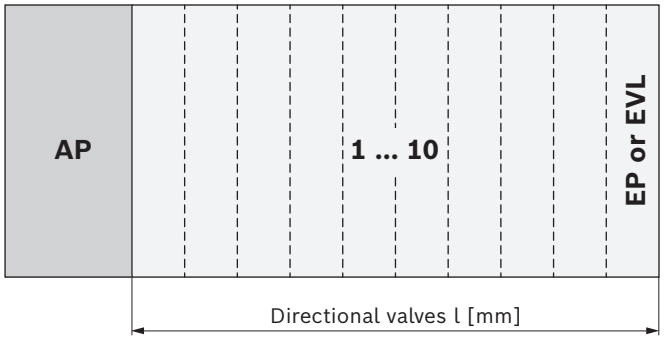
All valve sections and plates of the modular system SB24/34 have a uniform flange surface:

▼ **Flange surface SB24/34**



A SB24/34 control block consists of:

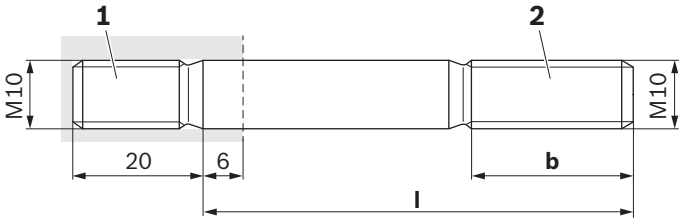
- maximum 6 directional valves (SB and EHR) if the connecting plate is mounted in the machine.
- maximum 10 directional valves (SB and EHR) if the end valve and/or the end plate are also mounted in the machine. To this end, an appropriate mounting hole must be provided.



Notice
For the permissible number of directional valves, additional loading caused by the parts assembled to the block is not taken into account!
Installation in the vehicle must always be tested by the customer, as both the load in the vehicle and the elasticity of the mounting point have a decisive influence on the fastening of the block.

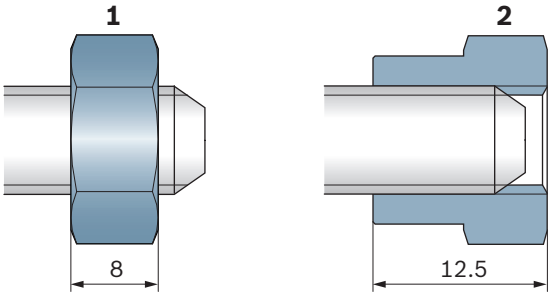
The plates and valve sections of the control block are held together by 3 tie rods (for blocks with ZAP 3 tied rods for each side).

▼ **Stud screw according to DIN 835, M10 × l (length) – 10.9**



The tie rods are directly screwed into the AP/ZAP on one side (**1**) and screwed down with nuts at the block closure. If connection valve or end valve are used, special nuts are used.

▼ **Nuts**



1 Standard nut if block is closed by AP/EP
2 Special nut if block is closed by EVL/CVL

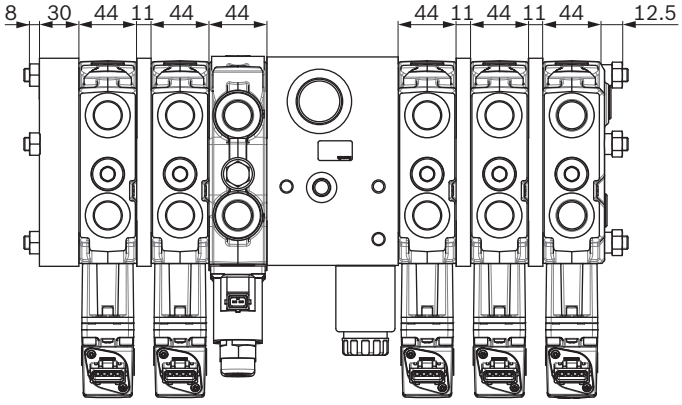
The tightening torque for tie rods and nuts is:
$M_A = 45^{+5}$ Nm

The available tie rod lengths **l** are defined in 5-mm steps. The suited block-specific length is calculated from the total of:

- 6 mm immersion depth of the tie rod into the connecting plate (in addition to the thread length of 20 mm)
- 44 mm width of the valve sections x number of valves
- Optional: Intermediate plate widths
- Optional: 30 mm end plate width
- Nut width 8 mm or 12.5 mm

Rounded up to the next 5 mm step. Please contact our sales department for design issues.

Example



Left block side:

6 mm	Screw-in depth
132 mm	3 valve sections, each 44 mm
11 mm	Intermediate plate
30 mm	End plate
8 mm	Standard nut
Total:	187 mm → DIN 835-M10×190-10.9 = R913060491

Right block side:

6 mm	Screw-in depth
132 mm	3 valve sections, each 44 mm
22 mm	2 intermediate plates, each 11 mm
12.5 mm	Special nut
Total:	172.5 mm → DIN 835-M10×175-10.9 = R913060492

Overview of available lengths, missing lengths on request.

Length l [mm]	Length b [mm]	Material number	Type code
70	26	R913054514	DIN835–M10×70–10.9
110	26	R913054524	DIN835–M10×110–10.9
150	32	R913054526	DIN835–M10×150–10.9
155	32	R913054737	DIN835–M10×155–10.9
175	32	R913060492	DIN835–M10×175–10.9
190	32	R913060491	DIN835–M10×190–10.9
200	32	R913054527	DIN835–M10×200–10.9
240	45	R913054528	DIN835–M10×240–10.9
245	45	R913033259	DIN835–M10×245–10.9
255	45	R913054530	DIN835–M10×255–10.9
290	45	R913004220	DIN835–M10×290–10.9
300	45	R913054534	DIN835–M10×300–10.9
310	45	R913054751	DIN835–M10×310–10.9
315	45	R913054537	DIN835–M10×315–10.9
325	45	R913054538	DIN835–M10×325–10.9
330	45	R913054752	DIN835–M10×330–10.9
335	45	R913054539	DIN835–M10×335–10.9
355	45	R913054540	DIN835–M10×355–10.9
360	45	R913054541	DIN835–M10×360–10.9
370	45	R913054542	DIN835–M10×370–10.9
375	45	R913054543	DIN835–M10×375–10.9
410	45	R913054753	DIN835–M10×410–10.9
415	45	R913054544	DIN835–M10×415–10.9
430	45	R913054545	DIN835–M10×430–10.9
445	45	R913054546	DIN835–M10×445–10.9

Commissioning

Notice
The valve itself does not assume any safety function. It may fail. The machine manufacturer must take safety measures if needed.

Additional operating and commissioning instructions for block and installation and installation in the machine:

- Do not loose or damage O-rings, support rings and shuttle valves.
- Shock loading exceeding the specified values may cause not visible damage and must be avoided in any case.
- The valves must be installed in the machine so that mechanical damage, e.g. caused by stones etc. resulting in housing deformation, jamming, damaged actuation elements, torn off or damaged cables, is avoided.
- Risk in case of pilot pressure drop, e.g. if oil is fed to the system through the inlet faster than it can be discharged via the check valve and the control spool. This may lead to impermissible pressure peaks. Critical operating conditions must be checked for commissioning.
- ESD was tested according to ISO 10605: 2008 tables C1 and C2 per category 1, see "General electrical information".
  Compliance with the standard must also be ensured during installation and painting.
- If the hydraulic motor is operated with a directional valve in release position, the motor can freely rotate. If the hydraulic motor is rotated by an external force and abruptly stopped by switching the directional valve while it is in a locked position, very high pressure peaks may occur due to the moment of inertia of the hydraulic motor. This may lead to damage to the hydraulic system. This may occur, e.g. if the machine or the pilot pressure is switched off. The check valves in the directional valve are closed and the control spool moves in neutral mode.

Abbreviations

This documentation uses the following abbreviations:

Abbreviation	Meaning
AP	Connecting plate
CAN	Controller Area Network
CVL	Connection valve, LS direction left
EHR	Electrohydraulic hitch control
EHS	Pilot operated electrohydraulic actuating unit
EP	End plate
EVL	End valve, LS direction left
IPC	Individual pressure compensator
LS	Load-sensing
SVL	Standard valve, LS direction left
T-PRV	Thermal pressure relief valve
ZAP	Central connecting plate

Spare parts

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Contact partners for accessories and spare parts
Accessories and spare parts are available:

- From the vehicle manufacturer (specialist dealer).
- From the system manufacturer.
- From your Bosch Rexroth specialist dealer.

Rexroth sales partners can be found on the Internet at
www.boschrexroth.com/addresses

If you have questions regarding spare parts, please contact your local Rexroth service or the service department of the control block manufacturer.

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Related documentation

Document type	Title	Document number
Instruction manual	Load-sensing control block SB24/34	66170-B
	Load-sensing directional valves SB24-EHS, SB34-EHS series 1X	66171
	Load-sensing directional valves SB24-EHS, SB34-EHS series 2X	66174
	Load-sensing directional valves SB24-M	66172
	Plates for load-sensing control block SB24/34	66173
	Hitch control valves EHR5, EHR24-EM2, EHR24-EHS	66126
	Mineral oil-based hydraulic fluids	90220
Repair manual	Control block assembly SB24/34	66170-10-R
	Control block assembly SB24/34 with central connecting plate	66170-11-R
	Repairing the directional valves SB24-EHS	66170-20-R
	Repairing the directional valves SB24-M	66170-21-R
	Repairing the directional valves SB34-EHS	66170-22-R
	Repairing the hitch control valves EHR24-EHS	66170-30-R
	Repairing the hitch control valves EHR24-EM2	66170-31-R
	Repairing the plates	66170-50-R

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