Load-sensing directional valves in sandwich plate design
SB24-EHS4, SB34-EHS4

Features
▶ Load-sensing system
▶ Load pressure independent flow control
▶ Type of actuation
  – Electrohydraulic with on-board electronics
▶ Flow
  – Load pressure-compensated
  – High repetition accuracy
  – Low hysteresis

Fields of application
▶ Tractors
▶ Agricultural machinery

Contents
CAN bus in the tractor 2
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Abbreviations 22
Spare parts 22

Series 2X
Maximum working pressure 250 bar
Maximum flow
  – SB24-EHS4 to 120 l/min
  – SB34-EHS4 to 170 l/min
**CAN bus in the tractor**

With the increase in electronics in the field of agricultural tractors, the Controller Area Network (CAN) developed by Bosch has become an established means of data exchange among the individual devices. This serial data bus connects devices with equal rights and coordinates the data exchange in the form of digital CAN messages.

**CAN features of the EHS actuating unit**

- Self-diagnostics and automatic repeat transmission in the event of damaged or incomplete messages
- Linking and thus simultaneous communication possible among several sensors, control units and display units
- Worldwide recognized standard, ISO 11898 and 11519-2 as well as SAE J1939
- Less cabling makes for reduced installation space and lower costs, and reduces risk for damages
- High fault tolerance and high security of the interface
- Diagnostics through output of error codes
- Barrier-free diagnostic access via UDS (Unified Diagnostic Services) according to ISO 14229
- CAN FD tolerant
Functional description

SB24-EHS4 and SB34-EHS4 are pilot-operated, electro-hydraulically actuated directional valves with four spool positions and on-board electronics.

The control spool is controlled via a 4/3 directional pilot control valve which pressurizes the chambers for deflection of the control spool. The control spool position is guided back by means of a position transducer on the control electronics. Using the current of the pilot control valve, the electronics then regulate the position of the control spool as a function of the setpoint value of the spool deflection. In this way, the flow required to operate the connected equipment is set at the consumer ports.

The individual pressure compensator (IPC) controls a constant pressure difference via the intake control edge of the control spool, such that flow control independent of load pressure is achieved over the entire adjusting range (load compensation), even in parallel operation.

The directional valve SB24-EHS4 is equipped with a check valve in consumer port B and directional valve SB34-EHS4 with two virtually leak-free check valves in the consumer ports A and B.

The mechanically actuated isolator valves act as check valves in the inlet. In the SB24-EHS4, the check valve function from the consumer port A is implemented via the third switching position of the 2/3-way IPC. This prevents return of the flow in P in the event of undersupply in parallel operation.

Features

- Double-acting with four switching positions
  (Neutral, Lifting, Lowering, Float)
- Mechanically actuated check valves:
  - SB24-EHS4 in B
  - SB34-EHS4 in A and B
- Check valves opened in Float without load pressure
- SB24: 2/3-way individual pressure compensator in inlet
  SB34: 2/2-way individual pressure compensator in inlet
- Optional flange surface for customer-specific coupling housing
- Optional thermal pressure relief valve integrated in the check valve
Modular system

The electrohydraulic directional valves SB24-EHS4 and SB34-EHS4 are part of the SB24/34 module and can be combined optimally with mechanically actuated valves SB24-M as well as hitch control valves EHR24-EM2 or EHR24-EHS4 for the relevant application to form control blocks. For further information, see data sheet 66170: Control block SB24/SB34.

The valve sections are available in the versions standard valve (SVL) with flange surfaces on both sides as well as end valve (EVL) and connection valve (CVL) each with one flange surface. Unlike the end valve, the connection valve has O-rings and a LS shuttle valve in the flange surface as well as an LS port to the variable displacement pump.

▼ Connection valve (CVL), standard valve (SVL) and end valve (EVL)

An end valve (EVL) can be used instead of a separate end plate (without hydraulic function) (Example 1).

In the case of blocks with central connecting plate (ZAP), a connection valve (CVL) can replace a separate connecting plate (without hydraulic function) (Example 2).

Each valve section 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 valve sections is signaled to the variable displacement pump via the LS output of the control block. The default signaling direction of the LS signals is "left".

▼ Example 1: Block configuration SB24 with connecting plate (AP) and end valve (EVL)

▼ Example 2: Block configuration SB24 with central connecting plate (ZAP), connection valve (CVL) and end valve (EVL)

▼ LS signaling direction "left"

<table>
<thead>
<tr>
<th>Ports</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Pump port</td>
</tr>
<tr>
<td>A, B</td>
<td>Consumer port</td>
</tr>
<tr>
<td>X</td>
<td>Pilot oil supply</td>
</tr>
<tr>
<td>Rx</td>
<td>Pilot oil return</td>
</tr>
<tr>
<td>Y</td>
<td>LS signal</td>
</tr>
<tr>
<td>R</td>
<td>Return flow reservoir</td>
</tr>
</tbody>
</table>

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!
## Technical data

### General

<table>
<thead>
<tr>
<th></th>
<th>SB24-EHS4</th>
<th>SB34-EHS4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>6.3</td>
<td>8.2</td>
</tr>
<tr>
<td>Additional weight (kg) for manual auxiliary actuation</td>
<td>–</td>
<td>0.3</td>
</tr>
</tbody>
</table>

### Installation position

See page 21

### Line connections

See page 20

### Ambient temperature range

<table>
<thead>
<tr>
<th></th>
<th>°C</th>
<th>~35 ... +80</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Hydraulic

<table>
<thead>
<tr>
<th></th>
<th>SB24-EHS4</th>
<th>SB34-EHS4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal pressure at port (P)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum working pressure at port (P)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A, B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R, Rx</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral circulation pressure for opening the IPC from the check function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow at port (P → R)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P → A, B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A, B → R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cracking pressure of thermal pressure relief valve (optional)</td>
<td></td>
<td>311±69</td>
</tr>
<tr>
<td>Pilot oil pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilot oil flow per directional valve (typical)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td>0.25</td>
</tr>
<tr>
<td>Control position Lifting/Lowering</td>
<td></td>
<td>0.6</td>
</tr>
<tr>
<td>Momentary at max. actuating speed</td>
<td></td>
<td>3.5</td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td>Mineral oil (HL, HLP) according to DIN 51524, see data sheet 90220. Other hydraulic fluids on request, e.g. environmentally acceptable fluids per ISO 15380 as specified in data sheet 90221.</td>
<td></td>
</tr>
<tr>
<td>Viscosity range</td>
<td>Max: ν</td>
<td>mm²/s</td>
</tr>
<tr>
<td></td>
<td>Min: ν</td>
<td>mm²/s</td>
</tr>
<tr>
<td>Maximum</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Maximum admissible degree of contamination of hydraulic fluid (per ISO 4406 (c))</td>
<td>Level 20/18/15, we recommend a filter with a minimum retention rate of β10 ≥ 75</td>
<td></td>
</tr>
<tr>
<td>Notice</td>
<td>▶ For applications outside these values, please consult us!</td>
<td></td>
</tr>
<tr>
<td>Notice</td>
<td>▶ The technical data were determined with a viscosity range of ν = 30 mm²/s and a temperature of θ = 50 °C.</td>
<td></td>
</tr>
<tr>
<td>Notice</td>
<td>▶ The stated check valve leakage values refer to a pressure of p = 125 bar.</td>
<td></td>
</tr>
<tr>
<td>Notice</td>
<td>▶ With external pilot oil supply, mixing of the pilot oil circuit with the working oil circuit cannot be avoided due to design reasons.</td>
<td></td>
</tr>
</tbody>
</table>

1) Any operation outside the recommended ranges may affect service life and function.
# Electrohydraulic

## Standard

| CAN control |

## Relative duty cycle (ED)

| 100 % ED to +110 °C \(^1\) |

## Input signal

| CAN, physical layer according to ISO 11898 “High Speed” 125 kBd, 250 kBd (default), 500 kBd, 1000 kBd |

## Supply voltage

| Vehicle electrical system according to ISO 16750-2: Code D |

## Electrical power consumption

| At \( V_{\text{bat}} = 14 \text{ V} \) |

<table>
<thead>
<tr>
<th>Typical</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Neutral position W</td>
<td>1.2</td>
</tr>
<tr>
<td>During max. actuating speed W</td>
<td>–</td>
</tr>
<tr>
<td>In position 1 or 2 W</td>
<td>4.0</td>
</tr>
<tr>
<td>In Float mode W</td>
<td>14</td>
</tr>
</tbody>
</table>

## Voltage range

| Normal voltage supply range V | 10.5 ... 16 |
| Undervoltage mode: Restrictions in function and dynamics V | 9.5 ... 10.5 |
| Very low voltage mode: Only CAN communication is guaranteed V | 6 ... 9.5 |
| No function, \( \mu \text{C} \) is reset, outputs are off V | < 6 |
| Overvoltage resistance (supply voltage) V | 26 (duration 5 min) |
| Reverse polarity protection (test voltage) V | 18 (duration 1 min) |

## Short circuit resistance

| Against 16 V, against ground, and between the individual inputs and outputs, duration 5 min |

## System start-up time

| First login message \( \rightarrow \) ready for communication ms | 500 |

## Actuating time for 100% deflection

| See characteristic curve on page 12 |

## Actuating time/dynamics (measured at 50 °C, 30 mm/s, VG46)

| Step function (incl. dead time) \(^2\) \( 0 \rightarrow 1/2 \) ms | 70 |
| \( 0 \rightarrow F \) ms | 100 |

## Hysteresis relative to flow

| Typically approx. 1 % of \( q_{\text{nom}} \) (in flow range up to 80% of \( q_{\text{nom}} \) |

## EMC measurement of interference

| ISO 11452: 0.5 MHz to 400 MHz BCI |
| Antenna absorber room 200 MHz to 4 GHz |
| Microstrip 150 mm – corresponds to BCI 200 mA |

## EMC emissions

| ISO 14982:1998, chapters 6.5 and 6.6 |

## ESD

| ISO 10605: 2008 |

| Unpowered test |
| Relay discharge: \( \pm 8 \text{ kV} \), air discharge \( \pm 15 \text{ kV} \), \( R_i = 2000 \Omega \), \( C = 150 \text{ pF} \) (table C1, category 1) |

| Powered-up test |
| Relay discharge: \( \pm 8 \text{ kV} \), air discharge \( \pm 15 \text{ kV} \), \( R_i = 2000 \Omega \), \( C = 330 \text{ pF} \) (table C21, category 1) |

## Line-bound transient interference

| ISO 7637-2:2004, test stage IV |

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1) Detailed information on request  
2) See characteristic curve on page 12
### Electrohydraulic

**Sinus vibration test**
DIN EN 60068-2-6 (sinus testing)

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>10 ... 2000, acceleration: 10 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration/axis (h)</td>
<td>8</td>
</tr>
</tbody>
</table>

**Broadband noise test**
DIN EN 60068-2-64, 5 ... 2000 Hz, $a_{eff}$ 86.9 m/s²

**Shock test**
DIN EN 60068-2-27, $a = 500$ m/s², 11 ms, 60 cycles
DIN EN 60068-2-29, $a = 400$ m/s², 6 ms, 300 cycles

**Applied standards:**
- EMC directive 2014/30/EU
- EN ISO 14982: 2009

**Connector version**
AMP Superseal, 4-pin

**Pin assignment**
- Pin 1 = Ground
- Pin 2 = CAN-high
- Pin 3 = CAN-low
- Pin 4 = $U_{Bat}$

**Conformity according to**
- DIN EN 60068-2-27, $a = 500$ m/s², 11 ms, 60 cycles
- DIN EN 60068-2-29, $a = 400$ m/s², 6 ms, 300 cycles

**Type of protection**
IP66, IP67, IP69K (with installed and locked plug-in connector)

**Required components**

<table>
<thead>
<tr>
<th>Material no. TYCO</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug AMP Superseal</td>
<td>282088-1</td>
</tr>
<tr>
<td>Contact MINI-MIC for wire size 0.75 ... 1.5 mm² and insulation diameter 1.7 ... 2.4 mm</td>
<td>282110-1</td>
</tr>
<tr>
<td>Individual wire sealing cross section width 1.7 ... 2.4 mm</td>
<td>281934-2</td>
</tr>
<tr>
<td>Recommended cable protection</td>
<td>493581-1</td>
</tr>
<tr>
<td>General data</td>
<td>Tyco Product Specification 108-20090</td>
</tr>
</tbody>
</table>

**Prescribed conduction type**
FLR

### Notice

The OBE is designed for a service life of 10 years operating time and 5 years storage time (within the recommended temperature range). After this time, the probability of error may increase.

The operating time is not monitored by the on-board electronics itself. The machine manufacturer is responsible for monitoring and defining suitable measures (e.g. test or maintenance intervals).
Hydraulic functions

Example configurations SB24-EHS4

<table>
<thead>
<tr>
<th>Type</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>– Standard valve (SVL)</td>
</tr>
<tr>
<td></td>
<td>– Check valve in B</td>
</tr>
<tr>
<td></td>
<td>– Without thermal pressure relief valve</td>
</tr>
<tr>
<td></td>
<td>Connection valve (CVL)</td>
</tr>
<tr>
<td></td>
<td>– Check valve in B</td>
</tr>
<tr>
<td></td>
<td>– Without thermal pressure relief valve</td>
</tr>
<tr>
<td></td>
<td>End valve (EVL)</td>
</tr>
<tr>
<td></td>
<td>– Check valve in B</td>
</tr>
<tr>
<td></td>
<td>– With thermal pressure relief valve</td>
</tr>
</tbody>
</table>

0 = Neutral  
1 = Lifting  
2 = Lowering  
F = Float
Example configurations SB34-EHS4

<table>
<thead>
<tr>
<th>Type</th>
<th>Features</th>
</tr>
</thead>
</table>
| | - Standard valve (SVL)  
| | - Check valve in A and B  
| | - Without thermal pressure relief valve  
| | - Without manual auxiliary actuation |
| | - Standard valve (SVL)  
| | - Check valve in A and B  
| | - With thermal pressure relief valve  
| | - With manual auxiliary actuation |
| | - End valve (EVL)  
| | - Check valve in A and B  
| | - With thermal pressure relief valve  
| | - Without manual auxiliary actuation |

0 = Neutral  
1 = Lifting  
2 = Lowering  
F = Float
Switching capacity limits
The maximum switchable return flow is dependent on the load pressure level. The flow forces at the spool have a limiting effect here.
The values represented refer to the pilot pressure 17 bar.

Characteristic curve return flows, switching capacity limits

Flow resolution
The characteristic curves apply for standard versions (flow edge comparison).
Other tolerances can occur for special versions or special spool versions.

Characteristic curve for flow resolution

Flow resolution \( q_{\text{nom}} \) = 170 l/min (maximum)

Flow resolution \( q_{\text{nom}} \) = 140 l/min (maximum)

Flow resolution \( q_{\text{nom}} \) = 120 l/min (maximum)

Flow resolution \( q_{\text{nom}} \) = 100 l/min (maximum)

Flow resolution \( q_{\text{nom}} \) = 170 l/min (typical)

Flow resolution \( q_{\text{nom}} \) = 140 l/min (typical)

Flow resolution \( q_{\text{nom}} \) = 120 l/min (typical)

Flow resolution \( q_{\text{nom}} \) = 100 l/min (typical)

For return flow edge comparison, the tolerances only apply above 10% of the nominal flow (greater tolerances are to be expected below this value).

Hysteresis
With respect to the flow:

- Typically approx. 1% of \( q_{\text{nom}} \) (in flow range up to 80% of \( q_{\text{nom}} \))
- Maximum 2% of \( q_{\text{nom}} \)

Temperature drift of flow
The temperature dependence of the flow is compensated electronically in the temperature range 30 °C to 90 °C.

Pressure drift of flow
Pressure drift of the flow (pressure increase due to parallel operation) is compensated by the individual pressure compensator.
Flow resistances (typical values)

**SB24-EHS4, 1 check valve**

- **Position 1 (Lifting)**
  - Flow \( q_V \) [l/min]
  - Pressure drop \( \Delta p \) [bar]
  - Graph showing \( A \rightarrow B \) and \( Y \rightarrow B \) with values 9.5, 5.1, and 6.1.

- **Position 2 (Lowering)**
  - Flow \( q_V \) [l/min]
  - Pressure drop \( \Delta p \) [bar]
  - Graph showing \( Y \rightarrow A \) and \( B \rightarrow R \) with values 10.7, 3.9, and 5.7.

- **Position F (Float)**
  - Flow \( q_V \) [l/min]
  - Pressure drop \( \Delta p \) [bar]
  - Graph showing \( A \rightarrow R \) and \( B \rightarrow R \) with values 18.8 and 10.8.

**SB34-EHS4, 2 check valves**

- **Position 1 (Lifting)**
  - Flow \( q_V \) [l/min]
  - Pressure drop \( \Delta p \) [bar]
  - Graph showing \( A \rightarrow R \) and \( Y \rightarrow B \) with values 42.5 and 5.3.

- **Position 2 (Lowering)**
  - Flow \( q_V \) [l/min]
  - Pressure drop \( \Delta p \) [bar]
  - Graph showing \( B \rightarrow R \) and \( Y \rightarrow A \) with values 38.7 and 4.9.

- **Position F (Float)**
  - Flow \( q_V \) [l/min]
  - Pressure drop \( \Delta p \) [bar]
  - Graph showing \( A \rightarrow R \) and \( B \rightarrow R \) with values 56.5 and 32.3.
**Pilot pressure**

\[ p_x = 17 \text{ to } 22 \text{ bar} \]

(Setting point for control flow 0.8 to 1.2 l/min)

The pilot pressure in accordance with the diagram must be available alone to the EHS4 Valves, since the full valve performance is otherwise not guaranteed.

**Pilot oil cleanliness**

Special attention must be paid to the purity of the oil for the pilot oil supply; additional pilot oil fine filters must be used if necessary.

**Actuating time / dynamics**

Base frequency in relation to spool stroke approx. 14 Hz for setpoint change from 0 to 100%

**Characteristic curve for step function**

<table>
<thead>
<tr>
<th>Viscosity [mm²/s]</th>
<th>Time [ms]</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>10000</td>
<td>10000</td>
</tr>
</tbody>
</table>

1. Actuating time: Neutral after Float
2. Actuating time: Neutral after Lowering
3. Actuating time: Neutral after Lifting
4. Delay time: Neutral after Float
5. Delay time: Neutral after Lowering
6. Delay time: Neutral after Lifting

**Thermal pressure relief valve**

Optional pressure limitation function integrated in the check valve, which prevents an impermissible high pressure developing between the valve and the quick couplers installed.

Such pressure peaks can occur when the oil volume enclosed heats up, for example. The pressure is relieved internally in the valve.

**Symbol T-PRV**
Directional valves | SB24-EHS4, SB34-EHS4
Hydraulic functions

Internal leakage

<table>
<thead>
<tr>
<th>Leakage in consumer port SB24-EHS4 with 1 check valve</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B → R</strong> in position 0: 2 ml/min</td>
</tr>
<tr>
<td><strong>A → R</strong> in position 0: 60 ml/min (standard)</td>
</tr>
<tr>
<td><strong>A → R</strong> in position 2: 150 ml/min (typ.) (Check function IPC)</td>
</tr>
<tr>
<td><strong>A → R</strong> in position 2: 300 ml/min (max.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leakage in consumer port SB34-EHS4 with 2 check valves</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A, B → R</strong> in position 0: 2 ml/min</td>
</tr>
</tbody>
</table>

Leakage P to R in various spool positions

<table>
<thead>
<tr>
<th>Leakage P → R in position 0: 60 ml/min (typ.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P → R</strong> in position 0: 60 ml/min (typ.)</td>
</tr>
<tr>
<td><strong>P → R</strong> in position 1, 2: 100 ml/min (typ.)</td>
</tr>
<tr>
<td><strong>P → R</strong> in position 1, 2: 250 ml/min (max.)</td>
</tr>
<tr>
<td><strong>P → R</strong> in position F: 60 ml/min (typ.)</td>
</tr>
<tr>
<td><strong>P → R</strong> in position F: 250 ml/min (max.)</td>
</tr>
</tbody>
</table>

Additional leakage values on request.
High values can occur for specific spool versions.

Notice

- Check valve leakage values measured with $p = 125$ bar,
  $v = 30 \text{ mm}^2/\text{s}$, $\vartheta = 50 \, ^\circ\text{C}$, $t_{\text{waiting time}} = 15 \, \text{s}$,
  $t_{\text{measuring time}} = 60 \, \text{s}$.
- Leakage P → R measured with $p = 200$ bar.

Typical development of leakage, chronological sequence of leak at check valve

<table>
<thead>
<tr>
<th>Measure time [min]</th>
<th>Measuring time [min]</th>
<th>Leakage [ml/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>4.5</td>
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<td>6</td>
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<td>5.5</td>
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<td>7</td>
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<tr>
<td>8</td>
<td>8</td>
<td>7.5</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>8.5</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>9.5</td>
</tr>
</tbody>
</table>

Manual auxiliary actuation for control spool
(optional for SB34-EHS4)

- Mechanical manual actuation
- Operable with standard tools (hex size 13)

Notice

Valves with manual auxiliary actuation must be mechanically actuated after painting. The actuating force to break the layer of paint between the rotating setting shaft and housing could be too high for the electrohydraulic actuation.
The valves in the tractor must be arranged such that no dirt can accumulate at the setting shaft and block the control spool.

1. Position mark, milled off edge of hexagon
2. Size 13, max. wrench width 6.5 mm, actuation torque max. 10.5 Nm permitted
Pilot oil supply
The pilot oil supply is not part of the directional valve but part of the block or system.

Required control flow per EHS directional valve
(applicable to SB-EHS and EHR-EHS)

▼ Values for a viscosity of 30 mm²/sec

<table>
<thead>
<tr>
<th></th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Neutral position</td>
<td>250 ml/min</td>
<td>460 ml/min</td>
</tr>
<tr>
<td>In Lifting or Lowering mode</td>
<td>600 ml/min</td>
<td>600 ml/min</td>
</tr>
<tr>
<td>In Float mode</td>
<td>250 ml/min</td>
<td>460 ml/min</td>
</tr>
<tr>
<td>During step function (Lifting or Lowering mode)</td>
<td>3.5 l/min (Actuating time approx. 40 ms, no ramp)</td>
<td></td>
</tr>
<tr>
<td>During step function (Float mode)</td>
<td>4.4 l/min (Actuating time approx. 75 ms)</td>
<td></td>
</tr>
</tbody>
</table>

Demand peaks in the pilot oil limited by
▶ Avoiding simultaneous connection of several consumers (delay by actuating time + safety distance)
▶ Programming in time ramps

Control pressure referencing
The pilot oil pressure $p_x$ must be referenced to the highest return flow pressure of all EHS valves.

$\left( p_{x \text{ abs.}} = p_x + p_{R \text{ max}} \right)$
Electronic functions

Notice
- Safety-relevant project planning instructions can be found in manual 66157-01-B.
- For a detailed description of the error codes, please refer to manual 66157-02-B.

General information about CAN control
The EHS valve can be easily actuated via the serial CAN interface. In this way, a message can be used to specify the operating modes "Neutral", "Lifting", "Lowering", "Float" as well as the flow setpoint. A second message can be used to set the characteristic curve form, the characteristic curve rise and the ramp times separately for "Lifting" and "Lowering". Conversely, the valve can use the error code to report the details of any faults that occur to the superordinate control panel.

The valve can be permanently reprogrammed via the diagnosis interface (CAN baud rate and identifier, battery voltage limits, valve number, etc.).

Characteristic curves for setpoint generation and time ramps

Characteristic curve rise
The characteristic curve rise is used to reduce the modulation of the valve (for both Lifting and Lowering) linearly from 100% to 0%.

The characteristic curve rise can be programmed in the range from 1…1000 (0.1% ... 100%):
- 0x0000 = 0.0% of max. flow
- 0x0001 = 0.1% of max. flow
- 0x0002 = 0.2% of max. flow
- ...
- 0x03E8 = 100.00% of max. flow

The values for the characteristic curve rise are transmitted in the "Process data message".

Input signal [%]:
When the CAN is actuated, equates to flow setpoint.

Output signal [%]:
Corresponds to the flow at the directional valve.

The input corresponds to the flow setpoint value of the switch or joystick. The output corresponds to the percentage of the maximum flow. Reducing the gradient reduces the output flow available with the switch or joystick. It also improves the flow resolution if higher accuracy is required.
**Characteristic curve form**

The characteristic form allows the valve behavior to change from linear to highly progressive. If necessary, that means that the fine control behavior can be changed with a single control element (e.g. joystick).

16 separate steps can be programmed for Lifting and Lowering:

▶ **0**hex (linear) to **F**hex (progressive).

The values for the characteristic curve form are transmitted in the "Process data message".

**Input signal [%]:**

When the CAN is actuated, equates to flow setpoint.

**Output signal [%]:**

Corresponds to the flow at the directional valve.

The input corresponds to the flow setpoint value of the switch or joystick. The output corresponds to the percentage of the maximum flow.

---

**Time ramps**

Time ramps can be used selectively to reduce the valve dynamics. The ramp time is the time required to complete the entire stroke (from 0% to 100% or from 100% to 0% Lifting or Lowering).

4000 separate steps can be programmed for Lifting and Lowering, each for increasing or decreasing flow setpoints:

▶ **0x00** = 0 ms
▶ **0x01** = 1 ms
▶ **0x02** = 2 ms
▶ ...
▶ **0xFA0** = 4000 ms

The values for the time ramps are transmitted in the "Process data message".
### Dimensions

**Standard valve SB24-EHS4**

1. Electrohydraulic actuation (actuating unit EHS4, see page 20)
2. Three mounting holes drilled through
3. Consumer ports A, B in thread design M22 × 1.5; optional in flange design
4. Name plate
- **End valve SB34-EHS4**

1. Electrohydraulic actuation (actuating unit EHS4; see page 20)
2. Three mounting holes drilled through
3. Consumer ports A, B in thread design M22 × 1.5 or M27 × 2; optional in flange design
4. Name plate
5. Sinking depth Ø22

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Bosch Rexroth AG, RE 66174/2021-11-11
- **Standard valve SB34-EHS4 with manual auxiliary actuation**

1. Electrohydraulic actuation (actuating unit EHS4, see page 20)
2. Three holes drilled through for mounting
3. Consumer ports A, B in thread design M22 × 1.5 or M27 × 2; optional in flange design
4. Name plate
**Actuating unit EHS4**

### Thread design of consumer ports A and B

**Version I**
- DIN 3852-1 (metric thread)
  - For seal ring sealing

**Version II (preferred version)**
- EN ISO 6149-1 (metric thread)
  - No female thread characterization
  - For O-ring sealing

### Product identification

The valve sections are identified by a 26 × 15 mm adhesive label containing a data matrix code (6 × 6 mm) which includes an encoded unique serial number. For unpainted products, the adhesive labels are protected by an additional protective film.
### Installation position

<table>
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<tr>
<th>SB24-EHS4 and SB34-EHS4 without manual auxiliary actuation</th>
<th>SB34-EHS4 with manual auxiliary actuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  1) −45° 0° +10° +45°</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4  1) −45° 0° +45°</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
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</table>

1) Permissible with restrictions. Please contact us.
Related documentation

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<tr>
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<td>Load-sensing control block SB24/34</td>
<td>66170-B</td>
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<tr>
<td>Data sheet</td>
<td>Load-sensing control block SB24/34</td>
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<td>Load-sensing directional valves in sandwich plate design SB24-M</td>
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<td>90220</td>
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<td>Control block assembly SB24/34</td>
<td>66170-10-R</td>
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<td></td>
<td>Control block assembly SB24/34 (central connecting plate)</td>
<td>66170-11-R</td>
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<td>Repairing the directional valves SB24-EHS4, SB34-EHS4</td>
<td>66170-20-R</td>
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<td>Technical information</td>
<td>Interface description, hydraulics</td>
<td>Z 206 803 930</td>
</tr>
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<td></td>
<td>Pilot module EHS4 – Safety-relevant project planning instructions</td>
<td>66157-01-B</td>
</tr>
<tr>
<td></td>
<td>Pilot module EHS4 – Technical customer documentation (TKU)</td>
<td>66157-02-B</td>
</tr>
</tbody>
</table>

Abbreviations

This documentation uses the following abbreviations:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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</thead>
<tbody>
<tr>
<td>AP</td>
<td>Connecting plate</td>
</tr>
<tr>
<td>CAN</td>
<td>Controller Area Network</td>
</tr>
<tr>
<td>CAN FD</td>
<td>CAN flexible data rate</td>
</tr>
<tr>
<td>CVL</td>
<td>Connection valve, LS direction left</td>
</tr>
<tr>
<td>EHR</td>
<td>Electrohydraulic hitch control</td>
</tr>
<tr>
<td>EHS</td>
<td>Pilot operated electrohydraulic actuating unit</td>
</tr>
<tr>
<td>EMC</td>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td>EP</td>
<td>End plate</td>
</tr>
<tr>
<td>ESD</td>
<td>Electrostatic discharge</td>
</tr>
<tr>
<td>EVL</td>
<td>End valve, LS direction left</td>
</tr>
<tr>
<td>IPC</td>
<td>Individual pressure compensator</td>
</tr>
<tr>
<td>LS</td>
<td>Load-sensing</td>
</tr>
<tr>
<td>OBE</td>
<td>On-board electronics</td>
</tr>
<tr>
<td>SVL</td>
<td>Standard valve, LS direction left</td>
</tr>
<tr>
<td>T-PRV</td>
<td>Thermal pressure relief valve</td>
</tr>
<tr>
<td>ZAP</td>
<td>Central connecting plate</td>
</tr>
</tbody>
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Spare parts

For spare parts, visit www.boschrexroth.com/spc

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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