LUDV control block of sandwich plate design

Type SX 14, SX 14 S

Nominal size 14
Series 2X
Maximum pressure, pump side 250 bar
Maximum pressure, actuator side 300 bar
Inlet flow 175 l/min

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Special features

- Distributes the flow between the directional valve elements according to the requirements, independently of the pressure and available flow.
- Compact sandwich plate design, can be combined so that the control block can meet the requirements of several type of machines.
- No shuttle valves.
- Limitation of system maximum pressure via LS pressure relief valve.
- System protection via LS and secondary pressure relief valves.
About this datasheet

This manual describes functioning, technical data and ordering details of control blocks SX 14 and SX 14 S. This manual is illustrated with hydraulic symbols, sections and unit dimensions drawings.

Related documents

SX 14 and SX 14 S are system components.

- Also follow the instructions for the other system components.
- Also follow the instructions in the following manuals:
  - System documentation from the system manufacturer
  - Service instruction manual RE64025
  - Spare parts manual RDEF64125-E
  - Assembly Instructions RE64125-S
Sections

Standard SX 14 (SX 14)

1 Housing
2 Spool
3 Check valves
4 Pressure compensator
5 Secondary valve
6 Plug

SX 14 S with pressure compensator and secondary valves (SX 14 S C)

SX 14 S without pressure compensator and without secondary valve (SX 14 S L)
**Functional description**

The SX 14 directional control block basically consists of one inlet element, a number of directional valve elements and one final element.

The inlet element contains 2 fixing points and the pipe connection ports P, T, LS, M.

This element also contains all the components required for the system function, namely: a flow control valve for the controlled unloading of the LS line and a LS relief valve for the limitation of the maximum pressure in the system. Each standard SX 14 (SX 14) directional valve element is composed of a housing (1), a spool (2), two load holding check valves (3), a pressure compensator (4), cavities (5) for secondary relief/anti-cavitation check valves, and anti-cavitation check valves or plugs (6).

Each SX 14 S directional valve element is composed of a housing (1), a spool (2), one load holding check valve / compensator (3/4) or only a load hold check valve (3), and if needed of cavity for secondary valves (5) or for plugs (6). The final element has one fixing point.

**Symbol, hydraulic**

### Standard SX 14 (SX 14)

**Ports**
- P: Pump
- A, B: Actuator
- T: Tank
- LS: Load Sensing

### SX 14 S with pressure compensator and secondary valves (SX 14 S C)

### SX 14 S without pressure compensator and without secondary valve (SX 14 S L)
### General

**Design** | Flangeable (up to 9 directional valve elements)
---|---
**Description** | Flow distribution between the directional valve elements according to the requirements, independently of the pressure and available flow

**Type** | SX 14
**Assembly position** | Any
**Connections** | Threads
**Nominal size** | 14
**Standard primer** | Blue (RAL 5010)

### Hydraulic

**Max. permissible flow on port P** | l/min 175
---|---
**Standard leakage oil flow on load holding (at 100 bar, 36 mm²/s)** | cm³/min 20
**Max. operating pressure per connection**  
- P, M, LS, D, DLS | bar 250  
- A, B | bar 300  
- T | bar 20

**Secondary valves setting pressure tolerances (at 5 l/min)**  
- H..0 direct actuated (SX14 S)  
  | setting | tolerance  
  | 71 → 120 | -4 / +8  
  | 121 → 200 | -6 / +12  
  | 201 → 270 | -8 / +12  
  | 271 → 320 | -10 / +14  
  | 321 → 420 | -12 / +18
- H..0 pilot operated (standard SX 14) | bar 0 / +5

**Max. control pressure per connection ¹)**  
- a, b | bar 35

¹) We recommend the use of control curve 6 to 25 bar, and inlet pressure (4TH6 curve no. 70)

**Pressure fluid** | Mineral oils (HL, HLP) according to DIN 51524 ²), Other hydraulic fluids, such as HEES (synthetic esters) according to VDMA 24568, as well as hydraulic fluids as specified under RE 90221, at request.

**Pressure fluid temperature range** | °C -20 to +100 (for higher temperatures, please consult us)
**Viscosity range** | mm²/s 10 to 380
**Max. admissible degree of contamination of the hydraulic fluid, cleanliness class according to NAS 1638** | Class 9, we therefore recommend a filter with a minimum retention rate of $\beta_{10} > 75$

¹) pilot pressure regulated by a pressure reducing valve and protected by a relief valve  
²) suitable for NBR seals
### Technical data (for applications outside these parameters, please consult us!)

#### Mechanical

<table>
<thead>
<tr>
<th>Weight</th>
<th>kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet element</td>
<td>10</td>
</tr>
<tr>
<td>Directional valve element SX 14</td>
<td>4.5</td>
</tr>
<tr>
<td>Directional valve element SX 14 S with secondary valves</td>
<td>5</td>
</tr>
<tr>
<td>Directional valve element SX 14 S without secondary valve</td>
<td>4</td>
</tr>
<tr>
<td>Blanking plate</td>
<td>2</td>
</tr>
</tbody>
</table>

Spool return force: N Minimum value 54, depending of operation (for more details please consult us)

Max. permissible actuation force on the spool (for 1 million cycles):
- axial: N 1000 during 20 % of total cycles then 500
- radial: N 20

Storage temperature range, ambient: °C -40 to +60

#### Electrical

Electrical detent when spool is pushed (operation S2) (data for 25 °C):
- supply voltage: V 12 (min. 10; max. 16)
- supply current: mA 780 (min. 670; max. 785)
- power input: W 9.35 ±5 %
- resistance: Ω 15.4 ±5 Ω
- lifetime: 1 million cycles at 90 °C, work factor 50%
- protection classification: IP65
- maximum temperature reached by the electro-magnet: °C 110 at a room temperature of 90 °C

Solenoid On / Off (operation V212):
- supply voltage: V 12
- supply current: A 4
- power input: W 48
- resistance: Ω 3

#### Application guidelines

<table>
<thead>
<tr>
<th>Pipe connections</th>
<th>A, B, P, T3</th>
<th>T</th>
<th>a, b, DLS, LS, M, T1</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tightening torque for the pipe connections</td>
<td>Nm 70</td>
<td>100</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Recommended fixing at 3 locations maximum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatness of the mounting surface</td>
<td>mm 0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting of system pressure</td>
<td>via the LS relief valve</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Do not direct the jet of a pressure washing unit directly at the unit.
- No free-wheeling diode required for electrical operations.
- Mechanical operation spool: a greasy appearance on the tongue side is normal (due to natural effect of seal lubrication). It could be necessary to proceed to a regular cleaning of this area.
Characteristic curves (measured at $\nu = 36 \text{ mm}^2/\text{s}$ and $\theta = 50 \degree \text{ C}$)

Pressure differential with P switched to A/B with spool 200 l/min

Pressure differential with A/B switched to T with spool 200 l/min

Pressure differential in the neutral position of inlet element type P (Open Center execution)

Pressure differential in the neutral position of the inlet element with flushing valve

Secondaries valves characteristic A/B switched to T

Anti-cavitation check valves Characteristic T switched to A/B

Priority flow in relationship to the inlet flow
Ordering details: separate elements

**Inlet element**

<table>
<thead>
<tr>
<th>SX 14</th>
<th>2X</th>
<th>..0</th>
<th>M</th>
<th>*</th>
</tr>
</thead>
</table>

see ordering details page 9
see ordering details of inlet element page 9

**Directional valve element**

<table>
<thead>
<tr>
<th>SX 14</th>
<th>2X</th>
<th>..0</th>
<th>..0</th>
<th>M</th>
<th>*</th>
</tr>
</thead>
</table>

see ordering details pages 9 and 10
see ordering details of directional valve element pages 9 and 10

**Final element**

<table>
<thead>
<tr>
<th>SX 14</th>
<th>2X</th>
<th>M</th>
<th>*</th>
</tr>
</thead>
</table>

see ordering details page 9
see ordering details of final element page 9
Ordering details: SX 14 directional control block

| SX 14 | 2X | ..0 |

Number or directional valve spools 1 to 9

Medium pressure = L

Series 20 to 29 = 2X
(20 to 29, unchanged installation and connection dimensions)

**Inlet element**
- Closed Center = A
- Closed Center with priority flow divider for dynamic servo-steering (with flow in the LS line) = CD
- Closed Center with priority flow divider for static servo-steering (without flow in the LS line) = CS
- Open Center = P
- With flushing valve (use with variable displacement pump) = S

1) Max. pressure in bar, measured at M, adjustable via the LS pressure relief valve

**Seals**
- M = NBR seals

⚠️ **Attention!**
The compatibility of the seals and pressure fluid has to be taken into account

**Connection threads**
- 01 = Pipe threads to standard ISO 228/1
- P, A, B, T3 = G 3/4
- T = G 1
- LS, DLS, M = G 1/4
- D = G 1/2
- a, b, T1 = G 1/4

19 = UNF connection threads to standard ISO 11926
- P, A, B, T3 = 1-1/16 UNF-2B
- T = 1-5/16 UNF-2B
- LS, DLS, M = 9/16 UNF-2B
- D = 3/4 UNF-2B
- a, b, T1 = 9/16 UNF-2B

Further details in clear text

**Final element**
- L = Blanking plate
- R = Outlet element with tank bridge
- C = Outlet element with solenoid operated control valve (12 V)
- F = Flushing valve

**Type of S element**
- Type of operation
- Operation orientation
- Secondary valve at connection port A
- Secondary valve at connection port B

**Type of directional valve element**
- Flow at connection port A (in l/min)
- Flow at connection port B (in l/min)
- Type of directional valve spool

1) set with a Δp of 15 bar between M and LS (not for inlet element in Open Center execution)
**Ordering details** additional details for the directional valve element (page 9)

<table>
<thead>
<tr>
<th></th>
<th>0.0</th>
<th>0.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection port “A”</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connection port “B”</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Secondary valves</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A..0*</td>
<td>direct actuated pressure relief valve without anti-cavitation</td>
<td></td>
</tr>
<tr>
<td>H..0*</td>
<td>relief / anti-cavitation check valve, pilot operated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or direct actuated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pressure value in bar</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>anti-cavitation check valve</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>plug</td>
<td></td>
</tr>
<tr>
<td>Z (7) (9)</td>
<td>without cavity for secondary valves</td>
<td></td>
</tr>
</tbody>
</table>

**Operation orientation**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No code</td>
<td>without mechanical operator</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>mechanical operator on connection side A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>mechanical operator on connection side B</td>
<td></td>
</tr>
</tbody>
</table>

**Type of operation**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>spool return via a spring</td>
<td></td>
</tr>
<tr>
<td>E2 (4)</td>
<td>spool return via a spring, mechanical detent in spool position 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4th or float position) pull function only</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>spool return via a spring, electrical detent when spool is pushed (12 V)</td>
<td></td>
</tr>
<tr>
<td>Z1</td>
<td>mechanical operator with tongue (Ø 8 or Ø 10)</td>
<td></td>
</tr>
<tr>
<td>H 200</td>
<td>hydraulic operator, spool return via a spring</td>
<td></td>
</tr>
<tr>
<td>H 230</td>
<td>hydraulic operator, spool return via a spring, stroke limitation on connection sides A and B</td>
<td></td>
</tr>
<tr>
<td>V 212 (5)</td>
<td>direct electrical operation (12 V)</td>
<td></td>
</tr>
</tbody>
</table>

**Type of S element**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>check valve and compensator</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>no compensator (check valve only)</td>
<td></td>
</tr>
</tbody>
</table>

**Flow at connection ports**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>060</td>
<td>flow at connection port B in l/min</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>flow at connection port B in l/min</td>
<td></td>
</tr>
</tbody>
</table>

Other flow values (rated in 10 l/min ranges): please consult us

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>060</td>
<td>flow at connection port A in l/min</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>flow at connection port A in l/min</td>
<td></td>
</tr>
</tbody>
</table>

Other flow values (rated in 10 l/min ranges): please consult us

**Directional valve spools**

- **EA**
- **JA**
- **QA**
- **WA (3)**

**Type of directional valve element**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>standard element</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>S element</td>
<td></td>
</tr>
</tbody>
</table>

---

2) accuracies: consult us
3) for hydraulic operation, consult us
4) on SX 14 S, only available on tongue side A
5) if used, consult us
6) except on SX 14 S without secondary valves
7) only available on standard SX 14
8) only available on SX 14 S
9) only if both sides are not machined
Desired execution: 4 directional valve elements

Inlet element: Open Center, Max. pressure = 220 bar

4 directional valve elements:
  • 1st element:
    - Standard element
    - Spool symbol = EA
    - Flow in A = 120 l/min, flow in B = 80 l/min
    - Mechanical operator with tongue on connection side A, spool return via a spring
    - Secondary valve in A = relief / anti-cavitation check valve set at 300 bar
    - Secondary valve in B = plug

  • 2nd element:
    - S element
    - Spool symbol = EA
    - Flow in A = 120 l/min, flow in B = 80 l/min
    - Check valve + pressure compensator
    - Mechanical operator with tongue on connection side A, spool return via a spring
    - Secondary valve in A = direct actuated relief / anti-cavitation check valve set at 300 bar
    - Secondary valve in B = direct actuated relief / anti-cavitation check valve set at 250 bar

  • 3rd element:
    - S element
    - Spool symbol = EA
    - Flow in A = 100 l/min, flow in B = 100 l/min
    - Check valve
    - Mechanical operator with tongue on connection side A, spool return via a spring
    - Plugs in A and B

  • 4th element:
    - Standard element
    - Spool symbol = JA
    - Flow in A = 100 l/min, Flow in B = 100 l/min
    - Hydraulic operator, spool return via a spring
    - Secondary valves in A and B = anti-cavitation check valve

Final element: Blanking plate

Type code:

Ordering example: complete block SX 14
Inlet elements

Closed Center
Ordering detail
A

Open Center
Ordering detail
P

Closed Center with priority flow divider
for static servo-steering
Ordering detail
CS

for dynamic servo-steering
Ordering detail
CD

Flushing valve
(use with variable displacement pump and \( q_{\text{min}} \))
Ordering detail
S

Inlet elements
Directional valve elements

Representation of the SX directional valve element
Simplified symbol used to illustrate SX directional control circuits

Spool variations
Ordering detail

<table>
<thead>
<tr>
<th>EA...-... :</th>
<th>symbol EA</th>
</tr>
</thead>
<tbody>
<tr>
<td>JA...-... :</td>
<td>symbol JA</td>
</tr>
<tr>
<td>QA...-... :</td>
<td>symbol QA</td>
</tr>
<tr>
<td>WA...-... :</td>
<td>symbol WA</td>
</tr>
</tbody>
</table>
### Directional valve elements

#### Type of operation

<table>
<thead>
<tr>
<th>Type of Operation</th>
<th>Ordering Detail</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic operator, spool return via a spring</td>
<td>H200</td>
<td><img src="image1" alt="Diagram" /></td>
</tr>
<tr>
<td>Hydraulic operator with stroke limitation, spool return via a spring</td>
<td>H230</td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td>Mechanical operator with tongue on connection side A, spool return via a spring</td>
<td>A2Z1A</td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td>Mechanical operator with tongue on connection side A, spool return via a spring and mechanical detent when spool is pulled</td>
<td>E2Z1A</td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
<tr>
<td>Direct electrical operation</td>
<td>V212</td>
<td><img src="image5" alt="Diagram" /></td>
</tr>
<tr>
<td>Mechanical operator with tongue on connection side A, spool return via a spring and electrical detent when spool is pushed</td>
<td>S2Z1A</td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
</tbody>
</table>
Directional valve elements

Secondary valves

Relief / anti-cavitation check valve, pilot operated (connection side A); direct actuated pressure relief valve (connection side B) on standard SX 14

(the setting of the given pressure values is carried out at a flow of 5 l/min)

Ordering detail

H...A...

Anti-cavitation check valve (connection side A); plug (connection side B) on standard SX 14

Ordering detail

EQ

Plug (connection side A); direct actuated pressure relief valve (connection side B) on SX 14 S

Ordering detail

QH...
### Final elements

**Outlet element with solenoid operated control valve**
- Ordering detail: C

![Outlet element with solenoid operated control valve](image)

**Outlet element with Flushing valve**
(for use with inlet element CS or CD)
- Ordering detail: F

![Outlet element with Flushing valve](image)

**Blanking plate**
- Ordering detail: L

![Blanking plate](image)

**Outlet element with tank bridge T**
- Ordering detail: R

![Outlet element with tank bridge T](image)

---

### Circuit example: complete directional control block

![Circuit example](image)

- **Open center inlet**
- **8 directional valve elements**
- **Outlet element with tank bridge T**
Unit dimensions (in mm)

SX 14 directional control block with inlet element in open center execution

1. Open center inlet element P
2. Flow control valve (tightening torque = 20 ± 10 % Nm)
3. LS relief valve (tightening torque = 45 ± 10 % Nm)
4. Pressure gauge connection
5. Directional valve element standard SX 14
6. Directional valve element SX 14 S
7. Hydraulic operation cover with stroke limitation, on connection side B
8. Secondary valve (pressure relief valve) (tightening torque = 70 ± 10 % Nm)
9. Secondary valve for SX 14 S (pressure relief valve) (tightening torque = 32 ± 10 % Nm)
10. Hydraulic operation cover, on connection side A
11. 3 tie rods (tightening torque = 30 to 35 Nm)
12. 3 fixation points Ø 11
13. Outlet element with tank bridge T.
Unit dimensions (in mm)

Inlet element in open center execution
Ordering detail
P

or

Inlet element in closed center execution
Ordering detail
A

or

Inlet element with flushing valve
Ordering detail
S

Inlet element in closed center execution with priority flow divider
Ordering detail
CD or CS
Unit dimensions (in mm)

Hydraulic operator, spool return via a spring
Ordering detail
H200

Hydraulic operator with stroke limitation, spool return via a spring
Ordering detail
H230

Mechanical operator with tongue, spool return via a spring
Ordering detail
A2Z1

Mechanical operator with tongue, mechanical detent in position 3
Ordering detail
E2Z1

Mechanical operator with tongue, electrical detent when spool is pushed
Ordering detail
S2Z1

Connector DEUTSCH DT 04 - 2P - CE04
(protection IP67)

Position 1 and 2
Position 3

550
Unit dimensions (in mm)

Direct electrical operation
Ordering detail V212

Blanking plate
Ordering detail L

Outlet element with tank bridge
Ordering detail R

Outlet element with solenoid operated control valve
Ordering detail C

Flushing valve
Ordering detail F

Connector DEUTSCH DT 04 - 2P - CE04 (protection IP67)

Connector DEUTSCH DT 04 - 2P - CE04 (protection IP67)
Assembly possibilities

1. Inlet element with priority flow divider CD or CS
2. Inlet element - Closed Center A - Open Center P or with flushing valve S
3. Directional valve element SX14 or SX14S
4. Blanking plate L
5. Outlet element with tank bridge R
6. Outlet element with solenoid operated control valve C
7. Flushing valve F
8. Mechanical operator with tongue Z1
9-1. Spring return arrangement, type A2
9-2. Spring return arrangement, type A2
9-3. Spring return arrangement, mechanical detent in spool position 3, type E2
9-4. Spring return arrangement, electrical detent when spool is pushed, type S2
10. Hydraulic operator with spool return via a spring H200
11. Hydraulic operator with stroke limitation H230
12. Direct electrical operation V212
13. LS relief valve
14. Flow control valve
15. Secondary valve
## Pipe connections

<table>
<thead>
<tr>
<th>Connection</th>
<th>d1</th>
<th>Ød2</th>
<th>t1</th>
<th>t2</th>
<th>d1</th>
<th>Ød2</th>
<th>t1</th>
<th>t2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, P, T3</td>
<td>42</td>
<td>25</td>
<td>2,5</td>
<td>1/16 UNF-2B</td>
<td>42</td>
<td>24</td>
<td>2,4</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>47</td>
<td>27</td>
<td>2,5</td>
<td>1-5/16 UNF-2B</td>
<td>50</td>
<td>24</td>
<td>3,2</td>
<td></td>
</tr>
<tr>
<td>M, LS, DLS, a, b, T1</td>
<td>25</td>
<td>16</td>
<td>1,5</td>
<td>9/16 UNF-2B</td>
<td>26</td>
<td>16</td>
<td>1,6</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>34</td>
<td>20</td>
<td>2,5</td>
<td>3/4 UNF-2B</td>
<td>32</td>
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