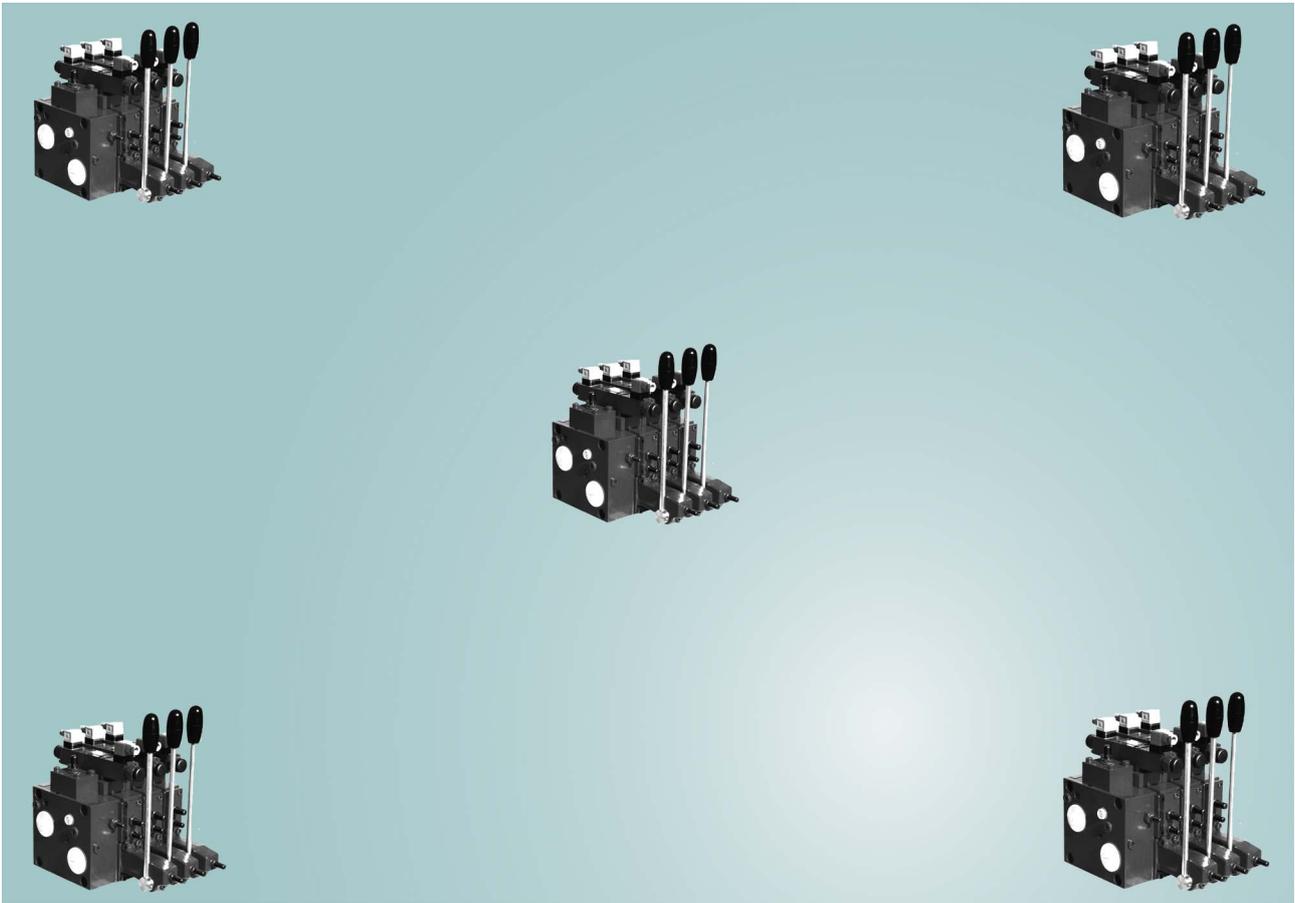


Safety for Hydraulics

User's information about proportional valves in sandwich design



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1. Functional description

Bucher proportional valves in sandwich design control the flow load-independently to the actuator, because one 2-way pressure compensator is attached to each proportional directional control valve of the actuator modules SZ, SY, SD and SE. In addition, the actuator modules including primary pressure-relief devices which can be adjusted individually for each actuator. (A and B side equal pressure adjustment). Optional there can be made different pressure adjustments of A and B of an actuator module.

The flexible modular system enables the setup to be adapted perfectly to the respective application. The available

types of actuation - manual, hydraulic, electrical or any combination thereof - as well as the various pump connection modules - e. g. with pressure compensator of 3-way type or as a pressure-relief valve - open up a wide range of possible applications.

The valve system consists of 2 to 9 individual modules hold together by tie rods. One pump connection module and 1 to 8 actuator modules make up a complete valve.

All proportional directional control valves have an internal load feed back for the associated 2-way pressure compensator. The highest load pressure si-

gnal is transmitted through shuttle valves to the pump connection module. At this module, the signal is available either to the SU pressure compensator or through port XL for controlling variable displacement pumps (SO, SL, SF). When the proportional directional control valves are in their neutral position, the load feed back channels and pressure compensator spring chambers can be relieved through 2 series-connected jets.

For the hydraulic and electrical control there are available remote control units as well as amplifier cards which are optimally suited to the proportional valves.

2. Safety instructions

- Use the valves only for their intended purpose.
- The valves may only be adjusted by specialized personnel.
- The hydraulic system must be depressurized before work can be performed on the system.
- The unit may only be opened with the manufacturer's authorization.
- Ensure that the pump provides an adequate flow for the supply of all actuators during parallel operation of multiple actuators. If this is not observed, the motion of the actuator with the highest load pressure may inadvertently change its direction. This refers only to actuator modules (SY, SD) without check valve in the 2-way pressure compensator (D2)
- In general there is a risk of sticking spool often caused by contamination of the pressure fluid. A risk assessment with regard to the safety of the machine/system must be performed during the design of the hydraulic control system and suitable safety measures must be implemented, which may be defined in categories as per EN 954.

3. Installation instructions

- Never lift the valve by the solenoids, displacement transducers or similar sensitive components.
- Do not exceed the tightening torque of threaded connections; see table 3.1.
- Attach the valve only at three points (three-point contact surface) to prevent deformations of the housing (see mounting holes "B" in fig. 3.3 and Table 3.2).
- It is strictly prohibited to loosen the tie rods ("Z" in Fig. 3.3) which are holding the individual valve modules together, and to misuse them for the fastening of the complete assembly.
- Pipeline systems must not be subjected to stress during installation.

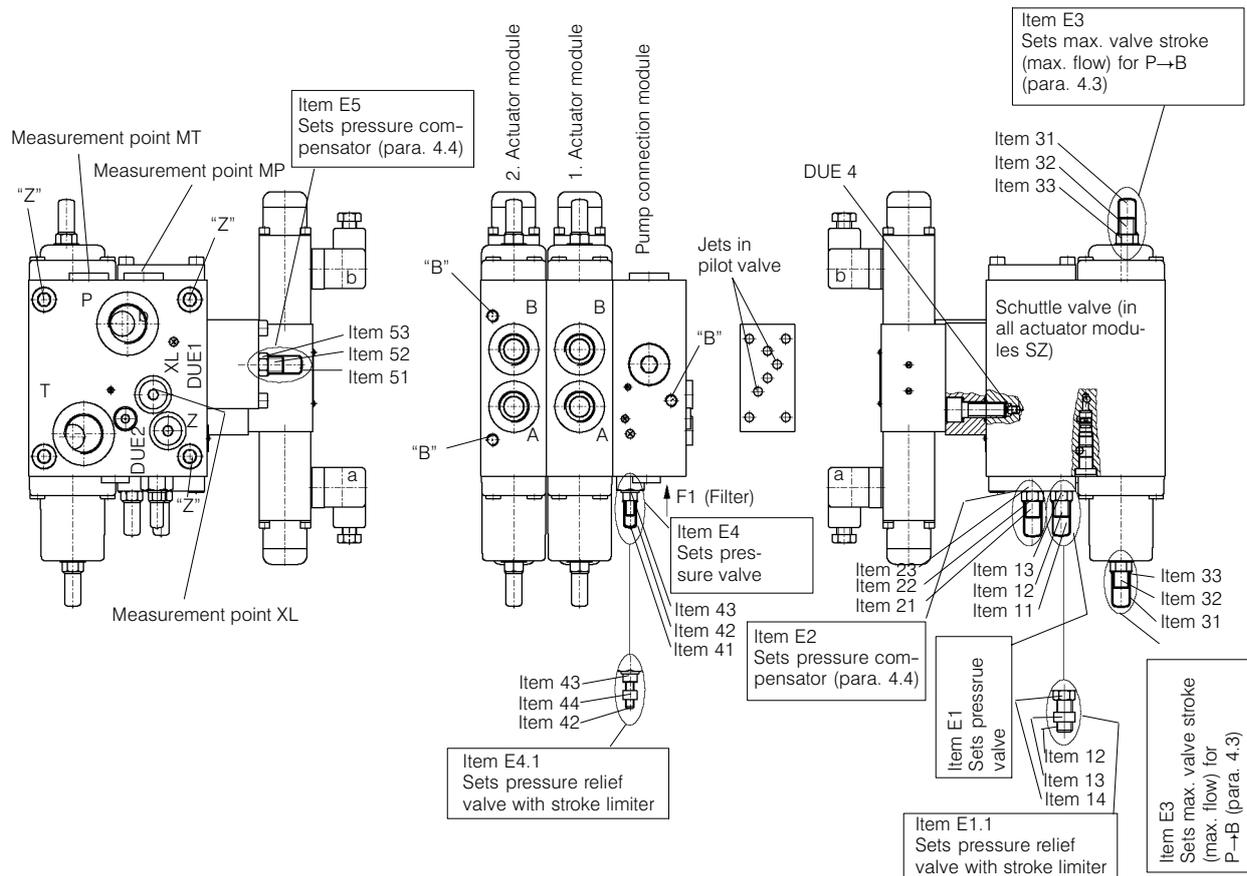
3.1 Table: tightening torques for threaded connections, S series - B type

Threads	Tightening torque [Nm]
G 1/4"	55
G 3/8"	80
G 1/2"	115
G1"	310
G1 1/4"	450
G1 1/2"	540

3.2 Table: tightening torques M_A ($\mu_{ges} = 0.125$) for the fastening bolts, ISO4762(DIN912)-12.9

Size	Thread	Wrench size	M_A [Nm]
12	M8	6	28
18	M10	10	55
25	M16	14	232

3.3 Figure: View of a proportional valve (here for example: SWV size 12 with 2 actuator modules, pump connection module SU)



4. Adjustment instructions

4.1 General safety instructions

The valves are adjusted according to the order datas of the customer.

Adjustments should be made only in exception and by specialized personnel !



Caution: The setting range of the adjustment units is not limited mechanically! Changes to the pressure or flow must be made with extreme care, in small steps and in accordance with the adjustment instructions (Para. 4.2 and 4.3)! Uncontrolled adjustments and non-observance of the adjustment instructions can lead to a failure of the maximum pressure-relief device!

4.2 Adjusting the maximum pressure-relief device

Changes of the maximum pressure setting may only be made with a pressure gauge connected to the measurement points MP or XL (measurement point XL = load pressure of port A or B, measurement point MP = pump pressure;

please refer to fig. 3.3 for the locations of the measuring points).



Caution: Do not mistake maximum pressure-relief device with set screw of the pressure compensator spring (item E2)!

The maximum pressure setting may be effected at the pressure-relief valve of the actuator module as well as at the pressure-relief valve of the pump connection module.

4.2.1 Adjustment of the pressure-relief valves

Maximum-pressure measurement may only be performed with an actuated directional control valve and blocked actuator

1. Adjustment of the pressure relief valves of the pump connection module (item E4, fig 3.3; only at pump connection modules SU, SR or SL):

- Connect the pressure measuring instrument at measurement point XL (see fig. 3.3).
- Block the pressure relief valve of the actuator module.



Caution: When the pressure relief valve adjustment of the pump connection module is fixed, unblock the pressure relief valve of the actuator module!

- Start pump and control actuator module.
- Adjust the pressure relief valve of the pump connection module (see "Procedure").

2. Adjustment of the pressure relief valve of the actuator module (item E1, fig. 3.3):

- Connect the pressure measuring instrument at measurement point XL.
- Start pump and actuate actuator module.
- Adjust pressure relief valve of actuator module (repeat this procedure for all actuator modules).

4.2.2 Procedure:

- Remove the protective cap (item 11 actuator module / item 41 pump connection module).
- Stick the hexagon socket screwdriver (according to DIN 911) into the set screw (item 12 actuator module / item 42 pump connection module).
- When loosen the lock nut (item 13 actuator module / item 43 pump connection module), hold set screw at its home position.
- During turning the set screw check the pressure gauge:

- Maximum pressure reduction: turn adjustment screw counterclockwise
- Maximum pressure increase: turn adjustment screw clockwise
- Standard value: 1/4 turn ~40 bar pressure change.
- For standard valves the maximum permissible set value is 350bar.

- For special designed valves with permissible set value under 350 bar the set screw must be fitted with a mechanical stop (item 14) (see item E1.1, fig. 3.3).



Caution: This special set screw may never be changed!

- After adjustment is finished hold set screw (item 12/item 42) with the hexagon socket screwdriver and tighten lock nut (item 13/item 43) (tightening torque: 20 Nm).
- Put on the protective cap (item 11/item 41).

4.3 Adjusting the maximum flow via the main spool stroke



Note: Uncontrolled movement of the adjustment screw by several clockwise turns can lead to the failure of the fail-safe position; i.e. the spool of the directional control valve may not be able to return to its neutral position!

Adjustment is effected with the adjustment screw in the main spool cover; see item E3, fig. 3.3.

4.3.1 Procedure:

- Check that the pump flow is adequate.
- Ensure that the directional control valve has reached its maximum stroke:
- manual lever adjustment: ~20° adjustment angle
- hydraulic adjustment: control pressure difference > 18 bar
- electrical adjustment: control current (24V) > 700 mA
control current (12V) > 1400 mA
control current (EEx ia I) > 270 mA

- Do not actuate valve.
- Remove the protective cap (item 31) from the side to be adjusted (actuator A/B).
- Loosen the lock nut (item 33) (wrench size see table 4.3.2).
- Turn the adjustment screw (item 32):
- clockwise to reduce the flow
- counterclockwise to increase the flow

- turn adjustment screw by ~1/2-turn.
- Tighten lock nut (item 33) with the correct tightening torque; see table 4.3.2
- Actuate valve, check the change in actuator speed.
- If actuator speed is o.k. – put on the protective cap (item 31).



Note: If a change will not be achieved, the adjustment of the pressure compensator can be changed.

4.3.2 Table: tightening torques and wrench sizes for the stroke adjustment of the directional control valve spool and of the pressure compensator (para 4.4)

Size	Thread	Allen key / Spanner size					Torque
		Compensator adjuster			Spool-stroke limiter		
		Setscrew (old) ISO4026 (DIN913)	Capscrew (new) ISO4762 (DIN912)	Hexagonal nut DINEN24032 (DIN934)	Setscrew ISO4026 (DIN913)	Sealing nut 'Seal-Lock'	Hexagonal nut and sealing nut
		Item 22 [mm]	Item 22 [mm]	Item 23 [mm]	Item 32 [mm]	Item 33 [mm]	
12	M8	4	6	13	4	13	20
18	M10	5	8	16 (17)	5	17	40
25	M12	6	10	18 (19)	6	19	65

4.4 Adjusting the maximum flow via pressure compensator adjustment (item E2 in fig. 3.3) at actuator module (SZ, SY, SE resp. SD)



Caution: Do not mistake the set screw of pressure compensator spring with maximum pressure-relief device (item E1, fig. 3.3)!

4.4.1 Procedure:

- Depressurize the system! (stop pump).
- Remove the protective cap (item 21, fig. 3.3).
- Stick the hexagon socket screwdriver (according to DIN 911) into the set screw (item 22).
- Turn the adjustment screw (item 22) clockwise until a hard stop is felt.
- Set the adjustment screw counterclockwise by the number of turns-mentioned in table 4.4.2 (with this adjustment the maximum possible speed will be reached).
- To check the speed, start pump and control actuator.
- If speed is too high, set the adjustment screw counterclockwise (reduction of the spring force) until the correct speed (flow rate) for the actuator is reached.



Caution: Never overturn the maximum set of the pressure compensator spring, otherwise the pressure compensator is unable to close and there will be no flow control- and-pressure relief function anymore!

- Tighten lock nut (item 23) with the correct tightening torque; see table 4.3.2
- Put on the protective cap (item 21).



Note: If a change will not be achieved please contact the valve manufacturer.

4.4.2 Table: pressure compensator adjustment for actuator modules (minimum number of turns back from the stop = maximum spring force)

Size	Pressure compensator *1 with check valve function	Pressure compensator *1 without check valve function
	Number of turns	Number of turns
12	9.5	4.75
18	10	4.5
25	-	10

*1 look at 4.4.3

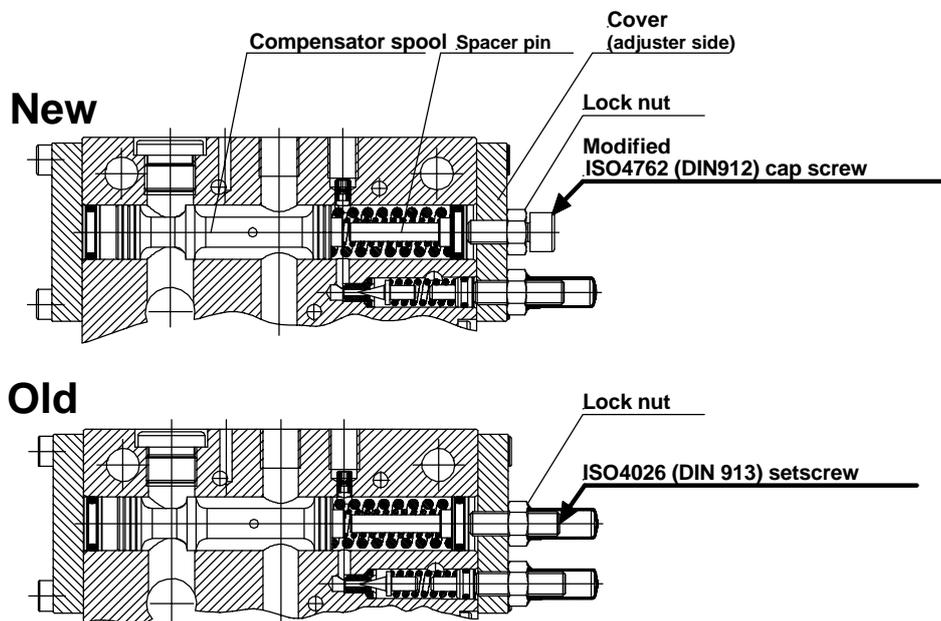


Information for the adjustment of valves with SU/SR modules:

When adjustment of the pressure compensator is finished it could be advantageous to adjust the pressure compensator of the SU/SR module (pump connection module) also (adjustment points see item E5, fig. 3.3). Then it is recommended to use the adjustment value of the SU/SR module mentioned in table 4.4.2

4.4.3 New adjuster on the 2-way compensator (hydrostat)

The previous ISO4026 (DIN 913) setscrew adjuster for the 2-way compensator has been superseded by a modified ISO4762 (DIN912) cap screw adjuster. This change is an improved engineering solution.



This change does not alter in any way the effect produced by the adjuster.

The change merely simplifies the procedure for setting the maximum compensator spring force.

To set the maximum compensator spring force with the previous adjuster, it was necessary to first screw the setscrew in to its end stop and then to un-

screw it by the number of turns specified in the User information leaflet.

To set the maximum compensator spring force with the new adjuster, it is only necessary to screw the cap screw complete with lock nut into the cover as far as it will go.

The maximum compensator spring force is identical in both cases. The spring force can be subsequently reduced by unscrewing the adjuster in the same way as before.

Advantages of the new adjuster:

- the maximum compensator spring force can be set reliably
 - the spring force can be changed easily
- For technical reasons, it is unfortunately not possible to retrofit any valve systems already supplied.



Warning: Replacing the modified cap screw by any other screw is not permitted and can result in failure of the pressure relief function.

4.4.4 Table: pressure compensator adjustment for pump connection module SU/SR (minimum number of turns back from the stop = maximum spring force)

Size	min. number of turns back from the stop
	(= max. spring force)
12	3.5
18	4
25	5

5. Storage notes

The maximum permissible storage period in closed, dry rooms is six months. Longer storage periods (up to 3 years) may be achieved by using suitable packaging materials and preservation.

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