

2-way slip-in cartridge valves series C_ENxx

- $Q_{max} = 3530$ l/min
- $p_{max} = 630$ bar

NG 16/25/32/40/50
 DIN ISO 7368

PRODUCT OVERVIEW

2-way slip-in cartridge valves are hydraulic logic elements which are installed in control blocks with standardised cavities according to ISO 7368. Their simple and compact construction enables very large volume flows with low pressure loss. These properties reduce power loss and increase efficiency. In addition, costs can be saved by the possibility of switching to smaller nominal sizes.

The slip-in cartridge valves of the new C_ENxx series are approved for operation up to a system pressure of 630 bar (9,000 psi). Two different basic versions, the switching and the pressure function, are available in five available nominal sizes NG16, NG25, NG32, NG40 and NG50. Spools with non-return function, damping nose and/or seal complete the range.

OPERATING PRINCIPLE

2-way slip-in cartridge valves require a corresponding control cover (5) for full function. The main function of this control cover is to hold the slip-in cartridge valve in the cavity (6). In addition, the cover (5) can be equipped with an additional pilot valve (7) and an orifice (8).

The slip-in cartridge valve has two main connections «A» and «B» and at least one pilot connection «X» which can be used for the pilot function of the valve. The conical spool (3) is pressed into the sleeve seat (2) by means of a compression spring (4). In closed position, this results in a seattight, leakage-free state and connections «A» and «B» are separated from each other.

2-way slip-in cartridge valves always react to pressurisation. This results in three different forces F_A , F_B and F_X , which act on three important functional surfaces A_A , A_B and A_X . Thus, depending on the individual pressures prevailing in connections A, B and X, these forces influence the response or movement of the spool.

If, for example, the pressure at connection «X» is reduced to the input pressure at connection «A», the valve opens and a volume flow from «A» to «B» is starting.

The spring force operates in the same direction as the pressure at connection «X» and must therefore also be taken into account with regard to the function of the valve.

Explanation of the area ratio:

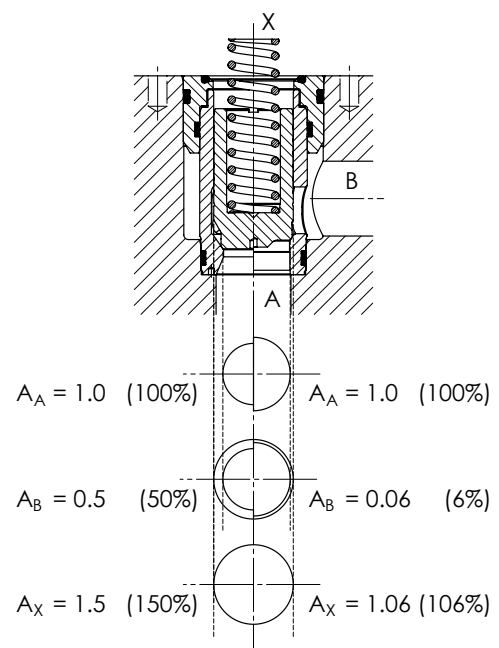
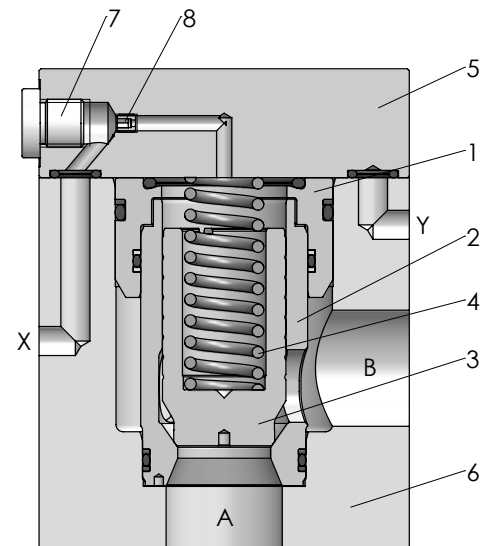
The circular area A_A at the valve seat of the spool is designated 100%. The defined taper on the valve spool influences the size of the ring area A_B . Depending on the execution, this is 0.06 (6%) or 0.5 (50%) of the area A_A (100%). The individual areas are compared with each other and form, among other things, the A_A to A_X area ratio. The area A_X corresponds to the sum A_A and A_B ($A_X = A_A + A_B$).

This results in two different area ratios **1:1.06** and **1:1.5**. These are also referred to as 106% and 150% respectively.

With the modular construction of the individual valve parts and the use of appropriate cover and pilot valve combinations, it is possible to obtain a large number of different functions, for example

- Spool valves (start, stop, direction control)
- Pressure control valves (pressure limitation, pressure relief, pressure sequence and discharge function)
- Non-return valve (spool valves with non-return valve function)

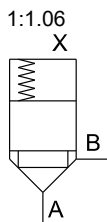
The details of the individual nominal sizes can be found in the corresponding data sheets.



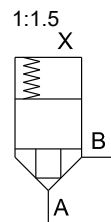
FUNCTION SPOOL VALVE

For the directional function valve spools (3) with an area ratio greater than 1:1 are normally used. This combination has the advantage that the medium flows through the valve not only from connection A to connection B, but also in the opposite direction from B to A. If the pressure at connection A is increased, the valve spool (3) opens the separate connection between connections A and B after the spring force F_F has been overcome. The hydraulic medium begins to flow. With the appropriate control pressure on the surface A_x , the valve can be closed again. If the system requires an inadmissible backflow from B to A, it is possible to use a spool (3) with non-return function. The pressure at connection B is transmitted to the A_x control surface and the valve moves to the closed position.

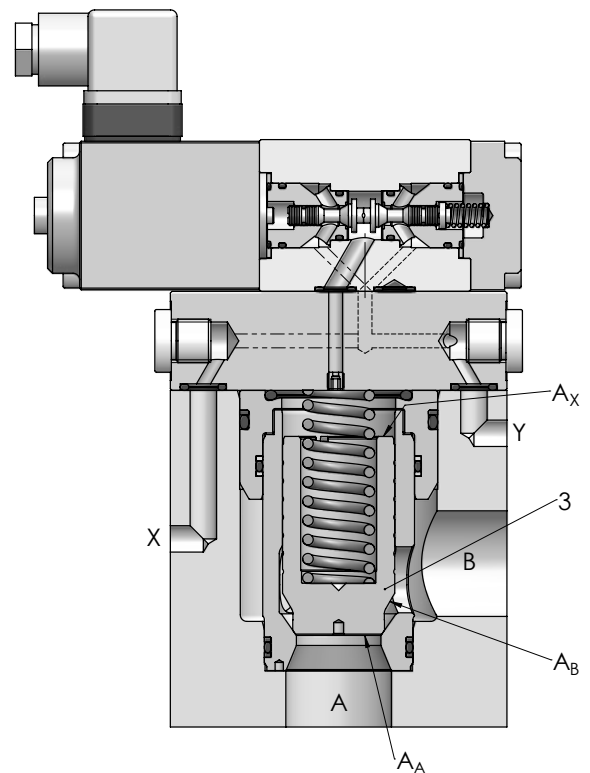
The areas A_A and A_B have an opening effect, A_x with the spring force a closing effect. Four different compression springs are available with nominal opening pressures of 0.5, 1.0, 2.0 and 4.0 bar. The geometry or area ratio of the spools, flow direction and spring force influence the effective opening pressure and can be found in the data sheets for the individual nominal sizes. Valve executions with a spool seal can only be equipped with a 1.0 bar spring and a 2.0 bar spring.

 Area ratio
 A:X


Type CSENxx-11



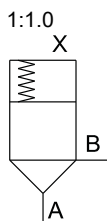
Type CSENxx-15


FUNCTION PRESSURE VALVE

Each hydraulic system contains at least one pressure relief valve, manually or proportionally controlled. With this valve, for example, it is possible to limit a maximum admissible pressure and to discharge the oil-bearing quantity in the event of an overload into the tank without any problems. A typical application is the protection of a pump respectively the pump drive or a cylinder against overload. In addition, it is possible to generate a specified pressing force with a cylinder.

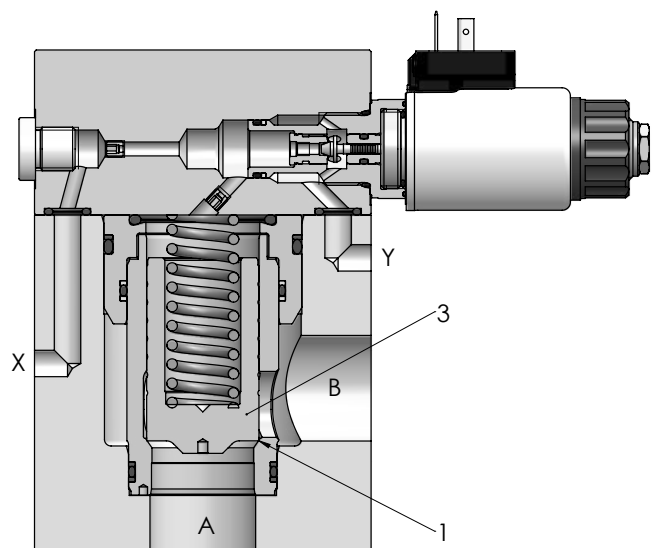
The compressive force on the A_x area and the spring force F_F act against the compressive force on the A_x area. If both forces are equal, the valve is in balance.

Unlike the spool valve, the pressure function has a special valve spool (3), which has an area ratio of 1:1 (area $A_A = A_x$). For fluidic reasons, the seat area (1) on the valve spool (3) is considerably smaller as it is with the directional function. Therefore, pressure valves are only permitted up to 420 bar.

 Area ratio
 A:X


Type

CPENxx-10



NOTE ON INSTALLATION

For proper and correct installation of a 2-way slip-in cartridge valve, the following points must be observed:

Seals (O-rings, support rings)

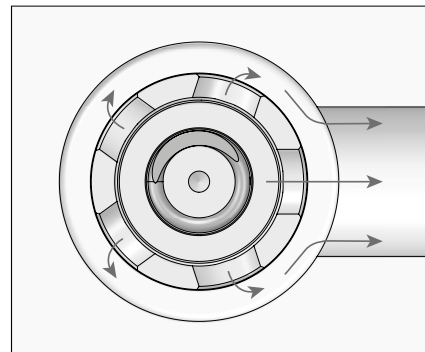
The external sealing elements on the valve must have a correct seat and must not be damaged. Before installation, clean the slip-in cartridge valve of the rust protection used and then lightly grease it. The mounting position in the cavity should be taken into account.

Mounting position of the valve

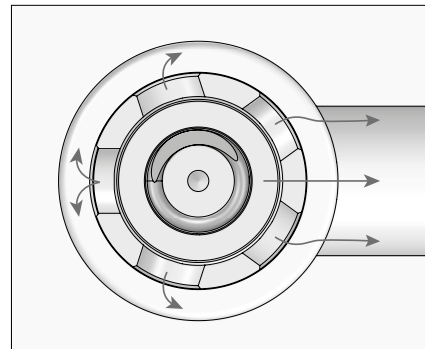
The following two diagrams show how the correct mounting position of a 2-way valve in the cavity ensures that the highest possible power density is maintained.

The valve sleeves have 5 cross bores which are arranged symmetrically to the main connection «B». With the correct mounting position, a higher, more optimal flow is achieved.

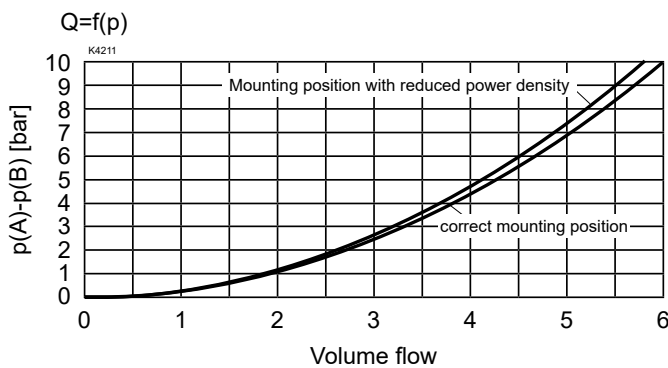
The diagram shows an example showing the difference in flow at a given pressure depending on the orientation of the valve.



Correct mounting position




Mounting position with reduced power density



NOTE ON THE DISMOUNTING TOOL

In order to pull the slip-in cartridge valve out of the cavity and not to damage it during dismounting, a special tool is required.

For each nominal size (NG16 to NG50), a corresponding special tool is available, which engages by a spreading mechanism (2) in the bore recess of the valve sleeve (4) by continuously turning the screw (1) and thus pulls the sleeve (4) and the ring sleeve (3) simultaneously out of the cavity (5).

 **Note!**
Prior removal of the valve spool is indispensable.

