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Data sheets

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Storage tray



Equipment set TP 501
in storage tray

All the components of the equipment set for the technology package TP 501 are retained in a storage tray.

This storage tray serves both as packaging for despatch purposes and as a drawer insert for the Didactic furniture range.

Mounting systems

The components of the equipment set are mounted on the Festo Didactic profile plate. The profile plate has 14 parallel T-grooves equally spaced 50 mm apart.

There is a choice of four alternative systems for mounting the components on the profile plate:

- Variant A:** Detent system, used without additional devices. Clamping mechanism with lever and spring which can be moved along the T-groove, for light non-load-bearing components
- Variant B:** Rotary system, used without additional devices. Grip nut with locking disc and T-head bolt, vertical or horizontal alignment, for medium-weight load-bearing components
- Variant C:** Screw-in system, used with additional devices. Cheese-head bolt with T-head nut, vertical and horizontal alignment, for heavy load-bearing components or components which are rarely removed from the profile plate
- Variant D:** Plug-in system, used with adapter. Components used on plug-in assembly board with locating pins, can be moved along the T-groove, for light non-load-bearing components

The signal input unit and indicator and relay plates can also be mounted in the mounting frame for ER units.

In the case of **variant A**, a slide engages in the T-groove of the profile plate. This slide is pre-tensioned by a spring. When the blue lever is pressed, the slide is retracted to allow the component to be removed from or fitted to the profile plate. Components are aligned with the groove and can be moved along this.

In the case of **variant B**, the component is secured to the profile plate by a T-head bolt and a blue grip nut. A locking disc which can be positioned in steps of 90° is used to position the components, allowing these to be aligned either parallel to or at right angles to the grooves.

After the locking disc has been set to the desired position, the component is placed on the profile plate. When the grip nut is turned clockwise, the T-head bolt is turned through 90° in the T-groove by thread friction. The grip nut is then turned further to clamp the component to the profile plate.

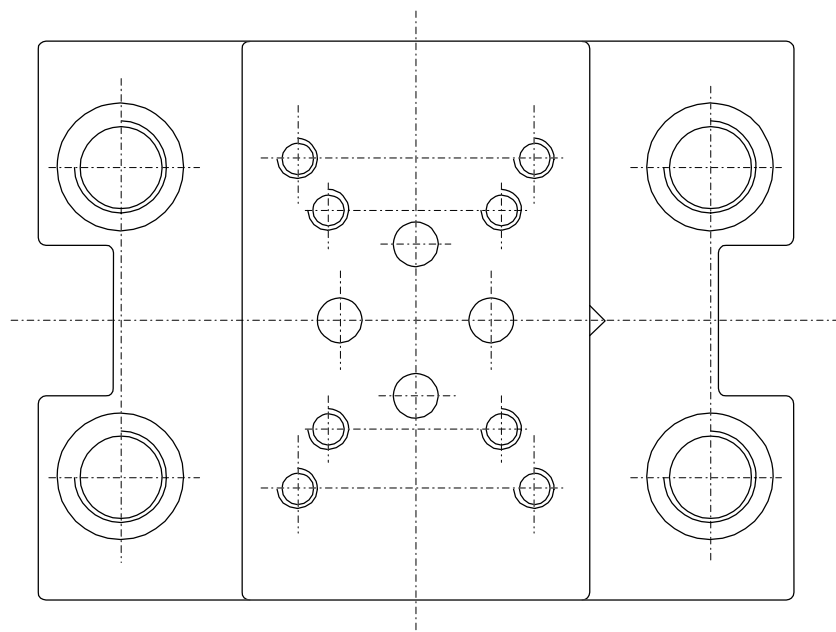
Variant C is used with heavy components or components which are to be secured to the profile plate once only or seldom removed. In this case, components are secured by means of internal-hex-head bolts and T-head nuts.

In the case of **variant D**, our well-proven ER units, for plug-in assembly boards with locating pins on a 50 mm grid pattern, can be attached to the profile plate by means of adapters. A black plastic adapter is required for each locating pin. The adapters are positioned in the T-grooves at intervals of 50 mm and secured by rotating them through 90°. The locating pins of the ER units are then inserted into the holes in the adapters.

Sub-base

The hole pattern of the sub-base for valves of nominal size 4 (DN 4) conforms to ISO 228 size 02. Due to the similarity between this hole pattern and the one for size 03, it has been possible by changing the dimensions slightly and providing additional mounting holes to allow valves of nominal size 6 (DN 6) to be used as well.

Connection panel

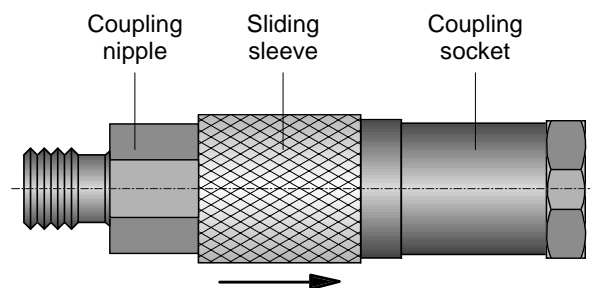


Coupling system

All hydraulic components are equipped with self-closing couplings. These have been designed in particular to be free of leaks, enabling circuits to be assembled and dismantled with virtually no oil leakage, while at the same time allowing connections to be made with very little effort.

A coupling consists of a nipple and socket. Connections are made by pushing a socket onto a nipple. The sliding sleeve then engages to provide a secure connection. This sleeve is pushed back to detach a connection. A spring then pushes the socket away from the nipple.

Coupling nipples can be screwed into the sub-bases. All valves mounted on sub-bases can thus be connected up via nipples. All other components should preferably also be equipped with nipples, and hoses should therefore be fitted with two sockets. Components such as shut-off valves or non-return valves which are connected on one side to hoses and on the other to components are equipped with coupling nipples and coupling sockets respectively.

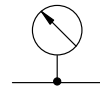


Self-closing coupling

Since the couplings close to create a leakproof seal, it may occur that pressure is trapped inside a component. If this happens, the force required to operate the coupling will increase to such an extent that the component cannot subsequently be coupled up again. The remedy in cases of this kind is to use a pressure relieving device. This is of similar design to a coupling socket but incorporates an adjustment spindle. The spindle should initially be rotated fully out and the device then pushed onto a nipple until the sliding sleeve engages. The spindle can be rotated inward to push back the sealing pin of the nipple and open the seal. The pressure behind the nipple will then be relieved; a drop of oil may escape during this operation. The pressure relieving device can be removed again by pushing back the sliding sleeve.

The coupling systems consist of the following components:

<i>Description</i>	<i>Order No.</i>
Coupling nipple	342 047
Coupling socket	034 649
Pressure relieving device	152 971



Design

Pressure gauge, branch tee, 2 connections (A = nipple, B = socket)

Function

The branch tee can be interposed at any desired point or connected close to a measuring point to allow pressure measurement. The pressure causes a spiral Bourdon tube to open out. This motion is applied to the pointer of the pressure gauge. The position of the pointer is therefore proportional to the pressure applied.

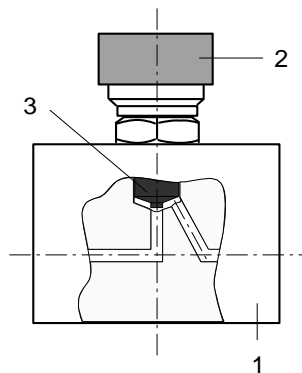
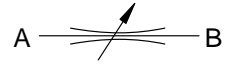
Note

The pressure gauge has a glycerine filled to protect it against impacts, condensation and the entry of water during cleaning.



Medium	Mineral oil, recommended viscosity 22 cSt (mm ² /s)
Accuracy	1.6 % of full-scale value
Indicating range	10 MPa (100 bar)
Operating pressure: Static	3/4 of full-scale value
Dynamic	2/3 of full-scale value
Damping fluid	Glycerine
Actuation	Hydraulic via a spiral Bourdon tube
Connections	For coupling nipple/socket
<i>Subject to change</i>	

Technical data



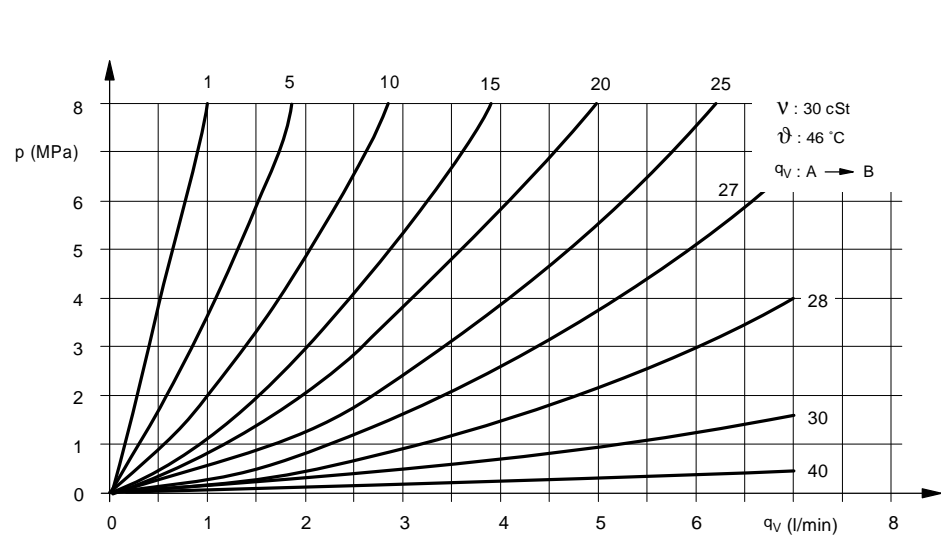
Design

Valve housing (1), rotary knob (2), throttle point (3), nipple (A), socket (B)

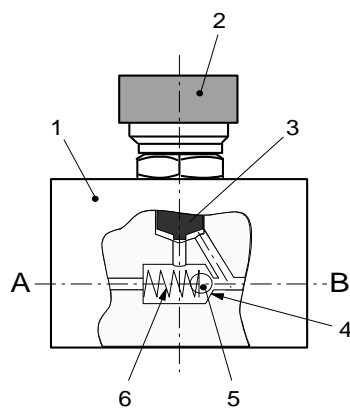
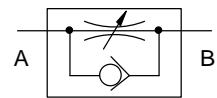
Function

In both directions, from A to B and B to A, hydraulic fluid flows through the throttle point (3), the size of which can be adjusted by means of the rotary knob.

Pressure-drop/
flow-rate characteristic for
various rotary-knob settings
(division lines)



Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure p	60 bar, (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Nominal flow rate	9 l/min
Actuation	Manual
Connections	For coupling nipple/socket
Technical data	<i>Subject to change</i>



Design

Valve housing (1), rotary knob (2), throttle valve (3), valve seat (4), sealing ball (5), spring (6), nipple (A), socket (B)

Function

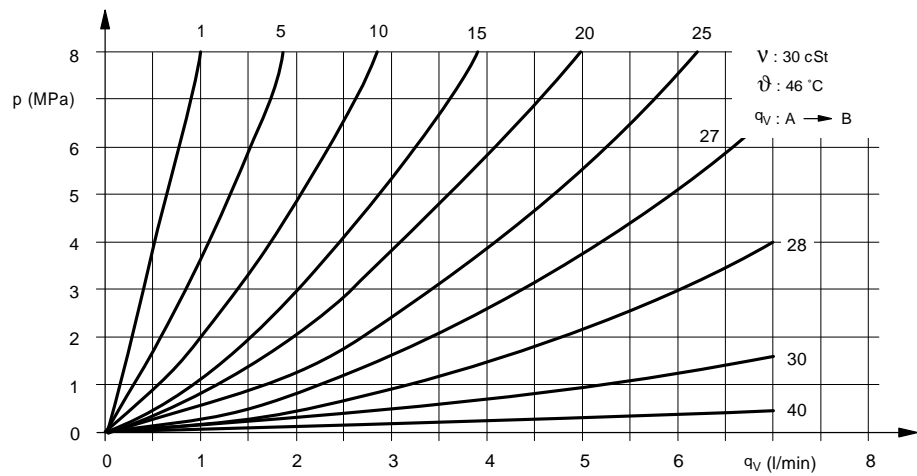
A one-way flow control valve is a combination of a throttle valve and non-return valve. In the flow direction from A to B, the hydraulic fluid flows only through the throttle point (3), the size of which is adjustable by means of the rotary knob (2). The valve seat (4) is closed by the sealing ball (5) and the spring (6). In the opposite direction, the non-return valve is open and the full flow cross-section is available.

Note

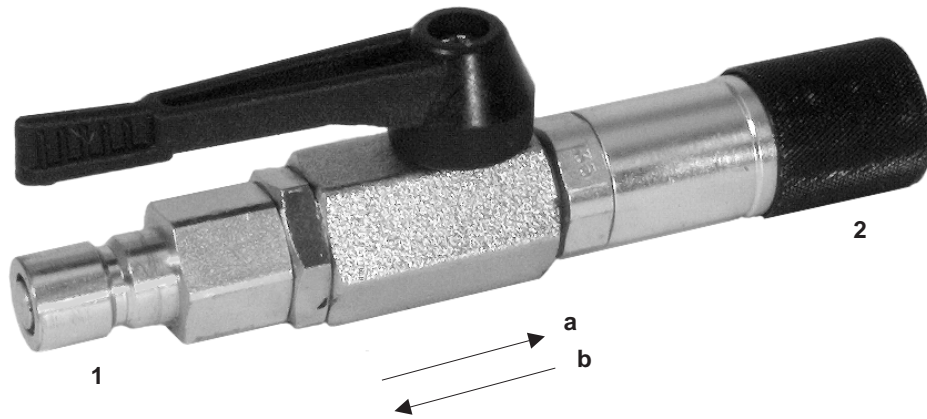
The valve ports identified by letters A and B are the working ports.



**Pressure-drop/
flow-rate characteristic
for various rotary-knob
settings**



Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Nominal flow rate	9 l/min
Opening pressure	0.7 bar (70 kPa)
Actuation	Manual
Connections	For coupling nipple/socket
Technical data	<i>Subject to change</i>

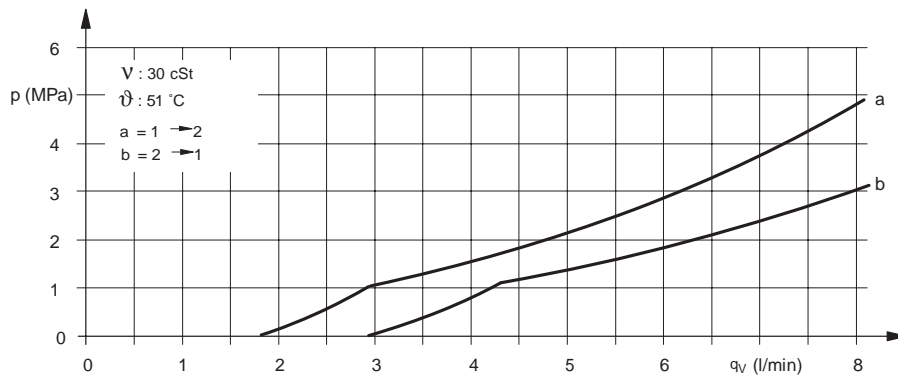


Design

Shut-off valve with two connections.

Function

The shut-off valve can be interposed at any point in the circuit to allow flow to be interrupted by means of the shut-off lever.



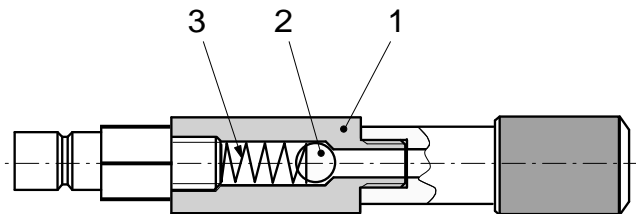
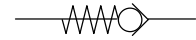
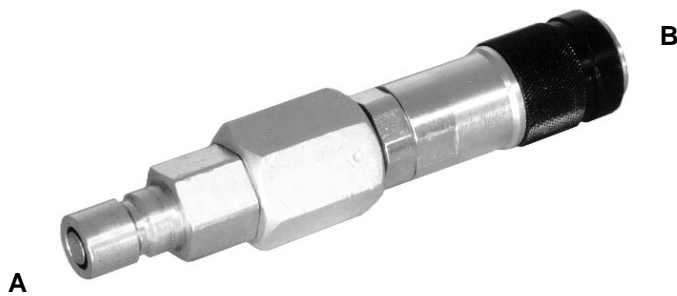
Note

In order to reduce leakage during coupling, the shut-off valve should always be open when being coupled up.



Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Actuation	Manual
Connections	For coupling nipple/socket
<i>Subject to change</i>	

Technical data



Design

Housing (1), sealing ball (2), spring (3), nipple (A), socket (B)

Function

A non-return valve prevents flow in one direction, while allowing free flow in the opposite direction.

In the closed position, the spring (3) presses the sealing ball (2) onto the valve seat.

Flow begins when the pressure in the flow direction exceeds a value of approx. 1 bar or 5 bar. The sealing ball (2) is then lifted off the valve seat against the force of the spring (3).

Note

Circuits must always be depressurised before a non-return valve is coupled up.

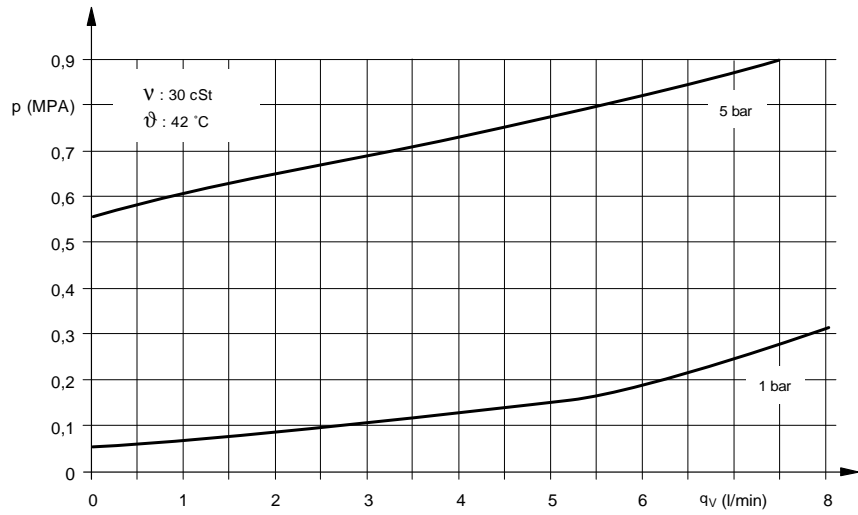
It is **not** possible in this case to release pressure by means of the pressure relief device PN 152971.

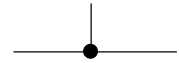
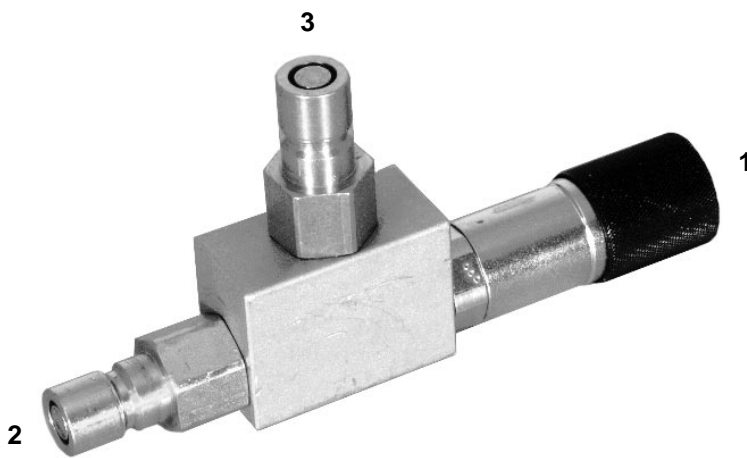


Medium	Mineral oil, recommended viscosity 22 cSt (mm ² /s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p _{max}	120 bar (12 MPa)
Opening pressure	1 bar (0.1 MPa) with PN 152845 5 bar (0.5 MPa) with PN 152846
Actuation	Hydraulic
Connections	For coupling nipple/socket
<i>Subject to change</i>	

Technical data

Pressure-drop/
flow-rate characteristic



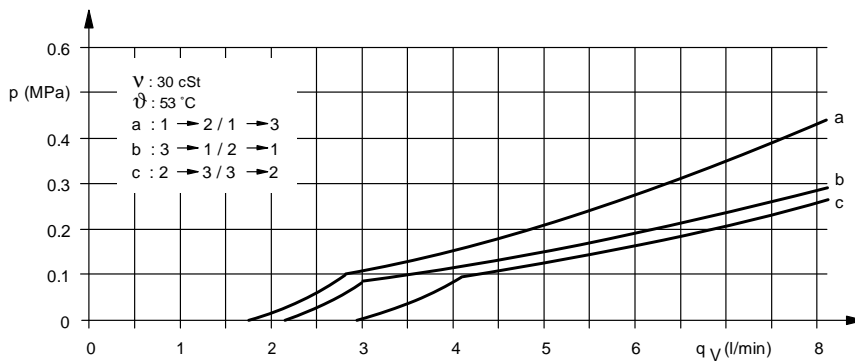


Design

Branch tee with 3 connections (1 = socket, 2 and 3 = nipples)

Function

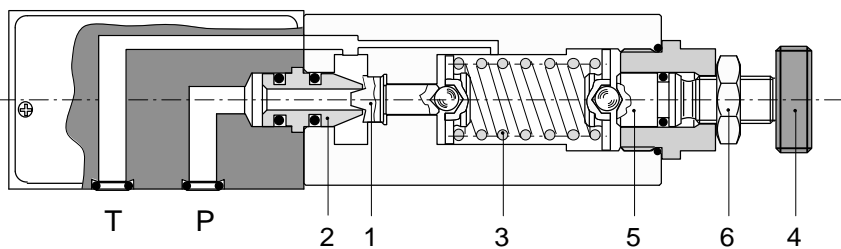
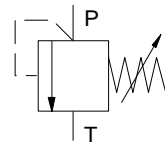
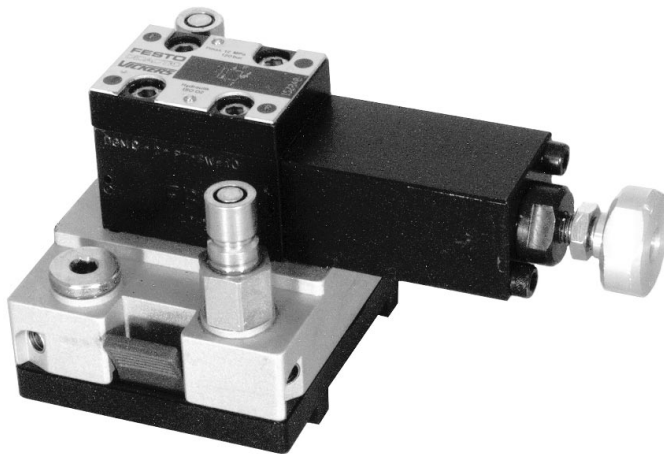
This component can be fitted at any desired point to create a branch.



Pressure-drop/
flow-rate characteristic

Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Connections	For coupling nipple/socket
<i>Subject to change</i>	

Technical data



Design

The pressure relief valve is mounted on a function plate equipped with two coupling nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A").

The valve consists of:

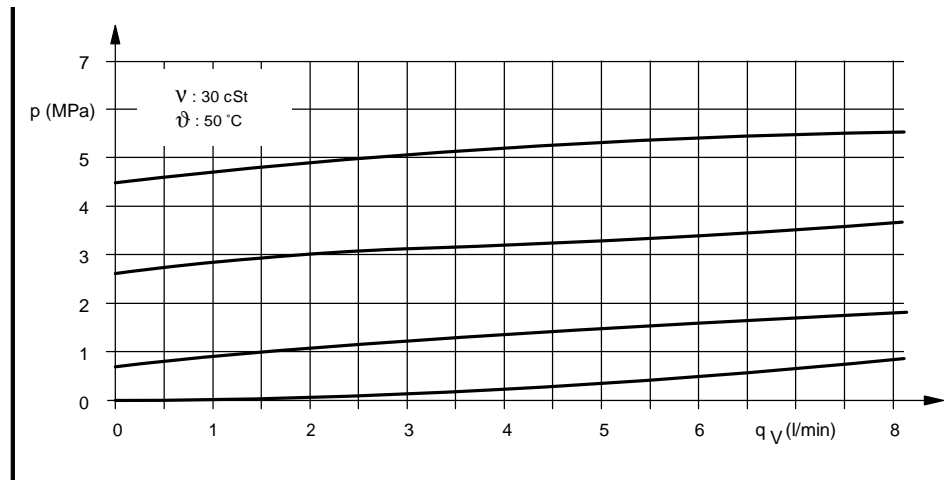
Sealing cone (1), valve seat (2), spring (3), rotary knob (4), threaded spindle (5), lock nut (6).

Function

The valve is closed in the normal position. When the opening pressure is reached at port P, the sealing cone (1) lifts away from the valve seat (2) against the force of the spring (3) and hydraulic fluid is discharged via the return line port T. When the pressure falls below the preset value, the valve closes again.

The valve is used as a pressure relief valve with port T connected to the tank and as a pressure sequence valve with port T connected to a further power component (such as a cylinder).

Pressure/flow-rate characteristic for various rotary-knob settings



Note

The valve ports are identified by letters.

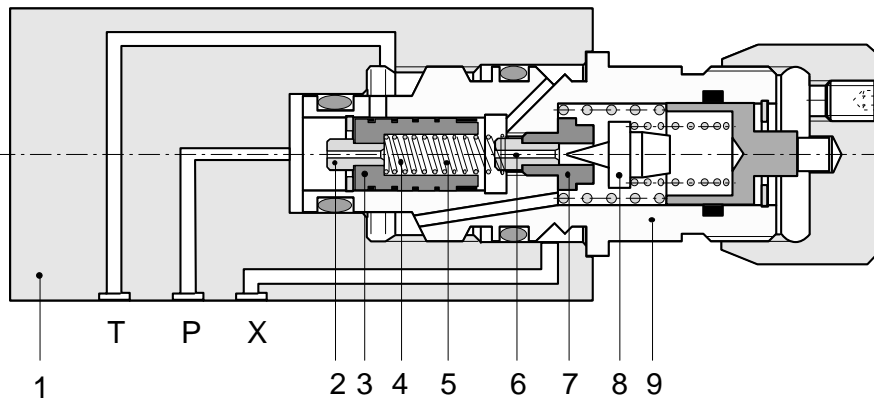
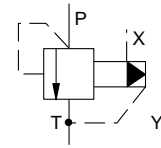
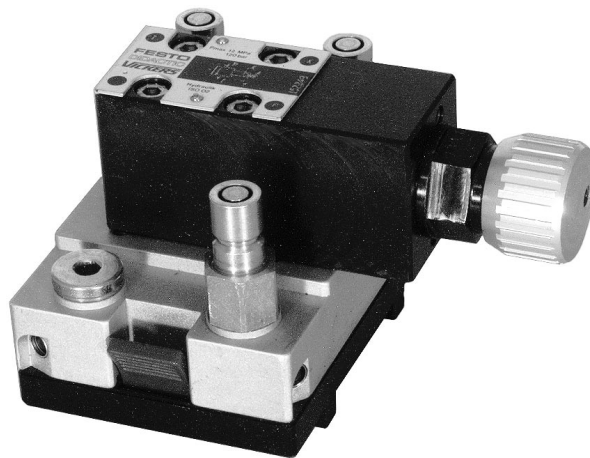
P Supply port

T Return-line port (tank connection)

The valve has an internal leakage-oil line to the tank.

Medium	Mineral oil, recommended viscosity 22 cSt (mm ² /s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Adjustment	Manual
Actuation	Hydraulic
Connections	For 2 coupling sockets
<i>Subject to change</i>	

Technical data



Design

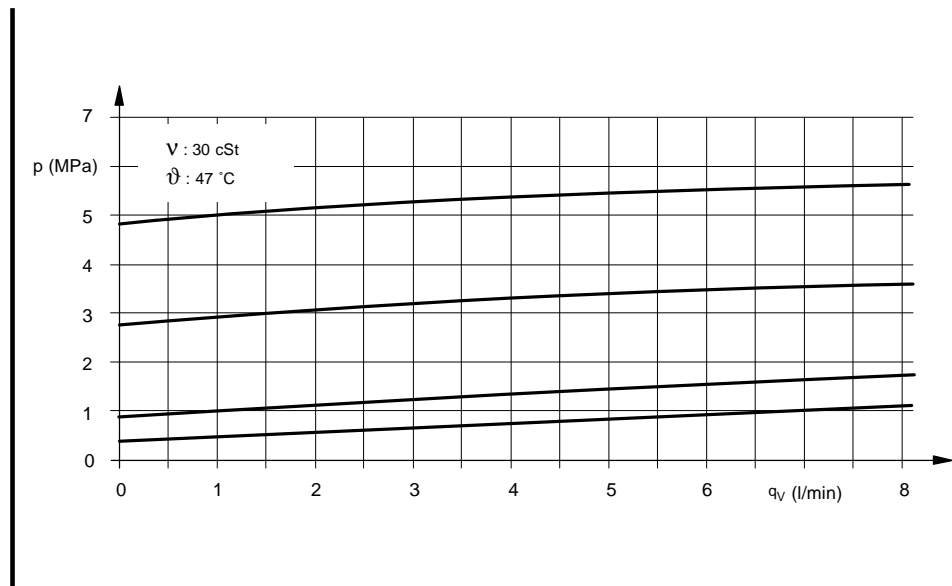
The pressure relief valve and the three barbed fittings are mounted on a sub-base. The component is mounted using the grid system of the profile plate by means of the two blue levers (mounting variant "A").

Housing (1), throttle point (2), piston (3), spring (4), spring chamber (5), linking bore (6), valve seat (7), sealing cone (8), cartridge (9) with main and pilot valves.

Function

The valve is closed in its neutral position. Hydraulic fluid flows from port P through the throttle point (2) and the linking bore (6) to the pilot valve. As long as this is not triggered, the main valve is pressure-compensated and is held in its neutral position by the relatively weak spring (4).

When the opening pressure of the pilot valve is reached, the sealing cone (8) is lifted away from the valve seat (7). The flow of pilot fluid passing through the throttle point (2) and the linking bore (6) flows via the internal link to T. This causes the pressure in the spring chamber (5) to fall; a pressure difference results between the supply side P and the spring chamber (5). The piston (3) leaves its neutral position and ports P is connected to port T.

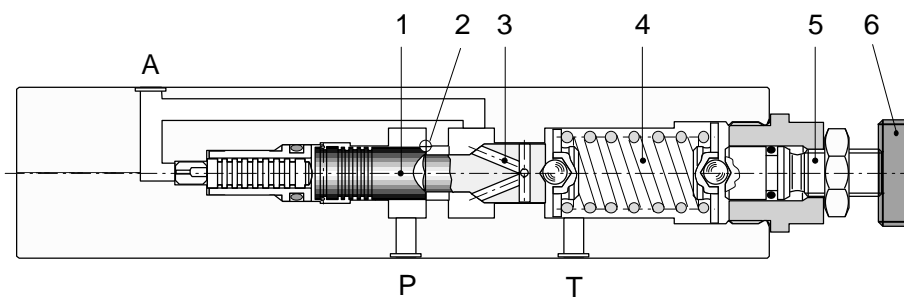
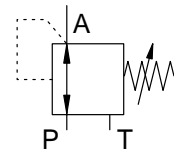
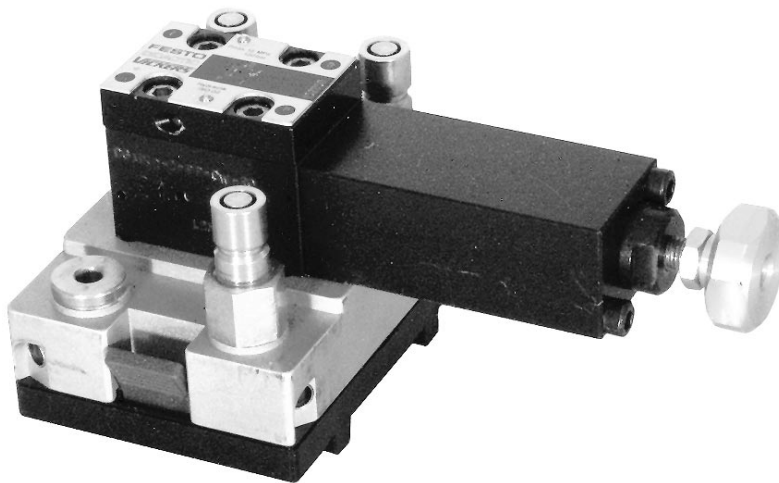


Note

Pilot port X can be used for external piloting, for example for a multi-stage pressure control.

Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Adjustment	Manual
Actuation	Hydraulic
Connections	For 3 coupling sockets
<i>Subject to change</i>	

Technical data



Design

The 3-way pressure reducing valve is mounted on a function plate equipped with three coupling nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A").

Control piston (1), throttle point (2), ducts (3), spring (4), threaded spindle (5), rotary knob (6)

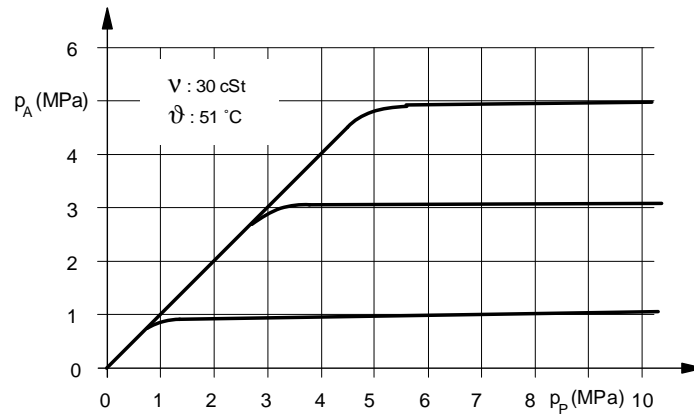
Function

The sectional view shows the normal position of the valve, with flow from P to A via the throttle point (2) of the control piston (1). The pressure at port A is lower than at port P (pressure difference caused by throttle point (2)).

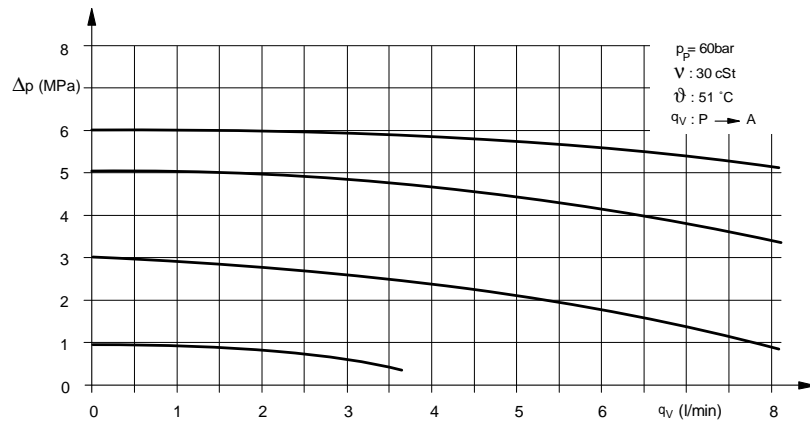
When the pressure rises at port A, the control piston (1) moves against the force of the spring (4) and closes port P. This causes the pressure at port A to fall. The control piston (1) is pushed back by the spring (4), once again allowing flow from P to A. If the pressure at port A exceeds the preset value, the control piston (1) moves still further against the force of the spring (4), allowing flow to T via the ducts (3). The valve is now acting as a safety valve. The pressure at port A is kept virtually constant, even if the pressure at port P fluctuates.

The reduced pressure at port A is adjusted by means of the rotary knob (6), the threaded spindle (5) and the spring (4).

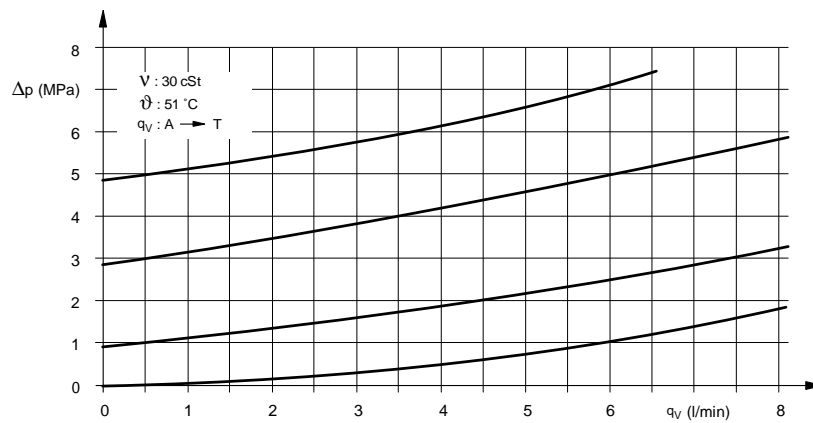
Operating-pressure characteristic for various rotary-knob settings



Pressure/flow-rate characteristic for various rotary-knob settings

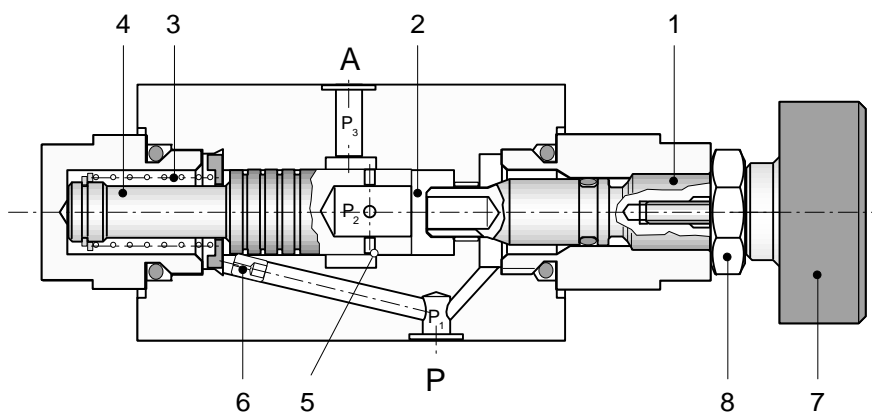
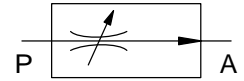
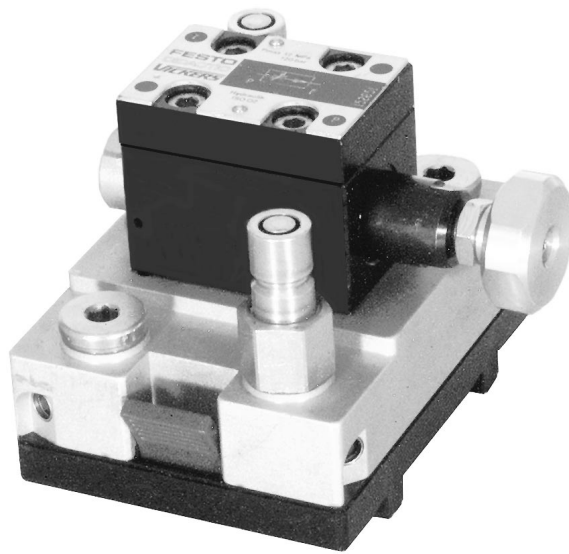


Pressure/flow-rate characteristic for various rotary-knob settings



Technical data

Medium	Mineral oil, recommended viscosity 22 cSt (mm ² /s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p _{max}	120 bar (12 MPa)
Adjustment	Manual
Actuation	Hydraulic
Connections	For 3 coupling sockets
<i>Subject to change</i>	



Design

The 2-way flow control valve is mounted on a function plate equipped with connection nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A").

The valve consists of:

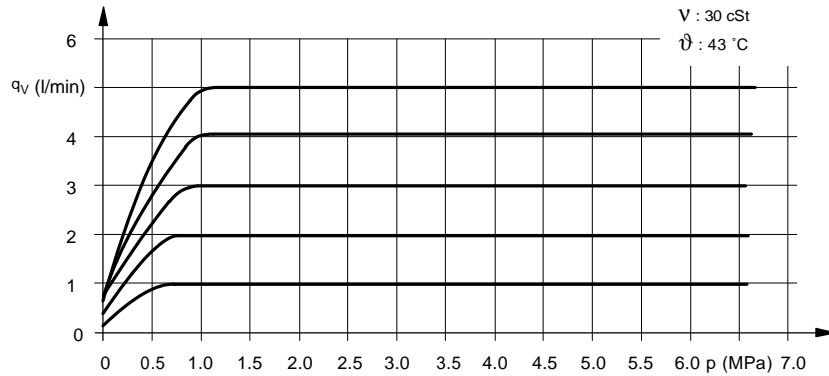
Adjusting spindle (1), adjusting spindle throttle point (2), spring (3), control piston (4), control piston throttle point (5), pilot hole (6), rotary knob (7), lock nut (8).

Function

From the supply port P of the control piston, the hydraulic fluid flows via the adjustable throttle point of the adjusting spindle (2) to the throttle point of the control piston (5) and on to port A. The throttle point (5) is formed by the control piston (4). This adjusts itself in accordance with the pressures p_1 at port P and p_3 at port A and varies the cross-section of the throttle point (5) as a function of pressure in such a way that the difference between p_1 and p_2 at the throttle point (2) remains constant.

The flow rate from P to A thus also remains constant.

Flow-rate/pressure-drop characteristic
for various rotary-knob settings



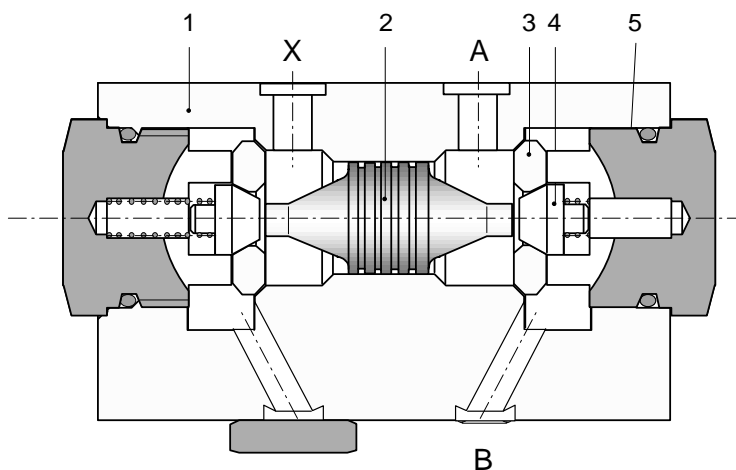
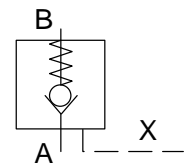
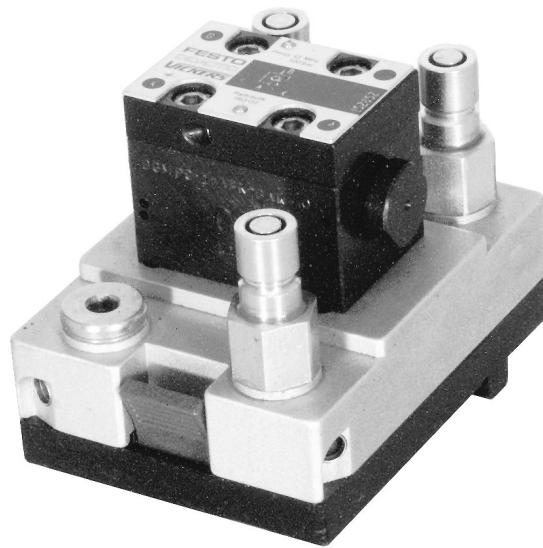
Note

The valve ports are identified by letters.

- P Supply port
- A Working port

Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Adjustment	Manual
Actuation	Hydraulic
Connections	For 2 coupling sockets
<i>Subject to change</i>	

Technical data



Design

This hydraulically piloted non-return valve is mounted on a function plate equipped with three connection nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A").

The valve consists of:

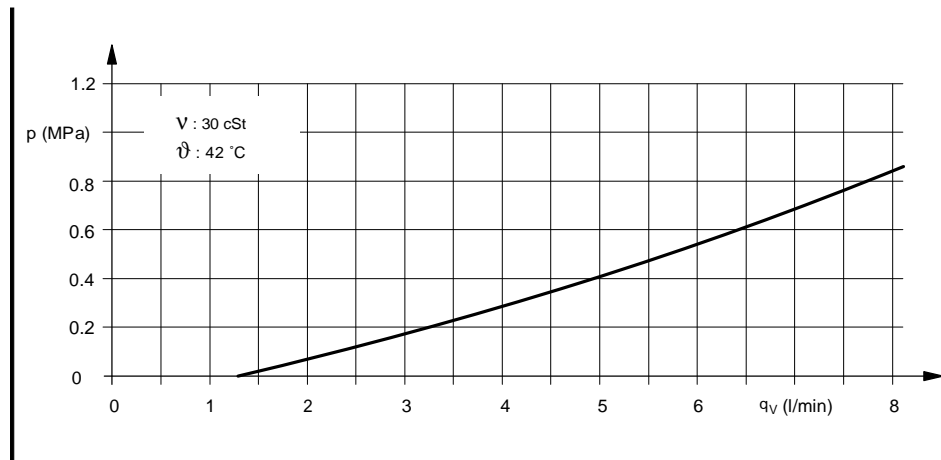
Housing (1), release piston (2), valve seat (3), sealing cone (4) spring (5).

Function

In the closed position, the sealing cone (4) is pressed onto the valve seat (3) by the spring (5). Flow from B to A is disabled.

The closed position is cancelled by applying pressure to the pilot port X. The released piston (2) lifts the sealing cone (4) away from the valve seat (3), enabling flow from B to A.

Pressure-drop/
flow-rate characteristic



Note

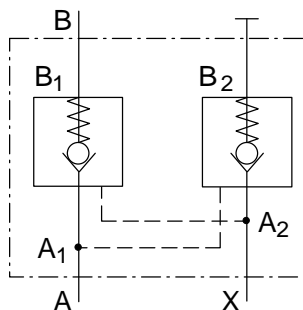
The valve ports are identified by letters.

A, B Working ports

X Pilot port

Double non-return valve, hydraulically piloted

As illustrated by the sectional view, the valve design corresponds to a non-return valve with piloted release in two directions. By using a coupling nipple PN 342047 a double non-return valve with piloted release in one direction will be produced (see symbol).



Technical data

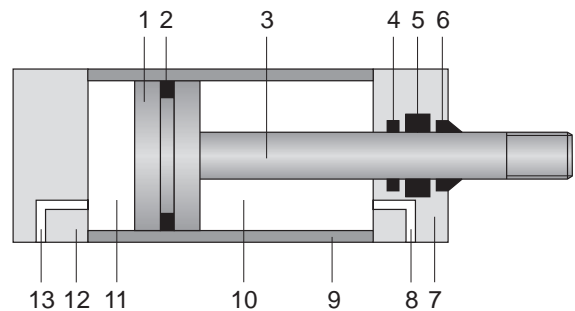
Medium	Mineral oil, recommended viscosity 22 cSt (mm ² /s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Actuation	Hydraulic (3.3 : 1)
Connections	For 3 coupling sockets
<i>Subject to change</i>	



Design

This double-acting cylinder is equipped with a switching cam and two barbed fittings and is mounted on a mounting plate. The unit is secured to the profile panel by the twist-lock system using two blue finger nuts (mounting variant "B"). The cylinder consists of:

Piston (1), piston seal and guide (2), piston rod (3), piston rod bearing (4), piston rod seal (5), scraper ring (6), cylinder cap (7), connections (8 and 13), cylinder barrel (9), piston rod chamber (10), piston chamber (11), cylinder base (12).



Function

The piston chamber (11) is pressurised via connection (13). The action of the pressure on the piston surface produces a force which sets the piston in motion. This causes oil to be displaced from the piston rod chamber; the oil is discharged via connection (8). In order to retract the piston again, the piston rod chamber (10) is pressurised via connection (8). The displaced oil is discharged in this case via connection (13). The piston seal (2) acts as a divider between the two chambers, while the piston guide supports the piston. The piston rod seal (5) provides a seal between the piston rod chamber (10) and the surrounding environment. The scraper ring (6) keeps the rod seal (5) free of contamination. The piston rod bearing (4) guides and supports the piston rod.

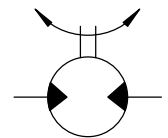
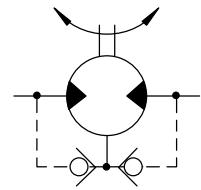
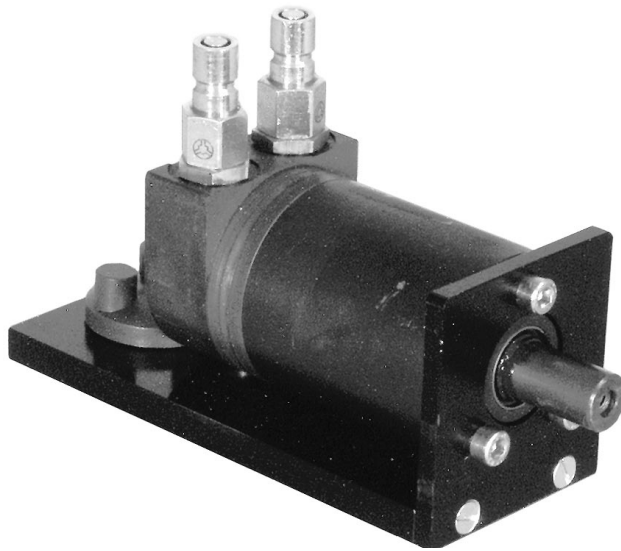
Note

If the cylinder is used in conjunction with the weight PN 152972, ensure that the cylinder is fully secured. For additional safety, the cover PN 152973 can be used with the cylinder PN 152857.

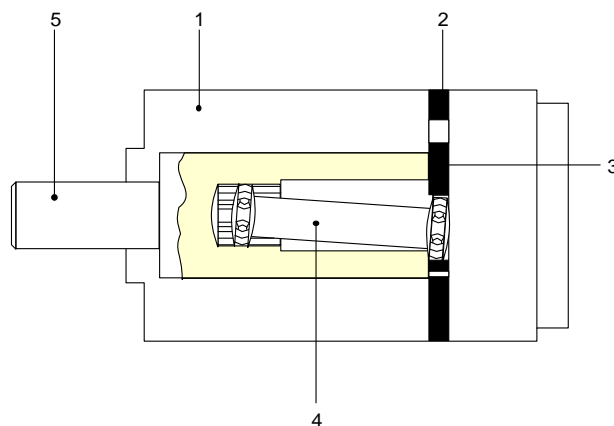


Cylinder version	PN 152857	PN 184489	PN 184488
Medium	Mineral oil: Recommended viscosity 22 cSt (mm ² /s)		
Piston diameter	16 mm		
Piston rod diameter	10 mm, with M8		
Stroke	200 mm	300 mm	400 mm
Operating pressure	6 MPa (60 bar)		
Max. permissible pressure p _{max}	12 MPa (120 bar)		
Connections	To accept 2 connector sockets		
<i>Subject to change</i>			

Technical data



simplified symbol



Design

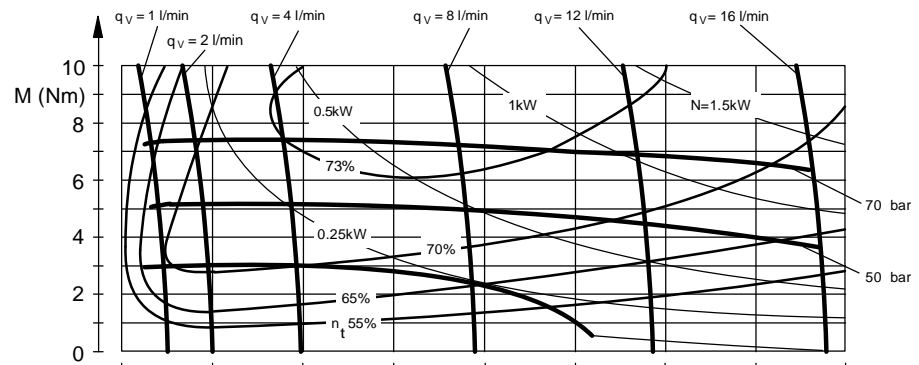
This hydraulic motor is mounted on a mounting plate. The component is fitted to the profile plate using the rotary system by means of two blue grip nuts (mounting variant "B"). The motor consists of:

Housing with pilot ducts (1), fixed internal-toothed gear wheel (2), external-toothed gear wheel (3), universal-joint shaft (4), output drive shaft (5).

Function

The direction of rotation of the motor depends on the direction in which fluid flows through it. Hydraulic fluid is fed in through one of the connection ports, causing the gear wheel (3) to rotate and acting via the universal-joint shaft (4) to drive the output shaft (5). The alternate feed and discharge of hydraulic fluid is controlled via the collector and the pilot ducts in the housing (1).

Torque/
rotary-speed characteristic

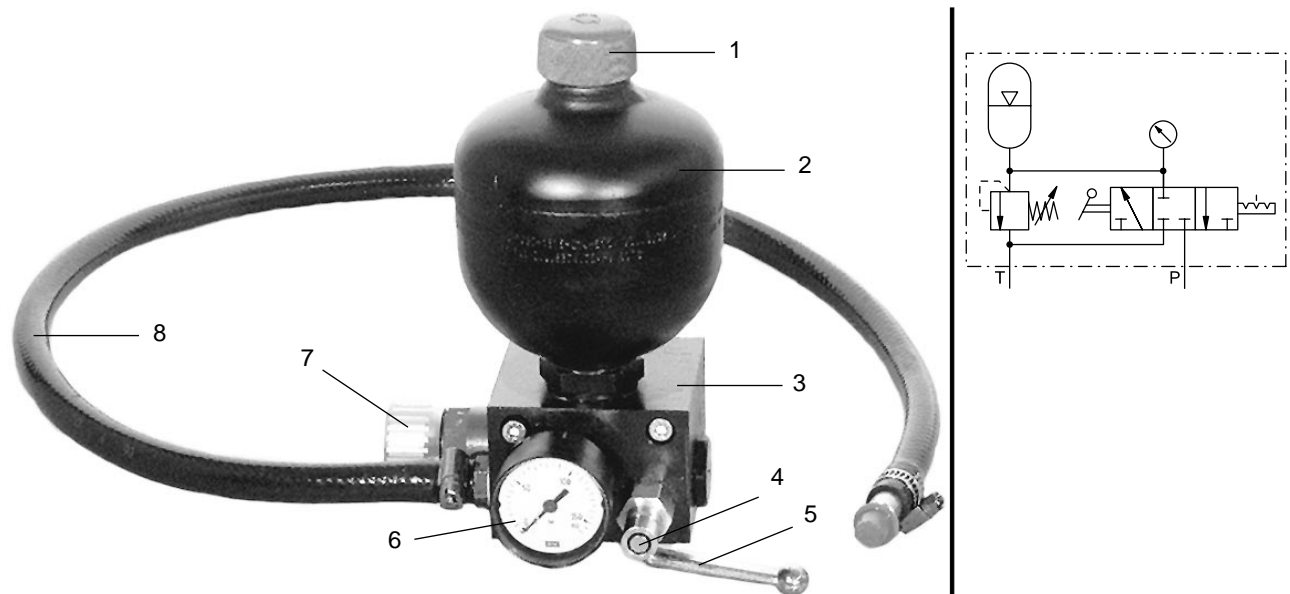


Note

The flow-rate/rotary-speed indicator PN 152991 can be attached using the top cheese-head bolt. Before doing this, however, screw the coupling adapter into the end of the shaft.

Medium	Mineral oil, recommended viscosity 22 cSt (mm ² /s)
Design	Orbital
Geometric displacement	8.2 cm ³
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p _{max}	120 bar (12 MPa)
Max. permissible pressure in return line p _{R max}	50 bar (5 MPa)
Max. rotary speed n _{max}	1950 rpm
Output shaft with spring	Ø 16 x 28, A5 x 5 DIN 6885
Max. permissible shaft load – radial – axial	1600 N 800 N
Connections	For 2 coupling sockets
<i>Subject to change</i>	

Technical data



Design

This accumulator is mounted on a block which contains the associated safety circuit. The component is fitted to the profile plate using cheese-head bolts and T-head nuts (mounting variant "C").

The accumulator consists of: Gas valve (1), pressure vessel (2), shut-off block (3), supply port (4), 3/3-way valve with hand lever (shut-off valve) (5), pressure gauge (6), pressure relief valve (7), tank connection (8)

Function

The pressure vessel (2) is filled via port (4) with the shut-off valve (5) open. This causes the gas volume, separated from the hydraulic fluid by the accumulator diaphragm, to be compressed. As the pressure at port (4) falls, the previously-compressed gas volume expands and displaces the fluid stored in the pressure vessel. The volume of stored fluid corresponds to the change in gas volume between the minimum working pressure and the instantaneous pressure. The instantaneous working pressure is shown on the pressure gauge (6).

The pressure relief valve (7) protects the accumulator against pressure overload. The gas valve (1) allows the gas filling pressure of the accumulator to be checked and corrected with the aid of the filling and test device PN 092491.

Important

Before disconnecting the accumulator unit from a pressure system, open the shut-off valve (5) or drain the unit. Ensure that the return line (8) is connected up while the unit is in operation.



Use only NITROGEN to fill the accumulator (green cylinders) !

Never use oxygen. This would create an EXPLOSION HAZARD !!!

Note concerning the filling of the accumulator

Gas filling pressure, general	$p_0 = 0.9 \cdot p_1$
Gas filling pressure, max.	$p_{0\max} = 0.25 \cdot p_{\max}$
Gas filling pressure, min.	$p_{0\min} = 0.25 \cdot p_2$
Gas filling pressure, temperature-dependent	

$$p_{0\text{temp}} = p_0 \cdot \frac{\text{Filling temperature}}{\text{Operating temperature}}$$

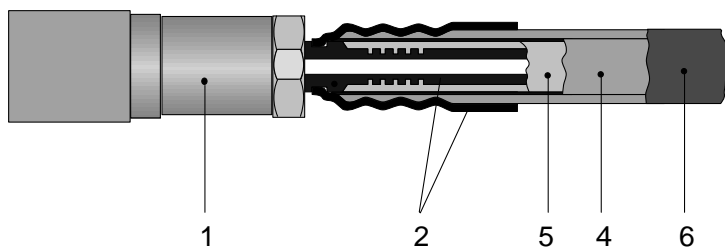
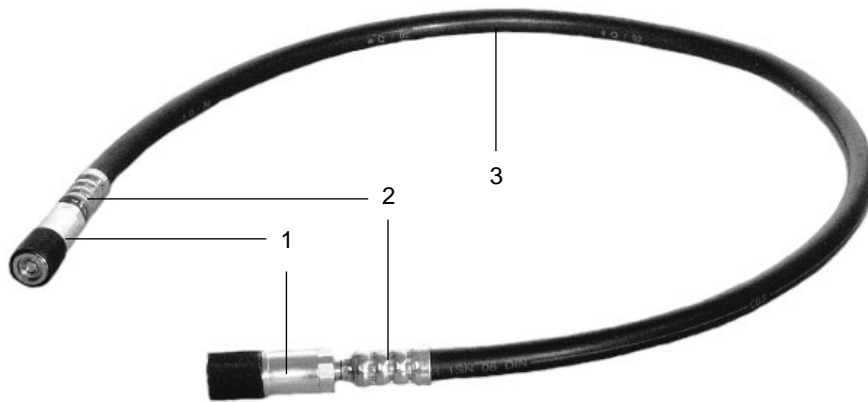
p_0	=	Gas filling pressure
p_1	=	Lower operating pressure
p_2	=	Upper operating pressure
p_{\max}	=	Max. permissible operating pressure

Example

Lower operating pressure	$p_1 = 11 \text{ bar}$
Upper operating pressure	$p_2 = 40 \text{ bar}$
Max. permissible operating pressure	$p_{\max} = 120 \text{ bar}$
Gas filling pressure	$p_0 = 0.9 \cdot 11 \text{ bar} = 10 \text{ bar}$
Gas filling pressure, min.	$p_{0\min} = 0.25 \cdot 40 \text{ bar} = 10 \text{ bar}$
Gas filling pressure, max.	$p_{0\max} = 0.25 \cdot 120 \text{ bar} = 30 \text{ bar}$

Medium	Gas: Nitrogen Fluid: Mineral oil, recommended viscosity 22 cSt (mm ² /s)
Max. permissible pressure p_{\max}	120 bar (12 MPa)
Gas filling pressure as supplied p_0	10 bar (1 MPa)
Nominal volume	0.32 cm ³
Adjustment	Manual
Actuation	Hydraulic
Connections	For 1 quick-acting coupling (P) For 1 blue coupling socket (TS on hydraulic power pack)
<i>Subject to change</i>	

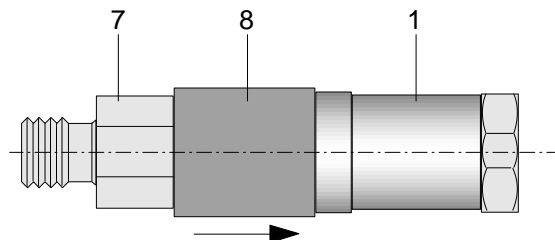
Technical data



Design

Coupling socket (1), fitting (2), high-pressure hose (3), braided wire (4), inner hose (5), cover sheath (6)

The high-pressure hose (3) is of 3-ply design. The inner hose (5) is made of synthetic rubber, the 2nd ply of braided wire (4) and the cover sheath (6) of abrasion-resistant synthetic rubber.



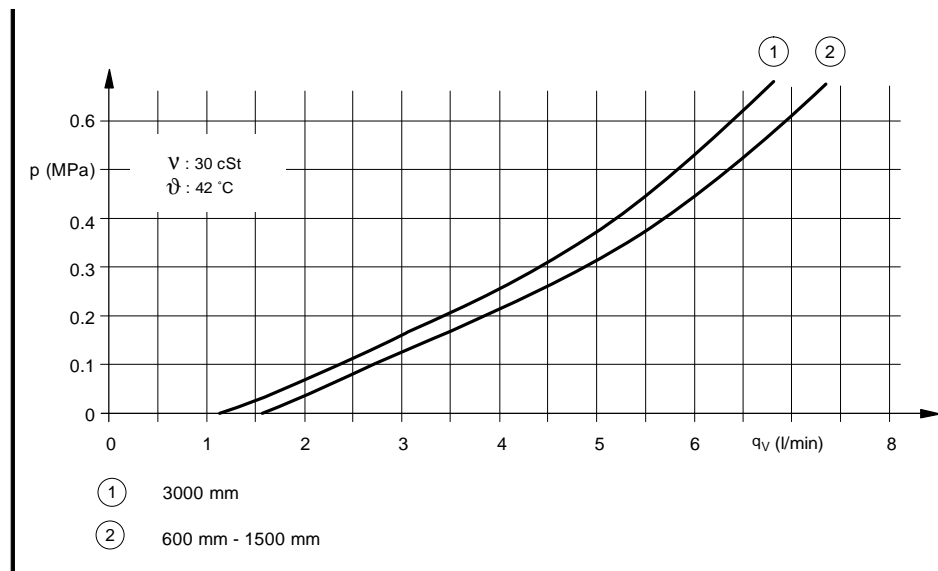
Function

The two coupling sockets (1) are self-closing when uncoupled. These sockets provide a leakproof hydraulic connection in conjunction with the coupling nipple (7). To make a connection, the coupling socket (1) is pushed onto the nipple until the sliding sleeve (8) snaps forward. This sleeve is pulled back to separate the connection. The coupling socket will then spring away from the nipple. Only the front faces of the couplings come into contact with hydraulic fluid during the coupling operation.



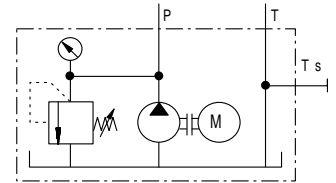
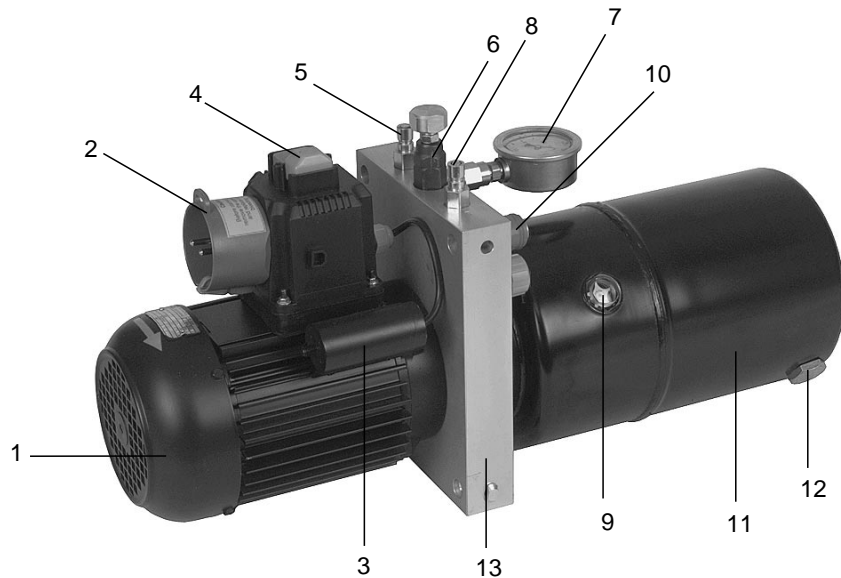
Notes

- Carry out coupling and decoupling only at zero pressure.
- In order to obtain a long service life with the hose lines, ensure that they are not twisted while assembling circuits and observe the specified minimum bending radius and operating temperature.
- The storage and use of hose lines are governed by the following safety regulations:
 - The maximum storage time is 4 years for hoses without fittings and 2 years for hoses with fittings.
 - Hose lines should not be used for longer than 6 years, including a storage period of a maximum of 2 years.
 - Hoses are marked with their date of production (quarter and year) e.g.: 1 Q 92.
 - Hose line fittings are marked with their date of production (month and year) e.g.: 10 93.
 - Fittings (2) are stamped with their maximum operating pressure.



Medium	Mineral oil, recommended viscosity 22 cSt (mm ² /s)
Hose length	600 mm in the case of PN 152960 1000 mm in the case of PN 152970 1500 mm in the case of PN 159386 3000 mm in the case of PN 158352
Nominal size	6 mm
Operating pressure	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Temperature range	- 40 ... +125 °C
Bending radius, min.	100 mm
Connections	For 2 coupling nipples
<i>Subject to change</i>	

Technical data



Design

The power supply unit is fitted on a flange. The device is mounted on the profile plate or another fixture by means of profile connectors (mounting variant "C").

(1) Electric motor, (2) Power supply plug, (3) Capacitor, (4) ON/OFF switch, (5) Pressure port, (6) Pressure-relief valve, (7) Pressure gauge, (8) Tank connection T, (9) Sight glass for level indicator, (10) Tank connection (blue) for reservoir TS, (11) Tank, (12) Drain screw, (13) Flange.

Function

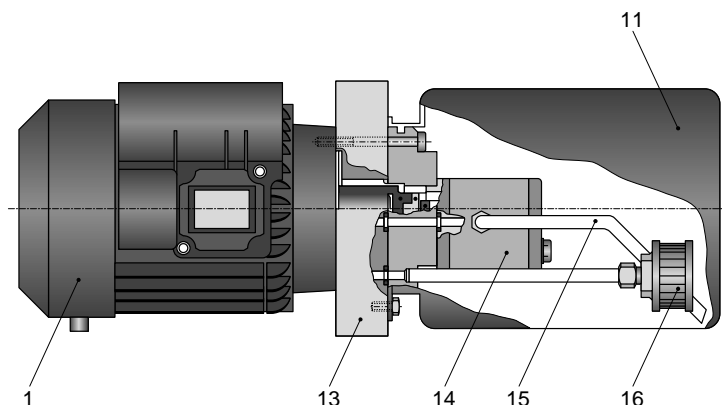
The hydraulic power pack converts electrical energy into hydraulic drive power.

The electric motor (1) drives a gear pump (14). The oil is fed from the tank (11) via the suction pipe (15) and applied at pressure port P (5).

The pressure can be read from the pressure gauge (7). The pump delivers a virtually constant flow rate.

The maximum pressure value is set by means of the pressure relief valve (6). This pressure can only be maintained up to the maximum delivery rate of the pump. If the connected hydraulic circuit requires a higher flow rate, the pressure will fail. The pressure prevailing at this point adapts itself to the flow resistance of the connected circuit, whereby the flow rate e.g. on a pump by-pass circuit, return at low pressure.

The return flow is effected via the tank connection T (8) through the return filter (16) into the tank (11). A blue quick coupling socket (10) has been provided for the return flow from the pressure reservoir. The filling level can be read from the sight glass (9).

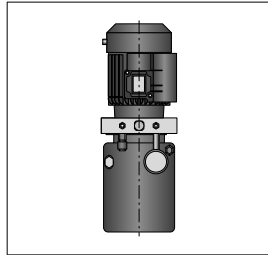


Commissioning

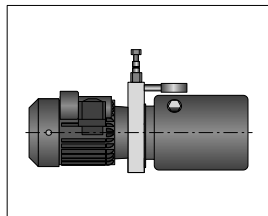
The hydraulic power pack is supplied without oil. The tank is to be filled with approx. 5 l of hydraulic oil before the initial switching on of the power pack.

To fill the tank, the air filter must be unscrewed. The air filter must not be replaced by a blanking plug.

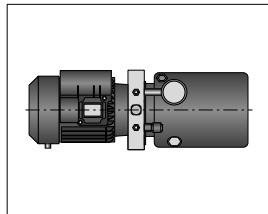
Holes have been drilled on three sides of the flange (13), whereby the power pack can be installed in various positions. Profile connectors are used for mounting. Three assembly positions are possible:



Vertical, electric motor facing upwards.



Horizontal, pressure gauge facing upwards.



Horizontal, pressure gauge on side with connection T facing downwards.

Caution ! In this assembly position, the filling level cannot be read from the sight glass.

The power pack is connected to the power supply plug (2) by means of an extension line. The power pack is switched on by means of pressing the green button and switched off via the red button.



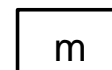
In the filled status, the power pack must always be positioned in such a way that the pressurising/venting screw (red) is above the oil level.

Notes

- The power pack must be operated using the pressurising/venting screw (red).
Caution! Failing this, the tank may burst.
- Regularly check the oil level. The pump must not run dry.
- If an initial start-up of devices takes place, the oil level in the tank is reduced as a result of the displacement. If the oil level can no longer be seen in the sight glass (9), the hydraulic oil must be topped up until the level is visible.
- The power pack is designed for a 50% duty cycle. If continuous operation is required, an external oil cooler is to be used.
- If the thermostatic switch of the electric motor is triggered, the red "off" switch must be actuated after a cooling phase and after checking and eliminating the cause. Normal operation can be re-started following this.
- The hydraulic power pack is not suitable for the connection of a flow measuring container Pt. No. 162344.
- If the hydraulic power pack is moved, carried or transported on a trolley, this can lead to sloshing in the tank. This may cause a small quantity of oil to escape via the air filter.
If the hydraulic power pack is incorrectly installed, whereby the air filter is below the oil level, the tank will discharge, added to which the pump may run dry.
- An increase in the flow rate by means of interconnecting several hydraulic power packs is not feasible, since it is not possible to compensate the various filling levels inside the tanks.

		PN 152962	PN 159328
Electrical	Motor	AC current, single-phase, convection-cooled	
	Nominal power rating	650 W	550 W
	Nominal voltage	230 V	110 V
	Nominal current	3.1 A	8.4 A
	Frequency	50 Hz	60 Hz
	Nominal speed	1320 rpm	1680 rpm
	Protection class	IP20	IP20
	Duty cycle	50%	50%
	Actuation	Manual via ON/OFF switch	
	Connection	Power supply plug to DIN 49441/CEE7 with additional earthing system	
Hydraulic	Medium	Mineral oil, recommended viscosity 22 cSt (mm ² /s)	
	Pump design	External gear pump	
	Volumetric delivery rate	1.6 cm ³	1.3 cm ³
	Delivery rate at nominal speed	2.2 l/min	2.3 l/min
	Operating pressure	5 – 60 bar (0.5 – 6 MPa)	
	Setting	Manual	
	Pressure gauge Indicating range	0 – 100 bar (0 – 10 MPa)	
	Pressure gauge accuracy class	1.6	
	Oil tank capacity	approx. 5 l	
	Return filter, grade of filtration	90 µm	
	Connections	One quick coupling socket for P and T, one coupling for tank line of reservoir Pt. No. 152859	
Dimensions, L x W x H		580 x 300 x 180 mm	
Weight		19 kg empty, 24 kg filled with oil	
<i>Subject to change</i>			

Technical data

**Design**

Steel block, painted, with castors and locking device, rod eye and clevis

Function

Applying loads to a cylinder.

The weight is locked into a profile groove by turning it through 90°.

It can then be attached to the piston rod of the cylinder using the rod eye and clevis.

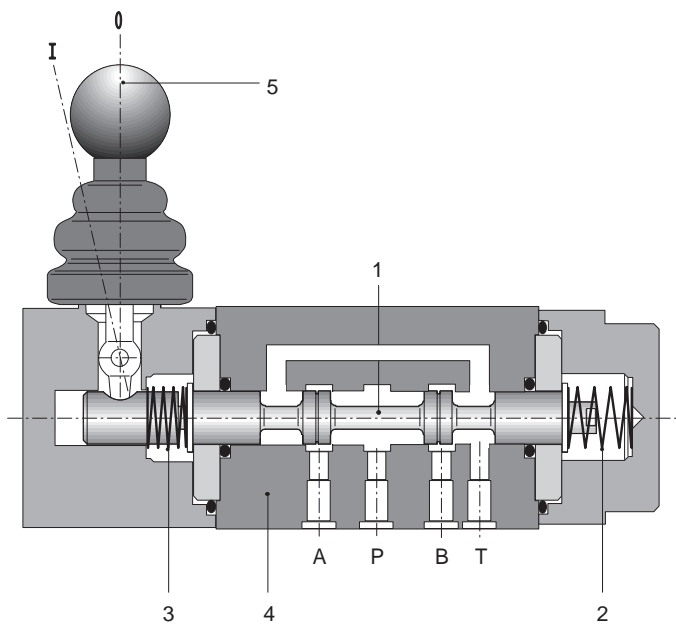
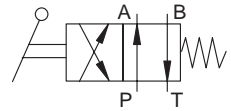
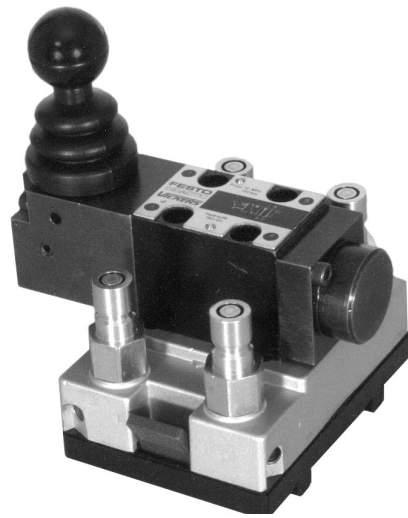
Note

Observe general safety rules. Use the protective cover PN 152973.



Mass	9 kg
Dimensions, L x W x H	150 x 100 x 80 mm
<i>Subject to change</i>	

Technical data



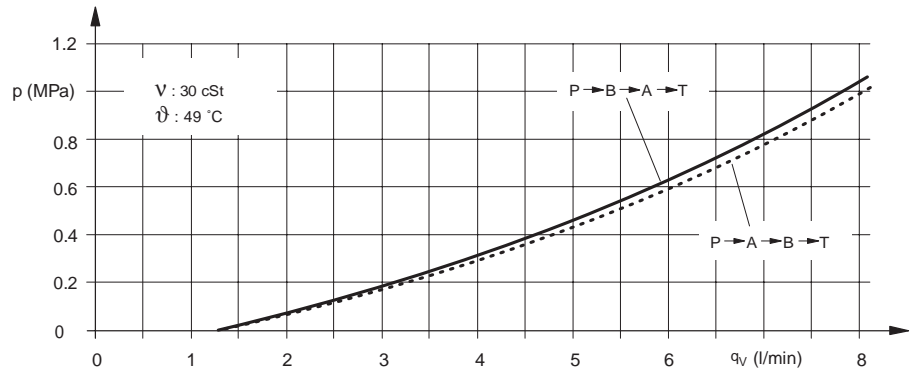
Design

The 4/3-way hand lever valve is mounted on a sub-base equipped with four connection nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A"). The valve consists of: Piston (1), springs (2) and (3), housing (4), hand lever (5).

Function

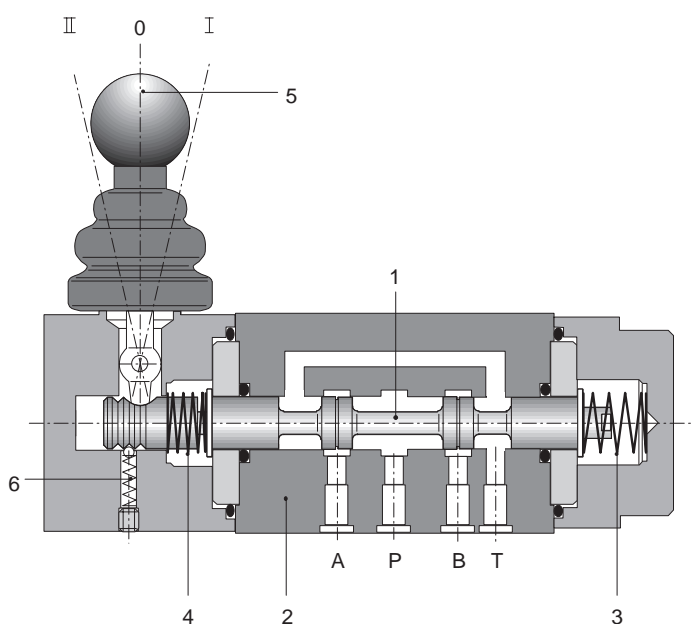
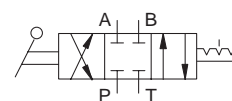
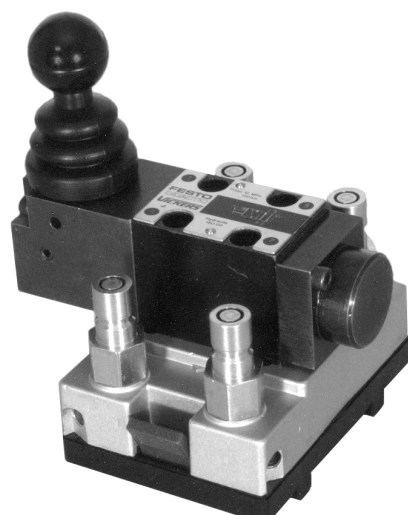
The normal position of the valve, with flow from P to A and B to T, is shown in the sectional view. The piston (1) is held by the springs (2) and (3) in the position shown in the sectional view. Hydraulic fluid flows from the supply port P via the annular groove of the piston (1) to the working port A. At the same time, the working port B is connected to the return-line port T. A position with flow from P to B is achieved by actuating the lever (5). The piston (1) is pressed against the spring (2). This links the supply port P to the working port B via the annular groove of the piston (1) and at the same time connects the working port A to the return-line port T.

Pressure-drop/
flow-rate characteristic



Technical data

Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Actuation	Manual
Connections	For 4 coupling sockets
<i>Subject to change</i>	



Design

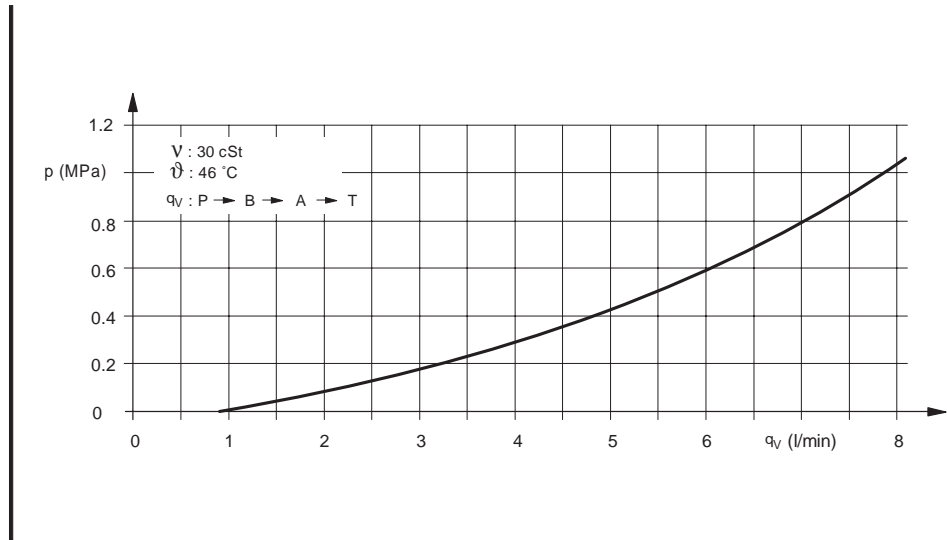
The 4/3-way hand lever valve is mounted on a function plate equipped with four connection nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A"). The valve consists of: Piston (1), housing (2), springs (3) and (4), lever (5), detent mechanism (6)

Function

The sectional view shows the mid-position, with ports P, T, A and B closed (spring-centred piston).

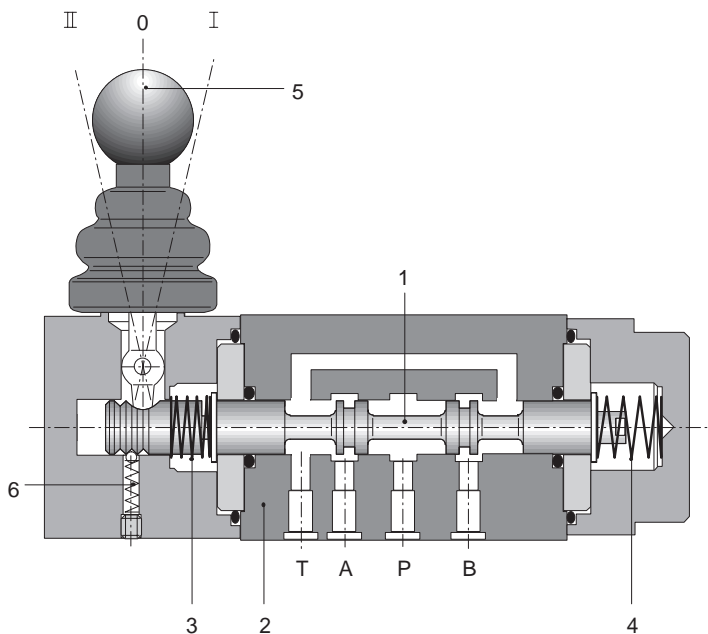
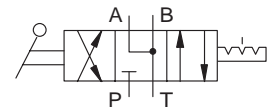
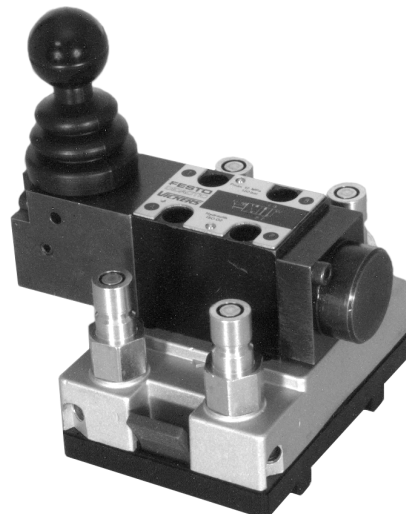
The switching position with flow from P to A is achieved by bringing the lever to position I. The result is that the supply port P is linked to the working port A via the annular groove of the piston (1), while at the same time the working port B is linked to the return-line port T via the second annular groove. The effect of bringing the lever into position II is that the supply port P is linked to the working port B via the annular groove of the piston (1), while at the same time the working port A is linked to the return-line port T via the second annular groove.

Pressure-drop/
flow-rate characteristic



Technical data

Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Actuation	Manual
Connections	For 4 coupling sockets
<i>Subject to change</i>	



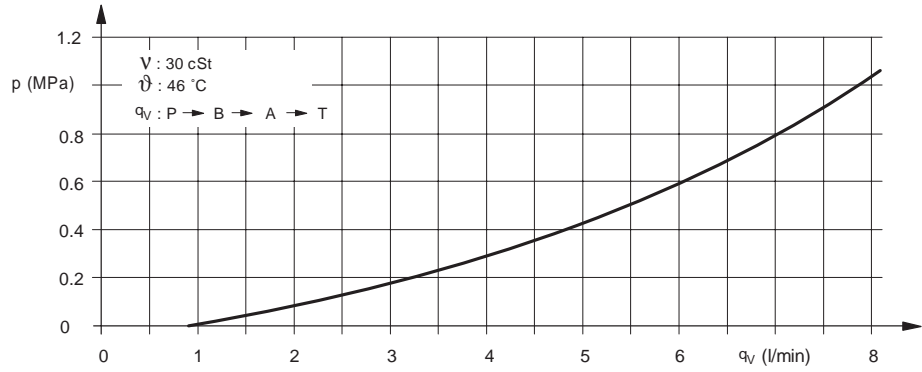
Design

The 4/3-way hand lever valve is mounted on a function plate equipped with four connection nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A"). The valve consists of: Piston (1), housing (2), springs (3) and (4), lever (5), detent mechanism (6)

Function

The sectional view shows the mid-position, with port P closed and ports A, B and T linked (spring-centred piston).

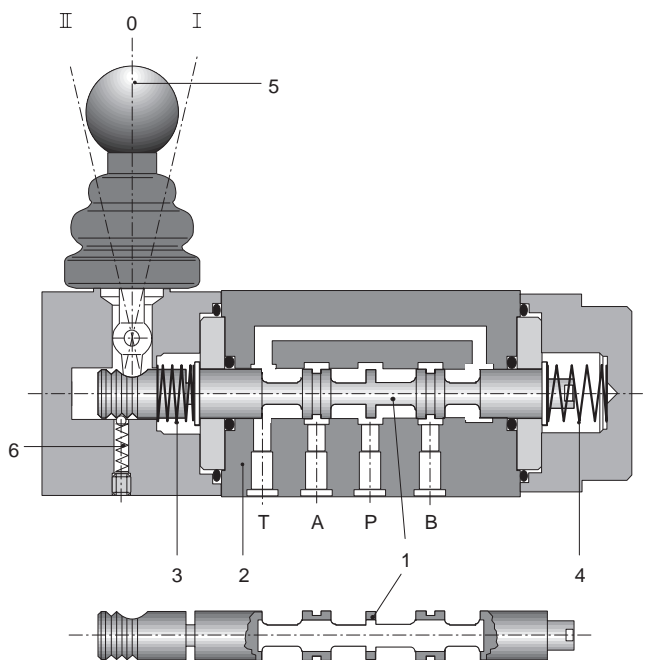
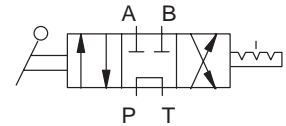
The effect of bringing the hand lever into position I is that the piston (1) allows flow from P to A, while at the same time the working port B is linked to the return-line port T via the second annular groove. When the hand lever (5) is brought into position II, the supply port P is linked to the working port B via the annular groove of the piston (1), while at the same time the working port A is linked to the return-line port T via the second annular groove.



Pressure-drop/
flow-rate characteristic

Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p_{max}	120 bar (12 MPa)
Actuation	Manual
Connections	For 4 coupling sockets
<i>Subject to change</i>	

Technical data

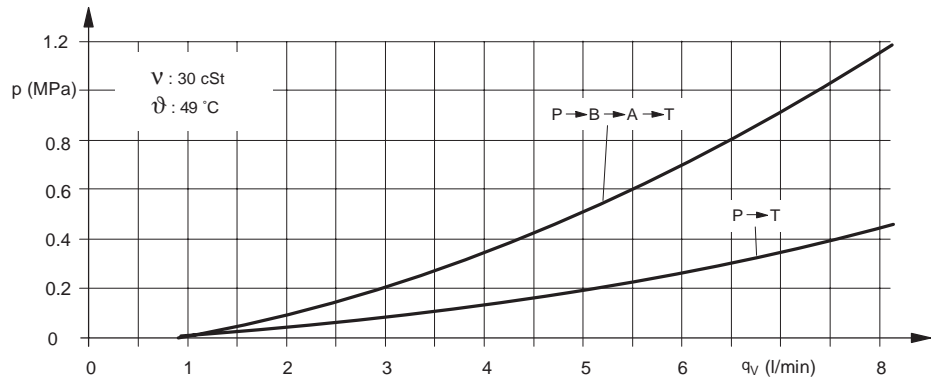


Design

The 4/3-way hand lever valve is mounted on a function plate equipped with four connection nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A"). The valve consists of: Piston (1), housing (2), springs (3) and (4), lever (5), detent mechanism (6)

Function

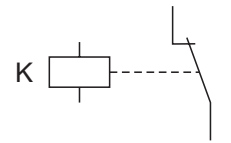
The sectional view shows the mid-position, with P and T linked via the hollow piston and A and B closed (spring-centred piston). The switching position with flow from P to A is achieved by bringing the hand lever (5) into position II. The result is that the supply port P is linked to the working port A via the annular groove of the piston (1), while at the same time the working port B is linked to the return-line port T via the second annular groove. When the hand lever (5) is brought into position I, the supply port P is linked to the working port B via the annular groove of the piston (1), while at the same time the working port A is linked to the return-line port T via the second annular groove.



Pressure-drop/
flow-rate characteristic

Medium	Mineral oil, recommended viscosity 22 cSt (mm ² /s)
Operating pressure p	60 bar (6 MPa)
Max. permissible pressure p_{\max}	120 bar (12 MPa)
Actuation	Manual
Connections	For 4 coupling sockets
<i>Subject to change</i>	

Technical data

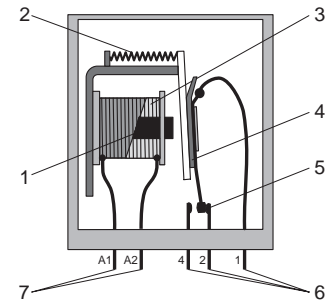


Design

This component consists of three relays with connections and two bus-bars for the power supply. All electrical connections are in the form of 4 mm sockets. The unit can be mounted in a mounting frame or on the profile plate using four plug-in adapters.

Function

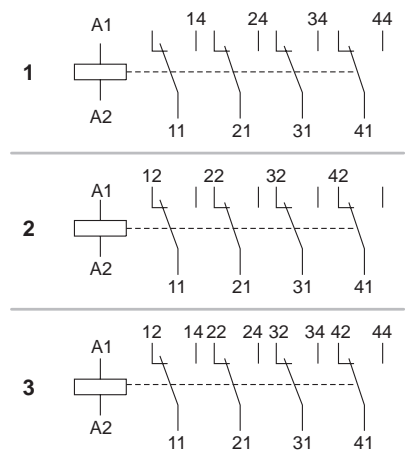
The relay consists of a coil with a core (1) and winding (3) with connection lugs (7), an armature (4), a return spring (2) and a contact assembly with four changeover contacts (5) and connection lugs (6). When power is applied to the coil connections, current flows through the winding, creating a magnetic field. The armature is pulled onto the coil core and the contact assembly is actuated. Electrical circuits are opened or closed via this assembly. When the electrical current is removed, the magnetic field collapses and the armature and contact assembly are returned to their original position by a return spring.



Note

The switching status of the relays is indicated by LEDs, which are protected against incorrect polarity.

The four changeover contacts of the contact assembly can be used as normally-open contacts (1), normally-closed contacts (2) or changeover contacts (3).

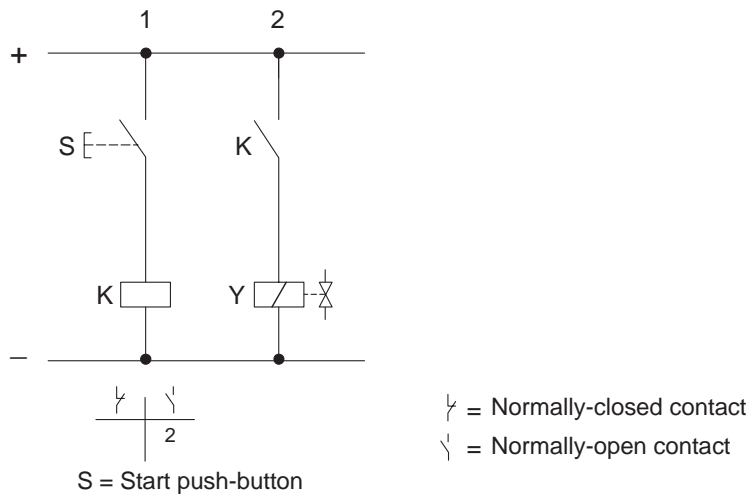


Voltage	24 V DC
Contact assembly	4 changeover contacts
Contact rating	Max. 5 A
Contact interrupt rating	Max. 90 W
Pichup time	10 ms
Drop-off time	8 ms
Connections	For 4 mm safety connector plug
Electromagnetic compatibility	
Emitted interference	tested to EN 500 81-1
Noise immunity	tested to EN 500 82-1
<i>Subject to change</i>	

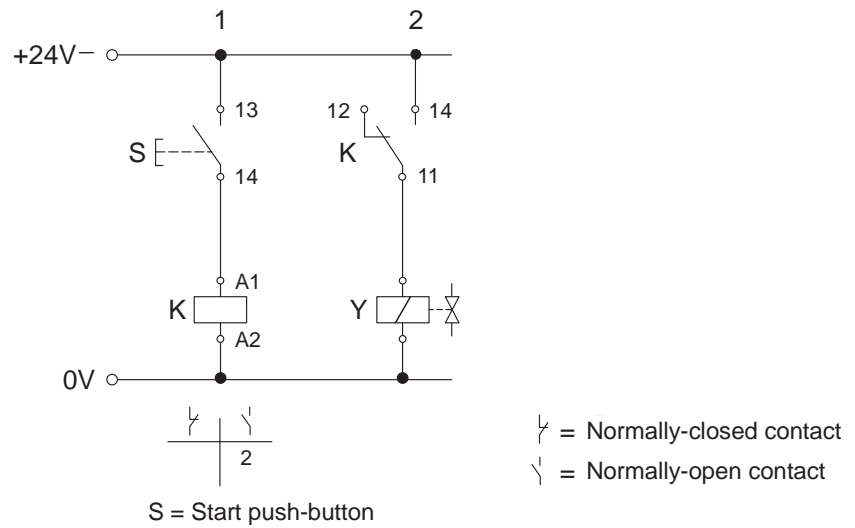


Technical data

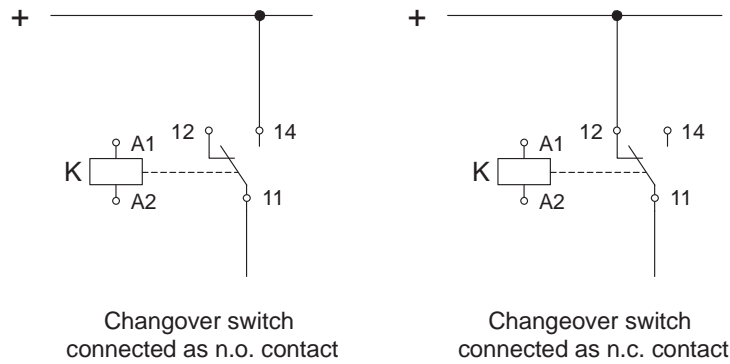
Example of application:
Circuit diagram,
electrical

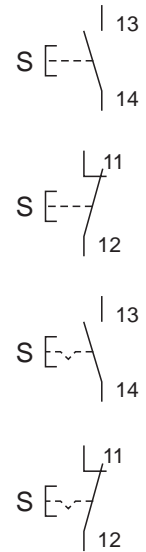
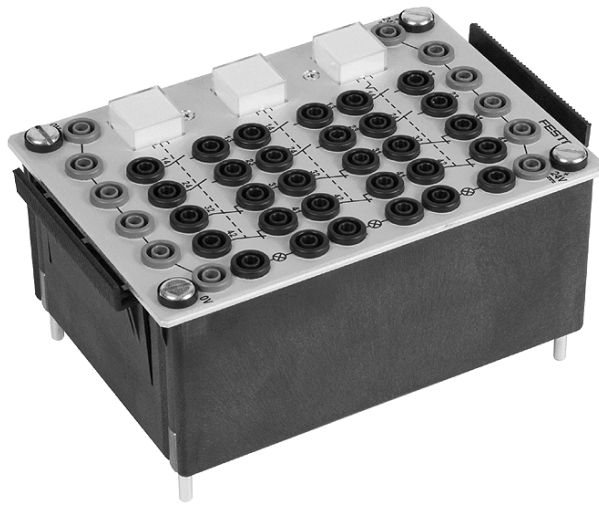


Example of application:
Practical assembly,
electrical



Normally-open contacts,
normally-closed
contacts:
Allocation of contacts on
relay plate





Design

This component consists of two illuminated pushbuttons in the form of momentary-contact switches and one illuminated pushbutton in the form of a detented switch. All electrical connections are in the form of 4 mm safety connectors. The unit can be mounted in a mounting frame or on the profile plate using four plug-in adapters.

Function

The **illuminated pushbutton** in the form of a detented switch consists of a contact assembly with two normally-open contacts and two normally-closed contacts, together with a colourless transparent pushbutton cap with a miniature lamp. The contact assembly is actuated by pressing this cap. Electrical circuits are opened or closed via the contact assembly. When the cap is released, the switching status is maintained. The contact assembly is returned to its initial position by pressing the pushbutton a second time.

The **illuminated pushbuttons** in the form of momentary-contact switches consist of a contact assembly with two normally-open contacts and two normally-closed contacts, together with a colourless transparent pushbutton cap with a miniature lamp. The contact assembly is actuated by pressing this cap. Electrical circuits are opened or closed via the contact assembly. When the cap is released, the contact assembly returns to its initial position.

Note

When power is applied to the connections of the visual indicator, the switching status is displayed by the built-in miniature lamp in the pushbuttons.

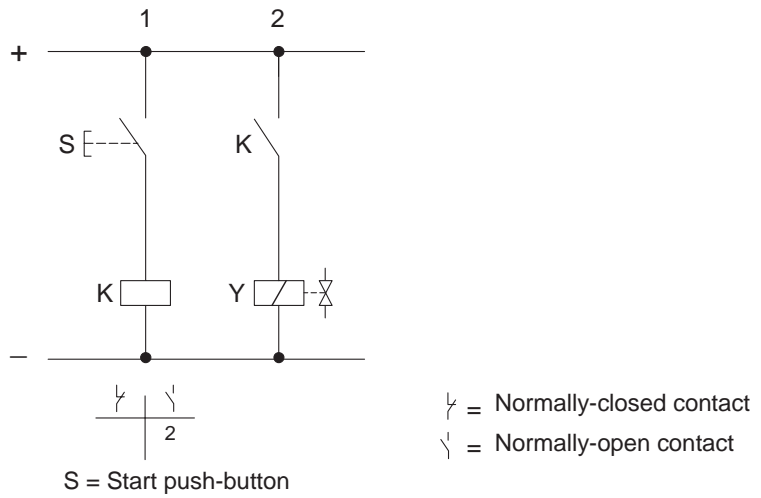


Voltage	24 V DC-
Contact assembly	2 normally-open contacts, 2 normally-closed contacts
Contact rating	Max. 1 A
Power consumption (miniature lamp)	0.48 W
Connections	For 4 mm safety connector plug
Electromagnetic compatibility	
Emitted interference	tested to EN 500 81-1
Noise immunity	tested to EN 500 82-1
<i>Subject to change</i>	

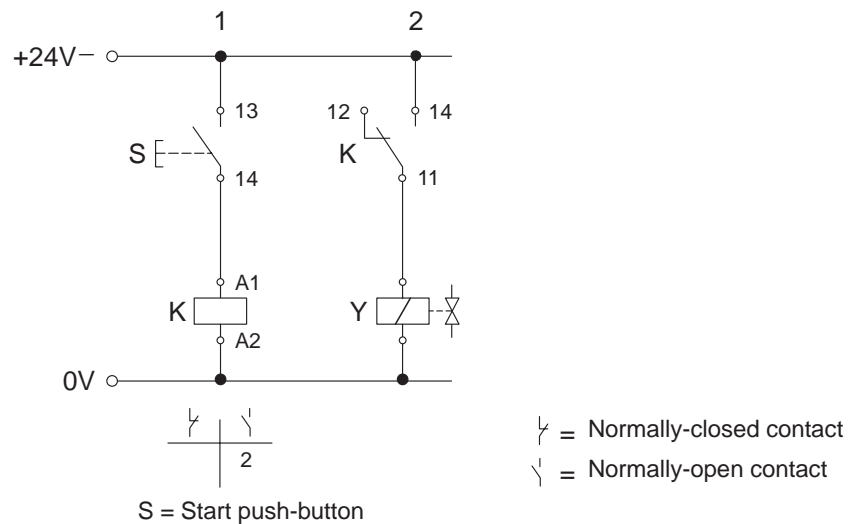


Technical data

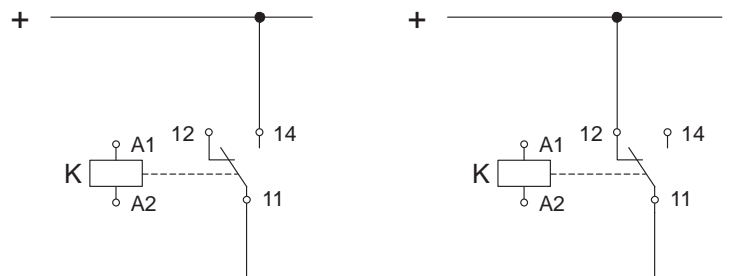
Example of application:
Circuit diagram,
electrical



Example of application:
Practical assembly,
electrical

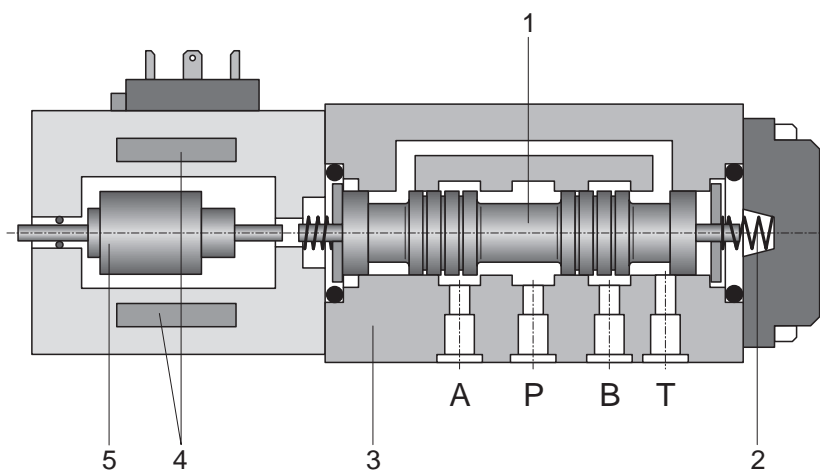
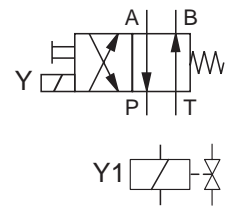
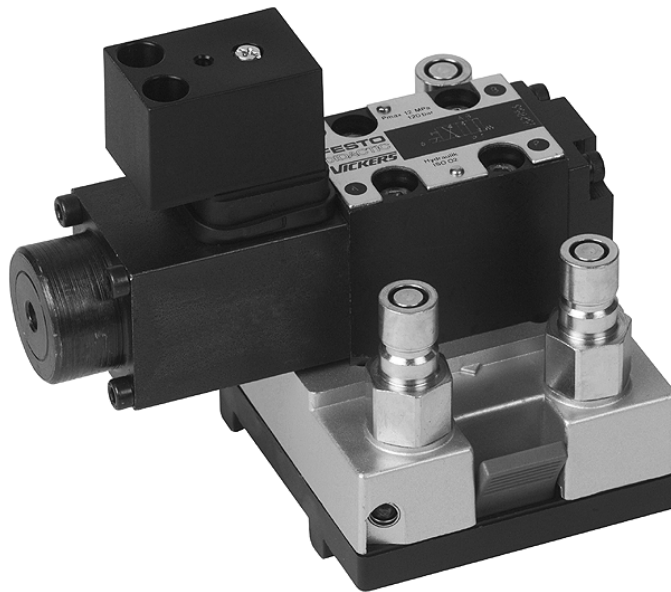


Normally-open contacts,
normally-closed
contacts:
Allocation of contacts
on relay plate



Changeover switch
connected as n.o. contact

Changeover switch
connected as n.c. contact



Design

The 4/2-way solenoid valve is mounted on a function plate equipped with four nipple connectors. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A").

The valve consists of:

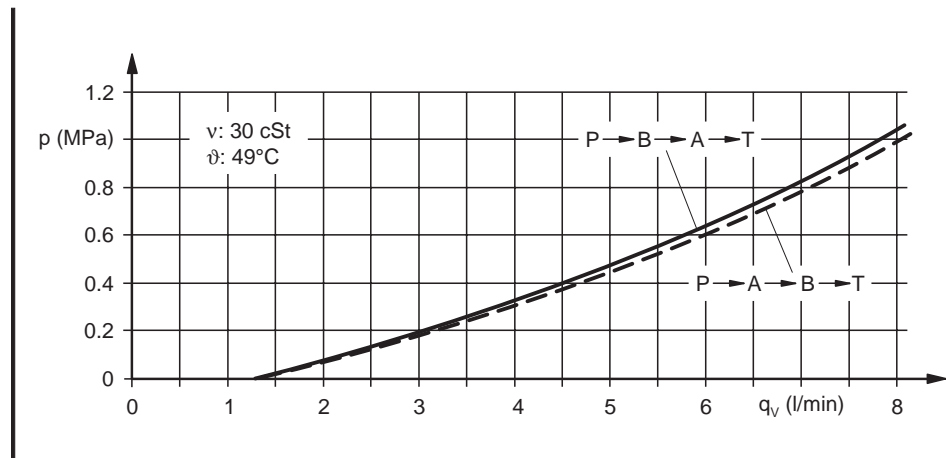
Piston (1), spring (2), housing (3), solenoid coil (4), armature (5).

Function

The normal position of the valve, with flow from P to A and B to T, is shown in the sectional view. The piston (1) is held by the spring (2) in the position shown in the sectional view. Hydraulic fluid flows from the supply port P via the annular groove of the piston (1) to the working port A. At the same time, the working port B is connected to the return-line port T.

A position with flow from P to B is achieved by applying power to the solenoid coil (4). The armature (5) presses the piston (1) against the spring (2). This links the supply port P to the working port B via the annular groove of the piston (1) and at the same time connects the working port A to the return-line port T.

Pressure-drop/
flow-rate characteristic



Note

The valve ports are identified by letters.

A, B Working ports

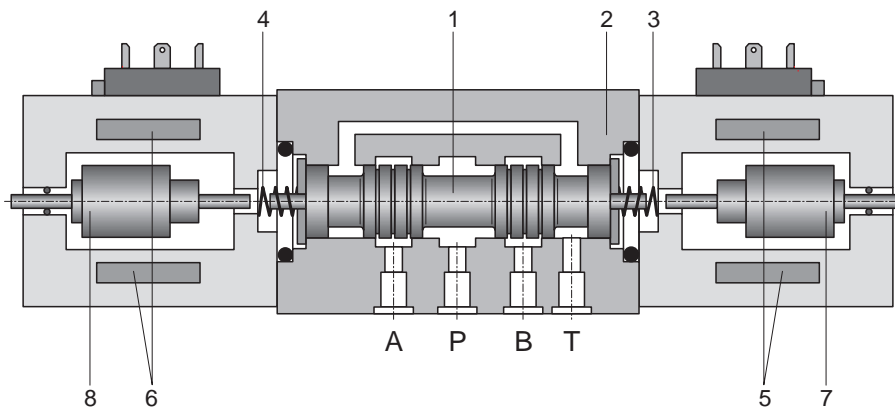
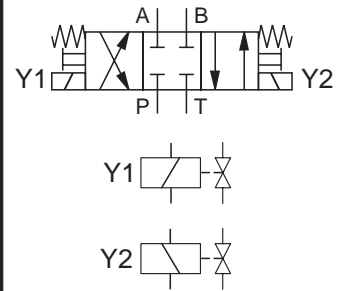
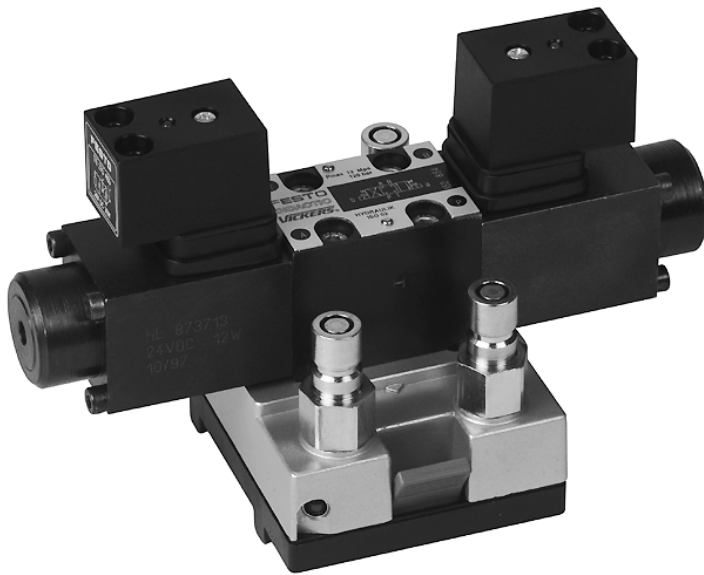
P Supply port

T Return-line port (tank connection)

The electrical connections are protected against overvoltage. The switching status is indicated by an LED.

Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Voltage	24 V DC
Power rating	12 W
Actuation	Electrical
Connections, electrical	For 4 mm safety connector plug
Connections, hydraulic	For 4 coupling sockets
<i>Subject to change</i>	

Technical data



Design

The 4/3-way solenoid valve is mounted on a function plate equipped with four connection nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A").

The valve consists of:

Piston (1), housing (2), springs (3), (4), solenoid coil (5), (6), armatures (7), (8).

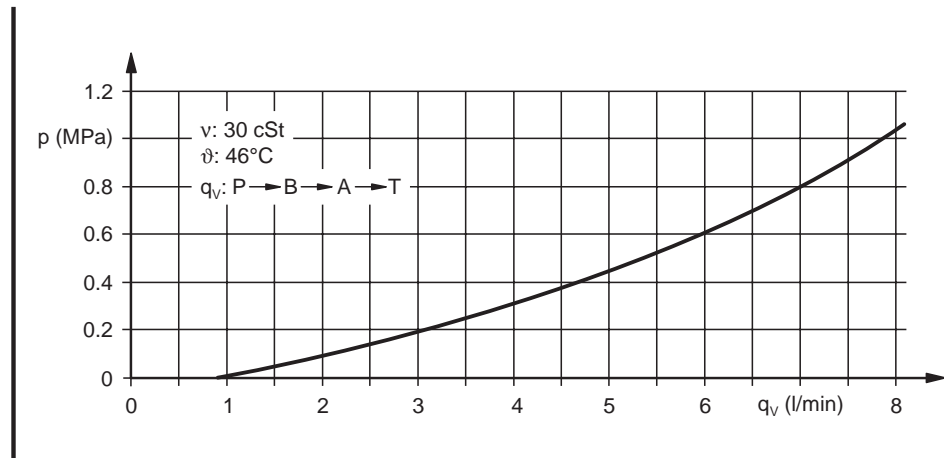
Function

The sectional view shows the mid-position, with ports P, T, A and B closed.

The switching position with flow from P to A is achieved by applying power to the solenoid coil Y2 (5), in which the armature (7) moves the piston (1) against the spring (4). The result is that the supply port P is linked to the working port A via the annular groove of the piston (1), while at the same time the working port B is linked to the return-line port T via the second annular groove.

The switching position with flow from P to B is achieved by applying power to the solenoid coil Y1 (6), in which the armature (8) moves the piston (1) against the spring (4). The result is that the supply port P is linked to the working port B via the annular groove of the piston (1), while at the same time the working port A is linked to the return-line port T via the second annular groove.

Pressure-drop/
flow-rate characteristic



Note

The valve ports are identified by letters.

A, B Working ports

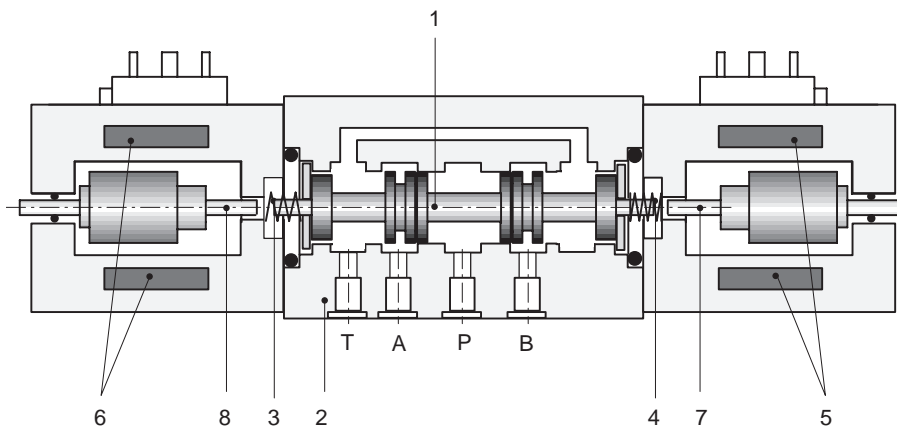
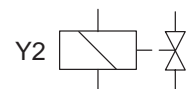
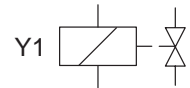
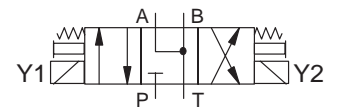
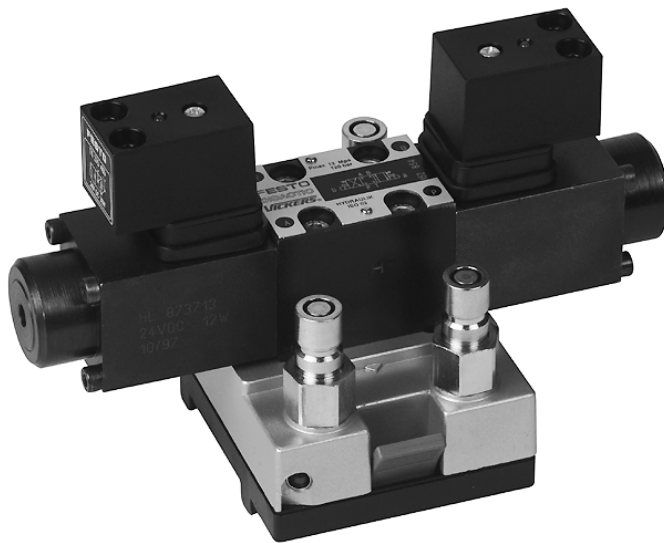
P Supply port

T Return-line port (tank connection)

The electrical connections are protected against overvoltage. The switching status is indicated by an LED.

Medium	Mineral oil, recommended viscosity $22 \text{ cSt (mm}^2/\text{s)}$
Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Voltage	24 V DC
Power rating	12 W
Connections, electrical	For 4 mm safety connector plug
Connections, hydraulic	For 4 coupling sockets
Actuation	Electrical
<i>Subject to change</i>	

Technical data



Design

The 4/3-way solenoid valve is mounted on a function plate equipped with four connection nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A").

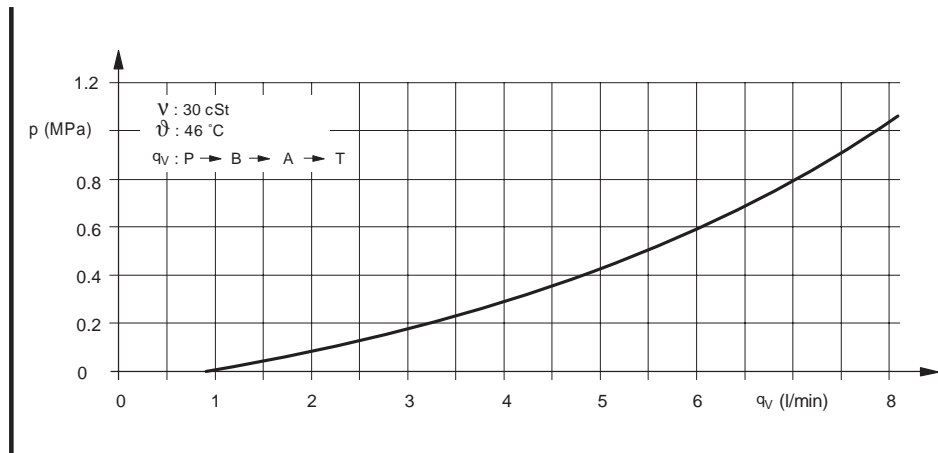
The valve consists of: Piston (1), housing (2), springs (3), (4), solenoid coil (5), (6), armatures (7) and (8)

Function

The mid-position, with P closed and A, B and T linked, is shown in the sectional view. The switching position with flow from P to A is achieved by applying power to the solenoid coil (5), in which the armature (7) moves the piston (1) against the spring (3). The result is that the supply port P is linked to the working port A via the annular groove of the piston (1), while at the same time the working port B is linked to the return-line port T via the second annular groove.

The switching position with flow from P to B is achieved by applying power to the solenoid coil (6), in which the armature (8) moves the piston (1) against the spring (4). The result is that the supply port P is linked to the working port B via the annular groove of the piston (1), while at the same time the working port A is linked to the return-line port T via the second annular groove.

Pressure-drop
flow-rate characteristic

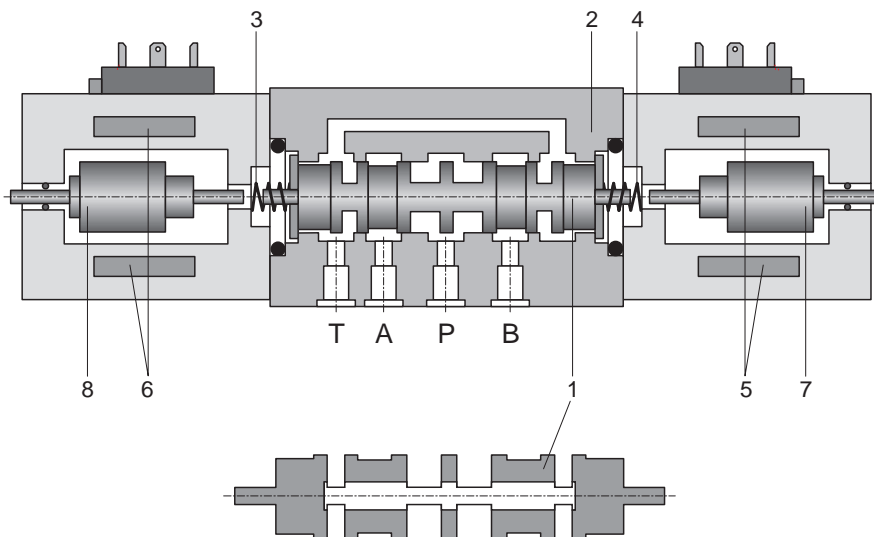
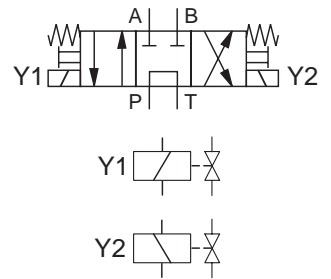
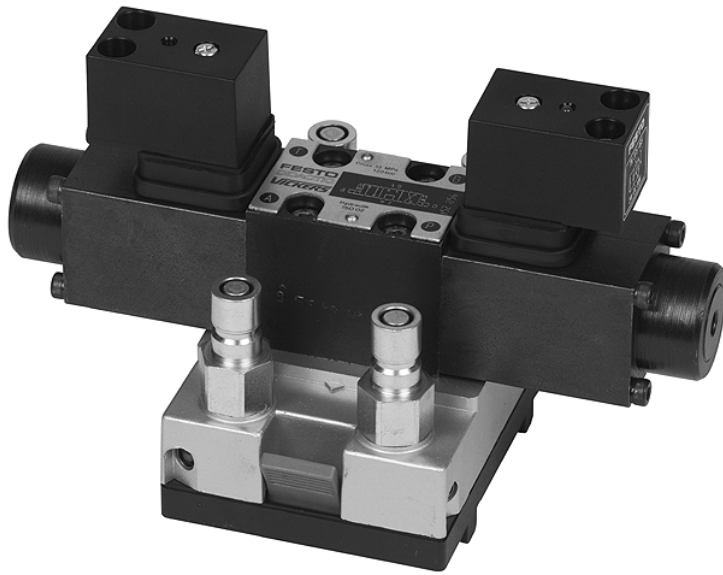


Note

The electrical connections are protected against overvoltage. The switching status is indicated by an LED.

Medium	Mineral oil, recommended viscosity 22 cSt (mm ² /s)
Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{\max}	12 MPa (120 bar)
Voltage	24 V DC
Power rating	12 W
Actuation	Electrical
Connections, electrical	For 4 mm safety connector plug
Connections, hydraulic	For 4 coupling sockets
<i>Subject to change</i>	

Technical data



Design

The 4/3-way solenoid valve is mounted on a function plate equipped with four connection nipples. The component is fitted to the grid system of the profile plate by means of the two blue levers (mounting variant "A").

The valve consists of: Piston (1), housing (2), springs (3), (4), solenoid coil (5), (6), armatures (7) and (8)

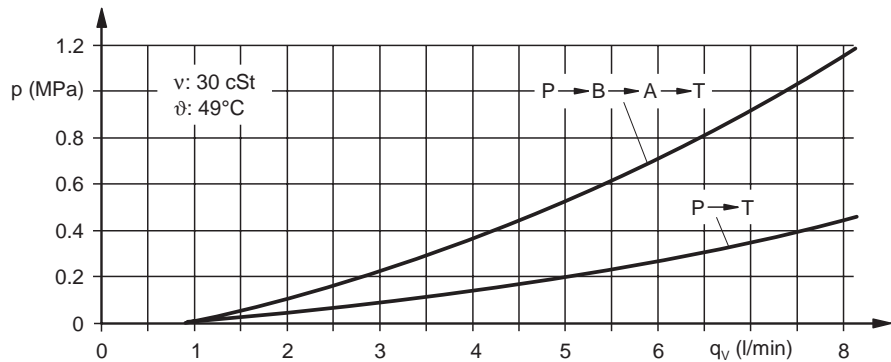
Function

The sectional view shows the mid-position, with P and T linked via the hollow piston and A and B closed.

The switching position with flow from P to A is achieved by applying power to the solenoid coil (6), in which the armature (8) moves the piston (1) against the spring (4). The result is that the supply port P is linked to the working port A via the annular groove of the piston (1), while at the same time the working port B is linked to the return-line port T via the second annular groove. The switching position with flow from P to B is achieved by applying power to the solenoid coil (5), in which the armature (7) moves the piston (1) against the spring (3).

The result is that the supply port P is linked to the working port B via the annular groove of the piston (1), while at the same time the working port A is linked to the return-line port T via the second annular groove.

Pressure-drop/
flow-rate characteristic



Note

The electrical connections are protected against overvoltage. The switching status is indicated by an LED.

Medium	Mineral oil, recommended viscosity 22 cSt (mm^2/s)
Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Voltage	24 V DC
Power rating	12 W
Actuation	Electrical
Connections, electrical	For 4 mm safety connector plug
Connections, hydraulic	For 4 coupling sockets
<i>Subject to change</i>	

Technical data