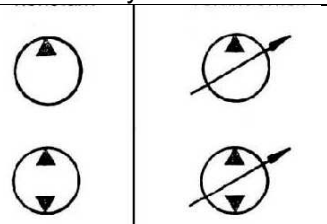
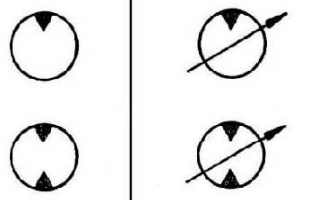
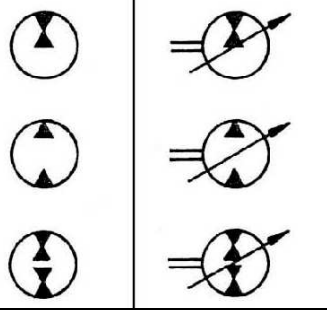
Graphic symbols pursuant to DIN ISO 1219

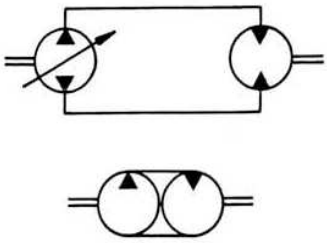
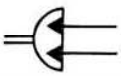
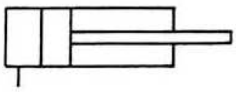
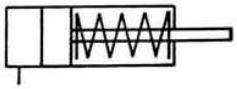
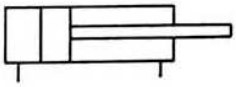
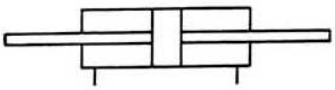
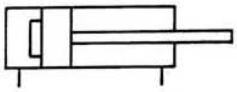
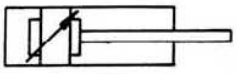
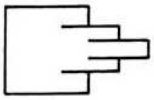
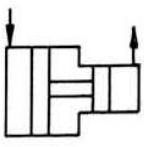
Standardized graphic symbols are required to draw hydraulic diagrams. ISO specifies these symbols at international level. In keeping with the commitment of DIN's Executive Committee to strive for a uniform international set of rules, it was decided to turn this ISO standard into DIN-ISO 1219 without any changes and to have the new standard replace the previous DIN 24300.

The most important graphic symbols are summarized on the next couple of pages.

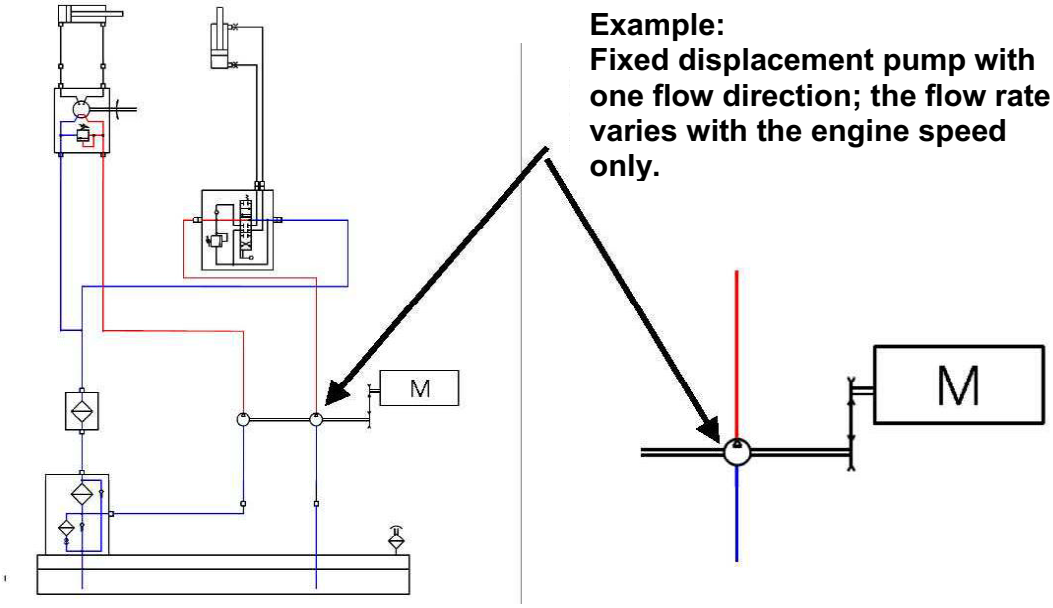
For further details, please refer to the functional descriptions of the devices.

1. Transformation of energy

Denomination	Explanation	Symbol
Pumps - with one flow direction - with two flow directions	Transformation of mechanical into hydraulic energy	
Hydraulic motors - with one flow direction - with two flow directions	Transformation of hydraulic energy into mechanical energy plus rotating motion	
Pump/motor - with reversibility of flow direction - with one flow direction - with two flow directions	Units working as both pump and hydraulic motor	

Denomination	Explanation	Symbol
Hydrostatic transmission - Remote transmission - Compact transmission	Torque converter comprised of variable displacement pump and hydraulic motor	
Limited angle rotary actuator		
Cylinder - single-acting	Transformation of hydraulic energy into mechanical energy plus linear motion	
- single-acting with spring return		
- double-acting differential cylinder	Different piston areas	
- double-acting cylinder with double rod end	Same piston area	
- cylinder with end-of-stroke damper		
- adjustable damper on both sides		
- telescopic cylinder		
- pressure transmitter		

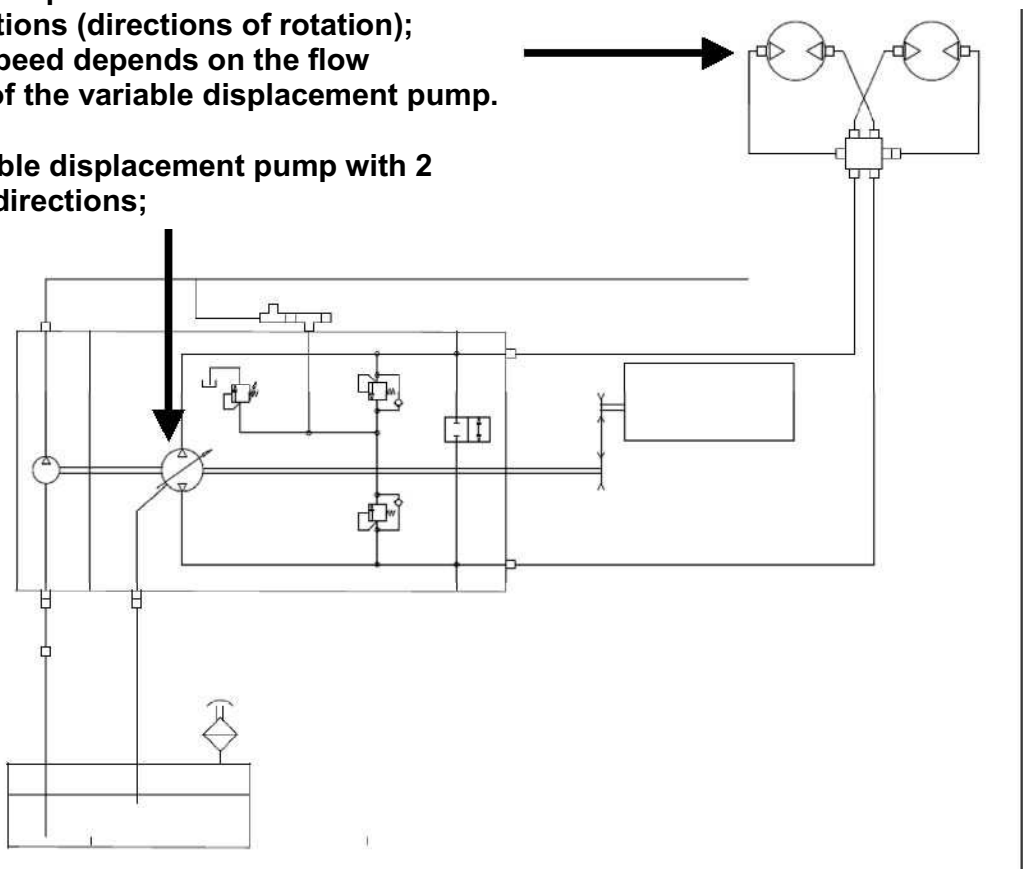
Hydraulic pumps



Example:
Fixed displacement pump with one flow direction; the flow rate varies with the engine speed only.

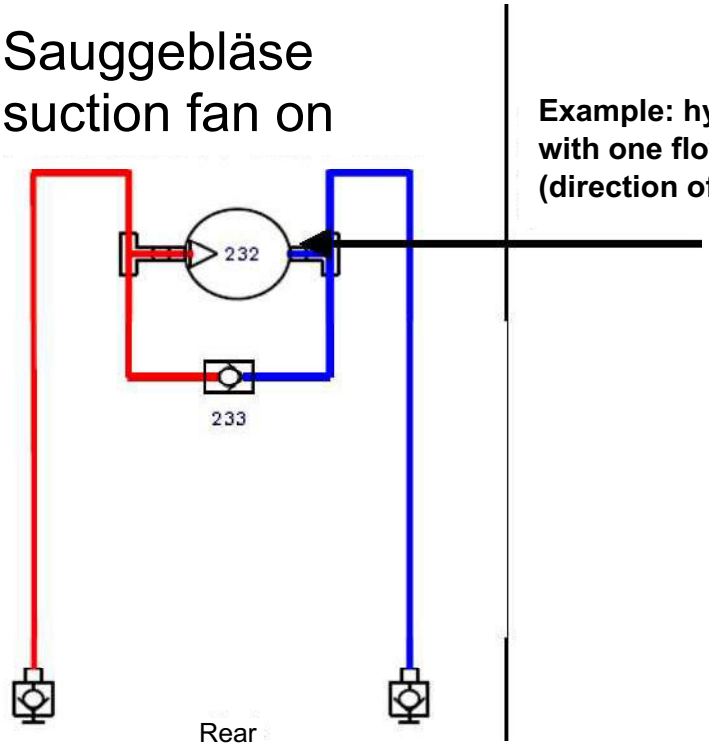
Examples:
fixed displacement motor with 2 flow directions (directions of rotation); the speed depends on the flow rate of the variable displacement pump.

Variable displacement pump with 2 flow directions;



Hydraulic motor

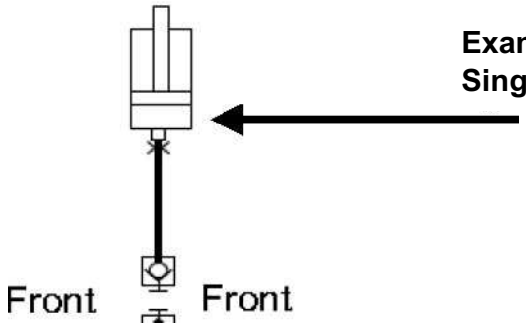
232 Sauggebläse
232 suction fan on



Example: hydraulic motor with one flow direction (direction of rotation).

Hydraulic cylinder

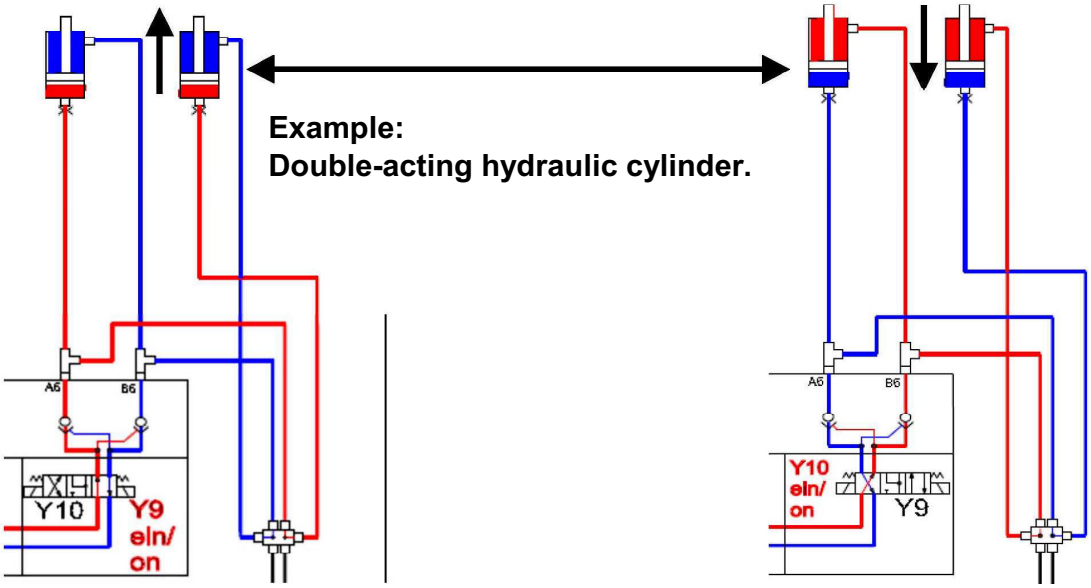
Saugmund heben
Lift suction unit



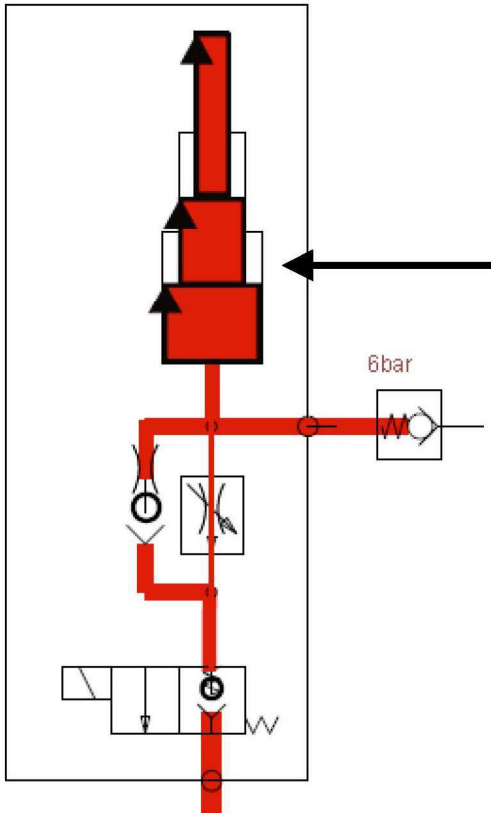
Example:
Single-acting hydraulic cylinder.

Kehrgutbehälter
Heben/senken
Lift/lower hopper

Hydraulic cylinder

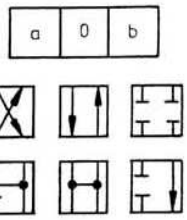
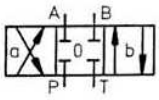
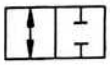
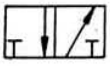
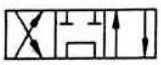


Example:
Double-acting hydraulic cylinder.

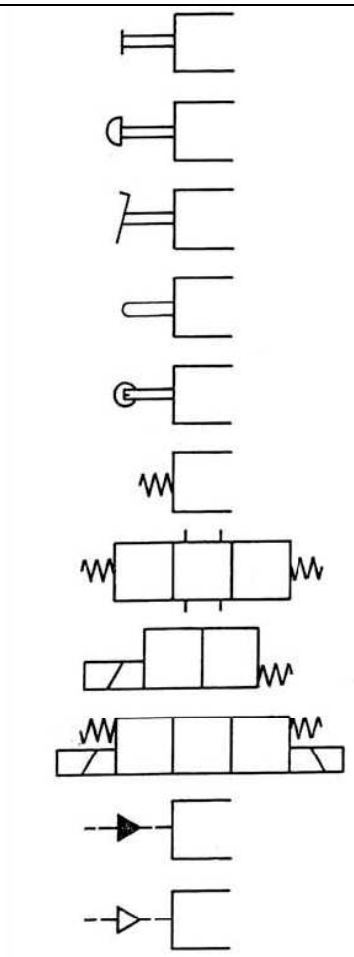
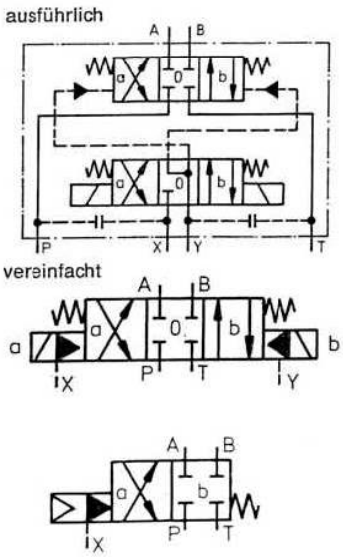


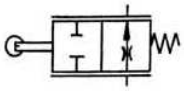
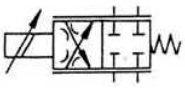
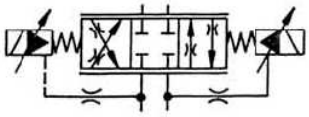
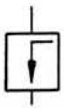
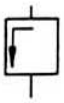
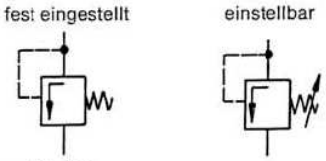
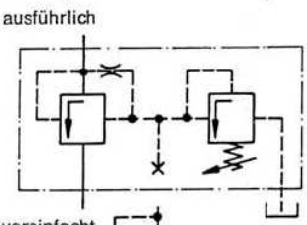
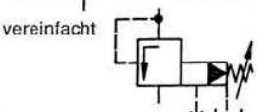
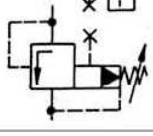
Example:
Single-acting telescopic cylinder.

2. Control valves

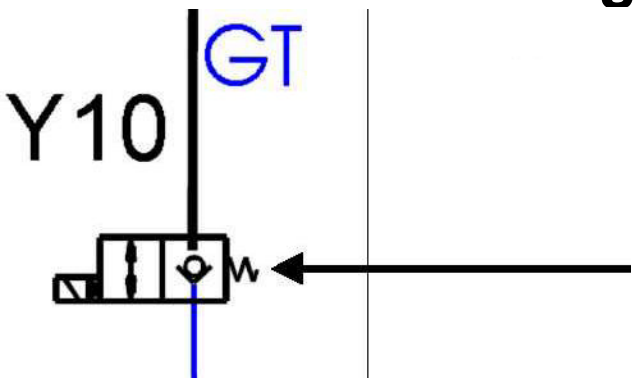
Denomination	Explanation	Symbol
Distributing valves Valves used to open or close different flow paths. Distributing valves are mainly - the r Number of ports corre as o, a, b (*) - the number of ports and links within the switching positions; shown by lines and arrows	Number of switching positions s the d	
Identification of ports by letters (at the normal position o)* P pump, pressure T tank, return flow A B consumer X Y control connections Z L leak oil		
Denomination: Example: 4/3 valve		
Pronounces as: three-position four-port switching valve		
- 2/2 valve		
- 3/2 valve		
- 4/3 valve		
- 6/3 valve		

* Identification of switching positions and ports is not (yet) part of DIN ISO 1219.

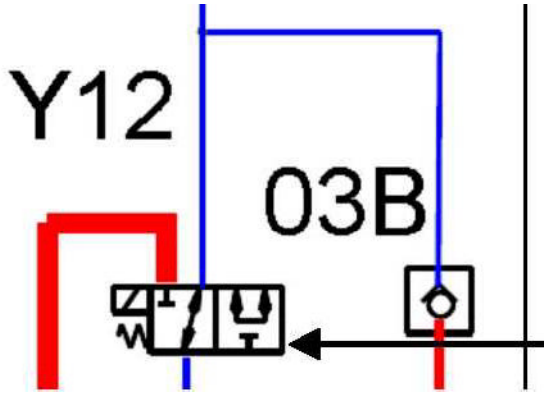
Denomination	Explanation	Symbol
Types of distributing valve actuation **a) direct acting**	Configuration at the allocated switching position	
- Manual lever with catch - Push button - Pedal - Plunger - Pulley - Spring return - Spring centering - Electromagnetic actuation - Hydraulic actuation - Pneumatic actuation	Example: single-sided with spring return Example: double-sided with spring centering	
b) pilot-controlled **detailed** - Hydraulic actuation, electromagnetic actuation **simplified** - Hydraulic actuation, pneumatic actuation	A pilot valve is used to perform hydraulic actuation of larger distributing valves. The pilot valve is controlled electically or pneumatically	

Denomination	Explanation	Symbol
Throttling distributing valves Distributing valves with a continuous transition from one switching position to the next at variable throttle. Represented by parallel lines across the entire length of the symbol.		
- Sensing valve with pin, acting against retaining spring		
- Electromagnetically actuated proportional valve	Solenoid stroke proportional to an electric input signal	
- Electrohydraulic pilot controlled valve		
Pressure valves Valves controlling the pressure. Represented by a single square with an arrow. Infinitely variable throttle cross-section.		
- Throttle cross-section, normally open		
- Throttle cross-section, normally closed		
- set / adjustable g valve, directly controlled	Inlet pressure limited by continuously opening the throttle cross-section	
detailed - Throttle limiting valve, pilot-controlled	With remote control connection and external control oil discharge	
simplified	External control oil discharge	
- ditto	Internal control oil discharge	

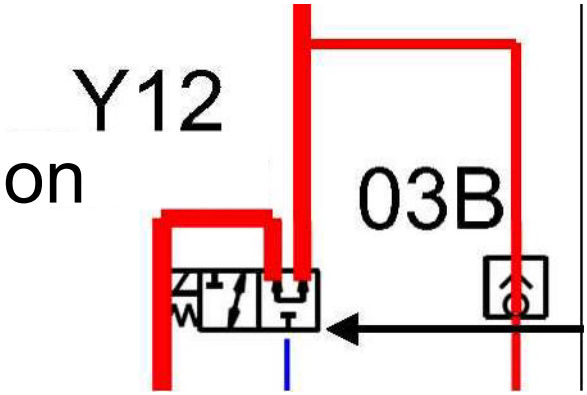
Distributing valves



Example:
2/2 valve; electromagnetically actuated, with spring return
(2 hydraulic ports; 2 switching positions)

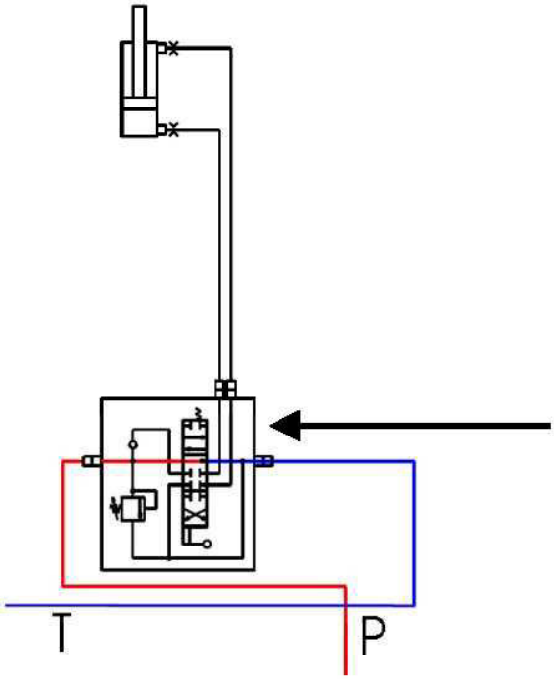


Example:
3/2 valve; electromagnetically actuated, with spring return
(3 hydraulic ports; 2 switching positions)

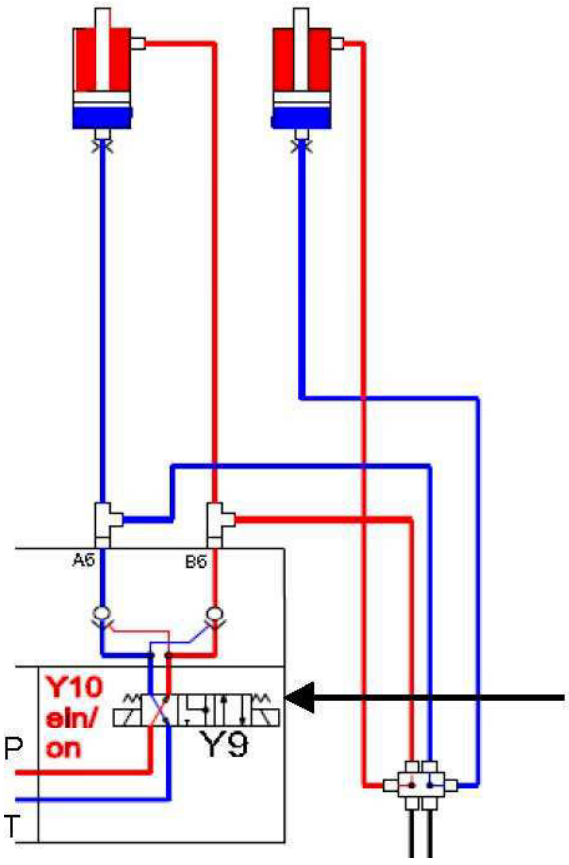


Example:
3/2 valve; electromagnetically actuated, with spring return
(3 hydraulic ports; 2 switching positions)

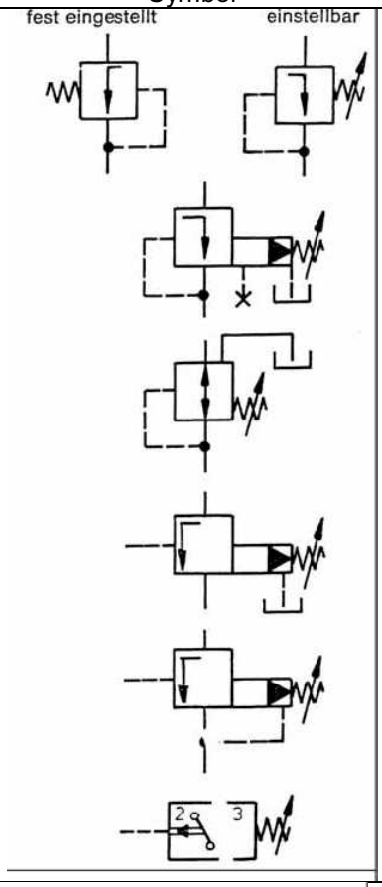
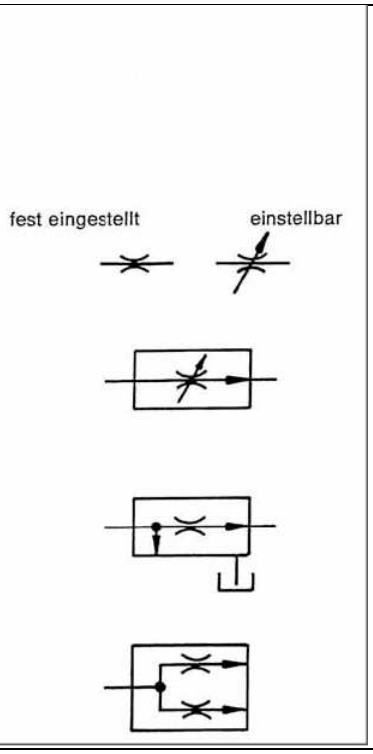
Distributing valves



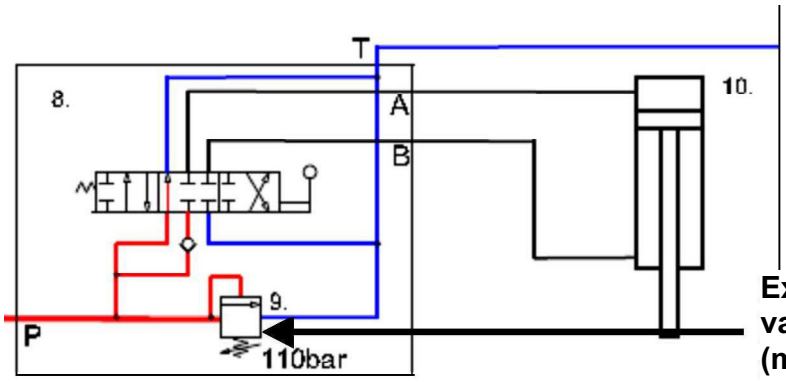
Example:
6/3 valve, manual,
with spring return
(6 hydraulic ports; 3 switching positions)



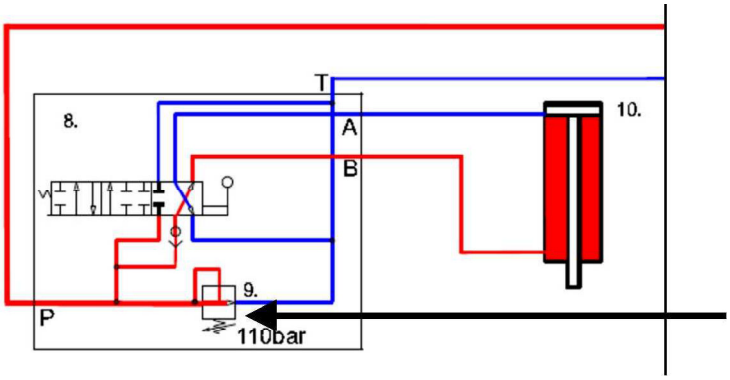
Example:
4/3 valve; electromagnetically actuated,
with spring return
(4 hydraulic ports; 3 switching positions)

Denomination	Explanation	Symbol
set **adjustable**		
- Pressure relief valve (pressure control valve), directly controlled	Constant outlet pressure maintained by continuously closing the orifice cross-section	
- Pressure relief valve, pilot-controlled		
- Pressure relief valve with load relief (3-way pressure relief valve)	Outlet pressure exceeding the preset value is relieved through the third port	
- Externally actuated sequence valve, pilot-controlled	Throttle cross-section fully opens at a set control pressure threshold. Circuit built like a distributing valve	
	Ditto with internal control oil discharge	
- Shut-off valve, pilot-controlled		
- Electric pressure switch		
Flow-control valves Valves controlling the volume flow. Represented by constricted line cross-section.		
- **set** **adjustable**	Volume flow depends on difference in pressure	
- 2-way flow control	Volume flow not influenced by difference in pressure	
- 3-way flow control	Excess flow relieved through third port	
- Flow divider.	Set apportioning ratio independent of load pressure	

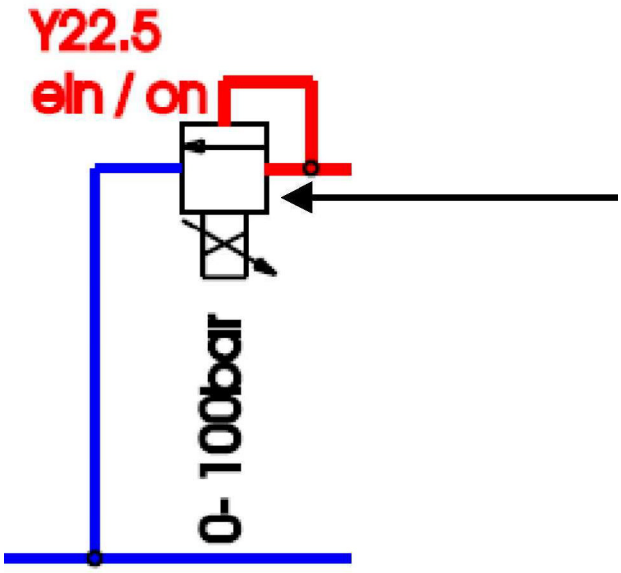
Pressure control valves



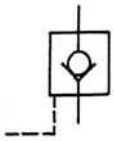
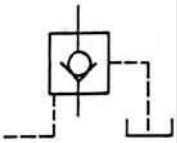
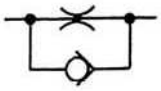
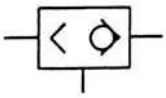
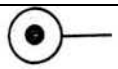
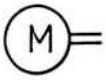
Example: pressure control valve (closed) (mechanically adjustable)



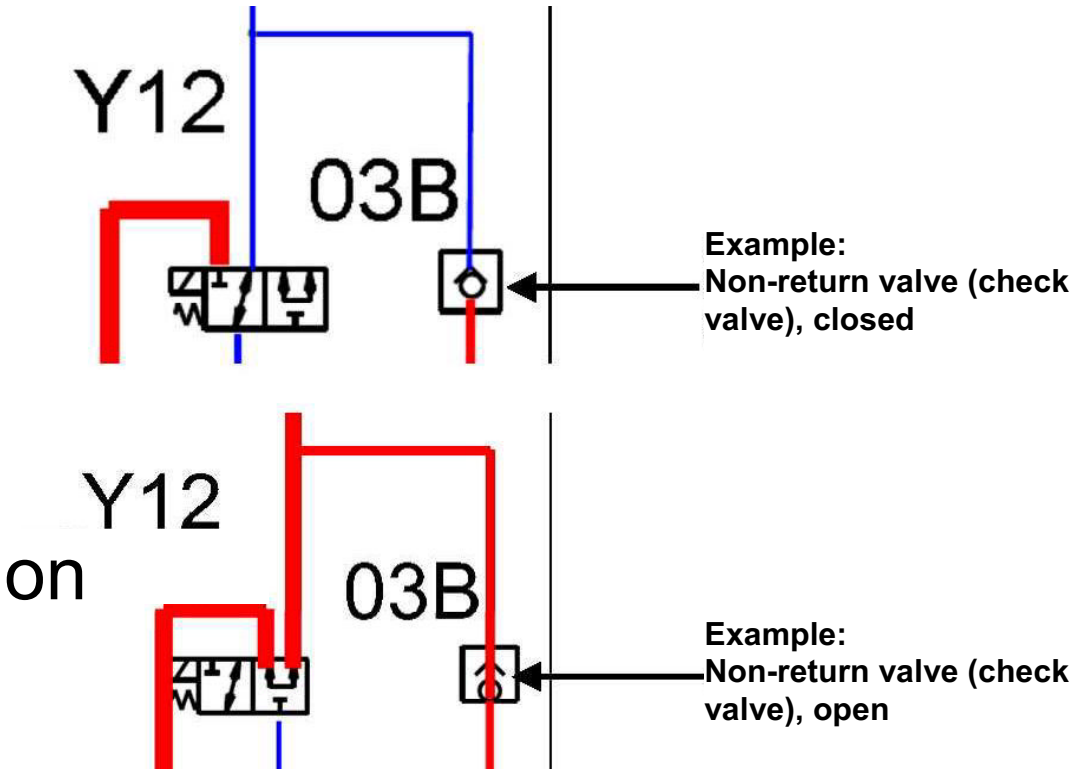
Example: pressure control valve (open) (mechanically adjustable)



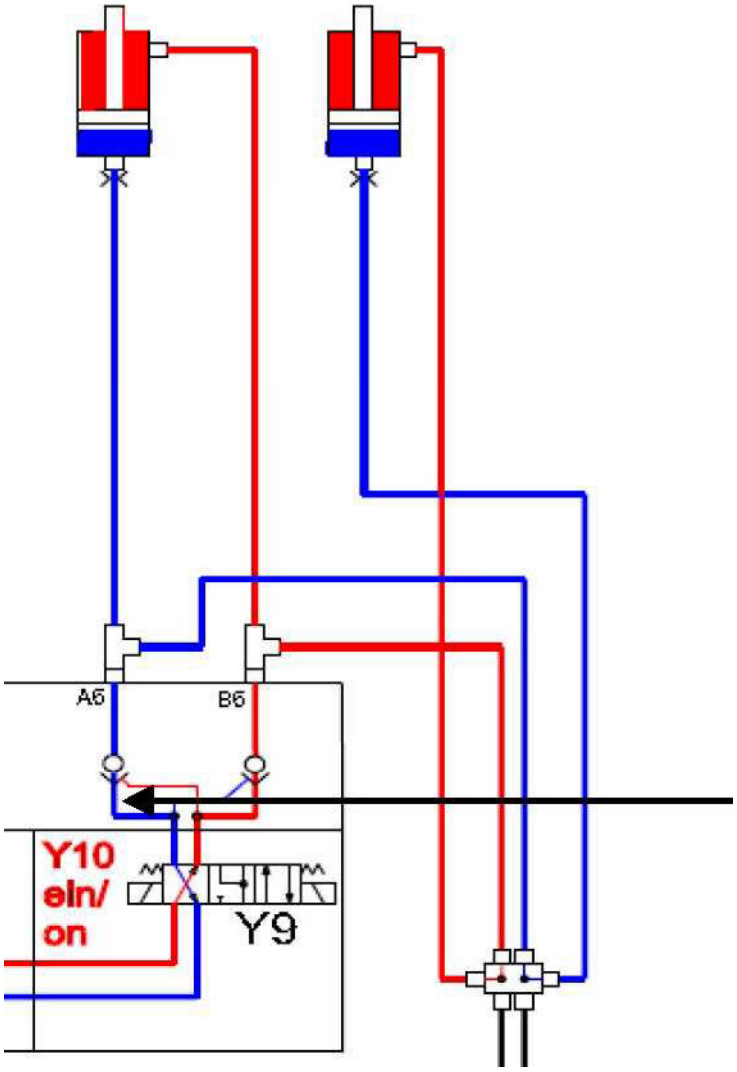
Example: pressure control valve electromagnetically adjustable; here: 0-100 bar

Denomination	Explanation	Symbol
Non-return valves		
- Check valve, unloaded	Valves allowing the medium to flow in one direction only	
- Check valve, spring-loaded		
- Unlockable check valve, (internal control oil discharge)	Unlocks by applying pressure to a control port	
- ditto (external control oil discharge)		
- One-way restrictor	Valve combination	
- Shuttle valve	"OR" element	
- Pressure source		
- Electric motor		
- Combustion engine		
- Driving and driven shafts		
- Shaft coupling		
- Main hydraulic line	Load, control, return flow line	
- Pilot control line		
- Leak oil line		
- Flexible line	Hose	

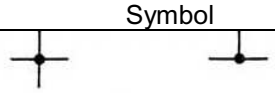
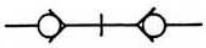
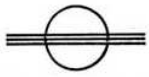
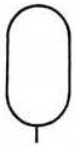
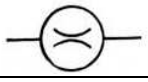
Non-return valves
(check valves)



Non-return valves
(check valves)



Example:
Unlockable check valve

Denomination	Explanation	Symbol
- Line junction		
- Crossover line without junction		
- Vent		
- Tapping point		
- Quick-action coupling		
- Rotary joint		
- Tank with lines below oil level		
- Hydraulic accumulator		
- Filter		
- Cooler		
- Heater		
- Pressure gauge		
- Volume flow meter		

Basic circuits
Applications

1. **Circuit diagram**
A circuit diagram is the device-related schematic of a control or drive unit. It is comprised of the graphic symbols defined by DIN-ISO 1219.

In order to maintain a tidy diagram, it should try to disregard the actual arrangement of devices and show how the energy flows from the bottom of the diagram upwards.

Distributing valves should be drawn horizontally, lines straight and without intersections if at all possible.

Valves featuring multiple switching positions are shown at their **normal position**, i.e., at the position they have when no pressure or power is supplied or when they are not actuated. They may also be shown at their initial position according to the conditions necessary to start the system.

Combined electro-hydraulic systems should be represented by separate diagrams of the electric and hydraulic circuitries. Signaling elements such as limit or pressure switches as well as solenoid valves appear in both diagrams. The functional diagram illustrates how the two systems interact.

Hydraulic diagrams may also have various additional data on them to specify pump, cylinder or hydraulic motor ratings, setup pressures, times, tube dimensions, power ratings, speeds, etc.