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Hydraulics Online E-book Series:

# HYDRAULIC SYMBOLS

## THE ULTIMATE GUIDE

More than 140 of the most common symbols  
representing hydraulic components and systems.



Sharing our  
knowledge of all  
things hydraulic

Hydraulics  
online

# Hydraulics Online

POWERING THE WORLD

## About Hydraulics Online

Hydraulics Online is the World's trusted, multi-award-winning and ISO 9001-accredited provider of fluid power solutions to customers in over 130 countries and 20 sectors.

A clear vision, highly committed employees and happy customers are the bedrock of our business.

Our success is built on quality and technical know-how, an unwavering commitment to service excellence, and the fact that we are 100% independent – we provide truly unbiased advice and the most optimal solutions for our customers. Every time.



**The Institute of  
Customer Service**

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FS 600920 ISO 9001

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# Lines & Basic Symbols



**Working hydraulic line**



**Pilot line**



**Drain line**



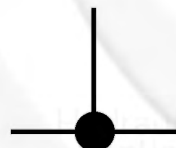
**Direction of flow**



**Hose or other flexible working line**



**Lines crossing  
(no connection)**



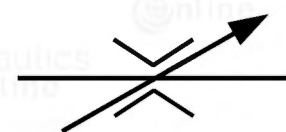
**Lines connecting**



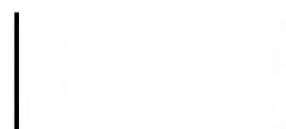
**Fixed throttle, lines with  
fixed restriction**



**Adjustable flow control  
valve (Throttle Valve)**



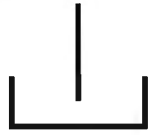
**Temperature compensated  
flow control valve**



**Vented reservoir**



**Pressurised reservoir**



**Connection to tank -  
above fluid level**



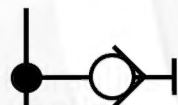
**Connection to tank -  
below fluid level**



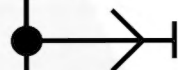
**Plugged port**



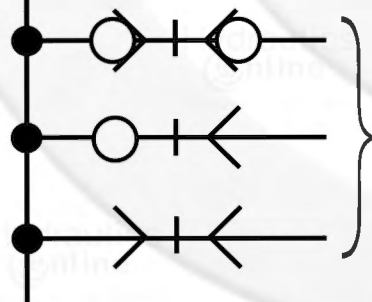
**Connection to tank -  
below fluid level**



**Quick release coupling  
(closes when decoupled)**



**Quick release coupling  
(still open when decoupled)**



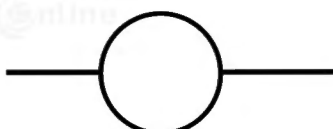
**Mated pairs of Couplings**



**Orifice**



**Replaceable orifice**



**Plug in place of replaceable  
orifice**

# MORE LINES AND BASIC SYMBOLS



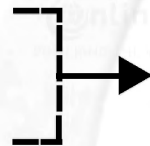
**Pneumatic energy source  
(gas energy)**



**Hydraulic energy source  
(liquid energy)**



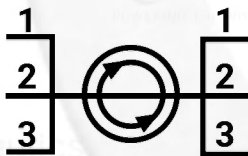
**Permanent Magnet**



**Port exhausting to  
atmosphere**



**Exhaust to atmosphere**



**Three-way rotary connection  
(3 way)**



**Spring**



**Adjustable spring**



**Pre-set stroke limiter**



**Adjustable stroke limiter**



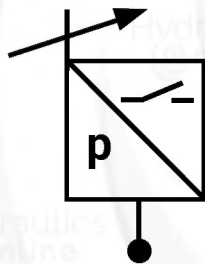
**Lockable**



**Pressure Switch**



**Pressure transducer  
(analogue)**



**Electronic pressure  
switch**



**Pressure  
gauge**



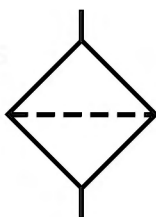
**Temperature  
gauge**



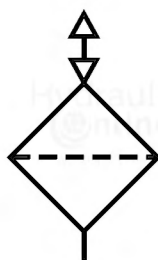
**Flow  
meter**



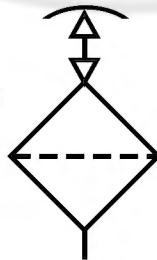
**Top: isolation valve  
(open for normal circuit)  
Bottom: isolation valve  
(closed for normal circuit  
operation)**



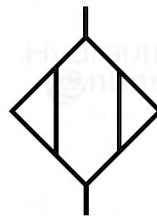
**Filter**



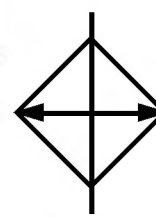
**Air  
Breather**



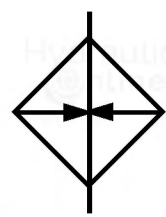
**Filler-  
Breather**



**Dryer**

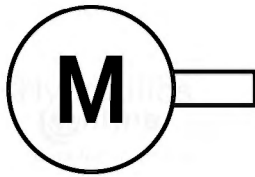


**Cooler**

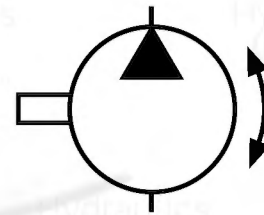
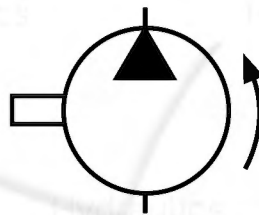
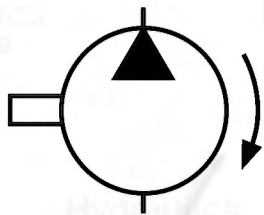


**Heater**

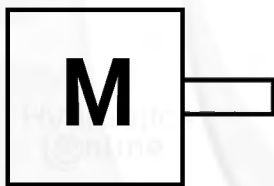
# MOTORS AND PUMPS SYMBOLS



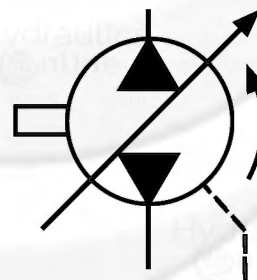
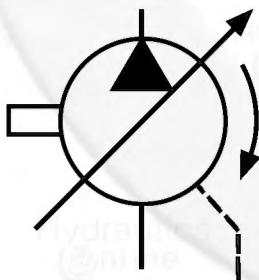
**Electric Motor**



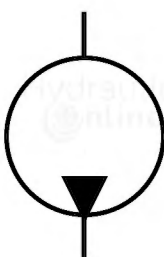
**Fixed Displacement Pump, single direction of flow,  
internal case drain (from left to right: clockwise rotation  
anti-clockwise rotation and bi directional rotation)**



**Combustion Engine**

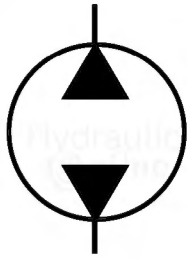


**Variable Displacement Pump, external case drain  
(from left to right: single flow direction, two flow  
direction)**

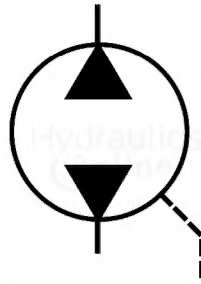


**Hydraulic Motor:  
Fixed displacement, single  
direction of flow / rotation,  
internal case drain...**

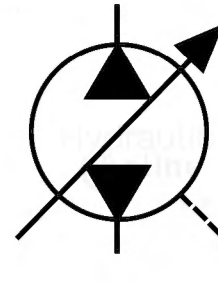




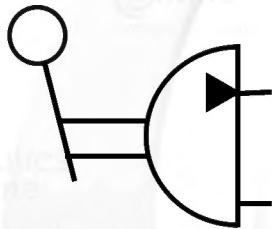
... now showing:  
two directions  
of flow / rotation



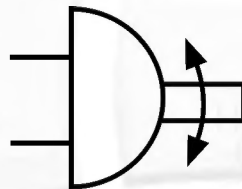
... now showing:  
external case  
drain.



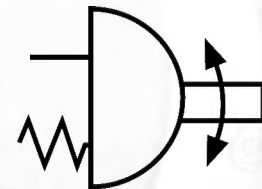
... now showing:  
variable  
displacement.



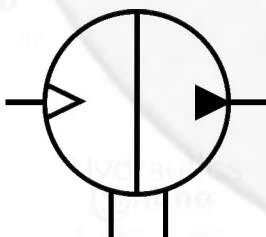
Lever operated  
hand pump  
(limited angle)



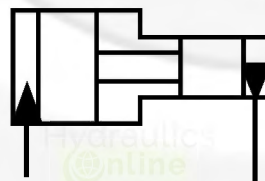
Double-acting  
rotary actuator  
(limited angle)



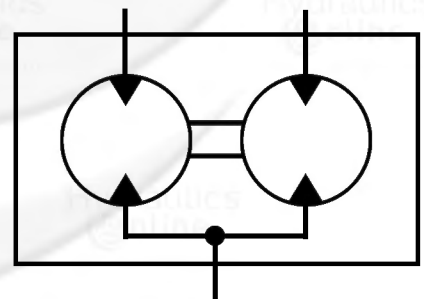
Single-acting,  
spring return  
rotary actuator  
(limited angle)



Continuous  
action air-hydraulic  
pressure intensifier

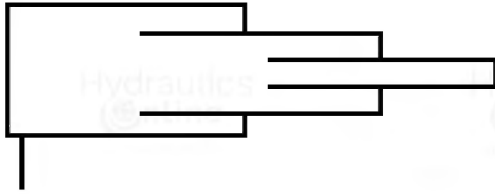


Single-acting  
hydraulic pressure  
intensifier

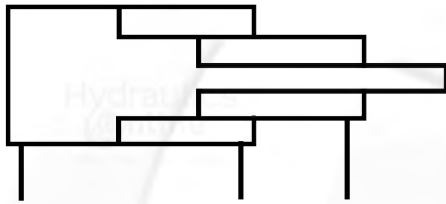


Rotary flow  
divider

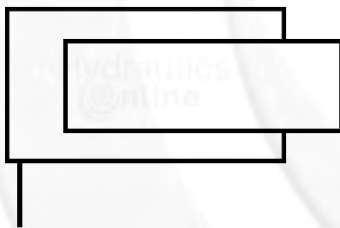
# CYLINDER SYMBOLS



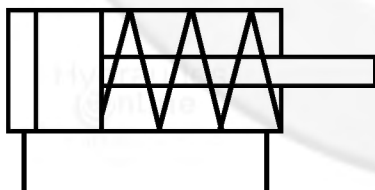
**Telescopic cylinder,  
single-acting**



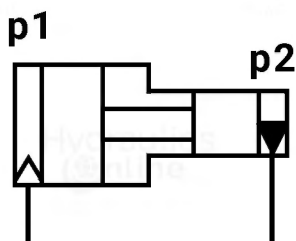
**Telescopic cylinder,  
double-acting**



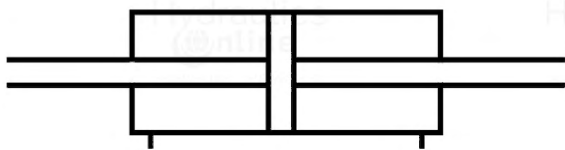
**Single-acting cylinder -  
plunger cylinder**



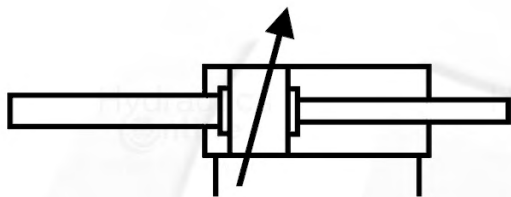
**Single-acting cylinder  
with single-ended piston  
rod, spring compartment  
with leakage oil connection**



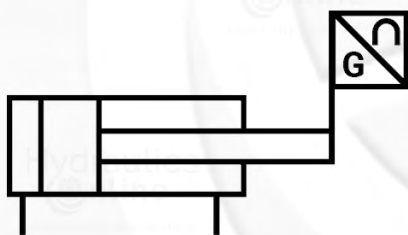
**Pressure booster single-  
acting, which converts a  
pneumatic pressure (p1)  
into a higher hydraulic  
pressure (p2)**



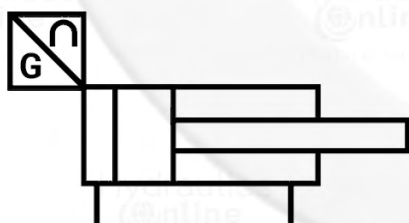
**Double-acting cylinder,  
double rod**



**Double-acting cylinder,  
with double-ended piston  
rod, with adjustable  
cushioning at each end  
of stroke**



**Double-acting cylinder  
with displacement encoder  
on piston rod**



**Double-acting cylinder  
with internal stroke  
transducer**



**Double-acting cylinder  
with single-ended piston  
rod**

# ACCUMULATOR SYMBOLS



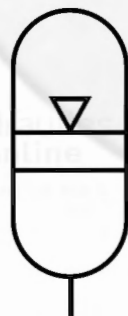
**Accumulator**



**Diaphragm Accumulator**



**Bladder Accumulator**

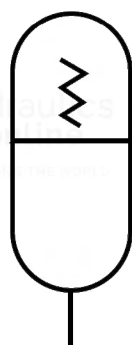


**Piston Accumulator**

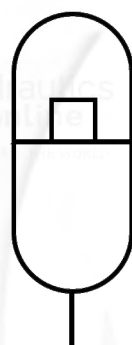


**Gas Bottle**

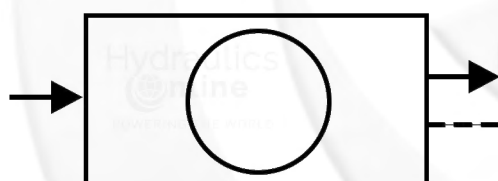




**Spring Loaded Accumulator**



**Weight Loaded Accumulator**



**Particle Counter  
(in-line)**

# VALVE SYMBOLS



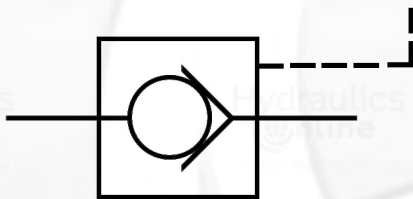
**Check Valve  
(non-return valve)**



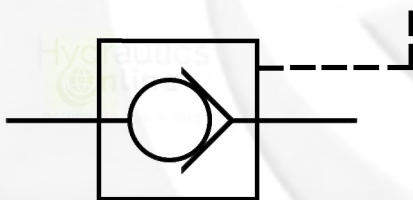
**Spring rating  
important**



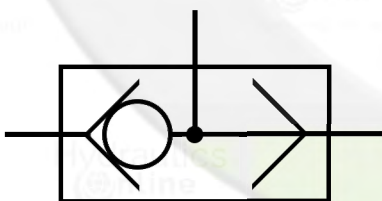
**Adjustable flow control  
valve**



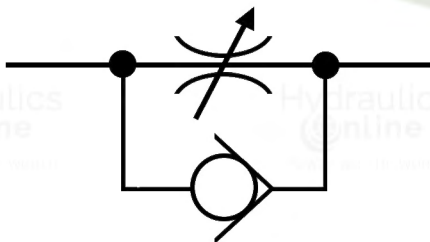
**Pilot-to-open check valve  
(3 port)**



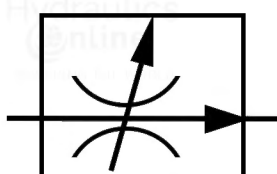
**Pilot-to-open check valve  
(4 port or "vented")**



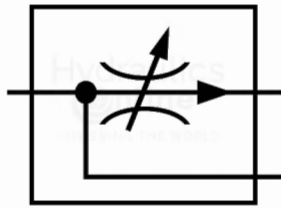
**Shuttle Valve**



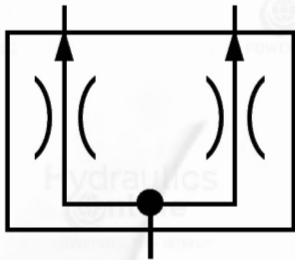
**Throttle-check valve**



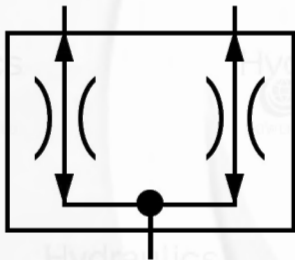
**Pressure compensated  
flow control valve**



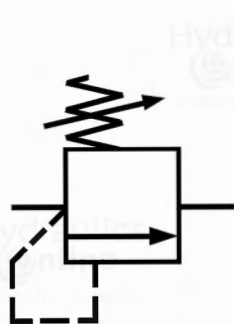
**Priority flow control  
valve (priority flow  
divider)**



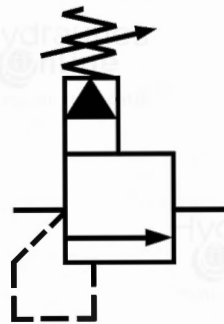
**Flow divider (spool type)**



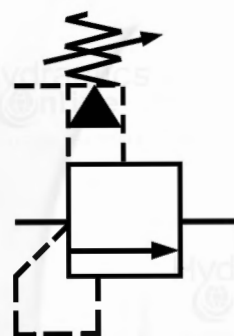
**Flow divider / combiner  
(spool type)**



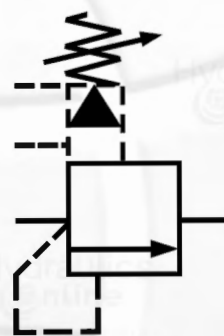
**Pressure relief valve: direct operated internal drain...**



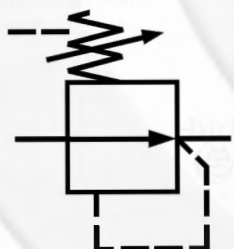
**... now showing: pilot operated**



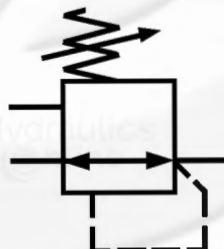
**... now showing external drain**



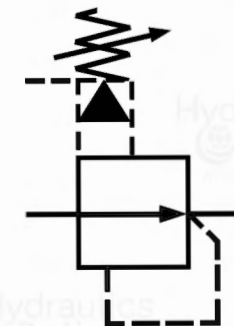
**... now showing: external control (unload or "vent")**



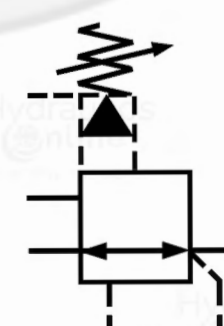
**Pressure reducing valve: direct operated...**



**...now showing: 3-way function**

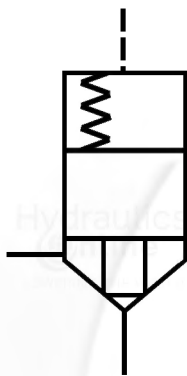


**Pressure reducing valve: pilot operated...**

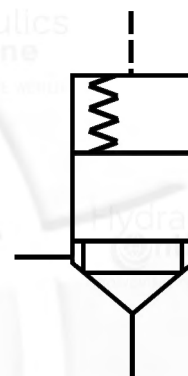


**... now showing: 3-way function**

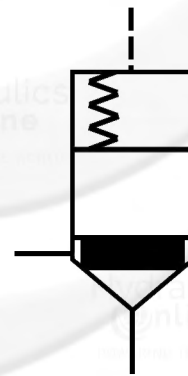
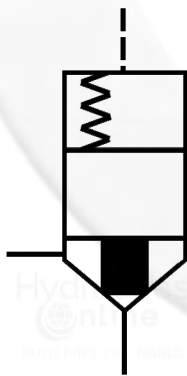




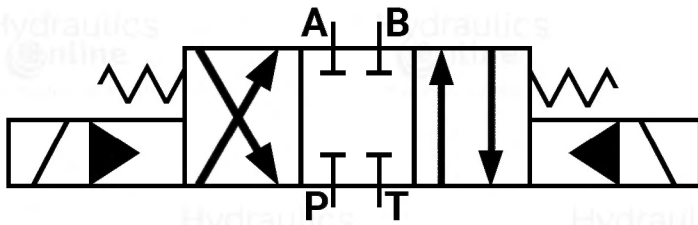
**Directional control  
valve cartridge:  
Small seat area...**



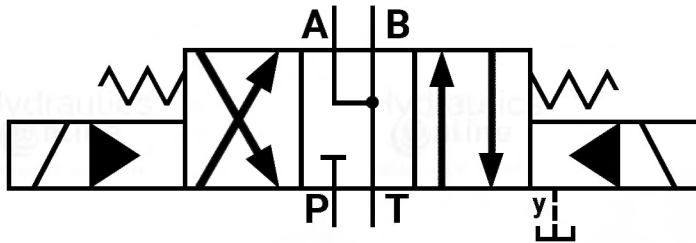
**...now showing:  
large seat area**



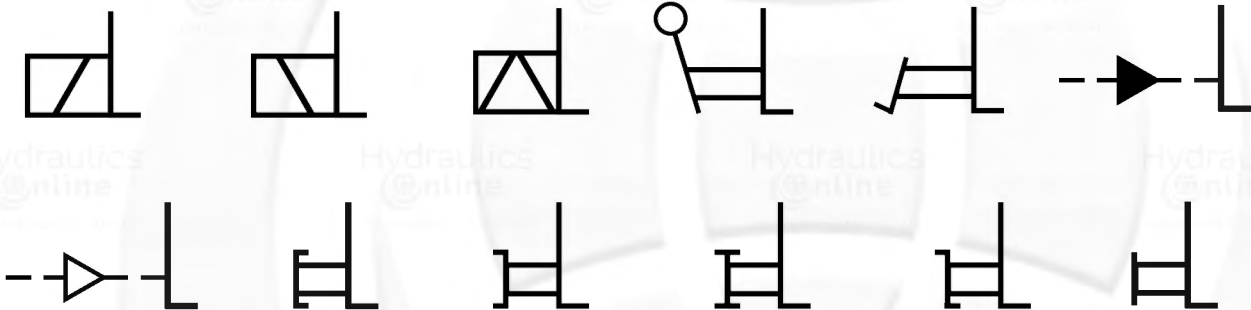
**Now showing: the poppet having a throttling effect (Damping nose)**



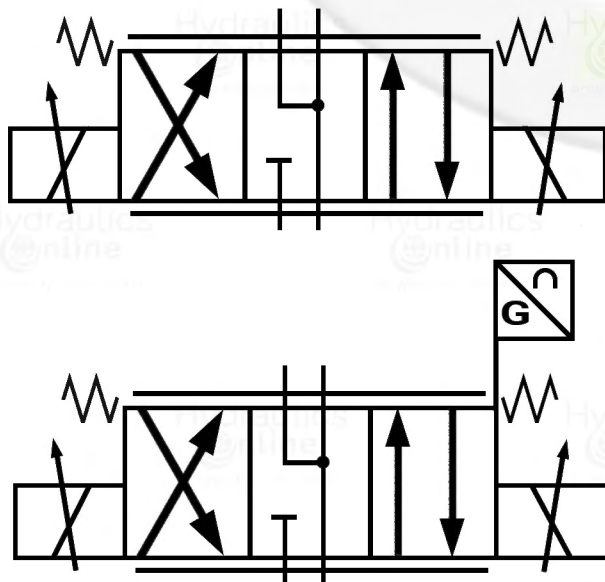
**4/3 Pilot operated directional control valve: solenoid operated, spring centered internal pilot, internal drain, all ports closed in neutral...**



**... now showing: external pilot, external drain, A-B-T in neutral**

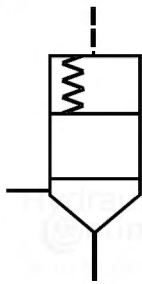


**Alternative valve actuators: (1) pushing solenoid, (2) pulling solenoid, (3) dual solenoid, (4) lever, (5) pedal, (6) direct hydraulic operation, (7) direct pneumatic operation, (8) push, (9) pull, (10) push-pull, (11) turn, (12) manual override**

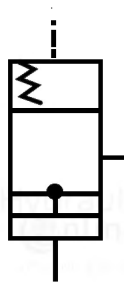


**Proportional directional control valve: direct operated, force controlled (non-feedback)...**

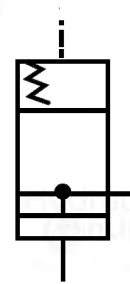
**...now showing: stroke controlled (with feedback)**



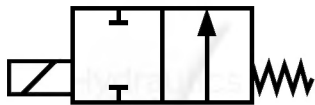
**Pressure control valve cartridge: poppet type, normally closed...**



**...now showing: spool type**



**...now showing: normally open**



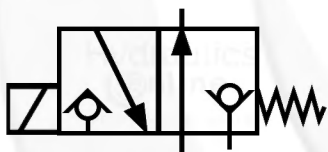
**Directional control valve: direct operated, 2 port & 2 positions, solenoid operated, spring return, normally open**



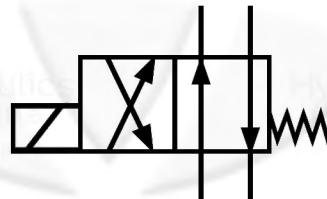
**...now showing: normally closed and permissable bi-directional flow**



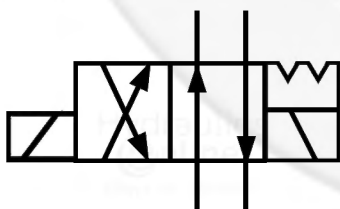
**...now showing: 3/2 configuration**



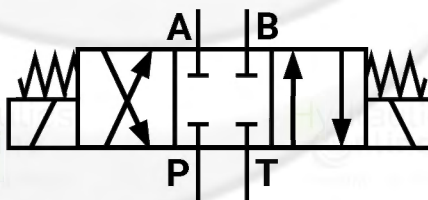
**...now showing: leak free closures (poppet valve)**



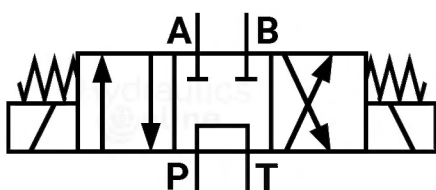
**... now showing: 4/2 configuration**



**...now showing: detents ("stay-put" operation)**



**4/3 direct operated directional control valve: solenoid operated, spring centered, all ports closed in neutral...**



**...now showing: P-T in neutral**





POWERING THE WORLD

# HYDRAULICS SYMBOLS

Hydraulic circuits can be comprised of an infinite combination of cylinders, motors, valves, pumps and other equipment connected via hydraulic pipes and tubes. The complexity of these components are difficult to represent fully, so a family of graphic symbols have been developed to represent fluid power components and systems on schematic drawings.

Hydraulic symbols are issued and controlled by The International Standards Organization (ISO), standard ISO 1219-1:2012.

The symbols do not identify component size or their actual position on the machine, however the symbols do provide vital information relating to the configurations and flow path connections.

In this e-book we have summarised more than 140 of the most common symbols you may come across when working with hydraulic systems



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