

www.hydraulicsonline.com

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**

UK Customer Satisfaction

Awards 2024 **FINALIST**



FS 600920 ISO 9001

Contents

<u>CHAPTER</u>	<u>PAGE(S)</u>
Hydraulic Symbols.....	14 – 5
Benedetto Castelli Symbols.....	26 – 7
Maisie & Pumps Symbols.....	48 – 9
Cylinder Symbols.....	70 – 11
Jean-Marie-Martin Boiseuille.....	102 – 13
William Armstrong.....	114 – 159
The Wonderful World of Hydraulics	16

Lines & Basic Symbols



Working hydraulic line



Pilot line



Drain line



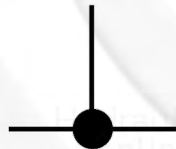
Direction of flow



Hose or other flexible working line



**Lines crossing
(no connection)**



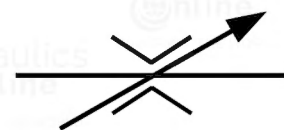
Lines connecting



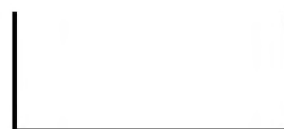
Fixed throttle, lines with fixed restriction



Adjustable flow control valve (Throttle Valve)



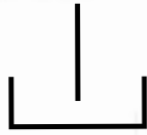
Temperature compensated flow control valve



Vented reservoir



Pressurised reservoir



**Connection to tank -
above fluid level**



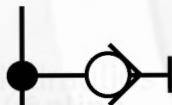
**Connection to tank -
below fluid level**



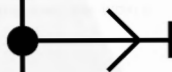
Plugged port



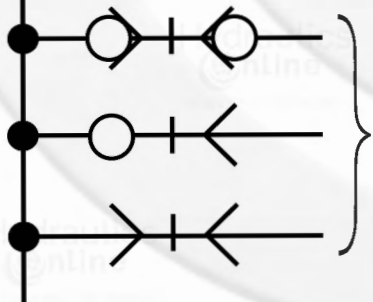
**Connection to tank -
below fluid level**



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



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



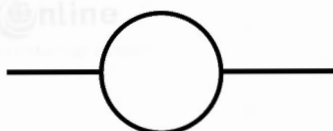
Mated pairs of Couplings



Orifice

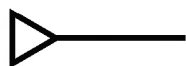


Replaceable orifice

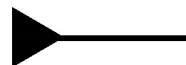


**Plug in place of replaceable
orifice**

MORE LINES AND BASIC SYMBOLS



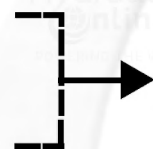
**Pneumatic energy source
(gas energy)**



**Hydraulic energy source
(liquid energy)**



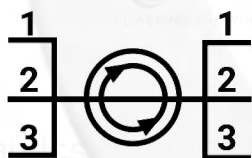
Permanent Magnet



**Port exhausting to
atmosphere**



Exhaust to atmosphere



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



Spring



Adjustable spring



Pre-set stroke limiter



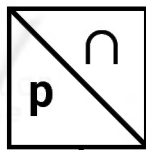
Adjustable stroke limiter



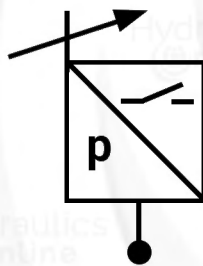
Lockable



Pressure Switch



**Pressure transducer
(analogue)**



**Electronic pressure
switch**



**Pressure
gauge**



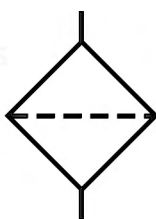
**Temperature
gauge**



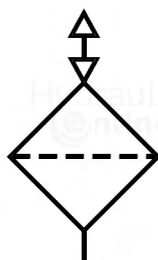
**Flow
meter**



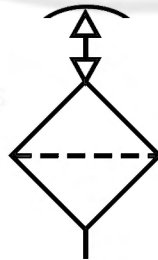
**Top: isolation valve
(open for normal circuit)
Bottom: isolation valve
(closed for normal circuit
operation)**



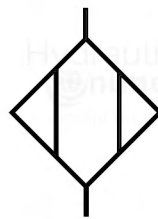
Filter



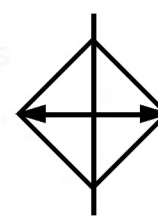
**Air
Breather**



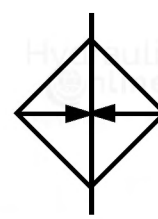
**Filler-
Breather**



Dryer

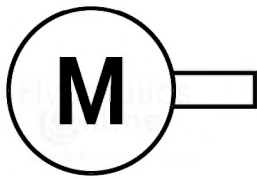


Cooler

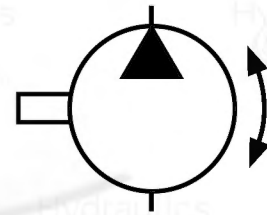
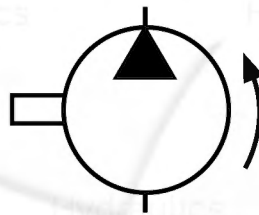
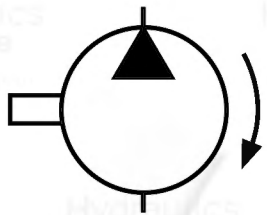


Heater

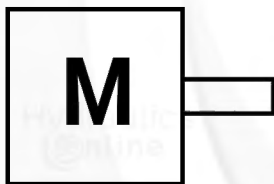
MOTORS AND PUMPS SYMBOLS



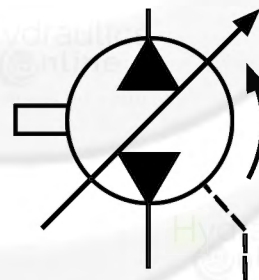
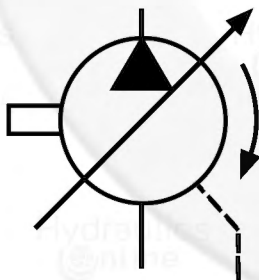
Electric Motor



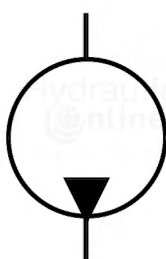
Fixed Displacement Pump, single direction of flow, internal case drain (from left to right: clockwise rotation anti-clockwise rotation and bi directional rotation)



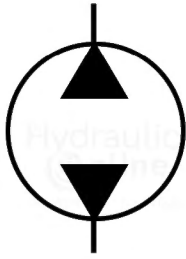
Combustion Engine



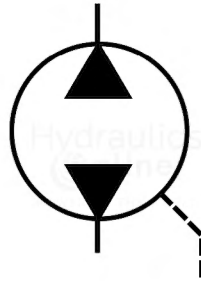
Variable Displacement Pump, external case drain (from left to right: single flow direction, two flow direction)



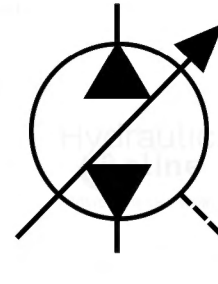
Hydraulic Motor: Fixed displacement, single direction of flow / rotation, internal case drain...



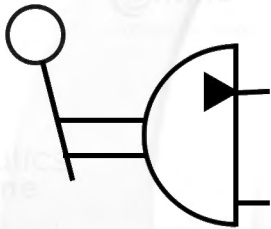
... now showing:
two directions
of flow / rotation



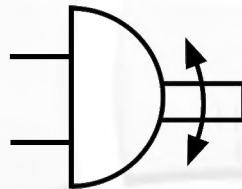
... now showing:
external case
drain.



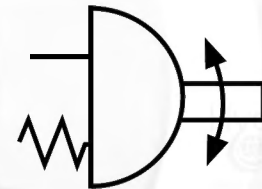
... now showing:
variable
displacement.



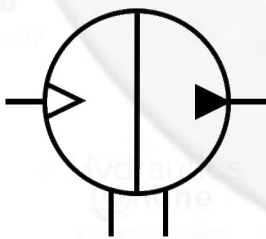
Lever operated
hand pump
(limited angle)



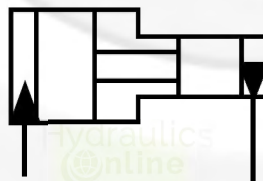
Double-acting
rotary actuator
(limited angle)



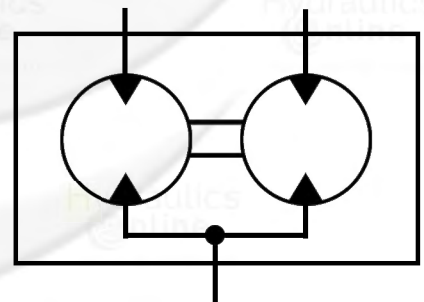
Single-acting,
spring return
rotary actuator
(limited angle)



Continuous
action air-hydraulic
pressure intensifier

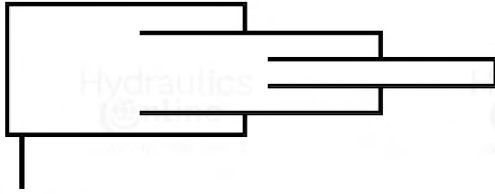


Single-acting
hydraulic pressure
intensifier

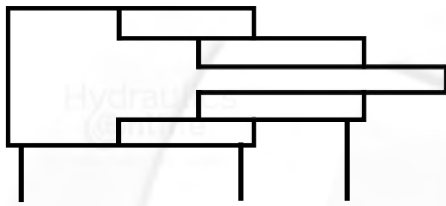


Rotary flow
divider

CYLINDER SYMBOLS



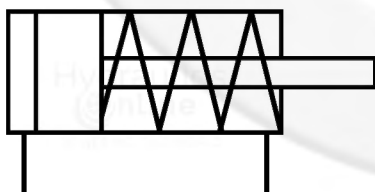
**Telescopic cylinder,
single-acting**



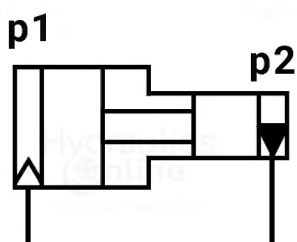
**Telescopic cylinder,
double-acting**



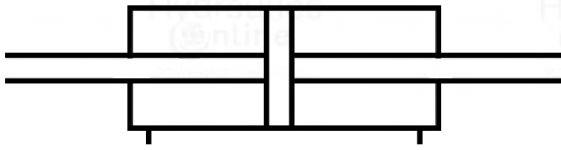
**Single-acting cylinder -
plunger cylinder**



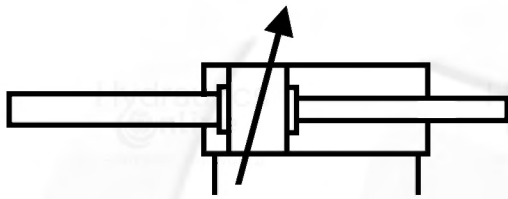
**Single-acting cylinder
with single-ended piston
rod, spring compartment
with leakage oil connection**



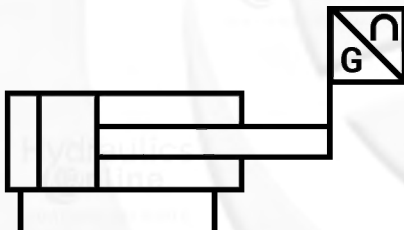
**Pressure booster single-
acting, which converts a
pneumatic pressure (p1)
into a higher hydraulic
pressure (p2)**



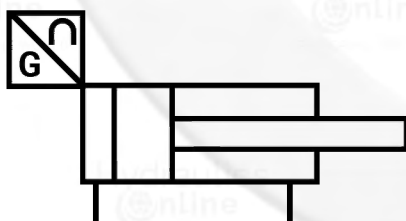
**Double-acting cylinder,
double rod**



**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



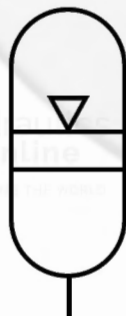
Accumulator



Diaphragm Accumulator



Bladder Accumulator



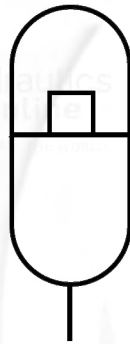
Piston Accumulator



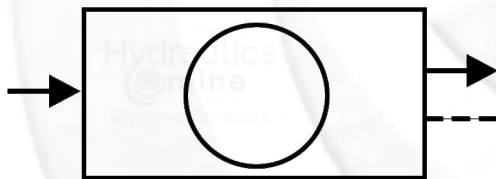
Gas Bottle



Spring Loaded Accumulator



Weight Loaded Accumulator



**Particle Counter
(in-line)**

VALVE SYMBOLS



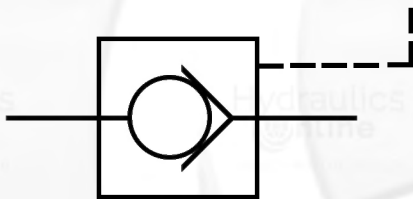
**Check Valve
(non-return valve)**



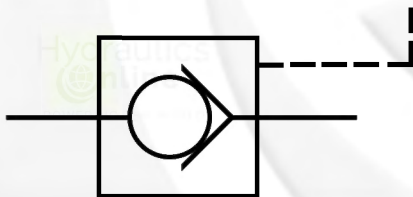
**Spring rating
important**



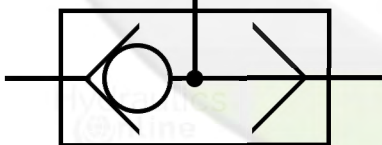
**Adjustable flow control
valve**



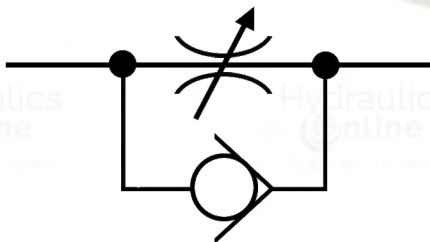
**Pilot-to-open check valve
(3 port)**



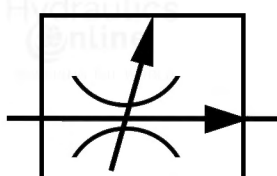
**Pilot-to-open check valve
(4 port or "vented")**



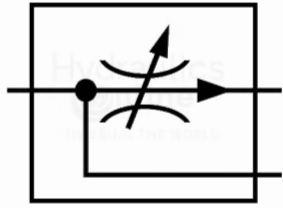
Shuttle Valve



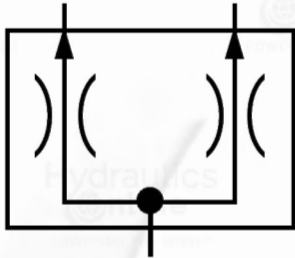
Throttle-check valve



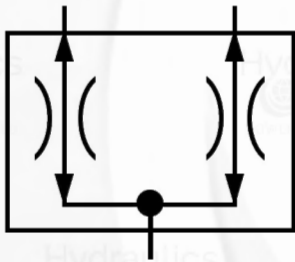
**Pressure compensated
flow control valve**



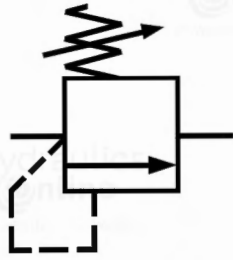
Priority flow control valve (priority flow divider)



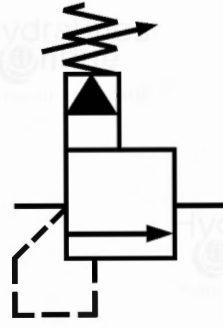
Flow divider (spool type)



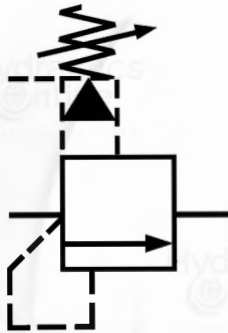
Flow divider / combiner (spool type)



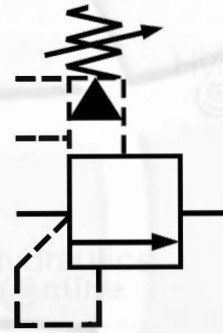
Pressure relief valve: direct operated internal drain...



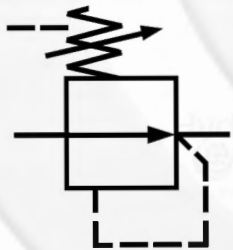
... now showing: pilot operated



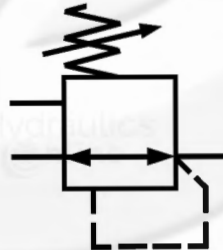
... now showing external drain



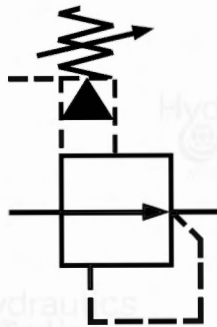
... now showing: external control (unload or "vent")



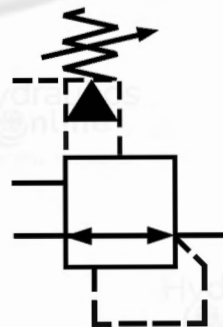
Pressure reducing valve: direct operated...



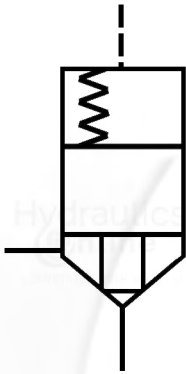
...now showing: 3-way function



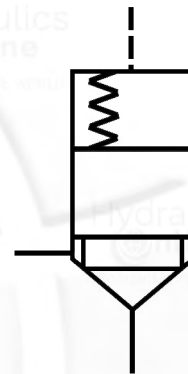
Pressure reducing valve: pilot operated...



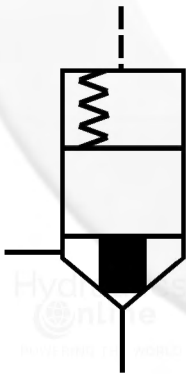
... now showing: 3-way function



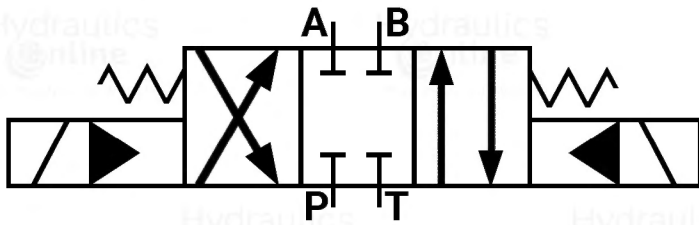
**Directional control
valve cartridge:
Small seat area...**



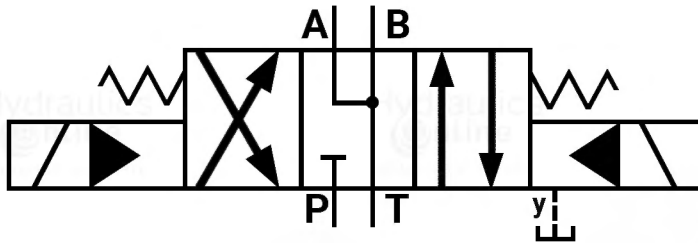
**...now showing:
large seat area**



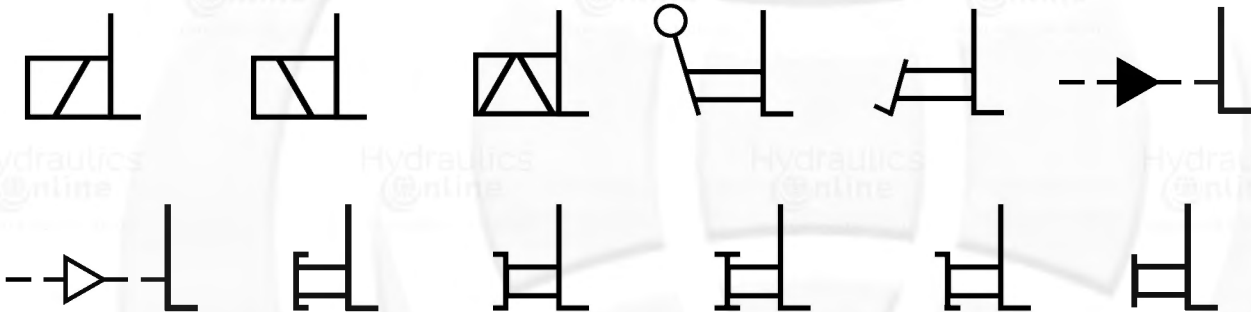
Now showing: the poppet having a throttling effect (Damping nose)



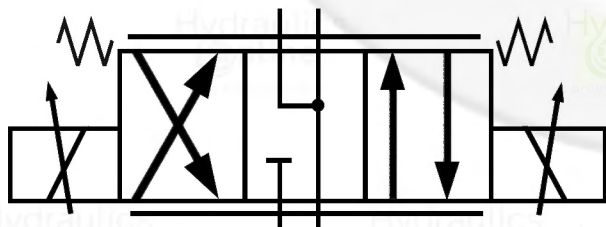
4/3 Pilot operated directional control valve: solenoid operated, spring centered internal pilot, internal drain, all ports closed in neutral...



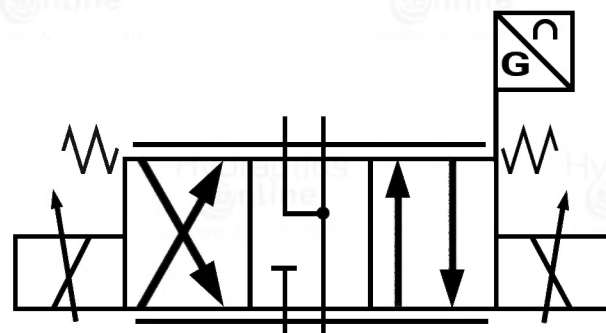
... now showing: external pilot, external drain, A-B-T in neutral



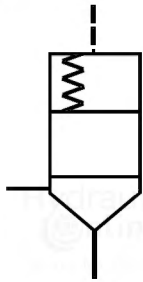
Alternative valve actuators: (1) pushing solenoid, (2) pulling solenoid, (3) dual solenoid, (4) lever, (5) pedal, (6) direct hydraulic operation, (7) direct pneumatic operation, (8) push, (9) pull, (10) push-pull, (11) turn, (12) manual override



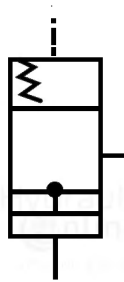
Proportional directional control valve: direct operated, force controlled (non-feedback)...



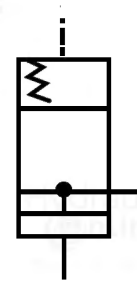
...now showing: stroke controlled (with feedback)



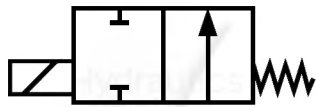
Pressure control valve cartridge: poppet type, normally closed...



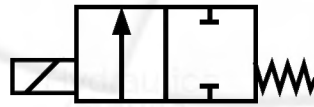
...now showing: spool type



...now showing: normally open



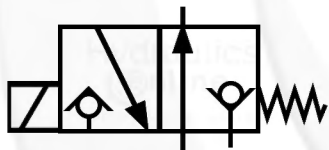
Directional control valve: direct operated, 2 port & 2 positions, solenoid operated, spring return, normally open



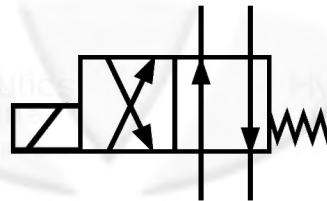
...now showing: normally closed and permissible bi-directional flow



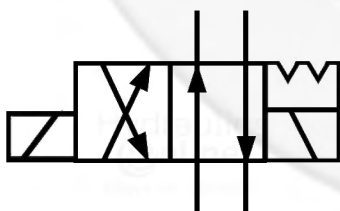
...now showing: 3/2 configuration



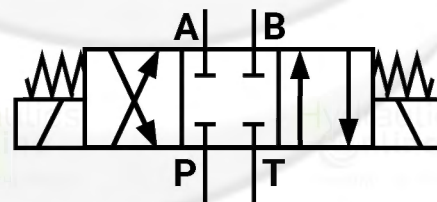
...now showing: leak free closures (poppet valve)



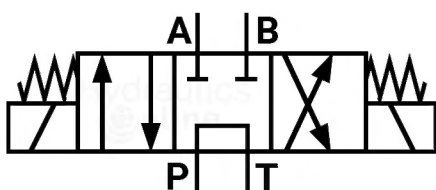
... now showing: 4/2 configuration



...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

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



FS 600920 ISO 9001



**The Institute of
Customer Service**

UK Customer Satisfaction
Awards 2024 **FINALIST**

**We are the first choice for customers in over 130 countries worldwide,
supplying a vast selection of hydraulic brands and components.**

GET IN TOUCH

T: +44 (0) 845 644 3640

Email: sales@hydraulicsonline.com

www.hydraulicsonline.com