

SYMBOLS USED IN HYDRAULIC & PNEUMATIC CIRCUITS

BASIC SYMBOLS

LINES-----



-CONTINUOUS LINE - FLOW LINE

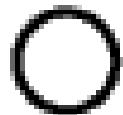


DASHED LINE - PILOT, DRAIN



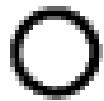
ENVELOPE - LONG AND SHORT
DASHES AROUND TWO OR MORE
COMPONENT SYMBOLS.

Circular-----



LARGE CIRCLE

PUMP, MOTOR



small circle

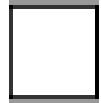
MEASURING DEVICES



semi-circle

ROTARY ACTUATOR

Square ----



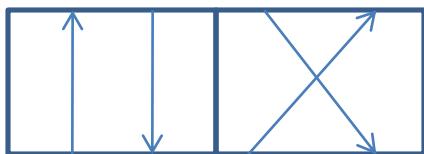
one square

- PRESSURE CONTROL FUNCTION

-two or three

Adjacent squares: -

DIRECTIONAL CONTROL

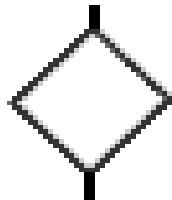


4/2 DC VALVE

4-PORTS

2-POSITIONS

Diamond---



FLUID CONDITIONER
**(filter, separator, lubricator,
Heat exchanger)**

Miscellaneous Symbols ----



SPRING



FLOW RESTRICTION

Triangle---



solid -

**DIRECTION OF HYDRAULIC FLUID
FLOW**



open -

DIRECTION OF PNEUMATIC FLOW

Pumps and Compressors----

Fixed Displacement hydraulic pump

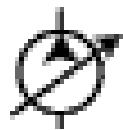


UNIDIRECTIONAL



BIDIRECTIONAL

Variable displacement hydraulic pump

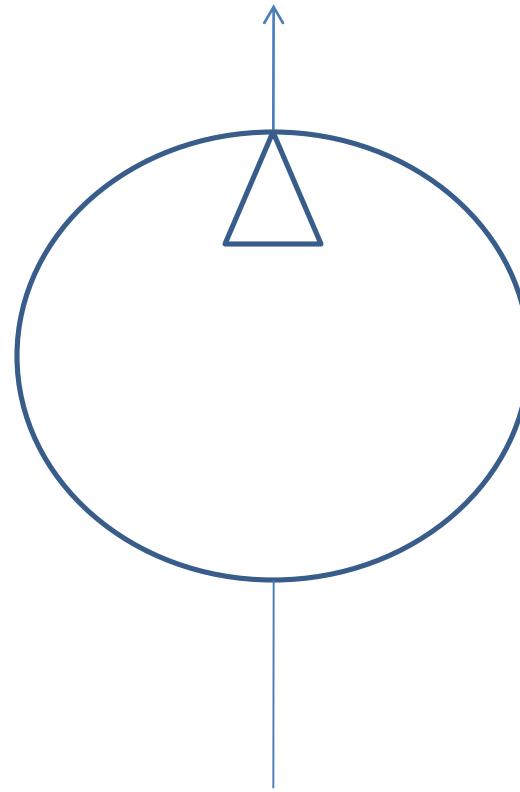


UNIDIRECTIONAL



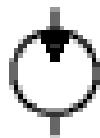
BIDIRECTIONAL

COMPRESSOR

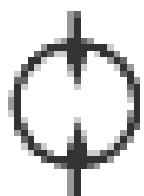


Motors---

FIXED DISPLACEMENT HYDRAULIC MOTOR

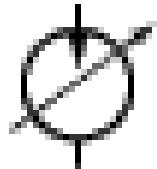


UNIDIRECTIONAL

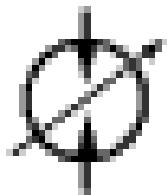


BIDIRECTIONAL

VARIABLE DISPLACEMENT HYDRAULIC MOTOR

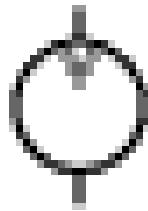


UNIDIRECTIONAL

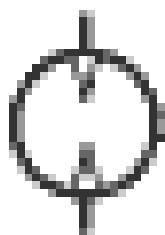


BIDIRECTIONAL

PNEUMATIC MOTOR

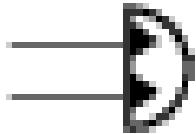


unidirectional

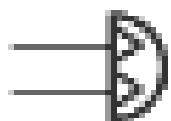


bidirectional

ROTARY ACTUATOR

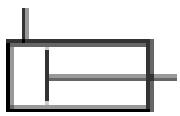


HYDRAULIC

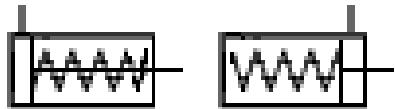


PNEUMATIC

SINGLE ACTING CYLINDER

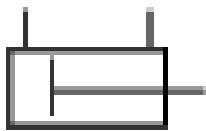


-RETURNED BY EXTERNAL FORCE

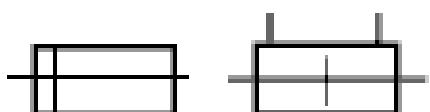


RETURNED BY SPRING OR
EXTENDED BY SPRING FORCE

DOUBLE ACTING CYLINDERS



-SINGLE PISTON ROD (FLUID REQUIRED TO EXTEND
AND RETRACT)

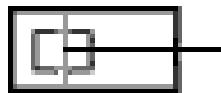


DOUBLE ENDED PISTON ROD

CYLINDERS WITH CUSHIONS

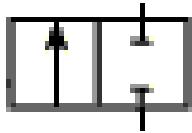


- SINGLE FIXED CUSHION

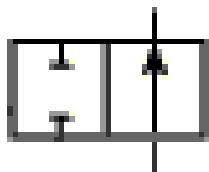


DOUBLE FIXED CUSHION

DIRECTIONAL CONTROL VALVES

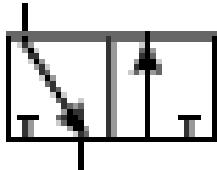


**NORMALLY CLOSED
DIRECTIONAL CONTROL VALVE
WITH 2 PORTS AND 2 FINITE
POSITIONS.**

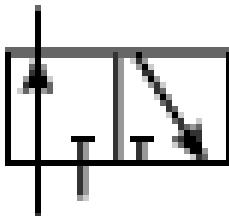


**NORMALLY OPEN DIRECTIONAL
CONTROL VALVE
WITH 2 PORTS AND 2 FINITE
POSITIONS**

Directional control valve (3 ports / 2 positions)



**NORMALLY CLOSED DIRECTIONAL
CONTROL VALVE WITH 3 PORTS
AND 2 FINITE POSITIONS.**



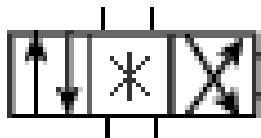
**NORMALLY OPEN
DIRECTIONAL CONTROL VALVE
WITH 3 PORTS AND 2 FINITE POSITIONS.**

DIRECTIONAL CONTROL VALVE (4 PORTS / 2 POSITIONS)



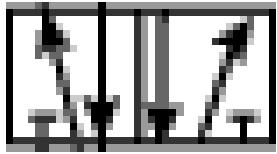
**DIRECTIONAL CONTROL VALVE
WITH 4 PORTS AND 2 FINITE POSITIONS**

DIRECTIONAL CONTROL VALVE (4 PORTS / 3 POSITIONS)



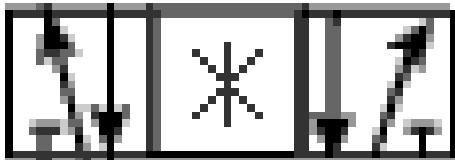
**DIRECTIONAL CONTROL VALVE WITH
4 PORTS AND 3 FINITE POSITIONS
-(CENTER POSITION CAN HAVE VARIOUS FLOW PATHS)**

DIRECTIONAL CONTROL VALVE (5 PORTS / 2 POSITIONS) NORMALLY A PNEUMATIC



**DIRECTIONAL CONTROL VALVE
WITH 5 PORTS AND 2 FINITE POSITIONS**

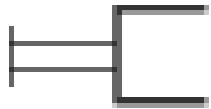
DIRECTIONAL CONTROL VALVE (5 PORTS / 3 POSITIONS) NORMALLY A PNEUMATIC VALVE



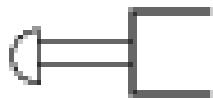
**DIRECTIONAL CONTROL VALVE
WITH 5 PORTS AND 3 FINITE
POSITIONS**

CONTROL METHODS

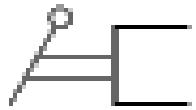
MANUAL CONTROL



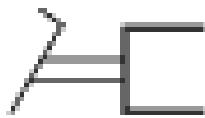
**GENERAL SYMBOL
(WITHOUT SHOWING THE CONTROL TYPE)**



PUSHBUTTON

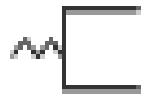


-LEVER

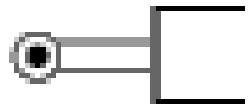


FOOT PEDAL

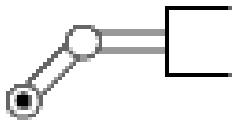
MECHANICAL CONTROL



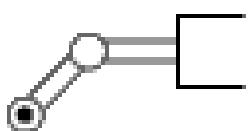
SPRING



PLUNGER OR TRACER

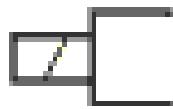


ROLLER



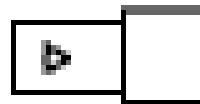
ROLLER(ONE DIRECTION ONLY)

ELECTRICAL CONTROL

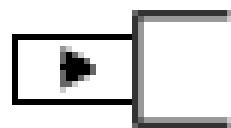


SOLENOID
(THE ONE WINDING)

Pilot Operation

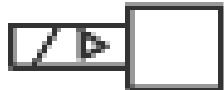


PNEUMATIC

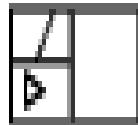


-HYDRAULIC

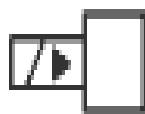
PILOT OPERATED TWO-STAGE VALVE



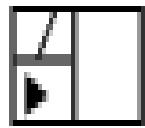
**PNEUMATIC:
SOLNOID FIRST STAGE**



**PNEUMATIC :
AIR PILOT SECOND STAGE**

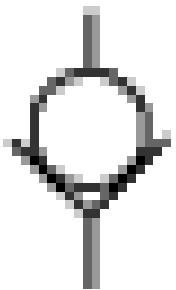


HYDRAULIC: SOLNOID FIRST STAGE

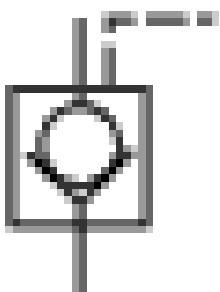


**HYDRAULIC:
HYD. PILOT SECOND STAGE**

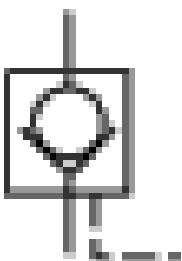
CHECK VALVES, SHUTTLE VALVES, RAPID EXHAUST VALVES



CHECK VALVE
**-FREE FLOW ONE DIRECTION,
BLOCKED FLOW IN OTHER DIRECTION**

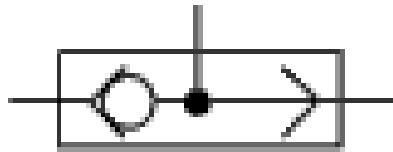


**PILOT OPERATED CHECK VALVE,
PILOT TO CLOSE**



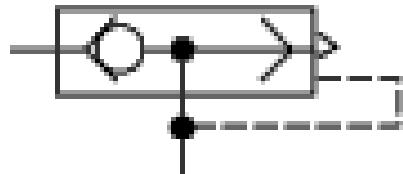
**PILOT OPERATED CHECK VALVE,
PILOT TO OPEN**

SHUTTLE VALVE



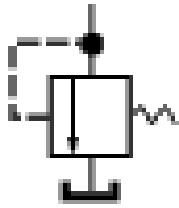
TO ISOLATE ONE PART OF A SYSTEM FROM AN ALTERNATE PART OF CIRCUIT.

RAPID EXHAUST VALVE/PNEUMATIC



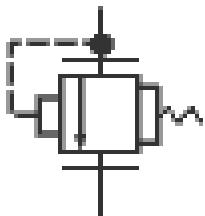
INSTALLED CLOSE TO AN ACTUATOR FOR RAPID MOVEMENT OF THE ACTUATOR.

PRESSURE CONTROL VALVES



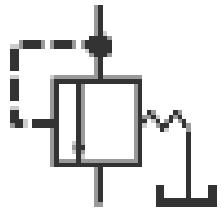
**LINE PRESSURE IS LIMITED TO THE SETTING OF THE VALVE,
SECONDARY PART IS DIRECTED TO TANK.**

PROPORTIONAL PRESSURE RELIEF



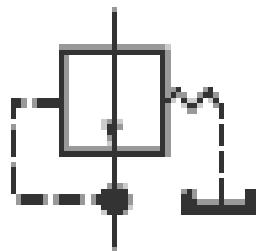
LINE PRESSURE IS LIMITED TO AND PROPORTIONAL TO AN ELECTRONIC SIGNAL

SEQUENCE VALVE



WHEN THE LINE PRESSURE REACHES THE SETTING OF THE VALVE, VALVE OPENS PERMITTING FLOW TO THE SECONDARY PORT. THE PILOT MUST BE EXTERNALLY DRAINED TO TANK.

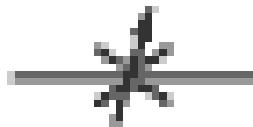
PRESSURE REDUCING VALVE



PRESSURE DOWNSTREAM OF VALVE IS LIMITED TO THE SETTING OF THE VALVE

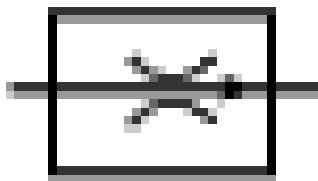
FLOW CONTROL VALVES

THROTTLE VALVE

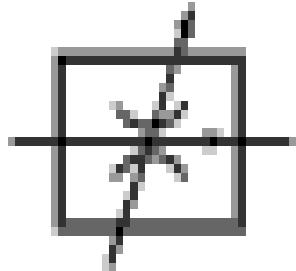


ADJUSTABLE OUTPUT FLOW

FLOW CONTROL VALVE



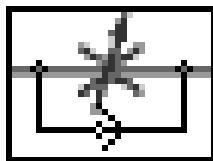
WITH FIXED OUTPUT
(VARIATIONS IN INLET
PRESSURE DO NOT AFFECT
RATE OF FLOW)



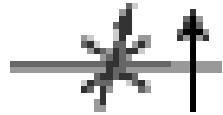
WITH VARIABLE OUTPUT



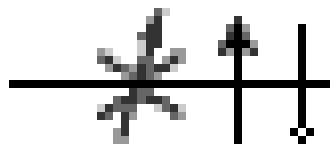
FIXED ORIFICE



**METERED FLOW TOWARD RIGHT
FREE FLOW TO LEFT**

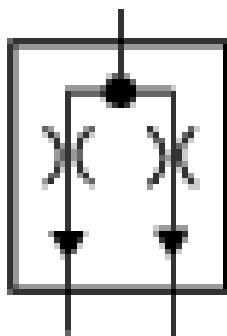


**PRESSURE COMPENSATED FLOW
CONTROL VALVE FIXED OUTPUT FLOW
REGARDLESS OF LOAD**



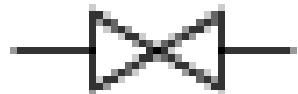
**PRESSURE AND TEMPERATURE
COMPENSATED FCV**

FLOW DIVIDING VALVE



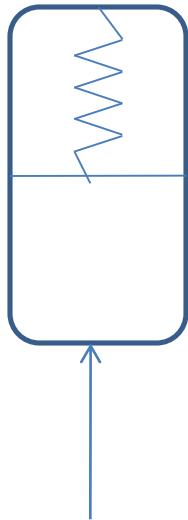
**FLOW IS DIVIDED EQUALLY TO
TWO OUTPUTS**

SHUT-OFF VALVE

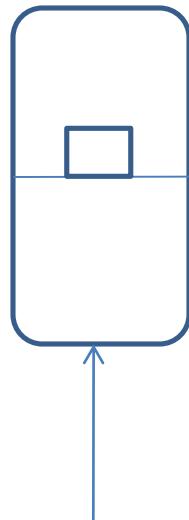


Simplified symbol

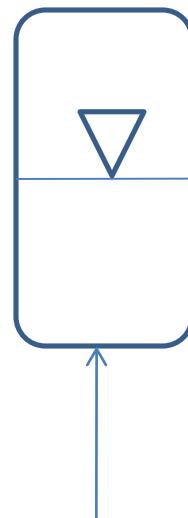
ACCUMULATORS



SPRING LOADED

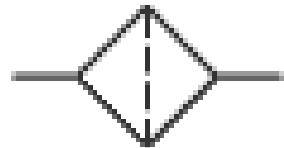


DEAD WEIGHT

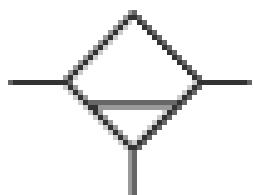


GAS FILLED

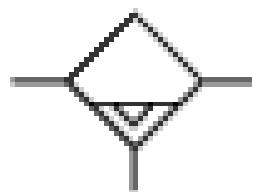
FILTERS, WATER TRAPS, LUBRICATORS AND MISCELLANEOUS APPARATUS



FILTER OR STRAINER

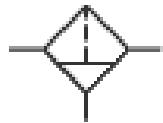


WITH MANUAL DRAIN

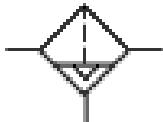


WITH AUTOMATIC DRAIN

FILTER WITH WATER TRAP

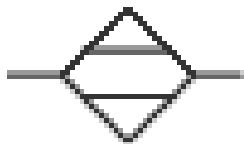


WITH MANUAL DRAIN



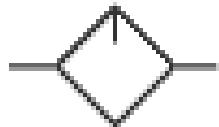
AUTOMATIC DRAIN

AIR DRYER



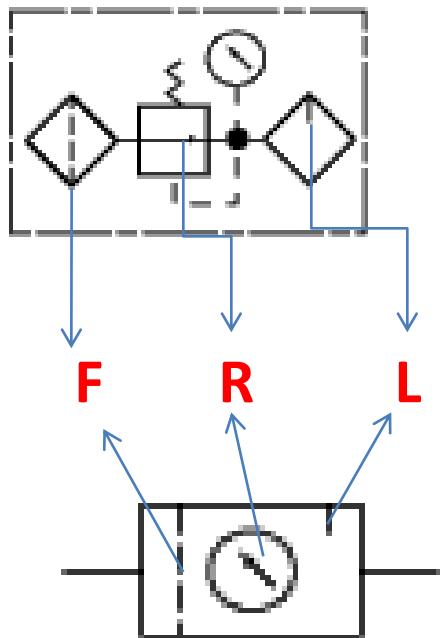
**REFRIGERANT, OR CHEMICAL REMOVAL OF
WATER FROM COMPRESSED
AIR LINE**

LUBRICATOR



OIL VAPOR IS INDUCTED INTO AIR LINE

CONDITIONING UNIT/ FRL UNIT

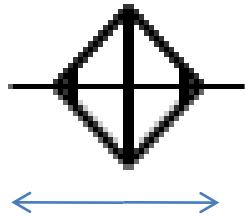


COMPOUND SYMBOL OF
FILTER, REGULATOR, LUBRICATOR
UNIT

Simplified Symbol

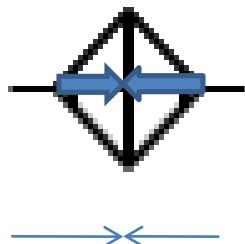
HEAT EXCHANGERS

COOLER



AIR OR WATER COOLED UNIT
DESIGNED TO REMOVE HEAT
FROM OIL RETURNING TO RESERVOIR

HEATER



TO HEAT OIL

HEAT ADDED