

Yuken Logic Valves

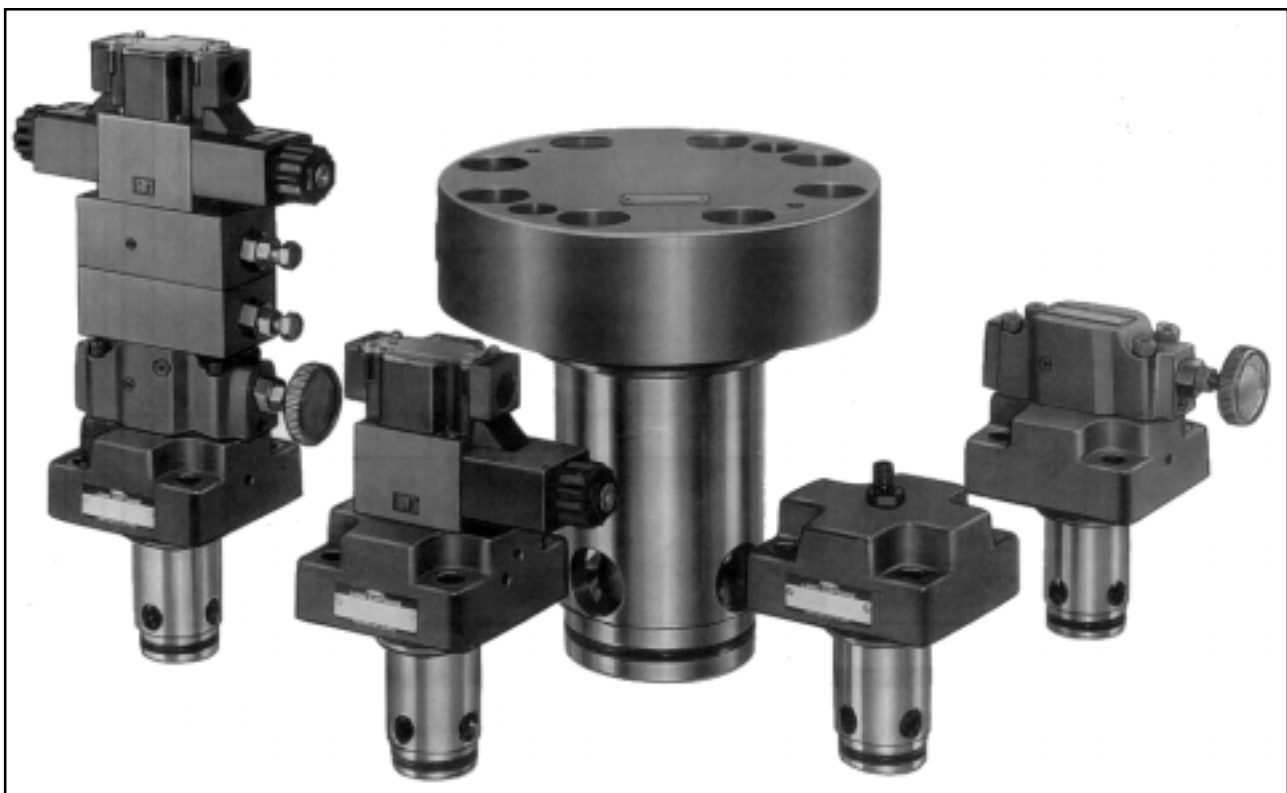
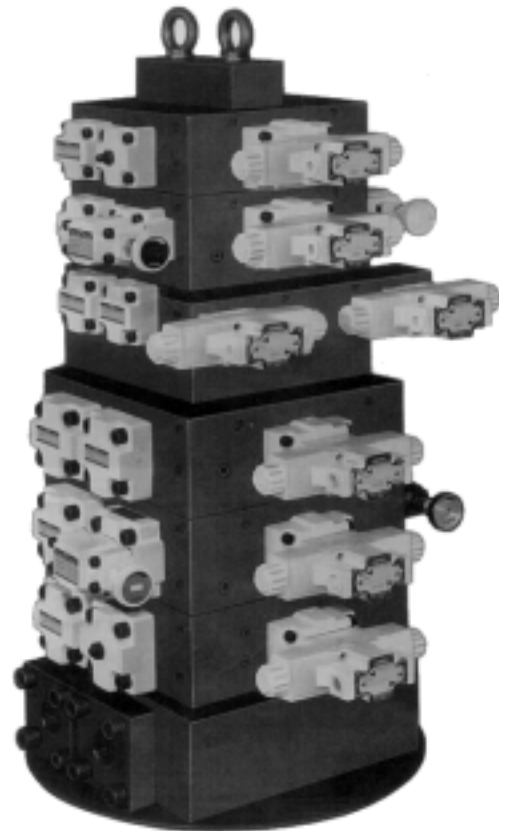
Yuken's Logic Valves comprise cartridge type elements and covers with pilot passages. Various types may be combined for direction, flow rate and pressure control.

Yuken Logic Valves can be incorporated in manifold blocks to form optimum integrated hydraulic circuits and compact hydraulic power units. Being a poppet type, the elements permit high-pressure, high flow rates, high speed and shockless shifting with low pressure drop.

Typical applications include steel mill machines, injection molding machines, machine tools and so on. In addition, Yuken logic Valves cavity specifications conform to ISO standards.

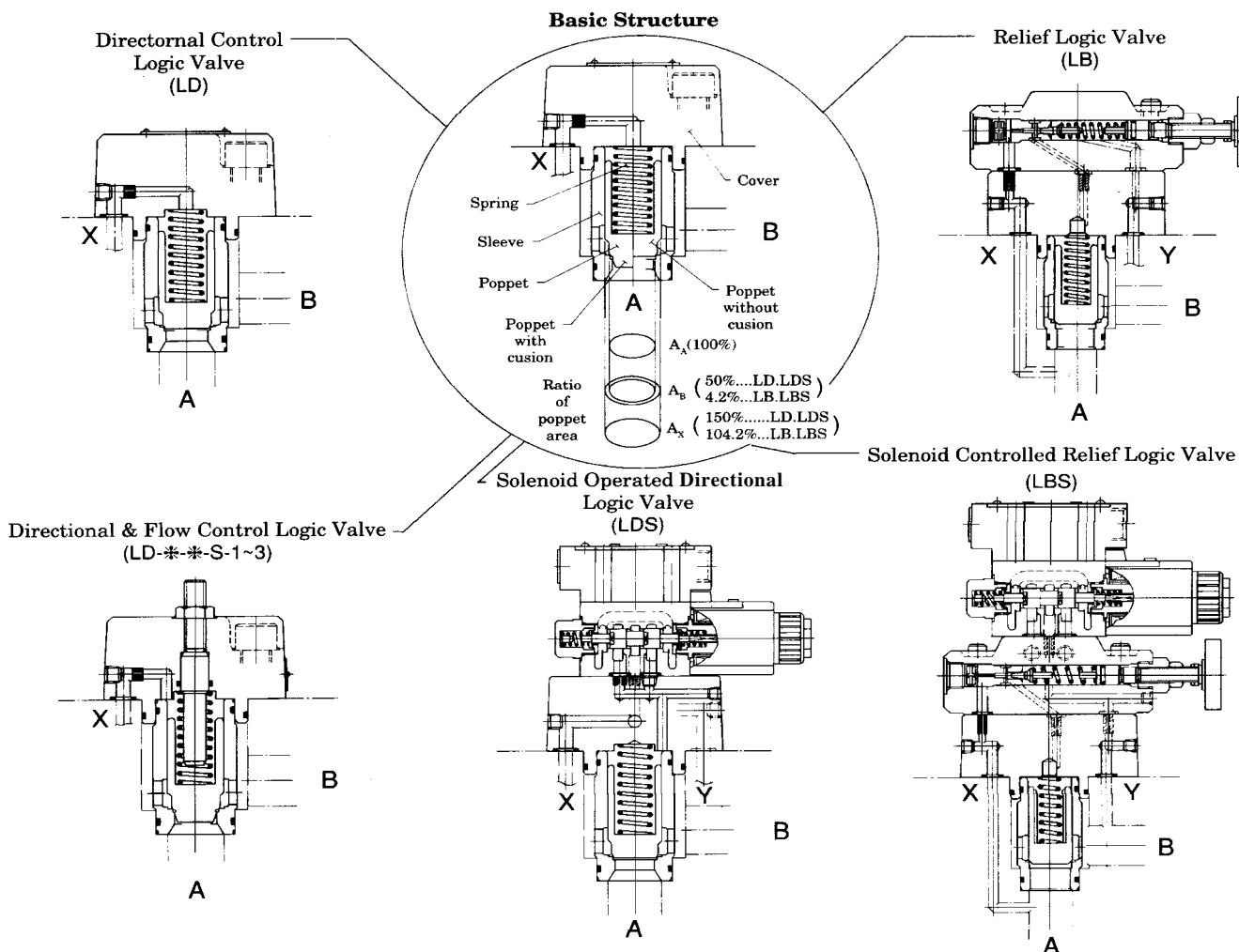
■ Features

- Multifunction performance in terms of direction, flow and pressure can be obtained by combining elements and covers.
- Poppet-type elements virtually eliminate internal leakage and hydraulic locking. Because there are no overlaps, response times are very high, permitting high-speed shifting.
- For high pressure, large capacity systems, optimum performance is achieved with low pressure losses.
- Since the logic valves are directly incorporated in cavities to piping such as oil leakage, vibration and noise, and higher reliability is achieved.
- Multifunction logic valves permit compact integrated hydraulic systems which reduce manifold dimensions, mass and achieve lower cost conventional types.



Structure and functions

As shown below, a logic valve consists of a cover, sleeve, poppets and a spring incorporated in a block. Although it is a simple port valve designed to open and close the poppets in accordance with the pressure signals from the pilot line, it serves as a multifunctional valve for controlling the direction, flow and pressure by controlling the pressure signals. Standard covers have several pressure signal ports (pilot ports) and control valves for control purposes are available. The covers are spigot mounted. There is no risk of oil leakage.



● Functions, working area ratios and features

Functions	Graphic Symbols	Working area ratio ($A_A : A_B$)	Features
Direction		(2 : 1)	<ul style="list-style-type: none"> Poppet shape Without cushion (LD/LDS-**-*) : high-speed shift/with cushion (LD/LDS-**-S) : Shockless shift No leakage between port A and B Flow A to B and B to A are possible Response time and shock can be adjusted by orifice selection.
Direction and Flow			<ul style="list-style-type: none"> Poppet shape With cushion (LD-**-S-1/2/3) : flow control No leakage between port A and B Flow A to B only is possible. Response time and shock can be adjusted by orifice selection.
Relief		(24 : 1)	<ul style="list-style-type: none"> Remote and unloading control is possible with vent circuit (LB-**-*) . Two or three pressure controls are possible in combination of solenoid operated directional valve and pilot relief valve (LBS-**-*) .

■ Operating Principles

The logic valve poppet is opened or closed by the pilot pressure balance between the pilot port "X" and the poppet force produced by the pressures at A and B ports.

If

- A_X : area under pressure at port X
- A_A : area under pressure at port A
- A_B : area under pressure at port B
- P_X : pressure at port X
- P_A : pressure at port A
- P_B : pressure at port B
- F_S : spring force
- F_X : pressing force at port X
- F_W : push-up force at port A and B

then

$$(A_X \cdot P_X) + F_S = F_X$$

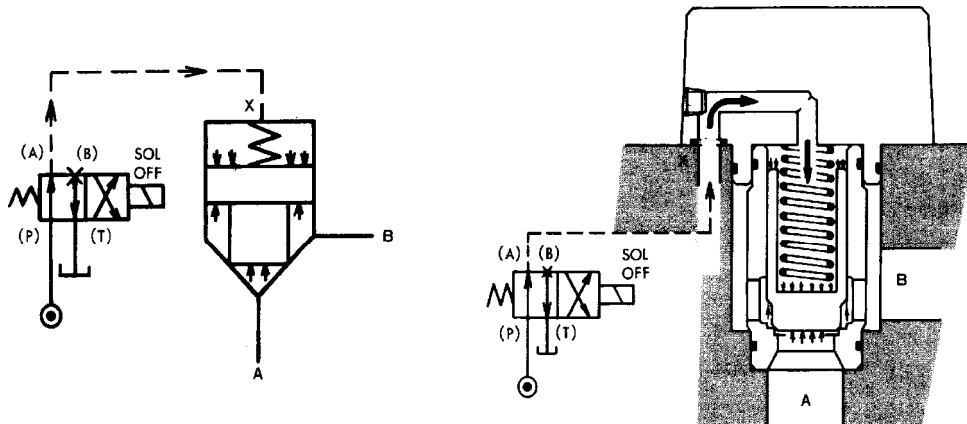
$$(A_A \cdot P_A) + (A_B \cdot P_B) = F_W$$

● Closing Operation

If the solenoid operated directional valve (SOL) at pilot port X is "off" in the figure below, there is the following relation:

$$F_X > F_W$$

Here, the poppet is pushed onto the seat and the valve closes.

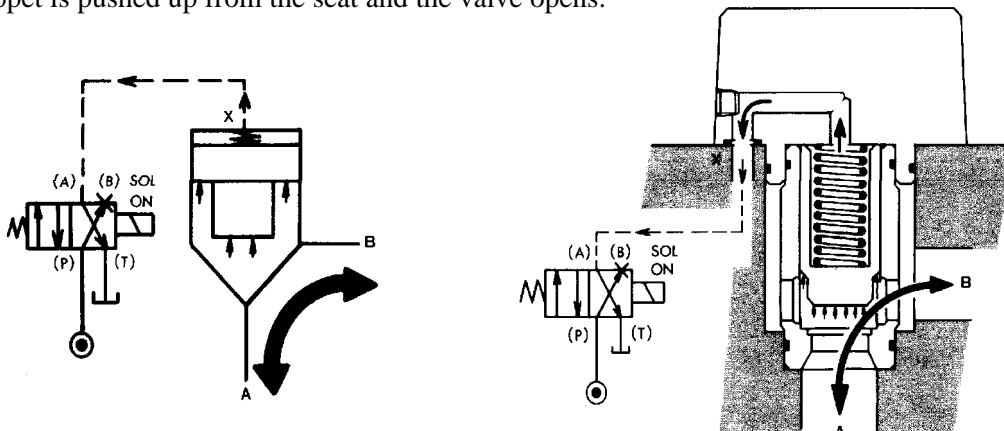


● Opening Operation

If the solenoid operated directional valve (SOL) at pilot port X is "on" in the figure below, there is the following relation:

$$F_X < F_W$$

Here, the poppet is pushed up from the seat and the valve opens.



■ Directional Control Logic Valves

■ Directional and Flow Control Logic Valves

The valves mentioned above are 2-way directional valves designed to open and close the circuits in accordance with pressure signals from the pilot lines. They are used as multifunctional valves for controlling flow directions or flow directions and rates.

Standard covers provided with a choice of several control valves are available so that optimum valves can be selected for control purposes.



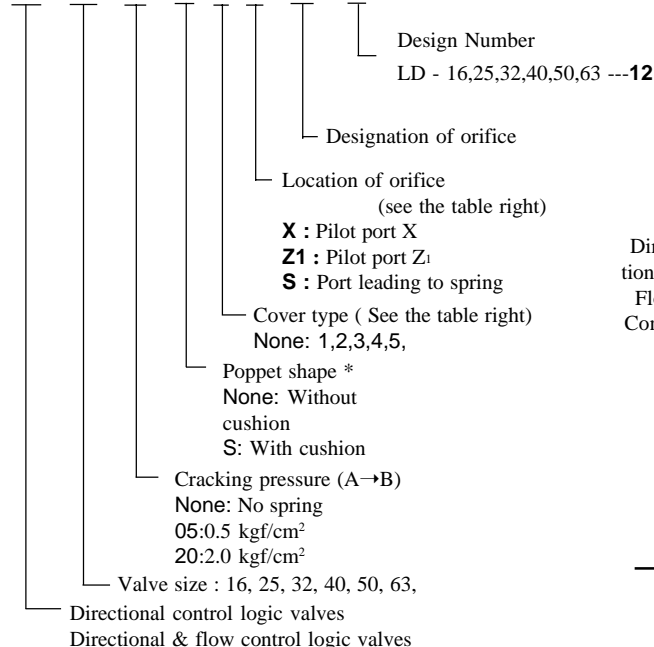
■ Ratings

Model No.	Rated flow l/min	Max. operating pressure kgf/cm ²	Cracking Pressure kgf/cm ²	Ratio of Poppet Area	Mass kg
LD-16	130	315	None: No Spring 05: 0.5 (A→B) [1 (B→A)] 20: 2 (A→B) [4 (B→A)]	2:1 (Annular area 50%)	1.6
LD-25	350				3.0
LD-32	500				5.3
LD-40	850				9.1
LD-50	1400				14.8
LD-63	2100				29.8

Note : The rated flow is values with a pressure drop of 3 kgf/cm² [fluid viscosity 35cSt (160SSU)]

■ Model Number Designation

LD - 32 - 05 - S - 1 - X - 05 - 12



■ List of Cover Types

Cover Type Designation	Graphic Symbols	Valve Size						
		16	25	32	40	50	63	
Directional Control	Standard (None)		O	O	O	O	O	O
	With Check Valve (4)		O	O	O	O	O	O
	With Shuttle Valve (5)		O	O	O	O	O	O
Directional & Flow Control	With Stoke Adjuster (1)		O	O	O	O	O	O
	With Check Valve & Stoke Adjuster (2)		O	O	O	O	O	O
	With Shuttle Valve & Stoke Adjuster (3)		O	O	O	O	O	O

* Poppet shapes

The type without a cushion and the type with a cushion are both suitable for high-speed shifting and shockless shifting respectively. For directional and flow control logic valves, be sure to specify "poppets with cushions"

■ Solenoid Operated Directional Control Logic Valves

The solenoid operated directional control logic valves are composed of directional control valves and solenoid operated directional valves combined together. The solenoid operated directional valves serve to switch pilot lines and the directional control valves are used to control the direction of the main circuits.

Covers provided with various control valves are available to provide optimum control.



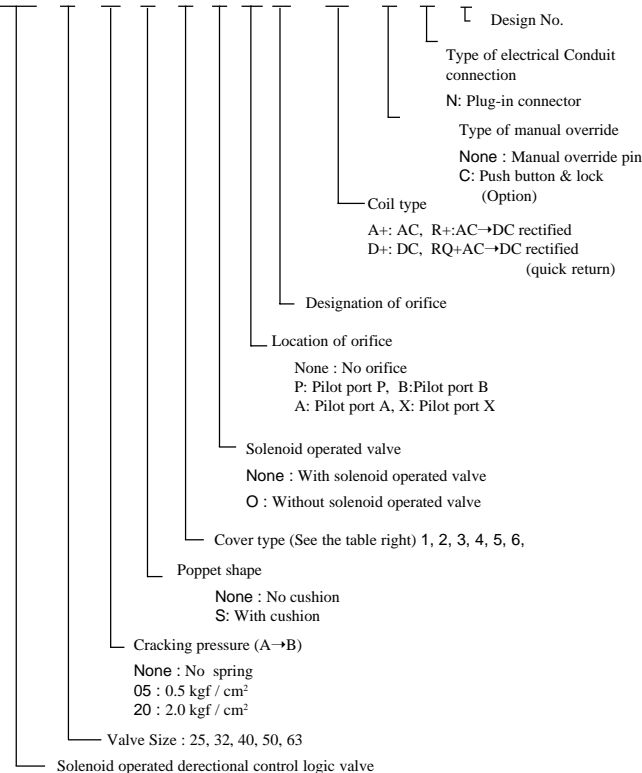
■ Ratings

Model No.	Rated Flow l/min.	Max. Operating Pressure kgf/cm ²	Cracking Pressure kgf/cm ²	Ratio of Poppet Area	Mass kg
LDS-25	350	315	None: No Spring	2 : 1 (Annular area 50%)	4.4
LDS-32	500		05: 0.5 (A→B)		6.7
LDS-40	850		[1 (B→A)]		10.5
LDS-50	1400		20: 2 (A→B)		18.6
LDS-63	2100		[4 (B→A)]		33.6

Note: The rated flow is values with a pressure drop of 3 kgf/cm² [fluid viscosity 35cSt (160 SSU)].

■ Model Number Designation

LDS - 32 - 05 - S - I - O - X 05 - A100 - C - N - 12



■ List of Cover Types

Cover Type Designation	Graphic Symbols	Valve Size					
		16	25	32	40	50	63
Normally Closed (1)		-	O	O	O	O	O
Normally Open (2)		-	O	O	O	O	O
Normally Closed with Shuttle Valve (3)		-	O	O	O	O	O
Normally Open with Shuttle Valve (4)		-	O	O	O	O	O
Normally Closed with Shuttle Valve (5)		-	O	O	O	O	O
Normally Open with Shuttle Valve (6)		-	O	O	O	O	O

■ Orifices

Valve response time and shock level can be adjusted by changing the orifice diameter on the pilot line. Favorable response and shockless effect can be obtained by selecting an optimum orifice diameter.

● How to select orifices

An orifice diameter can be obtained by using figs. 1 & 2 and only if a response time and a pressure differential at the orifice are determined.

Example:

Model No. : LD-40 (poppet without cushion)

Pressure differential at orifice : 5 kgf/cm²

Necessary response time : 0.1 s.

Under these conditions, obtain the orifice diameter.

Obtain the pilot flow rate by drawing lines in Fig.1 as shown by the dotted lines. In this example it is 14 l/min.

Draw lines in Fig.2 as shown by the dotted lines to obtain the cross-section. In this example, it is 2.0 mm.

Notes :

- 1) The response time refers to the times from when the solenoid of the solenoid operated directional valve is energised to when the main valve fully closes after full stroke.

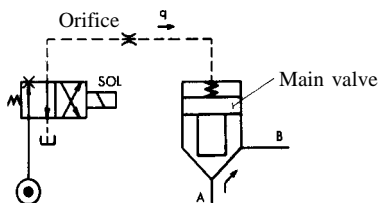
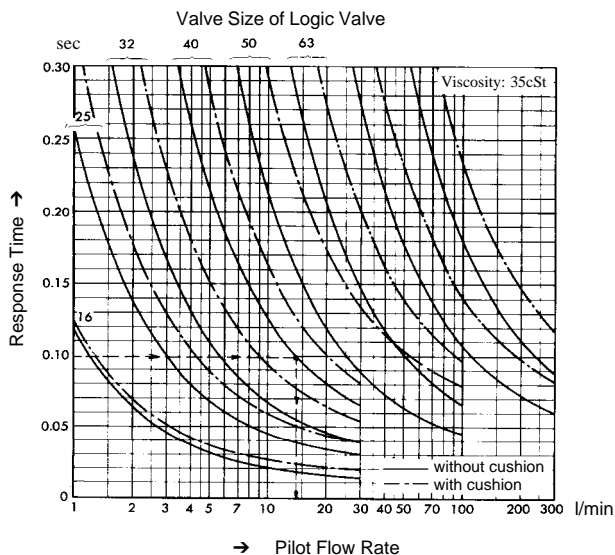


Fig. 1 Pilot Flow Rate vs. Response Time Characteristics



- 2) If logic valves are used at pressure above 200 kgf/cm² maximum orifice diameter are limited.

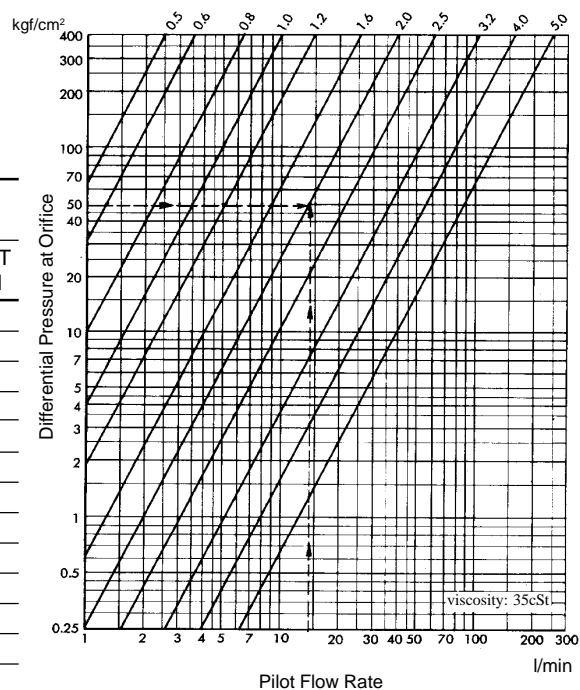
Valve Size	16	25	32	40	50	63
Designation of Orifice	12	12	14	16	18	20
Orifice Dia. (φ)	1.2	1.2	1.4	1.6	1.8	2.0

● Orifice types and standard orifice diameters

Standard orifice diameters for orifice types are shown below.

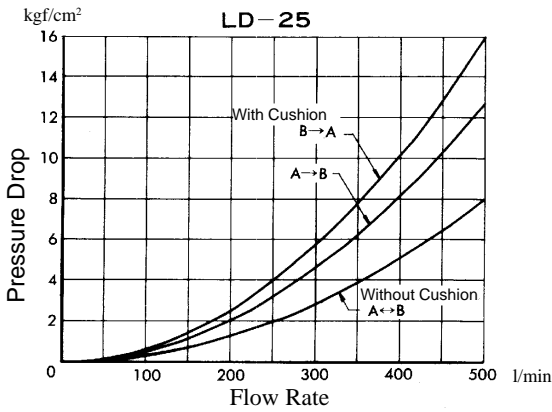
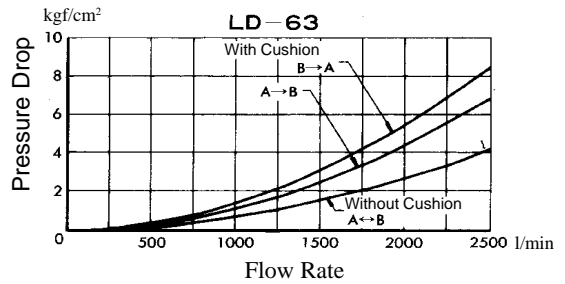
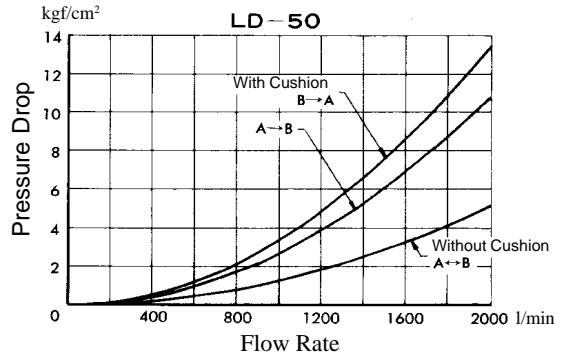
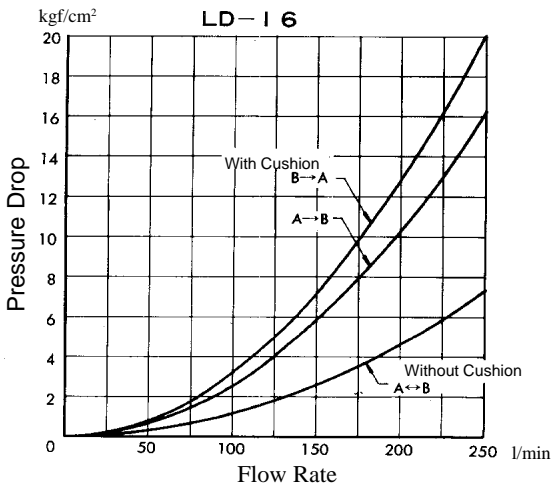
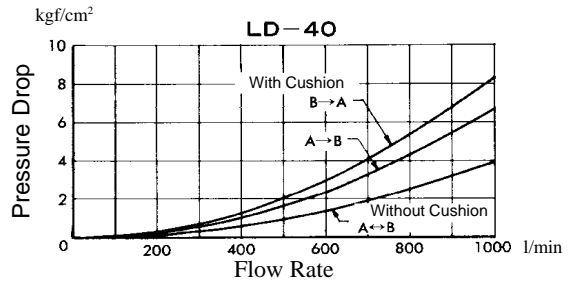
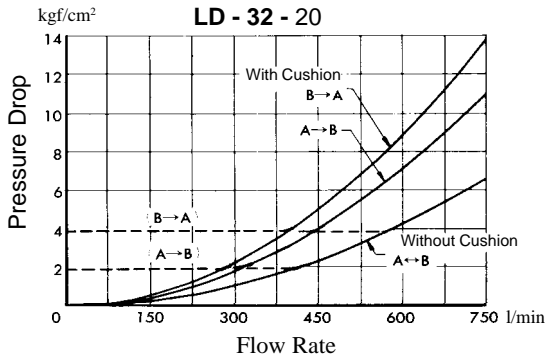
Standard Orifice		Orifice Type			
Designation of Orifice	Orifice Dia. "d" mm	TP-OPM -4 x d	TP-OPT -1/16 x d	TP-OPT -1/8 x d	TP-OPT -3/8 x d
05	0.5	○	○	—	—
06	0.6	○	○	—	—
08	0.8	○	○	○	—
10	1.0	○	○	○	—
12	1.2	○	○	○	—
14	1.4	○	○	○	—
16	1.6	○	○	○	○
18	1.8	—	○	○	○
20	2.0	—	○	○	○
25	2.5	—	○	○	○
32	3.2	—	—	○	○
40	4.0	—	—	—	○
50	5.0	—	—	—	○
Recommended tightening torque kgf-cm		17	55	105	500

Fig. 2 Pilot Flow Rate vs. Differential Pressure Characteristics

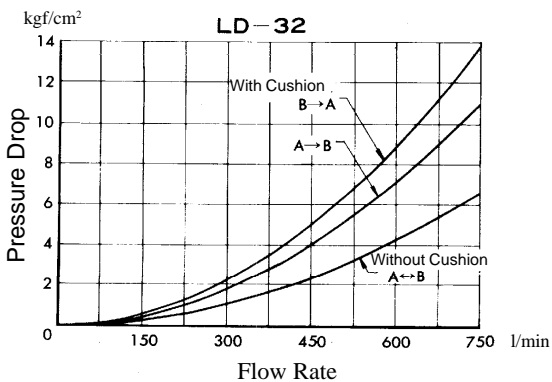


Flow Rate Vs. Pressure

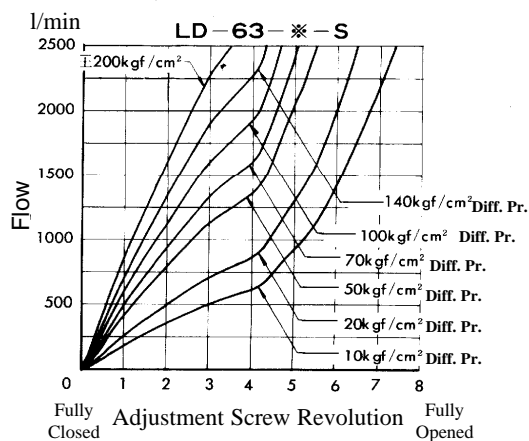
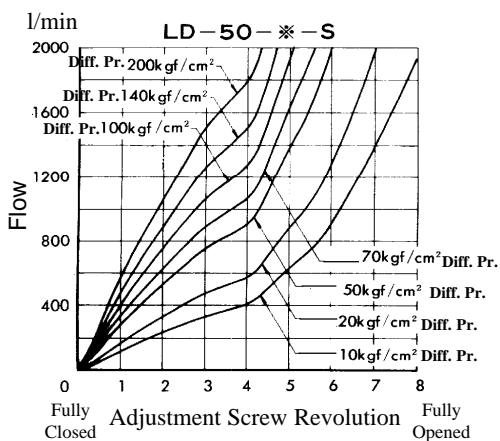
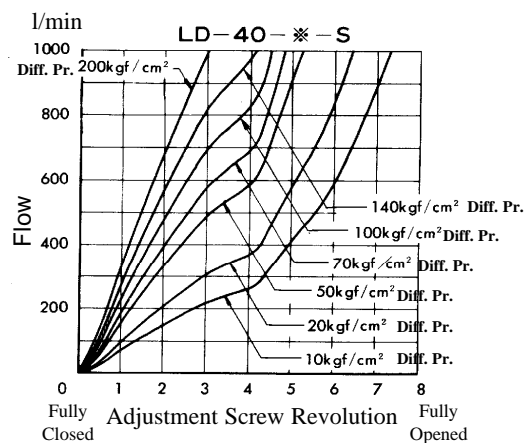
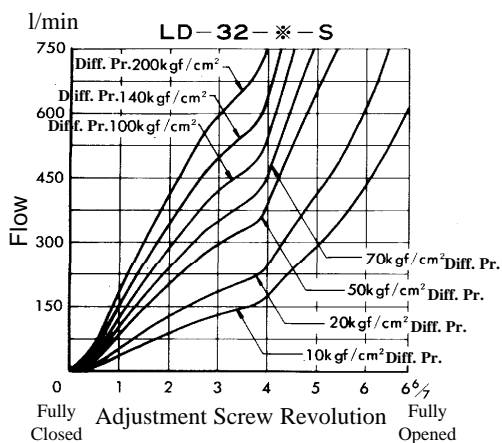
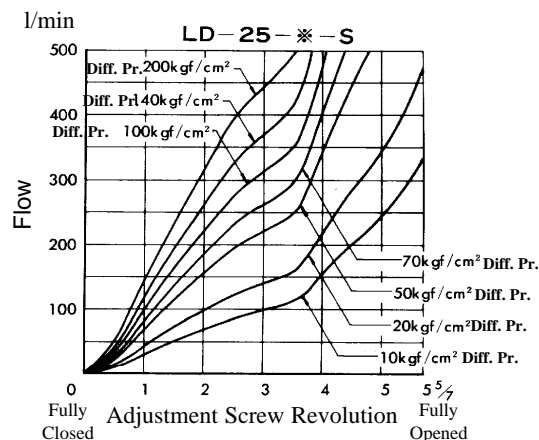
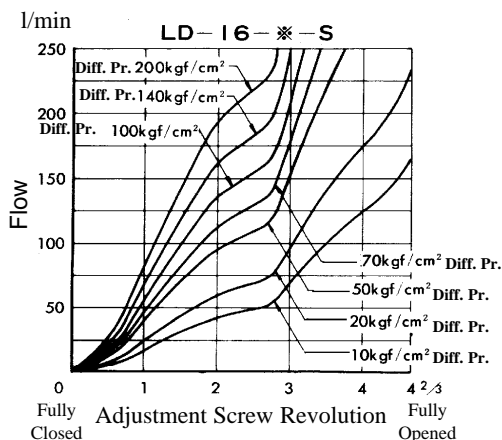
Ex :- Cracking pressure A B 2 kgf/cm² is required



Hydraulic Fluid ISO VG 46
Viscosity 35 mm²/s (cSt)



■ Adjustment Screw Revolution Vs. Flow Rate

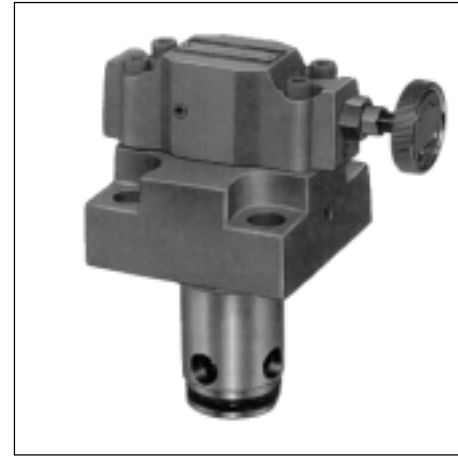


Hydraulic Fluid ISO VG 46
 Viscosity 35 mm²/s (cSt)

Relief Logic Valves

The relief logic valve is used to protect pumps and control valves from excessive pressure and controls the pressures of their hydraulic lines at constant levels.

With the help of vent lines, they are also capable of remote and unload control.



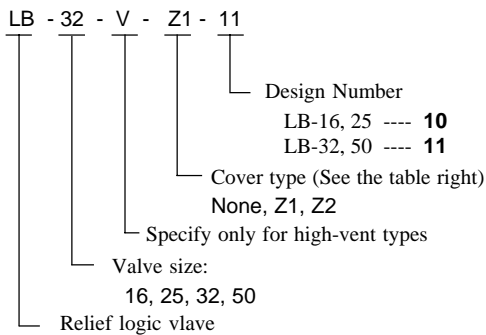
Ratings

Model Numbers	Max. Operating Pressure kgf/cm ²	Pres. Adj. Range kgf/cm ²	Max. Flow * l/min	Min. flow l/min	Mass kg.
LB-16-**-*-10	315	4 - 315	125	5	3.6
LB-25-**-*-10			250	5	4.5
LB-32-**-*-11			500	8	6.7
LB-50-**-*-11			1200	10	16.1

Ratings

* If the pressure is above 250 kgf/cm², keep the flow rate above 15 l/min for any model.

Model Number Designation



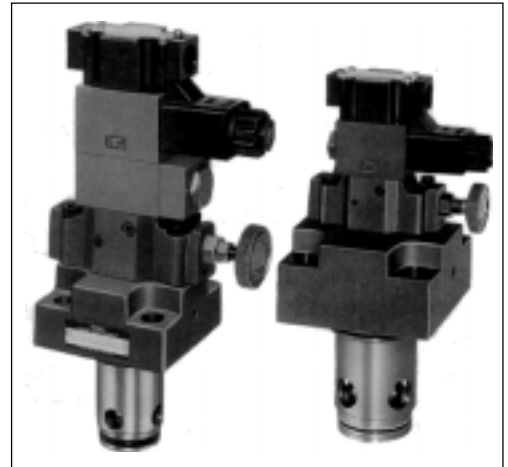
List of Cover Types

Cover Type Designation	Graphic Symbols	Valve Size				
		16	25	32	40	50
Standard (None)		O	O	O	—	—
Vent controlled (Z1)		O	O	O	—	—
Vent Controlled (Z2)		O	O	O	—	—

■ Solenoid Controlled Relief Logic Valves

The solenoid controlled relief logic valves are composite control valves having solenoid controlled directional and pilot relief valves and vent restrictors combined together.

This configuration eliminates pipes from the vent circuits of relief logic valves. They are used to put pumps into unloading operation, with the solenoid controlled directional valves serving to select pilot lines, or to place hydraulic system two or three pressure controls, with the pilot relief valves in action.



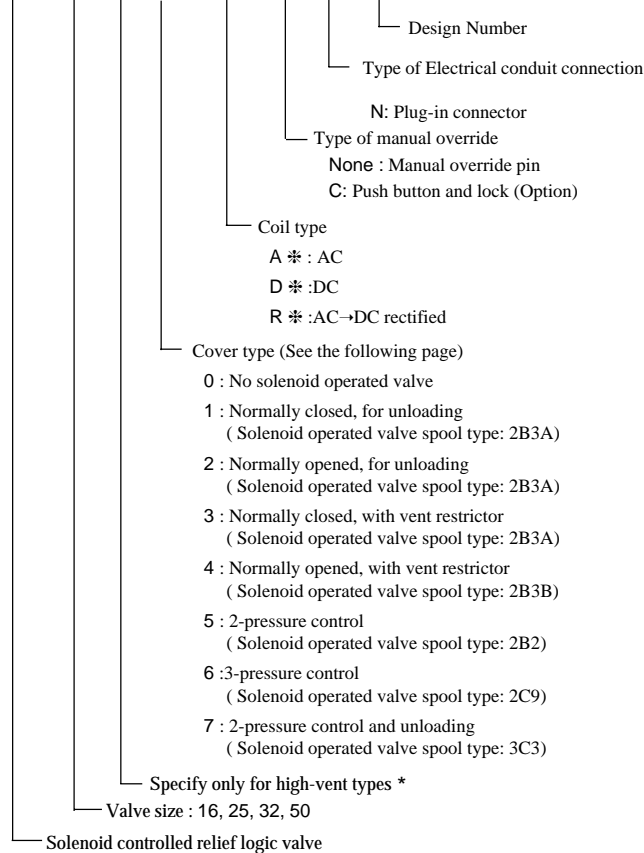
■ Ratings

Model Numbers	Max. Operating Pressure kgf/cm ²	Pressure Adj. Range kgf/cm ²	Max. Flow l/min	Min. Flow * l/min	Mass kg
LBS-16-**-**-12	315	4 - 315	125	5	8.8
LBS-25-**-**-12			250	5	9.7
LBS-32-**-**-12			500	8	11.9
LBS-50-**-**-12			1200	10	21.3

* If the pressure is above 250 kgf/cm², keep the flow rate above 15 l/min for any model.

■ Model Number Designation

LBS - 32 - V - 1 - A100 - C - N - 12



* Use high-vent pressure types if the shifting time from unloading to on-loading is reduced.

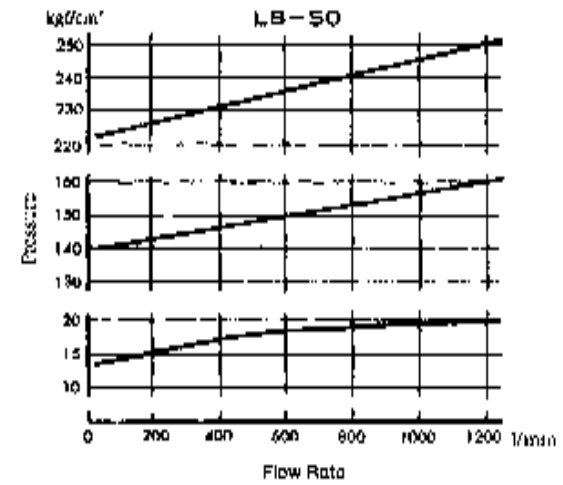
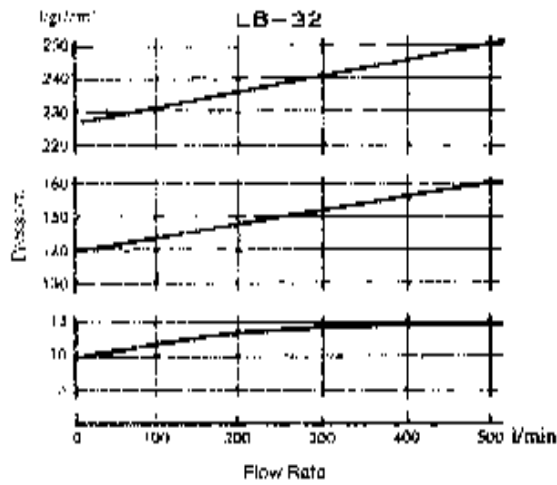
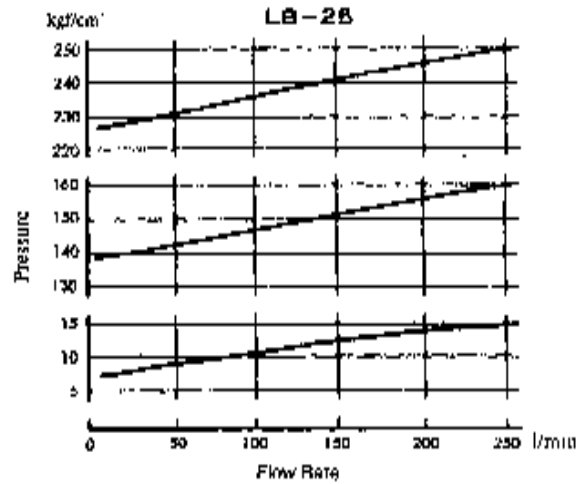
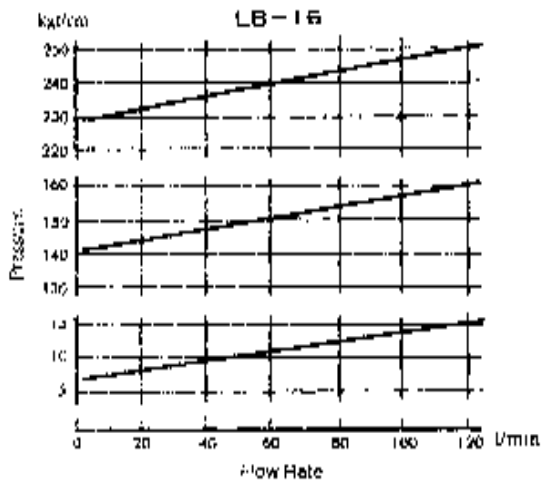
■ List of Cover Types

Cover Type Designation	Graphic Symbols	Valve Size				
		16	25	32	40	50
Without Solenoid Valve (0)		O	O	O	-	O
Normally Closed for Unloading (1)		O	O	O	-	O
Normally Open for Unloading (2)		O	O	O	-	O
Normally Closed with Vent Restrictor (3)		O	O	O	-	O
Normally Open with Vent Restrictor (4)		O	O	O	-	O

Cover Type Designation	Graphic Symbols	Valve Size				
		16	25	32	40	50
Two Pressure Control (5)		O	O	O	-	O
Three Pressure Control (6)		O	O	O	-	O
Two-Pressure Control and Unloading (7)		O	O	O	-	O

■ Flow Rate vs. Pressure

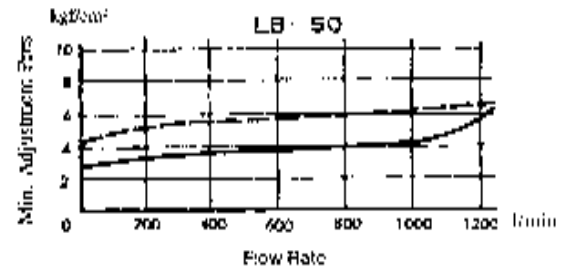
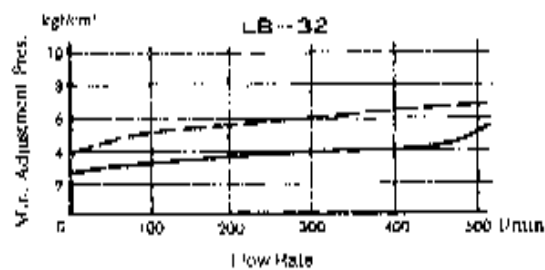
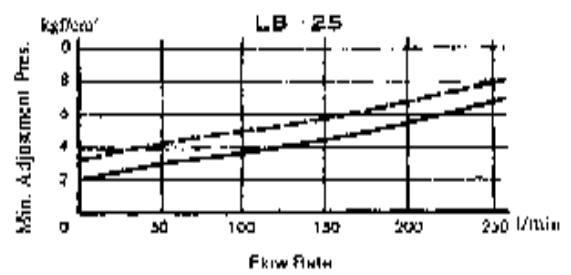
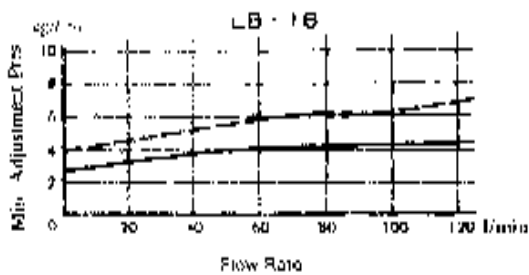
Hydraulic Fluid : ISO VG46 Oils
 Viscosity : 35 mm²/s (cSt)



■ Min. Adjustment Pressure

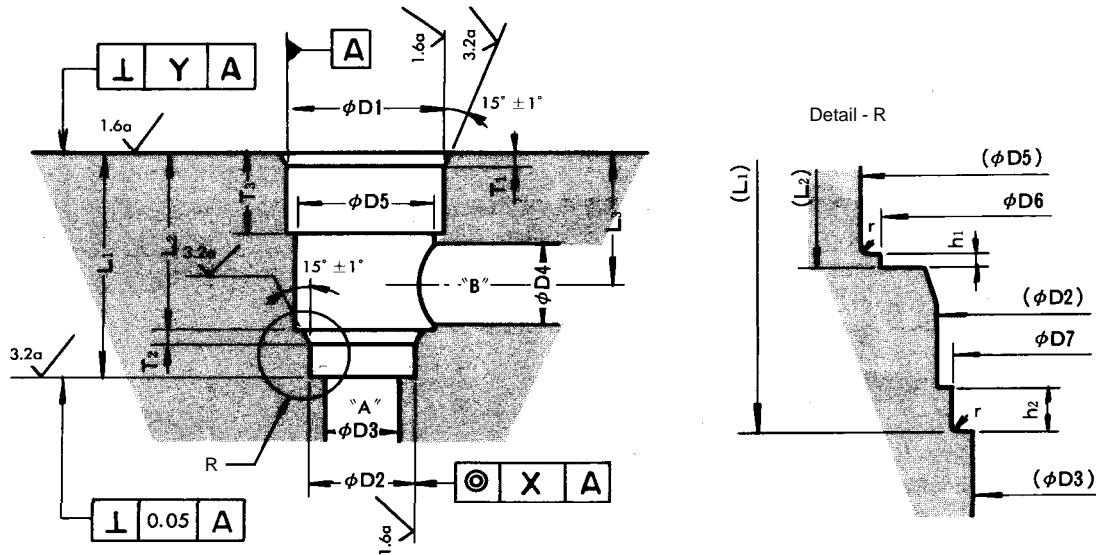
Hydraulic Fluid : ISO VG46 Oils
 Viscosity : 35 mm²/s (cSt)

— Low - Vent
 - - - High - Vent



■ Mounting Dimensions

The mounting dimensions of Yuken LogicValves conform to the cavity specifications conform to ISO 7368 (TWO-PORT SLIP-IN CARTRIDGE VALVES-CAVITIES).

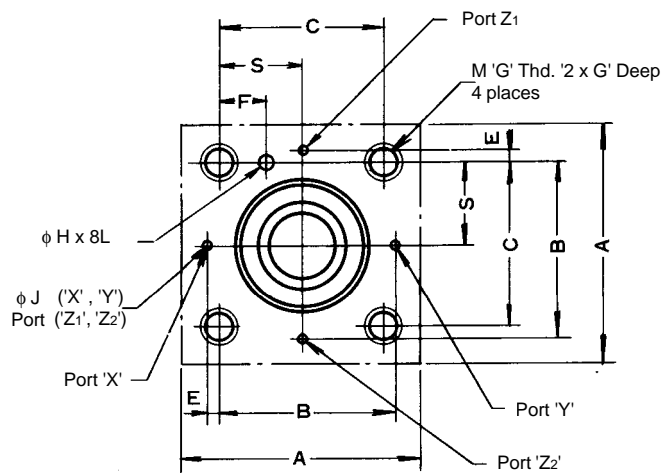


Valve size	L1		L2		L3 ± 0.3	D1		D2		D3	D4	D5 Min.
	Standard Dimensions	Tolerance	Standard Dimensions	Tolerance		Standard Dimensions	Tolerance	Standard Dimensions	Tolerance			
16	56	+ 0.1 0	43	+ 0.1 0	34	32	+ 0.039	25	$\begin{matrix} +0.033 \\ 0 \end{matrix}$	16	31.5	
25	72		58		44	45	0	34	+ 0.039	25	44.5	
32	85		70		52	60	+ 0.046	45	0	32	59.5	
40	105		87		64	75	0	55	+ 0.046	40	74	
50	122		100		72	90	+ 0.054	68	0	50	89	
63	155		130		95	120	0	90	$\begin{matrix} +0.054 \\ 0 \end{matrix}$	63	119	

Valve size	D6	D7	T1	T2	T3	h1	h2	r	x	y
16	28.5	24.6	2	2	20	0.2	2	0.8	0.03	0.05
25	39.5	33.6	2.5	2.5	30					
32	52.5	44.6	2.5	2.5	30					
40	65	54.6	3	3	30	0.3	0.05		0.1	
50	75	67.6	3	3	35					
63	105	89.6	4	4	40	0.4				5

■ Cover Mounting Dimensions

Square Type Flange Cover



Valve Size	*1 A +1 0	B ± 0.2	C ± 0.2	S ± 0.2	E ± 0.2	F ± 0.2	G ± 0.2	*2 H	*2.3 J
16	65	48	46	23	2	12.5	8	4	4
25	85	62	58	29	4	13	12	6	6
32	102	76	70	35	6	18	16	6	6
40	125	92.5	85	42.5	7.5	19.5	20	6	10
50	140	108	100	50	8	20	20	8	10
63	180	137.5	125	62.5	12.5	24.5	30	8	12

- * 1. The tolerances in column A apply to cutting.
- * 2. φ H and φ J are drilled holes.
- * 3. φ J should be drilled appropriately for X, Y, Z₁, or Z₂.