

F

MODULES

YUKEN's Modular Valves are stack type valves, and require no piping. They not only rationalise system build, but they also meet the technical requirements for a variety of hydraulic systems. Stacking systems is a new era in hydraulics.

The valves have standardized mounting surface conforming to ISO 4401 and optimum thickness for each size. Any hydraulic circuits can be easily composed by stacking the valves with mounting bolts. The valves can be used widely for hydraulic systems for various industries such as machine tools, special purpose machines, ships and steel mill equipment.

Valve Type	Max. Operating Pressure MPa (PSI)	Maximum Flow																Page
		1235710203050701002003005007001000 U.S.GPM 200 L/min																
005 Series Modular Valves	25 (3630)	005																517
01 Series Modular Valves	31.5 (4570)	01 01★																535
03 Series Modular Valves	25 (3630)	03 03★																577
06 Series Modular Valves	25 (3630)	06																619
10 Series Modular Valves	25 (3630)	10																633

★ Maximum Flow for Throttle and Check Modular Valves.

■ Hydraulic Fluids

● Fluid Types

Any type of hydraulic fluid listed in the table below can be used.

Petroleum Base Oils	Use fluids equivalent to ISO VG 32 or VG 46.
Synthetic Fluids	Use phosphate ester or polyol ester fluids. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.
Water-containing Fluids	Use water-glycol fluid.

Note: For use with hydraulic fluids other than those listed above, please consult your Yuken representatives in advance.

● Recommended Fluid Viscosity and Temperature

Use hydraulic fluids which satisfy the both recommended viscosity and oil temperatures given in the table below.

Name	Viscosity	Temperature
005 Series Modular Valves	15 - 200 mm ² /s (77 - 900 SSU)	-15 - +60°C (5 - 140°F)
01 Series Modular Valves 03 Series Modular Valves 06 Series Modular Valves 10 Series Modular Valves	15 - 400 mm ² /s (77 - 1800 SSU)	-15 - +70°C (5 - 160°F)

● Control of Contamination

Due caution must be paid to maintaining control over contamination of the hydraulic fluids which may otherwise lead to breakdowns and shorten the life of the valve.

Name	Contamination	Nominal Filtration
005 Series Modular Valves	Within NAS1638 - Grade 11	20 μm or less
01 Series Modular Valves 03 Series Modular Valves 06 Series Modular Valves 10 Series Modular Valves	Within NAS1638 - Grade 12	20 μm or less

High Pressure, High Flow Rate Modular Valves

Features

1. Installation and mounting space can be minimized.
2. No special skill is required for assembly and any addition or alteration of the hydraulic circuit can be made quickly and easily.
3. Problems such as oil-leaks, vibration and noise which may be caused by piping are minimized, increasing the reliability of the hydraulic system.
4. Maintenance and system check-ups can be easily carried out as they are normally installed in stackable units.

Specifications

Series	Valve Size	Max. Operating Pressure MPa (PSI)	Max. Flow L/min (U.S.GPM)	Number of Stack ^{★2}
005 Series	—	25 (3630)	15 (3.96)	1 to 4 stacks
01 Series	1/8	31.5 (4570)	35 [60] ^{★1} (9.24 [15.9]) ^{★1}	1 to 5 stacks ^{★3}
03 Series	3/8	25 [31.5] ^{★4} (3630 [4570]) ^{★4}	70 [120] ^{★1} (18.5 [31.7]) ^{★1}	1 to 5 stacks
06 Series	3/4	25 (3630)	500 (132)	
10 Series	1-1/4	25 (3630)	800 (211)	

★1. The values in parentheses represent the max. flow rates for throttle modular valves (MSP) and throttle check modular valves (MSA/MSB/MSW).

★2. Solenoid operated directional valve is included in the number of stack.

★3. Solenoid operated directional valve is included in the number of stack. If the working pressure is above 25 MPa (3630 PSI), the maximum number of layers in a stack is 4 including the solenoid operated directional valve.

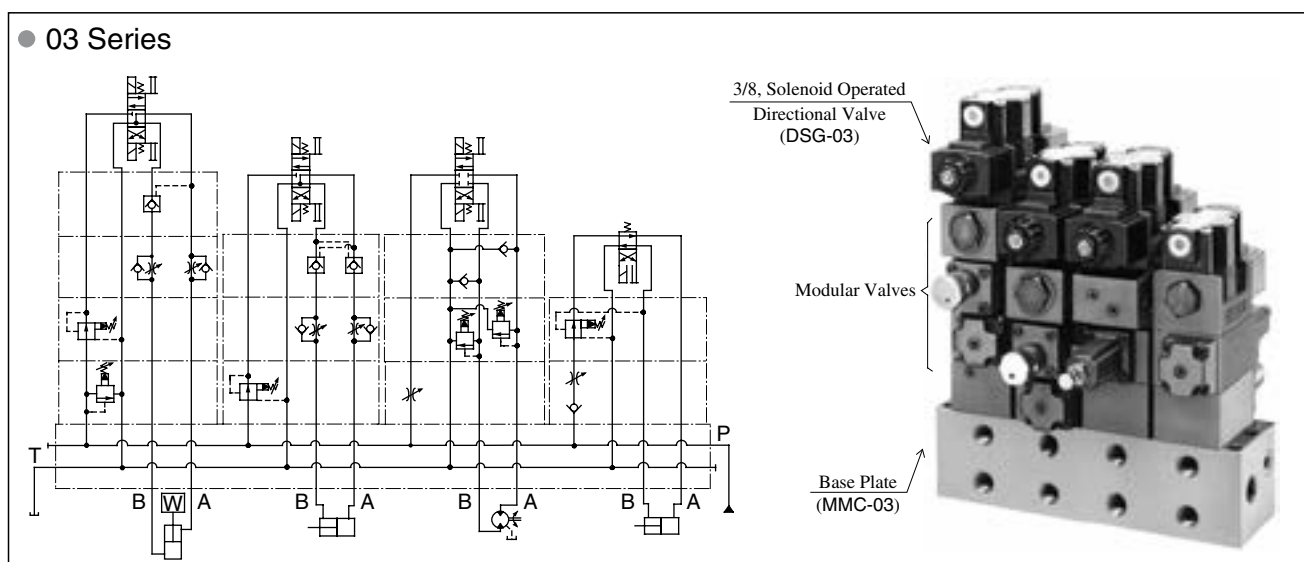
★4. The value range in parentheses represents the tightening torque requirements if the operating pressure is above 25 MPa (3630 PSI).

Mounting Surface

Mounting surface dimensions conform to ISO 4401 (Hydraulic fluid power four port directional control valves mounting surface) as listed in the table below.

Name of Valve	ISO Mtg. Surface Code No.
01 Series Modular Valve	ISO 4401-AB-03-4-A
03 Series Modular Valve	ISO 4401-AC-05-4-A
06 Series Modular Valve	ISO 4401-AE-08-4-A
10 Series Modular Valve	ISO 4401-AF-10-4-A

Stacking Example



Instructions

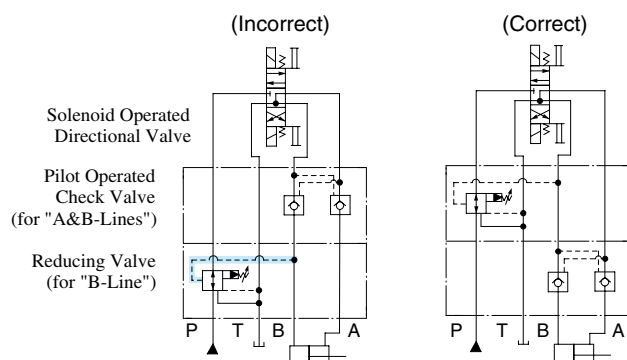
Caution in the selection of valves and circuit designing

The selection of modular valves, to suit a particular function or hydraulic circuit, are made in exactly the same way as conventional valves, taking into account of the flow and pressure of each valve to be used. In some cases, the stacking system may be restricted, so please refer to the following instructions for stacking sequence. Please note, that when designing a system using modular stacking valves, due consideration should be given to working space for future maintenance.

Stacking sequence when using reducing valves (for "A" or "B" line) and pilot operated check valves.

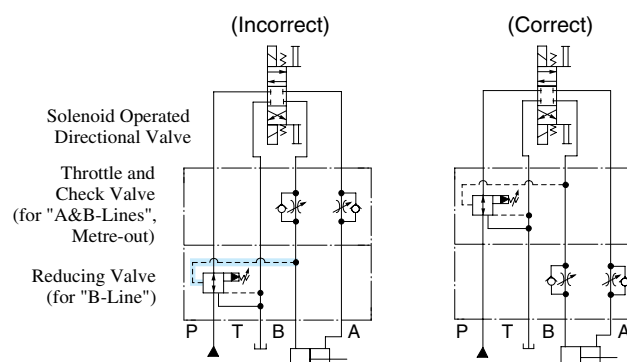
Because reducing valves are spool type, there is an internal leakage. In the stacking sequence shown in the drawing left (incorrect), the cylinder moves due to leakage through the pilot pressure line.

Consequently, retaining the position of the cylinder using a pilot operated check valve becomes impossible. The stacking sequence shown in the drawing right (correct) is required in order to retain the cylinder position.



Stacking sequence when using reducing valves (for "A" or "B" line) and throttle and check valves (for metre-out).

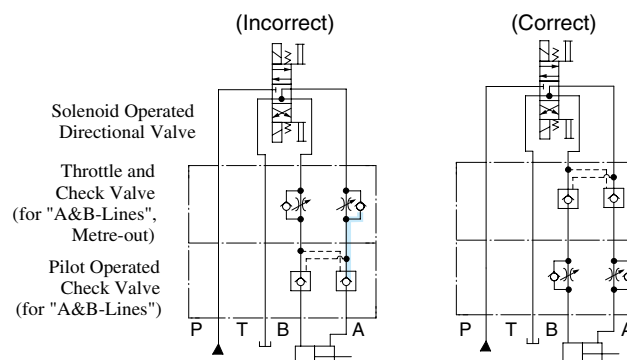
In B to T flow in the drawing left (incorrect), pressure is generated at part with a throttle effect of the throttle and check valve. Depending upon the pressure so generated, the reducing valve may perform a pressure reducing function which causes a shortage of output power of the cylinder and spoils the smooth operation of the cylinder. Therefore, stacking sequence in the drawing right (correct) is required in this combination.



Stacking sequence when using pilot operated check valves and throttle and check valves (metre-out).

In A to T flow in the drawing left (incorrect), pressure is generated at part with a throttle effect of the throttle and check valve.

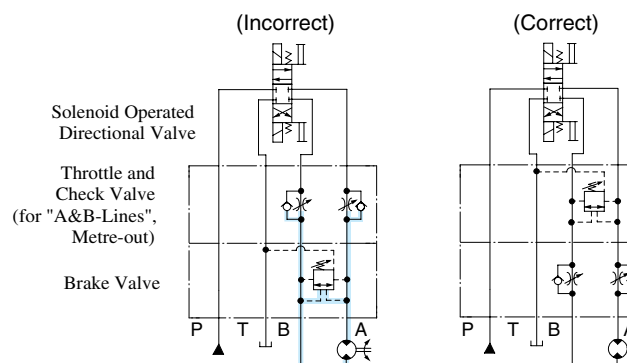
The pressure so generated acts to shut the pilot operated check valve and eventually creates an open and shut operation of the valve repeatedly which may cause the cylinder to have a knocking effect (the same effect will occur in the case of B to T flow). Therefore, the stacking sequence in the drawing right (correct) is required in this combination.



Stacking sequence when using brake valves and throttle and check valves.

In the drawing left (incorrect), pressure is generated at part (a load pressure and a back pressure from throttle effect). For structural reasons of the brake valve, the load pressure and back pressure act to open the valve, therefore, the setting pressure should be more than the pressure equal to the load pressure plus back pressure ($P_a + P_b$). If the setting pressure is less than $P_a + P_b$, the brake valve acts and brakes the movement of the actuator in operation, this eventually reduces the speed of the actuator.

On the contrary, if the setting pressure is more than $P_a + P_b$, shock may occur when braking the actuator since the setting pressure is too high against the load pressure. Therefore, the stacking sequence in the drawing right (correct) is required in this combination.



Base Plates and Sub-Plates

When mounting the modular valves, use base plates and sub-plates specified below. If these base plates and the sub-plates are not used, ensure that the mounting surface has a good machined finish.

Series	Base Plates		Sub-Plates	
	Model Numbers	Page	Model Numbers	Page
005 Series	MMC-005-*-20	531	DSGM-005*-20	342
01 Series	MMC-01-*-40	573	DSGM-01*-31	356
03 Series	MMC-03-T-*-21	615	DSGM-03*-40	373
06 Series	Consult your Yuken representative in advance.	—	DHGM-06*-50	402
10 Series		—	DHGM-10*-40	403

Assembly

Assembly should be carried out in clean conditions and in accordance with the following procedure. Cautious attention should be paid to ensure that the interface of the valves are clean and free from dirt or other foreign materials.

Assembly Procedure:

- 005 Series
 - 1) To stack modular valves and solenoid operated directional valves according to circuit requirements, match the O-ring surfaces to the mounting surface and check the alignment of the locating pins.
 - 2) Align the right and left sides of the stacked valves.
 - 3) Tighten the four mounting bolts to the specified tightening torque.
 - 4) Perform an operational test and re-check mounting bolt torque, re-tightening if required.
- 01-10 Series
 - 1) Screw-in the four stud bolts(06 and 10 series: six stud bolts), fully into the tapped holes on the mounting surface of the specified base plate, sub-plate or manifold.
 - 2) Stack the modular valves and solenoid operated directional valves in accordance with the hydraulic circuit, place the O-ring inserted surface face onto the base plate and make sure that the port arrangement of the modular valves are in the correct position before stacking the valves onto the stud bolts.
 - 3) Align both the end of the valves stacked.
 - 4) Screw-in the four nuts(06 and 10 series: six nuts) onto the stud bolts and tighten with the specified torque. After the test run, be sure to re-tighten the nuts firmly within the specified torque.

Pressure Drop

Pressure drop curves of the modular valves are those based on viscosity of 35 mm²/s (164 SSU) and specific gravity of 0.850.

When using the modular valves in conditions other than the above mentioned, find the appropriate values referring to the following table and formula.

- For any other viscosity, multiply the factors in the table below.

Viscosity	mm ² /s	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

- For any other specific gravity (G'), the pressure drop ($\Delta P'$) may be obtained from the following formula.

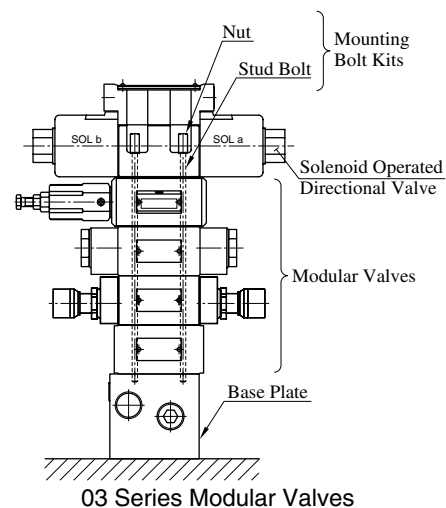
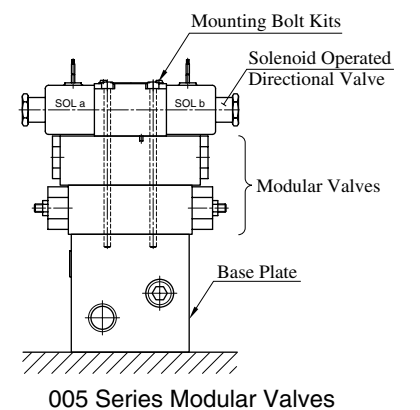
$$\Delta P' = \Delta P (G'/0.850)$$

Mounting Bolts

Modular valves are mounted using stud bolts which are supplied in a kit form. When mounting, see the following table for tightening torque. After the test run, be sure to tighten again firmly within the specified torque.

Series	Bolt Kit Model Numbers	Tightening Torque Nm (in. lbs.)
005 Series	MBK-005-*-20	2.5-3.5 (22-31)
01 Series	MBK-01-*-30	5-6[6-7] (44-53[53-62])★
03 Series	MBK-03-*-10	12-15 (106-133)
06 Series	MBK-06-*-30	50-60 (443-531)
10 Series	MBK-10-*-10	150-170 (1330-1505)

★ The value range in parentheses represents the tightening torque requirements if the operating pressure is above 25 MPa (3630 PSI).

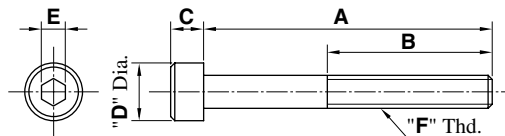


■ Interchangeability in Installation between Current and New Design

The model changed for the following models have been made.

Models		Model Numbers		Mtg. Inter-changeability	Main changes
		Current	New		
005 Series	Throttle and Check Modular Valves	MSW-005-* -10	^A MSB-005-* -20 _W	Yes	● Modification for large flow use. ● Addition of the valve for A & B lines.
	Pilot Operated Check Modular Valves	MP ^B _W -005-2-10	^A MPB-005-2-20 _W	Yes	● Modification for large flow use. ● Addition of the valve for A lines.
	Base Plates	MMC-005-* -10	MMC-005-* -20	Yes	Change of the port hole dia. for large flow use (3.4 Dia. → 4.3 Dia.).
	Bolt Kits	MBK-005-* -10	MBK-005-* -20	Yes	● Addition of bolt kit for 4-stage stacking. ● Change the bolt kit model numbers to conform to the required bolt length for the 01 to 10 series (See the table below for details.)
01 Series	Throttle Modular Valves	MSP-01-30	MSP-01-50	Yes	Modification for large flow use.
	Throttle and Check Modular Valves	^A MSB-01-* -* -40 _W	^A MSB-01-* -* -50 _W	Yes	Improved Controllability and Operatability.
03 Series	Relief Modular Valves	MB*-03-* -20	MB*-03-* -30	Yes	Higher Operating Pressure.
	Reducing Modular Valves	^P MRA-03-* -* -20 _B	^P MRA-03-* -* -30 _B	Yes	Modification for large flow use.

■ Comparison of MBK-005 bolt kit model numbers



Bolt Kit Model Numbers		Dimensions mm (Inches)					"F" Thd.	The number of the laminating steps quantity of valves to be stacked including solenoid operated directional Valve
(New) 20 Design	(Old) 10 Design	A	B	C	D	E		
MBK-005-01-20	MBK-005-02-10	65(2.56)	20 (0.79)	4 (0.16)	7 (0.28)	3 (0.12)	M4	2
MBK-005-02-20	MBK-005-03-10	95(3.74)						3
MBK-005-03-20	—	125(4.92)						4
MBK-005-05-20	MBK-005-05-10	35(1.38)						1
MBK-005-01-2090	MBK-005-02-1090	65.1(2-9/16)	22.4 (0.88)	4.17 (0.164)	6.86 (0.27)	3.6 (9/64)	No.8-32 UNC	2
MBK-005-02-2090	MBK-005-03-1090	95.2(3-3/4)						3
MBK-005-03-2090	—	125.4(4-15/16)						4
MBK-005-05-2090	MBK-005-05-1090	34.9(1-3/8)						1

1/8 Modular Valves

Type of Modular Valve

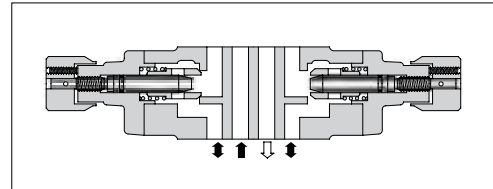
Class	Model Numbers	Graphic Symbols	Page	Class	Model Numbers	Graphic Symbols	Page
Pressure Control Valves	Solenoid Operated Directional Valve (S-)DSG-01-***-70/7090 E-DSG-01-***-D*60/6090 T-DSG-01-***-D24*70/7090 G-DSG-01-***-50/5090		344 378 379 412	Flow Control Valves	Throttle Valves (for "P-Line") MSP-01-50		559
	Relief Valves (for "P-Line") MBP-01-*30		536		Check and Throttle Valves (for "P-Line") MSCP-01-30		561
	Relief Valves (for "A-Line") MBA-01-*30		536		Throttle and Check Valves (for "A-Line", Metre-out) MSA-01-X-50		563
	Relief Valves (for "B-Line") MBB-01-*30		536		Throttle and Check Valves (for "A-Line", Metre-in) MSA-01-Y-50		563
	Reducing Valves (for "P-Line") MRP-01-*30/3090		539		Throttle and Check Valves (for "B-Line", Metre-out) MSB-01-X-50		563
	Reducing Valves (for "A-Line") MRA-01-*30/3090		539		Throttle and Check Valves (for "B-Line", Metre-in) MSB-01-Y-50		563
	Reducing Valves (for "B-Line") MRB-01-*30/3090		539		Throttle and Check Valves (for "A&B-Lines", Metre-out) MSW-01-X-50		563
	Brake Valves MBR-01-*30		542		Throttle and Check Valves (for "A&B-Lines", Metre-in) MSW-01-Y-50		563
	Sequence Valves (for "P-Line") MHP-01-*30		544	Directional Control Valves	Check Valves (for "P-Line") MCP-01-*30		567
	Counterbalance Valves (for "A-Line") MHA-01-*30		544		Check Valves (for "T-Line") MCT-01-*30		567
	Pressure Switch Valves (for "P-Line") MJP-01-*30		547		Anti-Cavitation Valves MAC-01-30		568
	Pressure Switch Valves (for "A-Line") MJA-01-*30		547		Pilot Operated Check Valves (for "A-Line") MPA-01-*40/4001		569
Flow Control Valves	Pressure Switch Valves (for "B-Line") MJB-01-*30		547		Pilot Operated Check Valves (for "B-Line") MPB-01-*40/4001		569
	Flow Control Valves (for "P-Line") MFP-01-10		551		Pilot Operated Check Valves (for "A&B-Lines") MPW-01-*40/4001		569
	Flow Control and Check Valves (for "A-Line", Metre-out) MFA-01-X-10		551	Modular Plates and Mounting Bolts	End Plates (Blocking plates) MDC-01-A-30		571
	Flow Control and Check Valves (for "A-Line", Metre-in) MFA-01-Y-10		551		End Plates (Bypass plates) MDC-01-B-30		571
	Flow Control and Check Valves (for "B-Line", Metre-out) MFB-01-X-10		551		Connecting Plates (for "P&A-Lines") MDS-01-PA-30/3090		572
	Flow Control and Check Valves (for "B-Line", Metre-in) MFB-01-Y-10		551		Connecting Plates (for "P&B-Lines") MDS-01-PB-30/3090		572
	Flow Control and Check Valves (for "A&B-Lines", Metre-out) MFW-01-X-10		551		Connecting Plates (for "A&T-Lines") MDS-01-AT-30/3090		572
	Flow Control and Check Valves (for "A&B-Lines", Metre-in) MFW-01-Y-10		551		Base Plates MMC-01-*40/4080/4090		573
	Temperature Compensated Throttle and Check Valves (for "A-Line", Metre-out) MSTA-01-X-10		555		Bolt Kits MBK-01-*30/3090		576
	Temperature Compensated Throttle and Check Valves (for "B-Line", Metre-out) MSTB-01-X-10		555				
	Temperature Compensated Throttle and Check Valves (for "A&B-Lines", Metre-out) MSTW-01-X-10		555				

Throttle and Check Modular Valves

Specifications

Model Numbers	Max. Operating Pressure MPa (PSI)	Max. Flow L/min (U.S.GPM)
MSA-01-*-50 MSB-01-*-50 MSW-01-*-50	31.5 (4570)	60 (15.9)★

★ At the low differential pressure, maximum flow is limited. See "Pressure Drop at Throttle Fully Open" of the next page.



Model Number Designation

F-	MSW	-01	-X	Y	-50	*
Special Seals	Series Number	Valve Size	Direction of Flow ("A" Line)	Direction of Flow ("B" Line)	Design Number	Design Standard
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	MSA : Throttle and Check Valve for A-Line	01	X: Metre-out Y: Metre-in	—	50	Refer to ★
	MSB : Throttle and Check Valve for B-Line		—	X: Metre-out Y: Metre-in		
	MSW : Throttle and Check Valve for A&B-Lines		X: Metre-out Y: Metre-in			
			X: Metre-out	Y: Metre-in		
			Y: Metre-in	X: Metre-out		

★ Design Standards: None Japanese Standard "JIS", European Design Standard and N. American Design Standard

Instructions

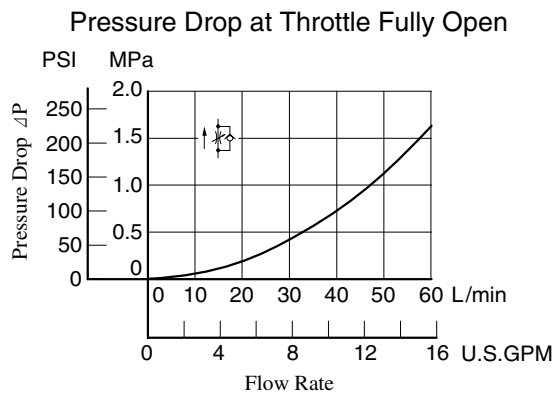
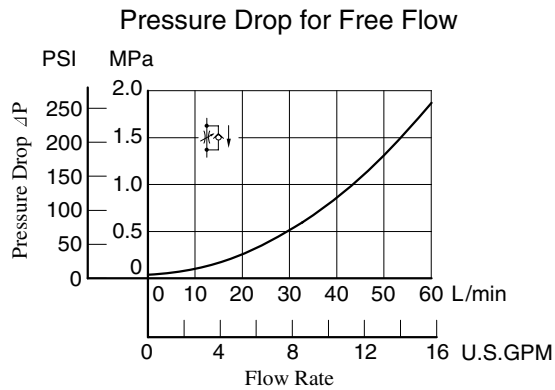
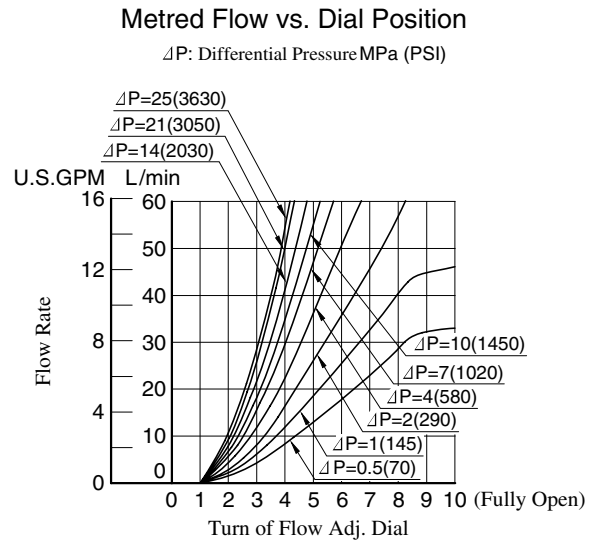
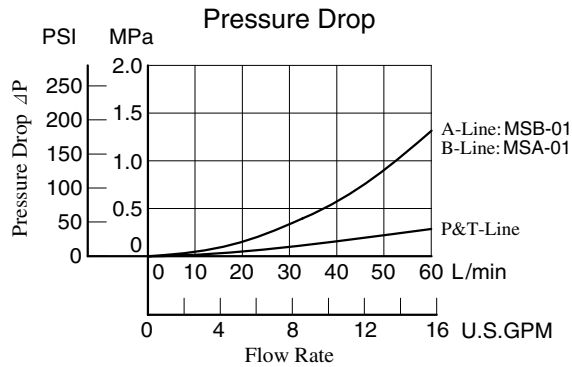
- To make flow rate adjustment, loosen locking screw for the dial and turn the flow adjustment dial clockwise or anti-clockwise. For a decrease of flow, turn the dial clockwise. Be sure to re-tighten the locking screw firmly after the adjustment of the flow rate.

Graphic Symbols

Metre-out	Metre-in
MSA-01-X	MSA-01-Y
MSB-01-X	MSB-01-Y
MSW-01-X	MSW-01-Y
Metre-out • Metre-in	Metre-in • Metre-out
MSW-01-XY	MSW-01-YX

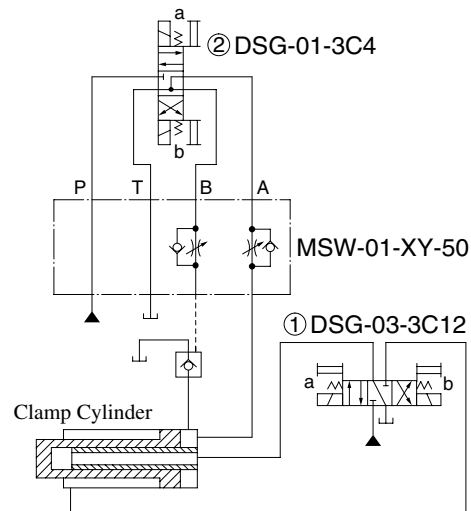
Typical Performance Characteristics

Hydraulic Fluid: Viscosity 35 mm²/s (164 SSU), Specific Gravity 0.850



Application

Circuit of Clamp Cylinder for Injection Molding Machine

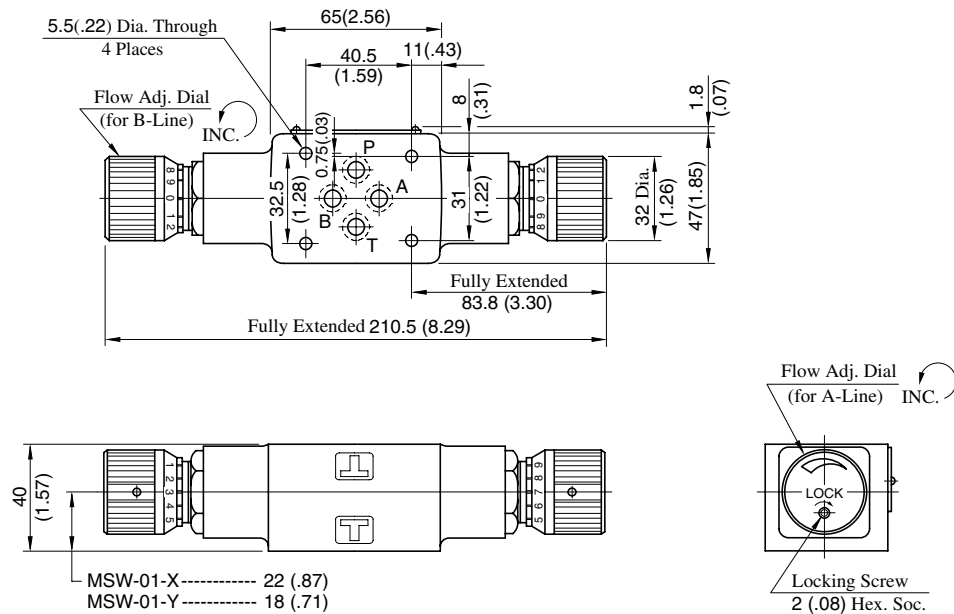


Operation Sequence

Clamp Cylinder	Advance	End Point Pressurisation	Decompression	Retreat
Solenoid Operated Directional Valve ①	Sol.a ON	→	Centre Position	Sol.b ON
Solenoid Operated Directional Valve ②	Sol.b ON	Sol.a ON	Sol.b ON	→

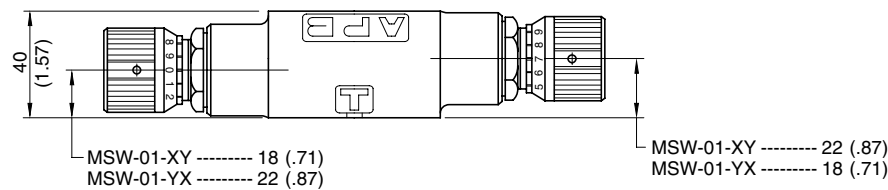
MSW-01-X_Y-50

DIMENSIONS IN
MILLIMETRES (INCHES)



Approx. Mass..... 1.5 kg (3.3 lbs.)

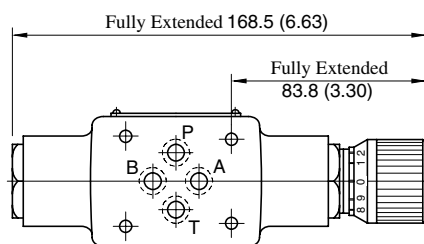
MSW-01-XY_{YX}-50



Approx. Mass..... 1.5 kg (3.3 lbs.)

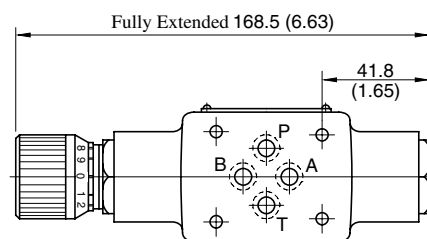
- For other dimensions, refer to "MSW-01-X_Y" drawing above.

MSA-01-X_Y-50



Approx. Mass..... 1.3 kg (2.9 lbs.)

MSB-01-X_Y-50

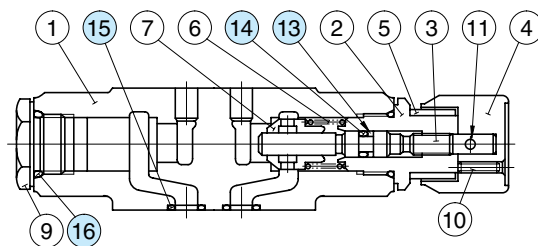


Approx. Mass..... 1.3 kg (2.9 lbs.)

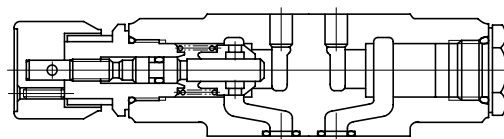
- For other dimensions, refer to "MSW-01" drawing above.

■ Spare Parts List

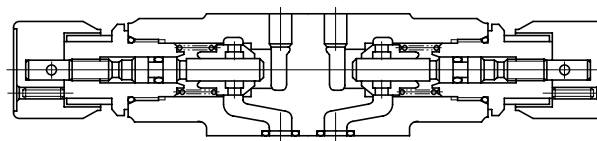
MSA-01-X_Y-50



MSB-01-X_Y-50



MSW-01-**-50



● List of Seals

Item	Name of Parts	Part Numbers	Quantity	
			MSA,MSB	MSW
13	Back Up Ring	SO-BB-P6	1	2
14	O-Ring	SO-NA-P6	1	2
15	O-Ring	SO-NB-P9	4	4
16	O-Ring	SO-NB-P18	2	2

Note: When ordering seals, please specify the seal kit number from the table right.

● List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
MSA-01	KS-MSA-01-30
MSB-01	
MSW-01	KS-MSW-01-30