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 U.S.GPM: 1 2 5 10 20 50 100 200 / L/min: 1 2 3 5 7 10 20 30 50 70 100 200 300 500 700 1000	Page
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 stackes
01 Series	1/8	31.5 (4570)	35 [60] ★1 (9.24 [15.9]) ★1	1 to 5 stackes ★3
03 Series	3/8	25 [31.5] ★4 (3630 [4570]) ★4	70 [120] ★1 (18.5 [31.7]) ★1	1 to 5 stackes
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).

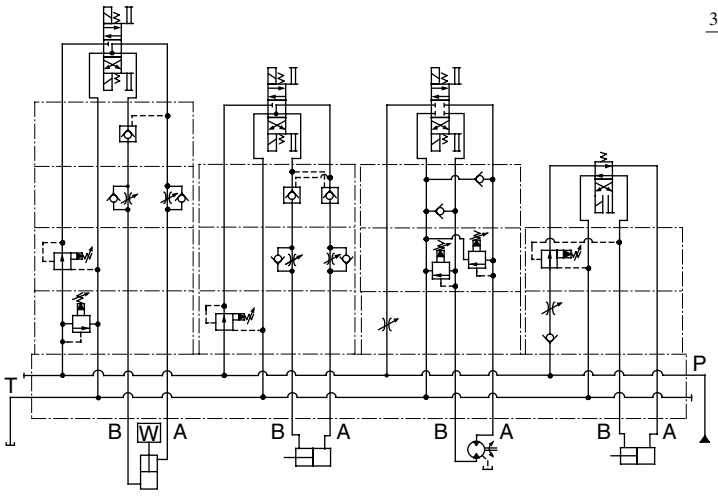
Mounting Surface

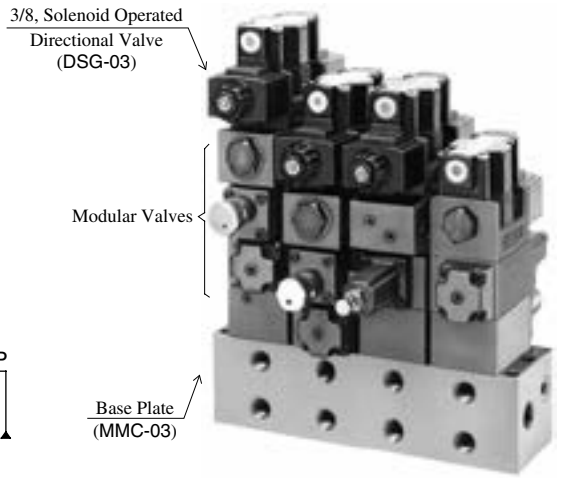
Mounting surface dimensions conform to ISO 4401 (Hydraulic fluid power four port directional control valves mounting surface) as listed in the table below.

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

03 Series





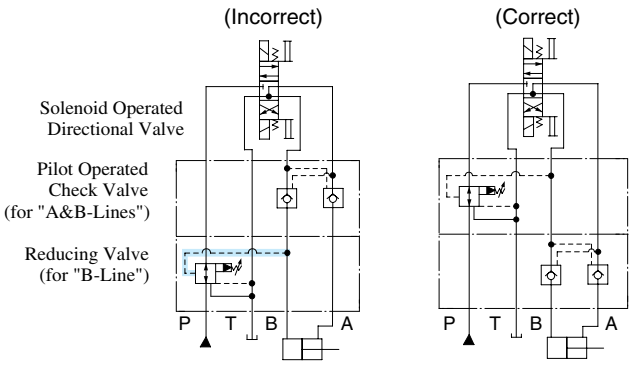
Instructions

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.

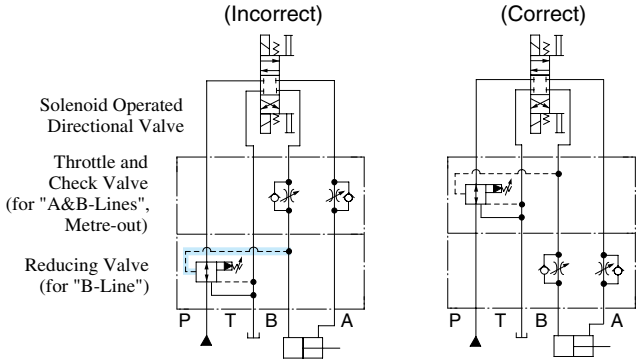
Stacking sequence when using reducing valves (for "A" or "B" line) and pilot operated check valves.

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.



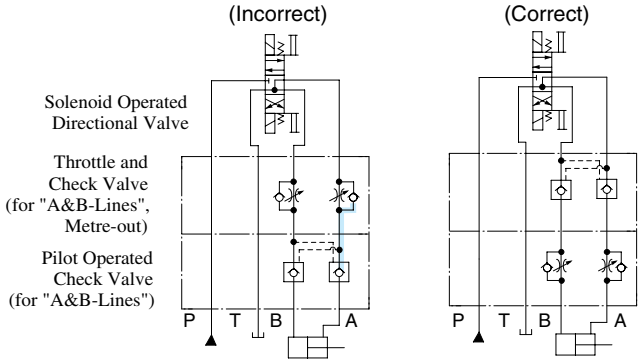
Stacking sequence when using reducing valves (for "A" or "B" line) and throttle and check valves (for metre-out).

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.



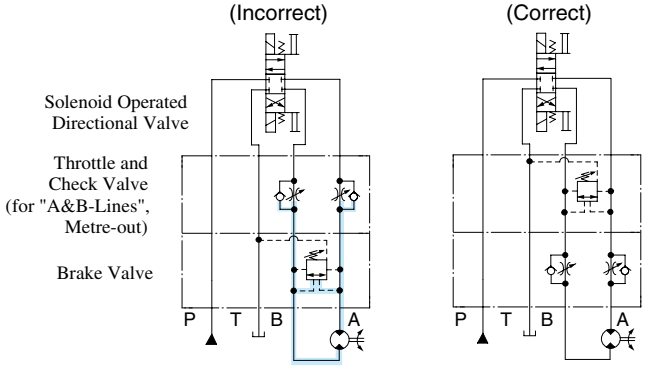
Stacking sequence when using pilot operated check valves and throttle and check valves (metre-out).

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 structual 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 (Pa + Pb). If the setting pressure is less than Pa + Pb, 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 Pa + Pb, 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

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).

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.

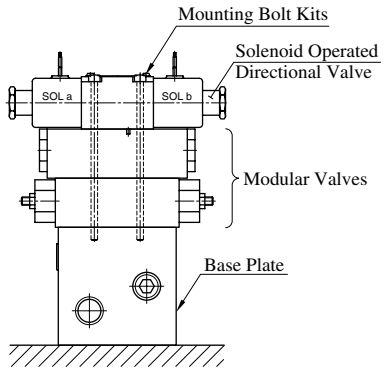
● **Assembly Procedure:**

• 005 Series

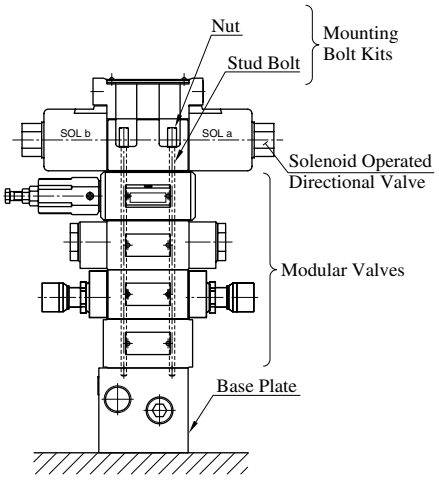
1) To stack modular valves and solenoid operated directional valves according to circuit requirements, match the O-ring surfaces to the mounting surface and check the alignment of the locating pins.
2) Align the right and left sides of the stacked valves.
3) Tighten the four mounting bolts to the specified 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.



005 Series Modular Valves



03 Series Modular Valves

Pressure Drop

Pressure drop curves of the modular valves are those based on viscosity of 35 mm^2/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.

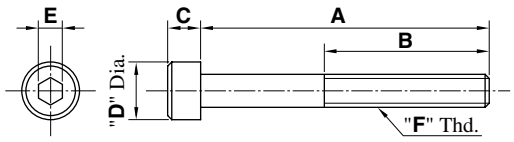
$$\Delta P' = \Delta P\ (G'/0.850)$$

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.

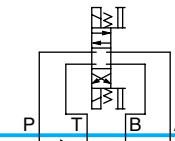
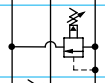
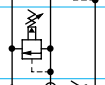
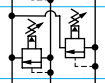
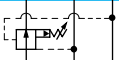
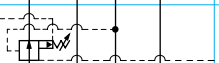
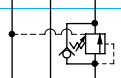
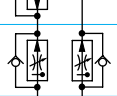
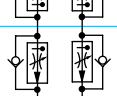
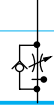
Comparison of MBK-005 bolt kit model numbers

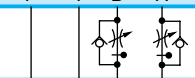
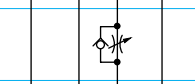
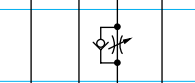
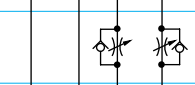
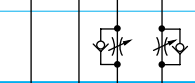
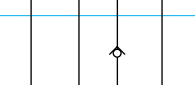
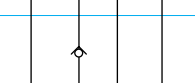
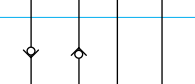
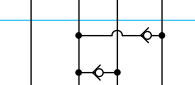
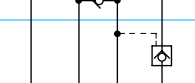
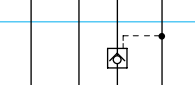


Bolt Kit Model Numbers		Dimensions mm (Inches)					"F" Thd.	The number of the laminating steps quantity of valves to be stacked including solenoid operated directional Valve
(New) 20 Design	(Old) 10 Design	A	B	C	D	E		
MBK-005-01-20	MBK-005-02-10	65(2.56)	20 (0.79)	4 (0.16)	7 (0.28)	3 (0.12)	M4	2
MBK-005-02-20	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

3/8 Modular Valves

Type of Modular Valve

Class	Model Numbers	Graphic Symbols	Page
	Solenoid Operated Directional Valve (S-)DSG-03-✻✻✻-✻-50/5090 E-DSG-03-✻✻✻-D✻-50/5090 T-DSG-03-✻✻✻-D24✻-50/5090 G-DSG-03-✻✻✻-✻-50/5090		361 378 379 412
Pressure Control Valves	Releif Valves (for "P-Line") MBP-03-✻-30		578
	Releif Valves (for "A-Line") MBA-03-✻-30		578
	Releif Valves (for "B-Line") MBB-03-✻-30		578
	Releif Valves (for "A&B-Lines") MBW-03-✻-30		578
	Reducing Valves (for "P-Line") MRP-03-✻-30/3090		581
	Reducing Valves (for "A-Line") MRA-03-✻-30/3090		581
	Reducing Valves (for "B-Line") MRB-03-✻-30/3090		581
	Reducing Valves for Low Pressure Setting (for "P-Line") MRLP-03-10/1090		584
	Reducing Valves for Low Pressure Setting (for "A-Line") MRLA-03-10/1090		584
	Reducing Valves for Low Pressure Setting (for "B-Line") MRLB-03-10/1090		584
	Sequence Valves (for "P-Line") MHP-03-✻-20		588
	Counterbalance Valves (for "A-Line") MHA-03-✻-20		588
	Counterbalance Valves (for "B-Line") MHB-03-✻-20		588
Flow Control Valves	Flow Control Valves (for "P-Line") MFP-03-11		591
	Flow Control and Check Valves (for "A-Line", Metre-out) MFA-03-X-11		591
	Flow Control and Check Valves (for "A-Line", Metre-in) MFA-03-Y-11		591
	Flow Control and Check Valves (for "B-Line", Metre-out) MFB-03-X-11		591
	Flow Control and Check Valves (for "B-Line", Metre-in) MFB-03-Y-11		591
	Flow Control and Check Valves (for "A&B-Lines", Metre-out) MFW-03-X-11		591
	Flow Control and Check Valves (for "A&B-Lines", Metre-in) MFW-03-Y-11		591
	Temperature Compensated Throttle and Check Valves (for "A-Line", Metre-out) MSTA-03-X-20		595
	Temperature Compensated Throttle and Check Valves (for "B-Line", Metre-out) MSTB-03-X-20		595

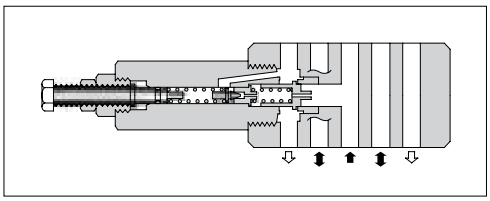
Class	Model Numbers	Graphic Symbols	Page
		P T B A	
Flow Control Valves	Temperature Compensated Throttle and Check Valves (for "A&B-Lines", Metre-out) MSTW-03-X-20		595
	Throttle Valves (for "P-Line") MSP-03-30		598
	Check and Throttle Valves (for "P-Line") MSCP-03-20		600
	Throttle and Check Valves (for "A-Line", Metre-out) MSA-03-X-40		602
	Throttle and Check Valves (for "A-Line", Metre-in) MSA-03-Y-40		602
	Throttle and Check Valves (for "B-Line", Metre-out) MSB-03-X-40		602
	Throttle and Check Valves (for "B-Line", Metre-in) MSB-03-Y-40		602
	Throttle and Check Valves (for "A&B-Lines", Metre-out) MSW-03-X-40		602
	Throttle and Check Valves (for "A&B-Lines", Metre-in) MSW-03-Y-40		602
Directional Control Valves	Check Valves (for "P-Line") MCP-03-✻-10		605
	Check Valves (for "A-Line") MCA-03-✻-20		605
	Check Valves (for "B-Line") MCB-03-✻-20		605
	Check Valves (for "T-Line") MCT-03-✻-10		605
	Check Valves (for "P&T-Lines") MCPT-03-P✻-T✻-10		607
	Anti-Cavitation Valves MAC-03-10		609
	Pilot Operated Check Valves (for "A-Line") MPA-03-✻-20/2001		610
	Pilot Operated Check Valves (for "B-Line") MPB-03-✻-20/2001		610
	Pilot Operated Check Valves (for "A&B-Lines") MPW-03-✻-20/2001		610
Modular Plates and Mounting Bolts	End Plates (Blocking Plates) MDC-03-A-10		613
	End Plates (Bypass Plates) MDC-03-B-10		613
	Connecting Plates MDS-03-10/1090		614
	Base Plates MMC-03-T-✻-21/2180/2190		615
	Bolt Kits MBK-03-✻-10/1090		618

Relief Modular Valves

Specifications

Model Numbers	Max. Operating Pressure MPa (PSI)	Max. Flow L/min (U.S.GPM)
MBP-03-∗-30 MBA-03-∗-30 MBB-03-∗-30 MBW-03-∗-30	31.5 (4570)	70 (18.5)





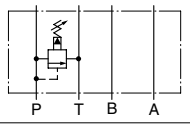
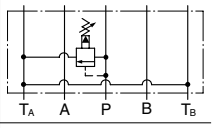
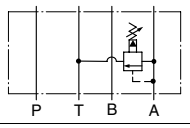
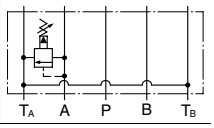
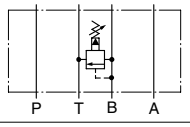
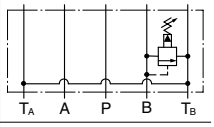
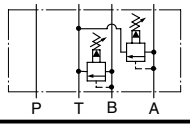
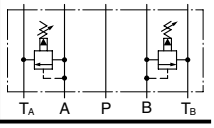
Model Number Designation

F-	MBA	-03	-B	-30	∗
Special Seals	Series Number	Valve Size	Pres. Adj. Range MPa (PSI)	Design Number	Design Standard
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	**MBP** : Relief Valve for P-Line **MBA** : Relief Valve for A-Line **MBB** : Relief Valve for B-Line **MBW** : Relief Valve for A&B-Lines	**03**	**B**: ∗-7 ★1 (∗-1020) **H**: 3.5-31.5 (510-4570)	**30**	Refer to ★2

★1. See the "Minimum Adjustment Pressure" of the next page for the item marked ∗.
★2. Design Standards: None ..... Japanese Standard "JIS", European Design Standard and N. American Design Standard

Instructions

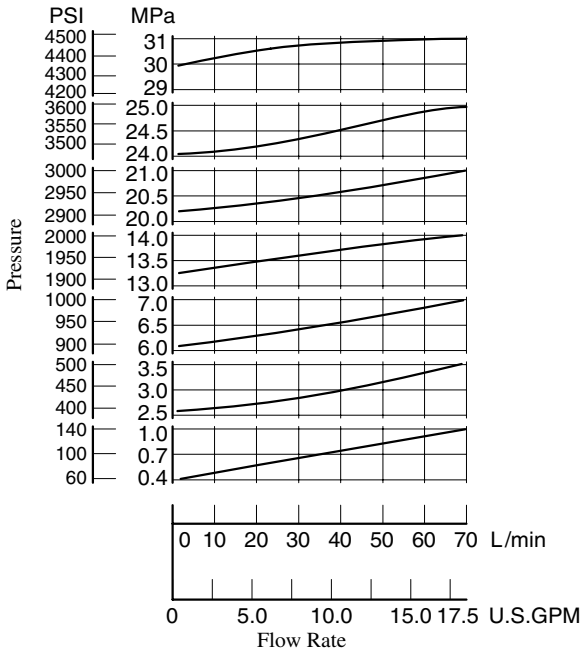
- The minimum adjustment pressure equals the value obtained from the minimum adjustment pressure characteristics plus the tank line back pressure of the next page. This back pressure should include the value of the T-line pressure drop characteristics of the valves stacked to the base plate side of the modular valve.
- To make pressure adjustment, loosen the lock nut and turn the pressure adjustment screw clockwise or anti-clockwise. For an increase of pressure, turn the screw clockwise. Be sure to re-tighten the lock nut firmly after making adjustment to the pressure.
- In case of a small flow, the setting pressure may become unstable. To avoid this, refer to the minimum flow characteristic curve of the next page and use the valve within a range as shown with .

Model Numbers	Graphic Symbols	Detailed Graphic Symbols
MBP-03		
MBA-03		
MBB-03		
MBW-03		

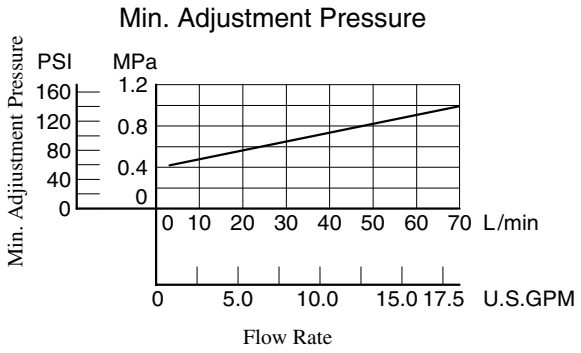
Typical Performance Characteristics

Hydraulic Fluid: Viscosity 35 mm^2/s (164 SSU), Specific Gravity 0.850

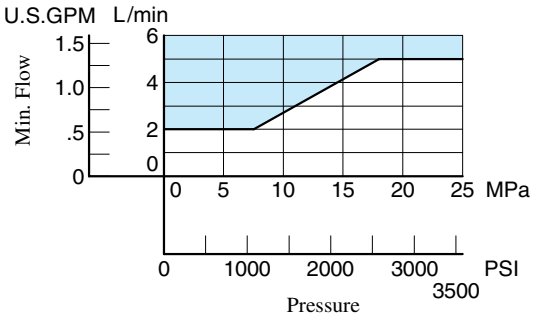
Nominal Override Characteristics



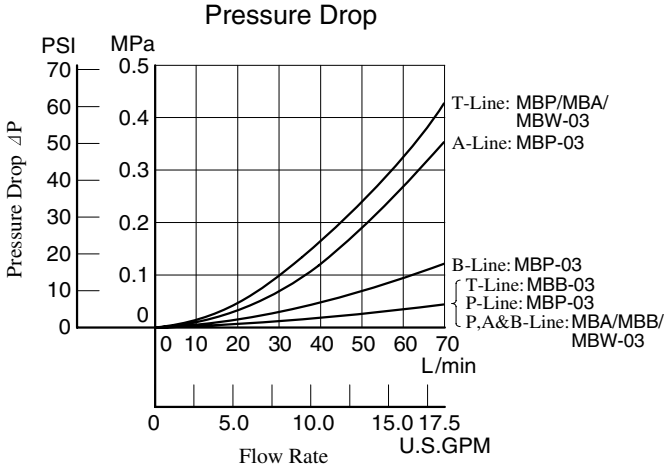
Min. Adjustment Pressure



Min. Flow vs. Adjustment Pressure

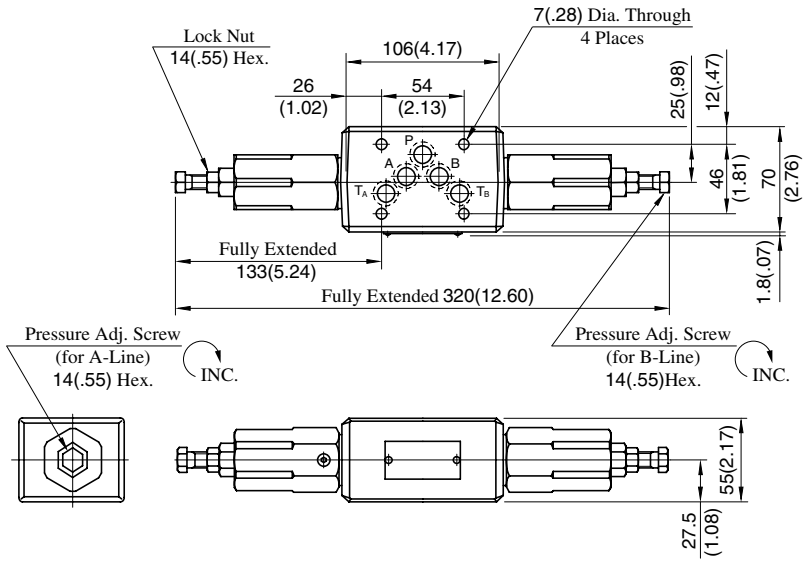


Pressure Drop



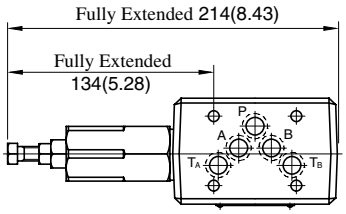
MBW-03-∗-30

DIMENSIONS IN MILLIMETRES (INCHES)



Approx. Mass..... 3.8 kg (8.4 lbs.)

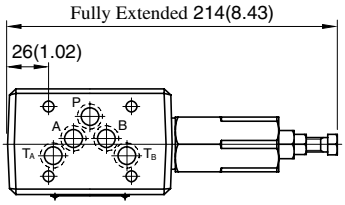
MBP-03-∗-30
MBA-03-∗-30



Approx. Mass..... 3.1 kg (6.8 lbs.)

- For other dimensions, refer to "MBW-03" drawing left.

MBB-03-∗-30

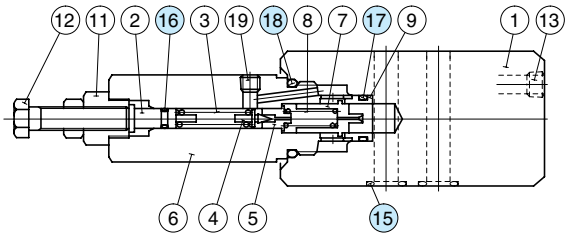


Approx. Mass..... 3.1 kg (6.8 lbs.)

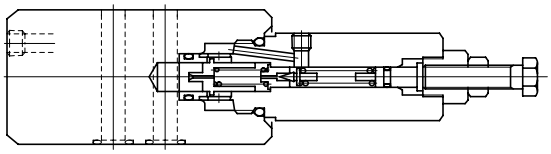
- For other dimensions, refer to "MBW-03" drawing left.

Spare Parts List

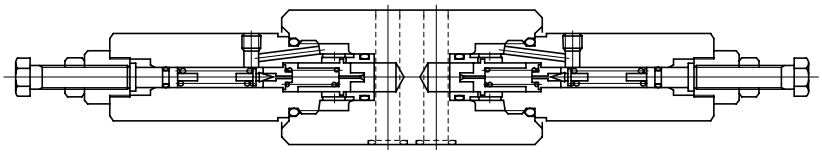
MBP-03-∗-30
MBA-03-∗-30



MBB-03-∗-30



MBW-03-∗-30



List of Seals

Item	Name of Parts	Part Numbers	Quantity			
			MBP-03	MBA-03	MBB-03	MBW-03
15	O-Ring	SO-NB-A014	5	5	5	5
16	O-Ring	SO-NA-P6	1	1	1	2
17	O-Ring	SO-NB-P16	1	1	1	2
18	O-Ring	SO-NB-P26	1	1	1	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
MBP-03	KS-MBP-03-30
MBA-03	
MBB-03	
MBW-03	KS-MBW-03-30