

# 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
		L/min	U.S.GPM	
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 <sup>2</sup> /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 <sup>2</sup> /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 <sup>★2</sup>
005 Series	—	25 (3630)	15 (3.96)	1 to 4 stacks
01 Series	1/8	31.5 (4570)	35 [60] <sup>★1</sup> (9.24 [15.9]) <sup>★1</sup>	1 to 5 stacks <sup>★3</sup>
03 Series	3/8	25 [31.5] <sup>★4</sup> (3630 [4570]) <sup>★4</sup>	70 [120] <sup>★1</sup> (18.5 [31.7]) <sup>★1</sup>	1 to 5 stacks
06 Series	3/4	25 (3630)	500 (132)	
10 Series	1-1/4	25 (3630)	800 (211)	

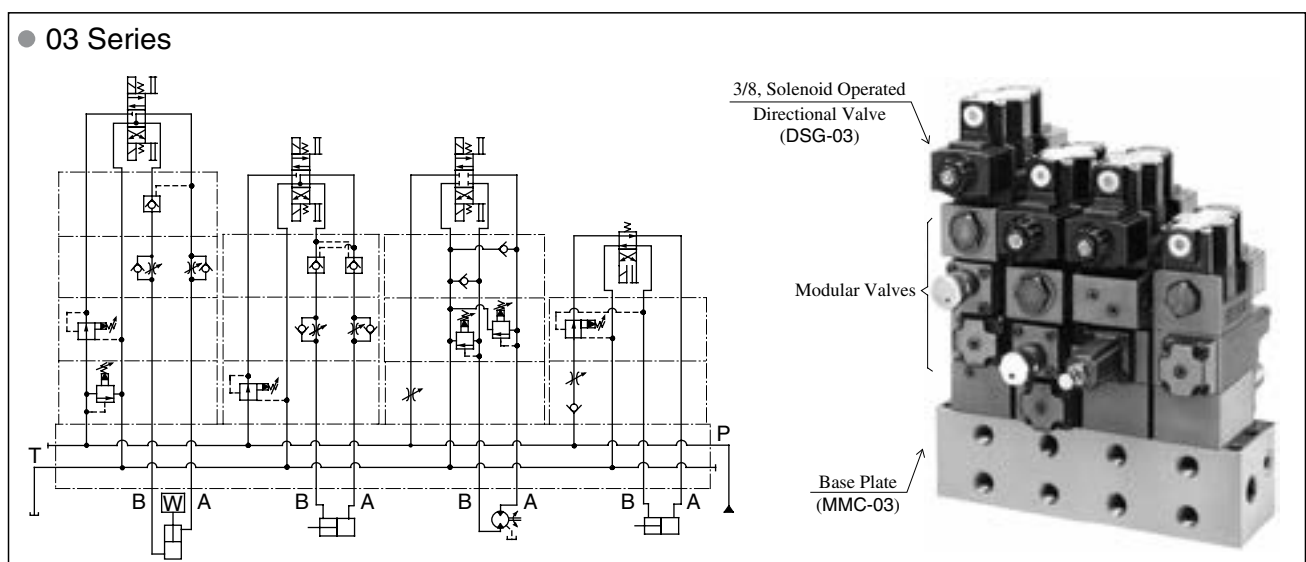
- ★1. The values in parentheses represent the max. flow rates for throttle modular valves (MSP) and throttle check modular valves (MSA/MSB/MSW).
- ★2. Solenoid operated directional valve is included in the number of stack.
- ★3. Solenoid operated directional valve is included in the number of stack. 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**

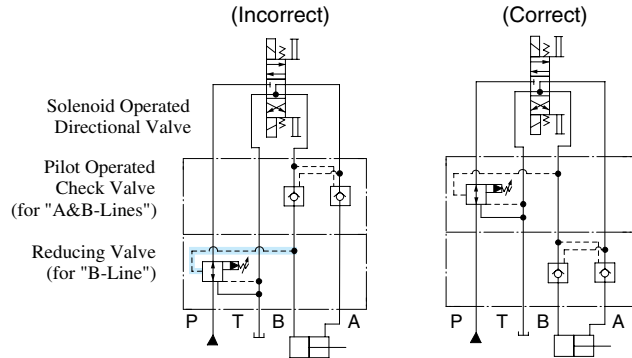
**Caution in the selection of valves and circuit designing**

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.**

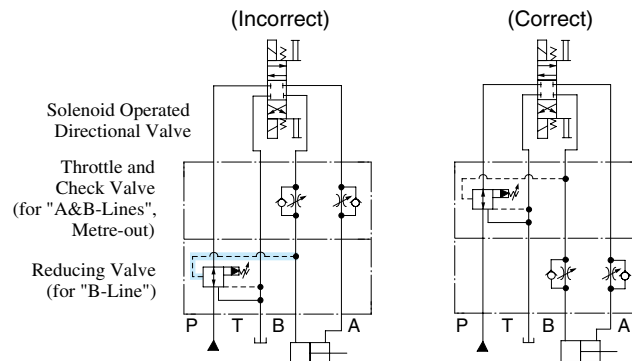
Because reducing valves are spool type, there is an internal leakage. In the stacking sequence shown in the drawing left (incorrect), the cylinder moves due to leakage through the pilot pressure line.

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).**

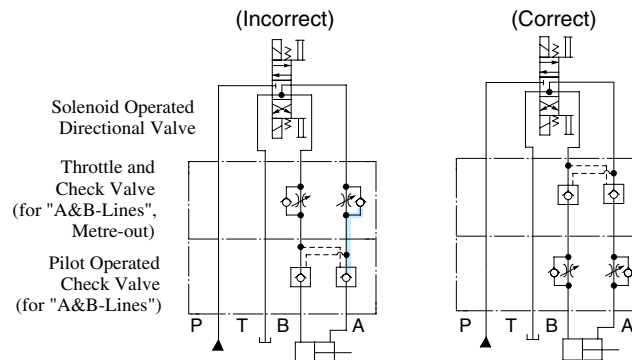
In B to T flow in the drawing left (incorrect), pressure is generated at the part with a throttle effect of the throttle and check valve. Depending upon the pressure so generated, the reducing valve may perform a pressure reducing function which causes a shortage of output power of the cylinder and spoils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

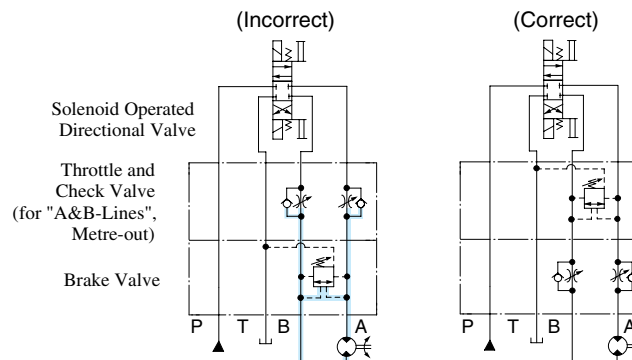
The pressure so generated acts to shut the pilot operated check valve and eventually creates an open and shut operation of the valve repeatedly which may cause the cylinder to have a knocking effect (the same effect will occur in the case of B to T flow). Therefore, the stacking sequence in the drawing 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 the 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-* <sup>-</sup> 20	531	DSGM-005* <sup>-</sup> 20	342
01 Series	MMC-01-* <sup>-</sup> 40	573	DSGM-01* <sup>-</sup> 31	356
03 Series	MMC-03-T-* <sup>-</sup> 21	615	DSGM-03* <sup>-</sup> 40	373
06 Series	Consult your Yuken representative in advance.	—	DHGM-06* <sup>-</sup> 50	402
10 Series	—	—	DHGM-10* <sup>-</sup> 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 mm<sup>2</sup>/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 <sup>2</sup> /s	15	20	30	40	50	60	70	80	90	100
		SSU	77	98	141	186	232	278	324	371	417
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 (ΔP') may be obtained from the following formula.

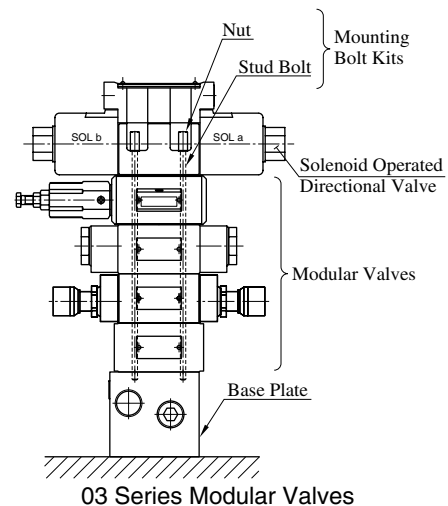
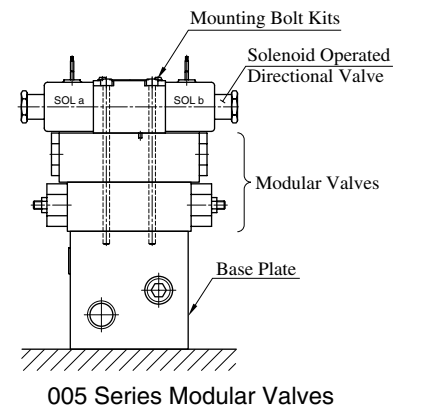
$$\Delta P' = \Delta P (G'/0.850)$$

## 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-* <sup>-</sup> 20	2.5-3.5 (22-31)
01 Series	MBK-01-* <sup>-</sup> 30	5-6[6-7] (44-53[53-62])★
03 Series	MBK-03-* <sup>-</sup> 10	12-15 (106-133)
06 Series	MBK-06-* <sup>-</sup> 30	50-60 (443-531)
10 Series	MBK-10-* <sup>-</sup> 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).

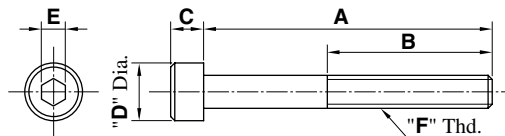


**Interchangeability in Installation between Current and New Design**

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-* <sup>A</sup> -10	MSB-005-* <sup>A</sup> -20 W	Yes	<ul style="list-style-type: none"> <li>● Modification for large flow use.</li> <li>● Addition of the valve for A &amp; B lines.</li> </ul>
	Pilot Operated Check Modular Valves	MP <sup>B</sup> <sub>W</sub> -005-2-10	MPB <sup>A</sup> <sub>W</sub> -005-2-20	Yes	<ul style="list-style-type: none"> <li>● Modification for large flow use.</li> <li>● Addition of the valve for A lines.</li> </ul>
	Base Plates	MMC-005-* <sup>A</sup> -10	MMC-005-* <sup>A</sup> -20	Yes	Change of the port hole dia. for large flow use (3.4 Dia. → 4.3 Dia.).
	Bolt Kits	MBK-005-* <sup>A</sup> -10	MBK-005-* <sup>A</sup> -20	Yes	<ul style="list-style-type: none"> <li>● Addition of bolt kit for 4-stage stacking.</li> <li>● 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.)</li> </ul>
01 Series	Throttle Modular Valves	MSP-01-30	MSP-01-50	Yes	Modification for large flow use.
	Throttle and Check Modular Valves	M <sup>A</sup> <sub>W</sub> SB-01-* <sup>A</sup> -40	M <sup>A</sup> <sub>W</sub> SB-01-* <sup>A</sup> -50	Yes	Improved Controllability and Operatability.
03 Series	Relief Modular Valves	MB*-03-* <sup>A</sup> -20	MB*-03-* <sup>A</sup> -30	Yes	Higher Operating Pressure.
	Reducing Modular Valves	M <sup>P</sup> <sub>B</sub> RA-03-* <sup>A</sup> -20	M <sup>P</sup> <sub>B</sub> RA-03-* <sup>A</sup> -30	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

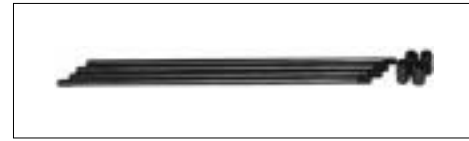
## Type of Modular Valve

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		Throttle and Check Valves (for "A&B-Lines", Metre-out, Metre-in) MSW-01-XY-50		563	
	Counterbalance Valves (for "A-Line") MHA-01-*30		544		Throttle and Check Valves (for "A&B-Lines", Metre-in, Metre-out) MSW-01-YX-50		563	
	Pressure Switch Valves (for "P-Line") MJP-01-*-*10		547		Directional Control Valves	Check Valves (for "P-Line") MCP-01-*30		567
	Pressure Switch Valves (for "A-Line") MJA-01-*-*10		547			Check Valves (for "T-Line") MCT-01-*30		567
	Pressure Switch Valves (for "B-Line") MJB-01-*-*10		547			Anti-Cavitation Valves MAC-01-30		568
Flow Control Valves (for "P-Line") MFP-01-10		551	Pilot Operated Check Valves (for "A-Line") MPA-01-*40/4001			569		
Flow Control and Check Valves (for "A-Line", Metre-out) MFA-01-X-10		551	Pilot Operated Check Valves (for "B-Line") MPB-01-*40/4001			569		
Flow Control and Check Valves (for "A-Line", Metre-in) MFA-01-Y-10		551	Pilot Operated Check Valves (for "A&B-Lines") MPW-01-*40/4001			569		
Flow Control and Check Valves (for "B-Line", Metre-out) MFB-01-X-10		551	Modular Plates and Mounting Bolts	End Plates (Blocking plates) MDC-01-A-30			571	
Flow Control and Check Valves (for "B-Line", Metre-in) MFB-01-Y-10		551		End Plates (Bypass plates) MDC-01-B-30			571	
Flow Control and Check Valves (for "A&B-Lines", Metre-out) MFW-01-X-10		551		Connecting Plates (for "P&A-Lines") MDS-01-PA-30/3090			572	
Flow Control and Check Valves (for "A&B-Lines", Metre-in) MFW-01-Y-10		551		Connecting Plates (for "P&B-Lines") MDS-01-PB-30/3090			572	
Temperature Compensated Throttle and Check Valves (for "A-Line", Metre-out) MSTA-01-X-10		555		Connecting Plates (for "A&T-Lines") MDS-01-AT-30/3090			572	
Temperature Compensated Throttle and Check Valves (for "B-Line", Metre-out) MSTB-01-X-10		555		Base Plates MMC-01-*40/4080/4090			573	
Temperature Compensated Throttle and Check Valves (for "A&B-Lines", Metre-out) MSTW-01-X-10		555		Bolt Kits MBK-01-*30/3090			576	

## Mounting Bolt Kits

Valves are mounted with four stud bolts. Valve combination varies according to the circuit type. Hence, the mounting bolt kits are available on a combination type basis.

When ordering the bolt kit, be sure to give the bolt kit model number from the table below.



### Model Number Designation

MBK	-01	-02	-30	*
Series Number	Size of Modular Valve	Bolt Number	Design Number	Design Standard
MBK: Bolt Kits for Modular Valves	01	01, 02, 03, 04, 05 (Refer to the following chart)	30	Refer to ★

★ Design Standards: None ..... Japanese Standard "JIS" and European Design Standard 90 ..... N. American Design Standard

### Bolt Kit Composition

Stud Bolt ----- 4 Pcs. } 1 Set  
Nut ----- 4 Pcs. }

Note: In case of bolt kit model number having "05", four hexagon socket head cap screws only.

### Tightening Torque:

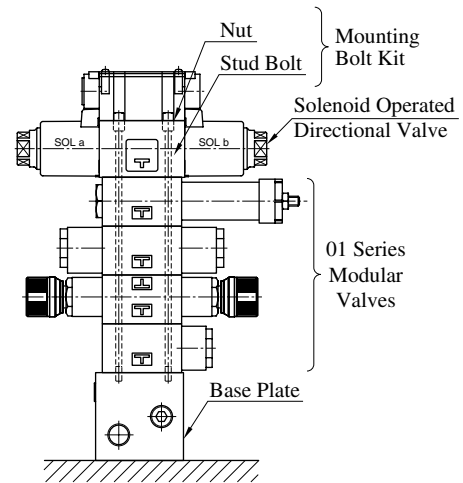
Operating Pressure MPa (PSI)	Tightening Torque Nm (in. lbs.)
25(3630) or less	5 - 6 (44 - 53)
More Than 25(3630)	6 - 7 (53 - 62)

### Bolt Kits Selection Chart

Model Numbers	Quantity of valves to be stacked			Approx. Mass g (lbs.)
	Solenoid Operated Directional Valve (*-DSG-01)	End Plate (MDC-01)	Modular Valve & Connecting Plate	
MBK-01-01-30*	1	0	1	60(.13)
	0	1		
MBK-01-02-30*	1	0	2	100(.22)
	0	1		
MBK-01-03-30*	1	0	3	130(.29)
	0	1		
MBK-01-04-30* <sup>★1</sup>	1	0	4	160(.35)
	0	1		
MBK-01-05-30* <sup>★2</sup>	1	0	0	40(.09)
	0	1		

★ 1. In case of MBK-01-04-30\*, operating pressure is restricted at 25 MPa (3630 PSI) or less.

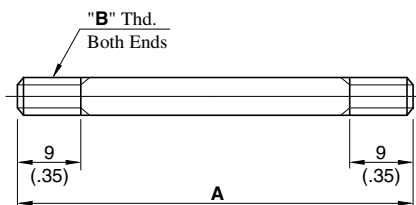
★ 2. The solenoid operated directional valve comes with mounting bolts.



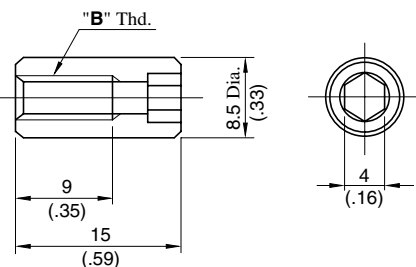
Stacking Example

### MBK-01-01/02/03/04-30/3090

#### Stud Bolt

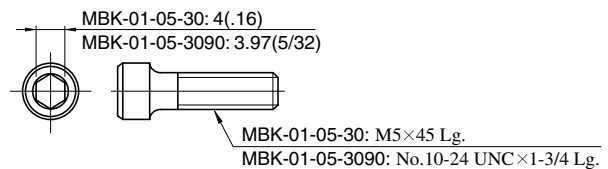


#### Nut



### MBK-01-05-30/3090

#### Socket Head Cap Screw



DIMENSIONS IN MILLIMETRES (INCHES)

Model Numbers	A mm (In.)	"B" Thd.
MBK-01-01-30	94 (3.70)	M5
MBK-01-02-30	134 (5.28)	
MBK-01-03-30	174 (6.85)	
MBK-01-04-30	214 (8.43)	
MBK-01-01-3090	94 (3.70)	No.10-24 UNC
MBK-01-02-3090	134 (5.28)	
MBK-01-03-3090	174 (6.85)	
MBK-01-04-3090	214 (8.43)	