4ManPro

Elements For Manufacturing Processes

MODULAR VALVES

YUKEN 油圧機器

油研工業株式會社

F3

005 SERIES

YUKEN

Hydraulic Equipment Catalogue

Please note before using this catalogue:

This catalogue was planned and edited in such manner it can be used in the planning of hydraulic system, for product recommendation, and as technical material for those who usually handle oil hydraulic equipment.

Product description

This catalogue describes Yuken's primary standard oil hydraulic equipment.

Details of Description

The principal details described for each model include the following.

- Specifications
- Model Number Designation
- Instructions
- Attachment
- Outer dimensional drawing
- Performance characteristics
- List of seals
- Interchangeability between new and old products
- Others

However, there are some models for which descriptions are shortened.
In this case, please request for separate materials.

Design Standards

The range of Yuken hydraulic products is available to three different Design Standards as follows:

a) Those products manufactured for use in Europe and other countries using metric standards are designed to meet the appropriate CETOP, DIN and ISO standards and are identified as "80" Design Standard.
b) Those products manufactured for use in North America are designed to meet the appropriate NAS, USAS and NFPA standards, and are identified as "90" or "950" Design Standard.
c) Those products manufactured for use in Japan are designed to meet the appropriate JIS standards, and have no suffix to the Design Number.

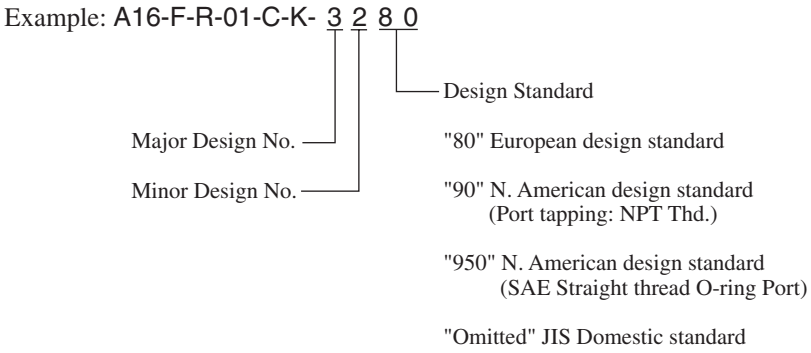
The distinctive features of the various Design Standards are as shown below.

Feature \ Design Standard	European Design Standard	N. American Design Standard◆		Japanese Standard "JIS"
	"80" Design Standard	"90" Design Standard	"950" Design Standard	
Port Tapping	BSP. F	NPT	SAE Straight Thread O-ring Port (UN/UNF Thread)	Rc
Pressure Gauge Connection	BSP. Tr	NPT		Rc
Mounting Bolt	Metric	UNC		Metric
Conduit Entry	BSW	NPT		G

◆ For North American Design Standards, this catalogue describes "950" for AR/A/A3H Series Variable Displacement Piston Pumps and "90" for other control valves. Control valves with "950" are also available. Please contact us for the details.

Design Number

Yuken products have factory applied Design numbers, the key to which is as follows.



Design Numbers are subject to change. But installation dimensions and specifications remain unchanged for variation in the second digit of design numbers (minor design number).

Index System

When looking up products by name, please use to “Yuken hydraulic Equipment Catalogue Index” on page 6.

When looking up products by model number, please use the “Model Number Index” on page 9.

Satety Precautions

To prevent serious accidents, equipment damage, and other property damage, please observe the following precautions, as well as all related regulations regarding safety.
Before using the product, be sure you read and understand all the instructions in the Operator's Manual entirely.

In this catalogue, safety precautions are classified into three ranks: DANGER, WARNING, and CAUTION. These words are defined as follows:

⚠ DANGER: Indicates an imminent danger that is very likely to cause death or severe injury unless the situation is avoided.

⚠ WARNING: Indicates a potential danger that may cause death or severe injury unless the situation is avoided.

⚠ CAUTION: Indicates a potential danger that may cause a minor or moderate injury or that may result in property damage.

1. Precautions for Use

⚠ CAUTION ❶ To avoid possible injury when handling the products, wear protective safety equipment in accordance with the instructions in the Operator's Manual.

⚠ CAUTION ❷ Failure to support the weight of the product or lifting the product with improper posture may result in injury to the hands or back. Be sure to follow the instructions in the operator's manual.

⚠ CAUTION ❸ Do not climb on, strike, drop or exert unnecessary force on the product. This may lead to injury or fire due to improper operation, damage, or oil leakage.

⚠ CAUTION ❹ Oil on the product or floor must be cleaned up thoroughly. Oil could cause you to drop the product or slip on the floor.

2. Precautions for Installation, Removal, and Maintenance

⚠ WARNING ❶ All installation, removal, maintenance, piping or wiring should be performed by properly trained personnel.

⚠ WARNING ❷ Before starting the work for installation, removal, maintenance, piping and wiring, do the following jobs. Failure to do these jobs may cause the equipment to move suddenly or spout the oil from it during the work, which eventually may cause the serious accidents.

- Shut off the power supply to the equipment and make sure that all the electrical motors or engines have stopped.
- Fix the Cylinder rod not move/move down when installing/removing the Cylinder.
- Get the pressure in the pipes and cylinders in the hydraulic system back to zero pressure.

⚠ WARNING ❸ Before working on any electrical wiring, be sure to shut off the power supply. Failure to do this may cause electrical shock.

⚠ CAUTION ❹ Keep all installation holes and surfaces clean. Failure to do this may cause insufficient tightening of the bolts that may cause fire due to oil leakage.

⚠ CAUTION ❺ Before installing the product, be sure that all specified bolts are tightened with the specified torque. Tightening with the outside specifications may cause improper operation, damage, oil leakage, etc.

3. Precautions for Operation

⚠ DANGER ❶ Never operate any device in an environment where there is danger of explosion or fire, unless the device is fully protected. This may lead to major and serious accidents including explosion or fire.

⚠ WARNING ❷ Do not approach near the pumps or motors in operation. There is a fear of injury by such an accident that the hands or clothes are caught by or coiled into the pumps and the motors.

⚠ WARNING ❸ In event of abnormal operation (unusual sounds, oil leakage, smoke, etc.), immediately stop operation and take appropriate corrective measures.

⚠ WARNING ❹ Completely discharge air from the cylinder at low pressure. Failure to do so may result in unexpected movement of the cylinder, which in turn may cause injury.

⚠ WARNING ❺ To adjust the cushion, gradually increase the cylinder speed from a low speed [50 mm/s (2 in./s) or less]. Rapidly accelerating the cylinder may produce abnormal surge pressure, resulting in damage to the cylinder or the machinery and consequently leading to a serious accident.

⚠ CAUTION ❻ Before operating this device for the first time, check that hydraulic and electrical circuits are properly connected and that adjoining surfaces are tightly aligned.

⚠ CAUTION ❼ Do not use the product out of the specification as described in the catalogue, related data sheets, drawings, etc. Not doing so may cause improper operation, damage or injury.

⚠ CAUTION ❽ During operation, high temperatures in the hydraulic system or solenoid units may occur. Wear protective gear on hands and body when around these parts.

⚠ CAUTION ❾ Be sure to operate the product with proper oil, and within established ranges for temperature, viscosity and purity. Use outside of specified limits may cause improper operation or fire due to oil leakage.

4. General Precautions

⚠ WARNING ❶ Never convert the products. If any conversions are made, unexpected machine movement may cause injury.

⚠ CAUTION ❷ Do not disassemble or change the products without prior consent of the manufacturer. Failure to do this will cause the products not to perform the specified performance and characteristics, and moreover will become the causes of the accidents or failures.

⚠ CAUTION ❸ For transportation/storage of the product, pay attention to environmental conditions, such as ambient temperature and humidity, and take anti-dust/rust measures.

⚠ CAUTION ❹ The seals may be required to replace if the products is used after long-term storage.

⚠ CAUTION ❺ Read the manual thoroughly and take due care to replace the seals.

5. Related Regulations

⚠ CAUTION To ensure that this product is used in a safe manner, it is essential to observe the above precautions, as well as all related regulations regarding safety.

Head Office and Sagami Plant

● Sagami Plant Front Gate

● R&D Centre Design Room

Fukuroda Plant

Outline of the Company

Live with hydraulic (Challenge to possibility)

The speed of technological innovations in the 21st century, hydraulic technology is also expected to undergo great change.
We YUKEN have been making efforts to meet the expectations of wide range of industrial fields as a leading manufacturer in hydraulic equipment, always thinking "What do our customers want?". It is YUKEN's desire to continue our efforts in development by fusing oil hydraulic with all high technology rather than adhering solely to it to ensure a widespread use of oil hydraulic in our daily lives.

Trade name: Yuken Kogyo Co., Ltd.
Inception: 1929
Incorporation: 1956
Capital: ¥4,109,101,656 (as of April 2007)
Sales: ¥19.4 billion (as of 2006)
Number of employees: about 460 persons (as of April 2007)
Head office: 4-34, Kamitsuchidana-Naka 4-chome, Ayase,
kanagawa Prefecture, 252-1113, Japan
Tel. 0467-77-2111
International Sales Department (Tokyo office) : Hamamatsucho Seiwa Bldg., 4-8, Shiba-Daimon
1-chome, Minato-ku, Tokyo, 105-0012, Japan
Tel. 03-3432-2110 Fax. 03-3436-2344
URL http://www.yuken.co.jp
E-mail int.bd@yuken.co.jp

Products:

- **Hydraulic equipment for industrial use:**
  Hydraulic pumps, Hydraulic motors, Directional control valves,
  Pressure control valves, Flow control valves, Modular valves,
  Logic valves, Proportional electro-hydraulic control equipment, Servo valves,
  Hydraulic cylinders, etc.
- **Hydraulic equipment for industrial vehicles**
  Hydraulic pumps, Hydraulic motors, Various control valves, etc.
- **Hydraulic systems**
  Various hydraulic systems for industrial machine,
  Various hydraulic systems for marine use, Special hydraulic power units,
  Various standard power packs, etc.
- **Applied hydraulic products**
  - ◆ Environmental machinery
    A compacting & separation machine for kitchen garbage,
    Automatic shavings compactor KIRIKO,
    PET bottle compacting press,
    Various compactors
- **Factories:**
  Sagami plant: 4-34, Kamitsuchidana-Naka 4-chome, Ayase, Kanagawa Prefecture, 252-1113
  Tel. 0467-77-2111
  (Technical Center, Sagami factory, Component Assembly Centre, Hydraulic System Centre)
  Fukuroda factory: 65, Kitadage, Daigo-machi, Kuji-gun, Ibaraki Prefecture, 319-3521
  Tel. 02957-2-0425

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).

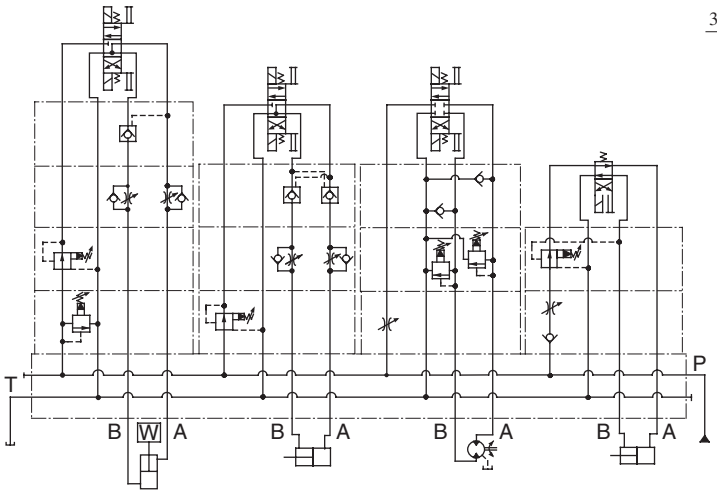
Mounting Surface

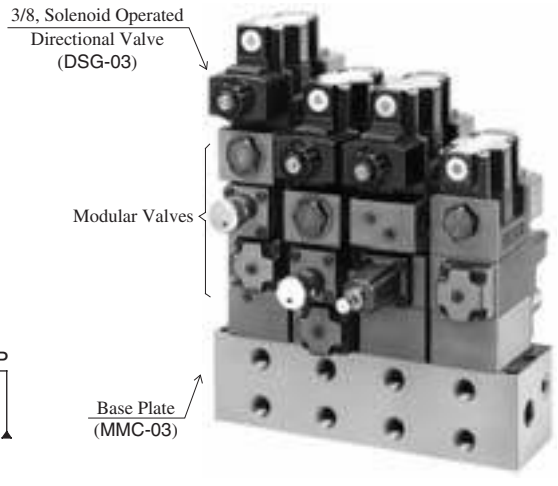
Mounting surface dimensions conform to ISO 4401 (Hydraulic fluid power four port directional control valves mounting surface) as listed in the table below.

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





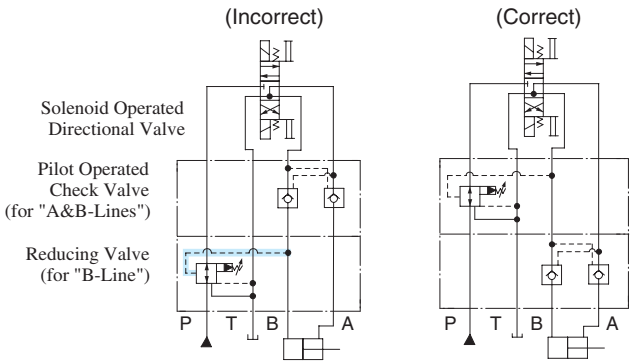
Instructions

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.

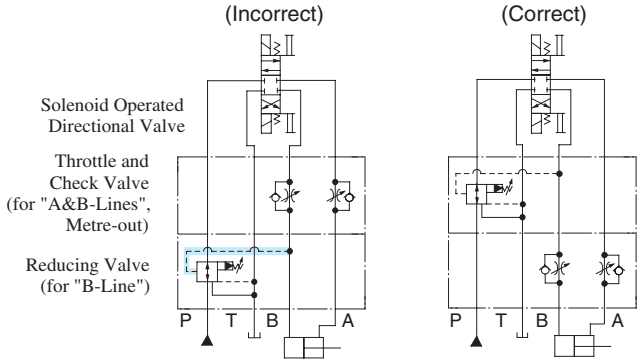
Stacking sequence when using reducing valves (for "A" or "B" line) and pilot operated check valves.

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.



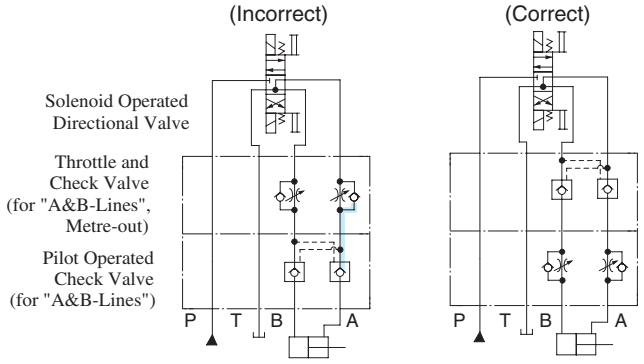
Stacking sequence when using reducing valves (for "A" or "B" line) and throttle and check valves (for metre-out).

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.



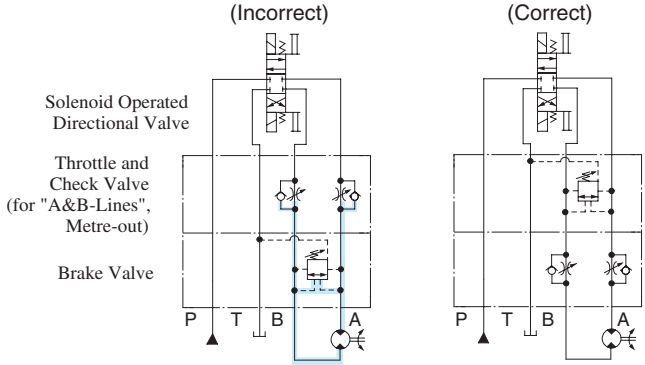
Stacking sequence when using pilot operated check valves and throttle and check valves (metre-out).

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.

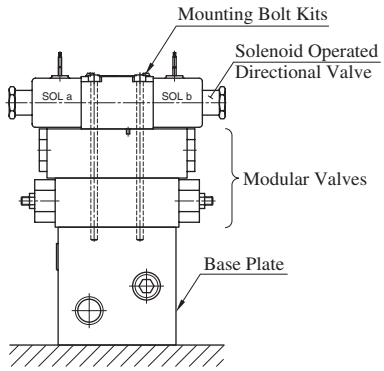
● **Assembly Procedure:**

• 005 Series

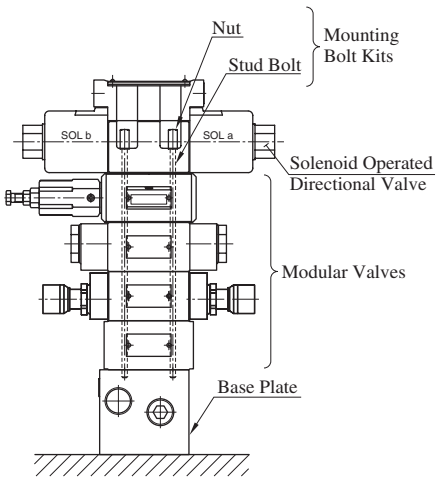
1) To stack modular valves and solenoid operated directional valves according to circuit requirements, match the O-ring surfaces to the mounting surface and check the alignment of the locating pins.
2) Align the right and left sides of the stacked valves.
3) Tighten the four mounting bolts to the specified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

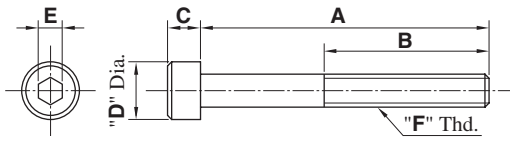
$$\Delta P' = \Delta P\ (G'/0.850)$$

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.

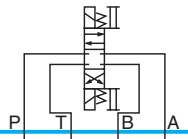
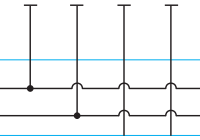
Comparison of MBK-005 bolt kit model numbers



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

005 Series Modular Valves

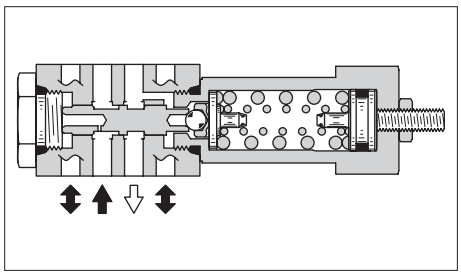
Type of Modular Valve

Class	Model Numbers	Graphic Symbols	Page
	Solenoid Operated Directional Valve DSG-005-✻✻✻-✻-40		336
Pressure Control Valves	Releif Valves (for "P-Line") MBP-005-✻-20		518
	Reducing Valves (for "P-Line") MRP-005-✻-20/2090		521
Flow Control Valves	Throttle and Check Valves (for "A-Line", Metre-out) MSA-005-X-20		524
	Throttle and Check Valves (for "A-Line", Metre-in) MSA-005-Y-20		
	Throttle and Check Valves (for "B-Line", Metre-out) MSB-005-X-20		
	Throttle and Check Valves (for "B-Line", Metre-in) MSB-005-Y-20		
	Throttle and Check Valves (for "A&B-Lines", Metre-out) MSW-005-X-20		
	Throttle and Check Valves (for "A&B-Lines", Metre-in) MSW-005-Y-20		
Directional Control Valves	Pilot Operated Check Valves (for "A-Line") MPA-005-2-20		527
	Pilot Operated Check Valves (for "B-Line") MPB-005-2-20		
	Pilot Operated Check Valves (for "A&B-Lines") MPW-005-2-20		
	Check Valves (for "P-Line") MCP-005-0-20		529
Modular Plates and Mounting Bolts	End Plates (Blocking plates) MDC-005-A-20		530
	Base Plates MMC-005-✻-20/2080/2090		531
	Bolts Kits MBK-005-✻-20/2090		534

Relief Modular Valves

Specifications

Model Numbers	Max. Operating Pressure MPa (PSI)	Max. Flow L/min (U.S.GPM)
MBP-005-∗-20	25 (3630)	15 (3.96)

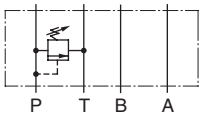


Model Number Designation

F-	MBP	-005	-C	-20	∗
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	**005**	**C**: ∗-16 ★1 (∗-2320) **H**: 7-25 (1020-3630)	**20**	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

Graphic Symbol



MBP-005

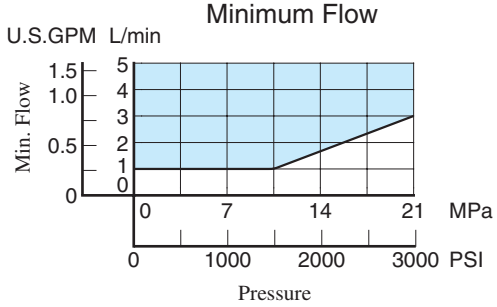
Instructions

- 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 .

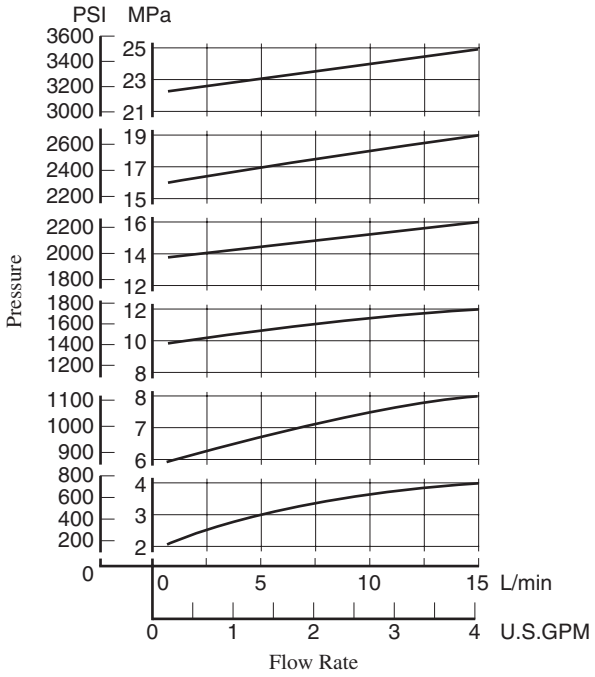
Typical Performance Characteristics

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

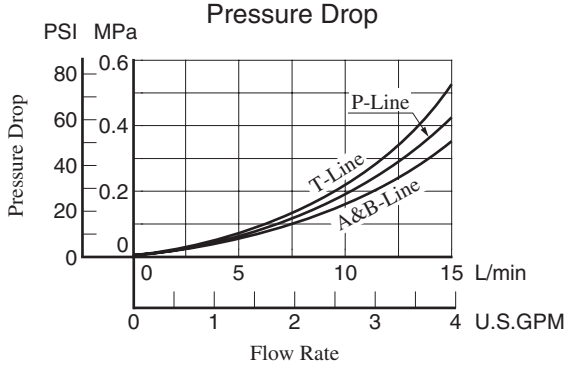
Minimum Flow



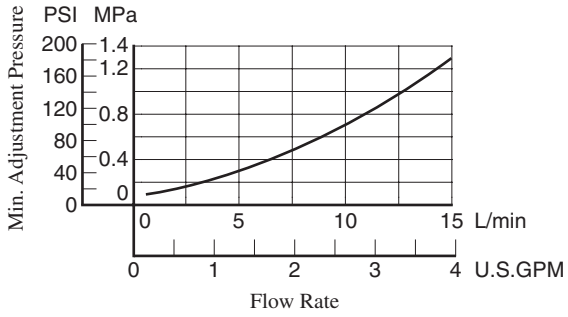
Nominal Override Characteristics



Pressure Drop

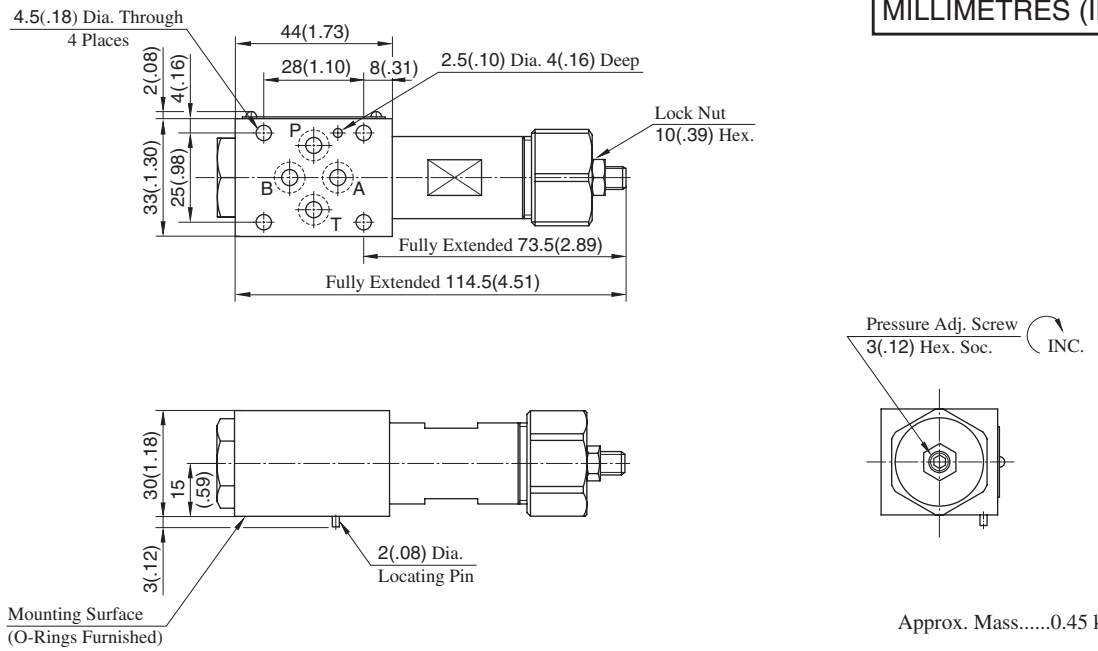


Min. Adjustment Pressure



MBP-005-∗-20

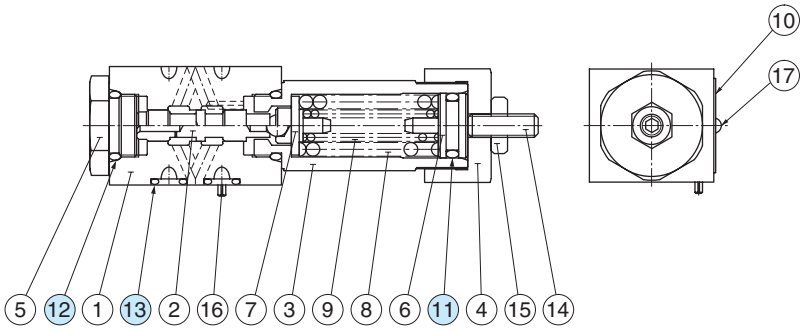
DIMENSIONS IN MILLIMETRES (INCHES)



Approx. Mass.....0.45 kg(.99 lbs.)

Spare Parts List

MBP-005-∗-20



List of Seals

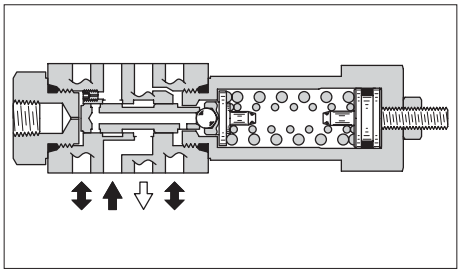
Item	Name of Parts	Part Numbers	Qty.	Remarks
11	O-Ring	SO-NA-P12.5	1	Included in Seal Kit Kit No. : KS-MBP-005-20
12	O-Ring	SO-NB-P14	2	
13	O-Ring	SO-NB-P6	4	

Reducing Modular Valves

Specifications

Model Numbers	Max. Operating Pressure MPa (PSI)	Max. Flow L/min (U.S.GPM)
MRP-005-∗-20/2090	25 (3630)	15 (3.96) ★

★ If the pressure is set below 1.6 MPa (232 PSI), the maximum flow is limited. See the minimum adjustment pressure vs. maximum flow characteristics and during use, stay within the shaded zone on the graph.

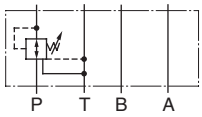


Model Number Designation

F-	MRP	-005	-B	-20	∗
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)	**MRP** : Reducing Valve for P-Line	**005**	**B**: ∗-7 (∗-1020) ★1 **C**: 3.5-16 (510-2320) **H**: 7-24.5 (1020-3550)	**20**	Refer to ★2

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

Graphic Symbol



MRP-005

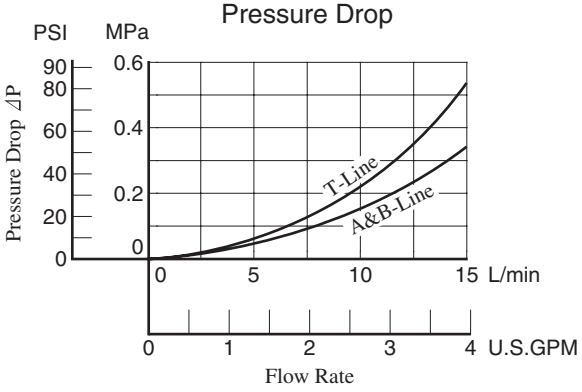
Instructions

- 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.

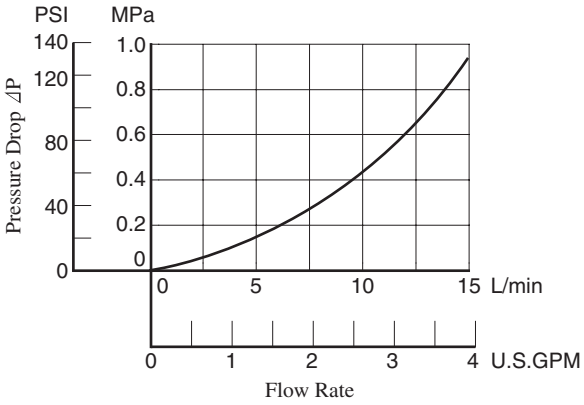
Typical Performance Characteristics

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

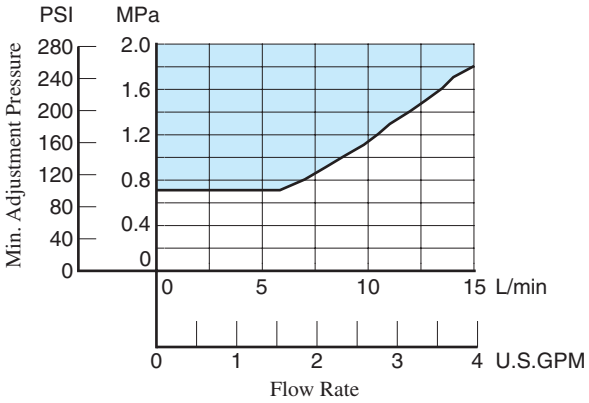
Pressure Drop



Pres. Drop at Spool Fully Open (P-Line)

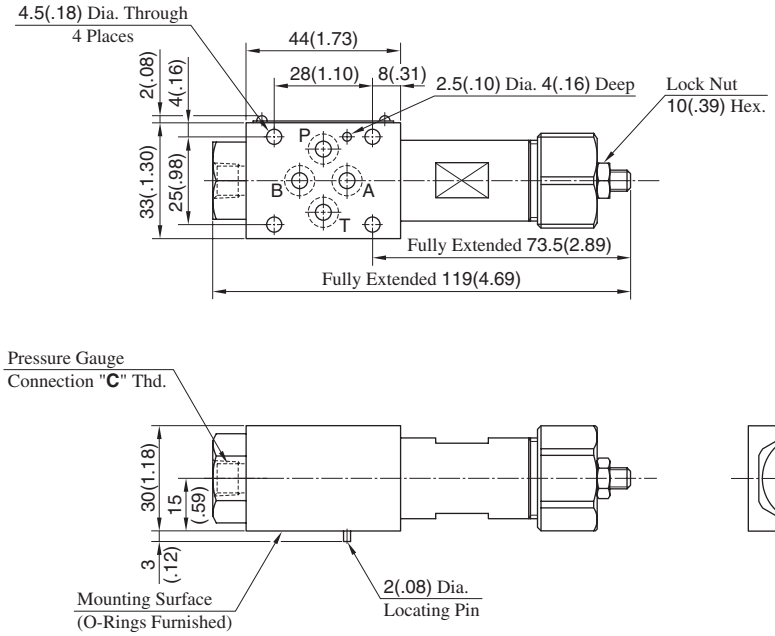


Min. Adjustment Pressure vs. Max. Flow



MRP-005-∗-20/2090

DIMENSIONS IN MILLIMETRES (INCHES)

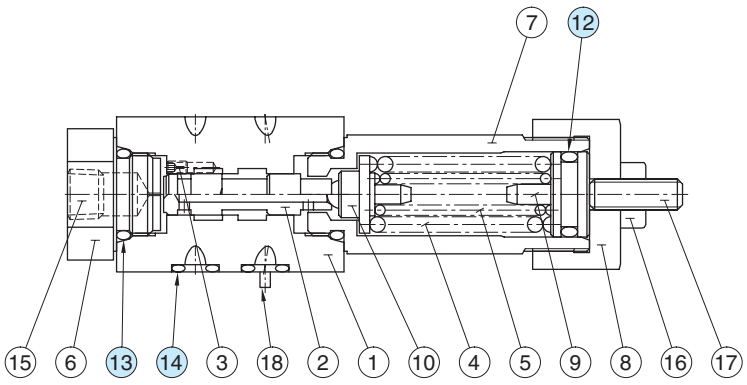


Model Numbers	Thread Size "C" Thd.
MR∗-005-∗-20	Rc 1/8 = 1/8 BSP.Tr
MR∗-005-∗-2090	1/8 NPT

Approx. Mass.....0.45 kg(.99 lbs.)

Spare Parts List

MRP-005-∗-20/2090



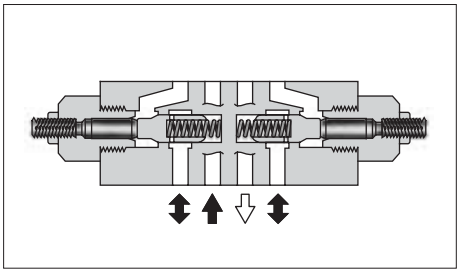
List of Seals

Item	Name of Parts	Part Numbers	Qty.	Remarks
12	O-Ring	SO-NA-P12.5	1	Included in Seal Kit Kit No. : KS-MRP-005-20
13	O-Ring	SO-NB-P14	2	
14	O-Ring	SO-NB-P6	4	

Throttle and Check Modular Valves

Specifications

Model Numbers	Max. Operating Pressure MPa (PSI)	Max. Flow L/min (U.S.GPM)
MSW-005-∗-20 MSA-005-∗-20 MSB-005-∗-20	25 (3630)	15 (3.96)



Model Number Designation

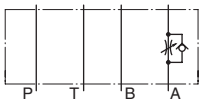
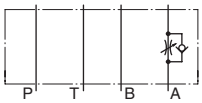
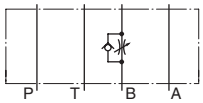
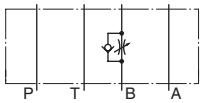
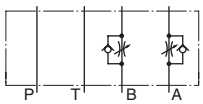
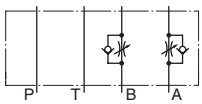
F-	MSW	-005	-X	-20	∗
Special Seals	Series Number	Valve Size	Direction of Flow	Design Number	Design Standard
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	**MSA**: Throttle and Check Valve for A-Line **MSB**: Throttle and Check Valve for B-Line **MSW**: Throttle and Check Valve for A&B-Lines	**005**	**X**: Metre-out **Y**: Metre-in	**20**	Refer to ★

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

Flow Adjustment

To make flow rate adjustment, loosen the lock nut and turn the flow adjustment screw clockwise or anti-clockwise. To throttle the flow, turn the screw clockwise. Be sure to re-tighten the lock nut firmly after the adjustment of the flow rate is completed.

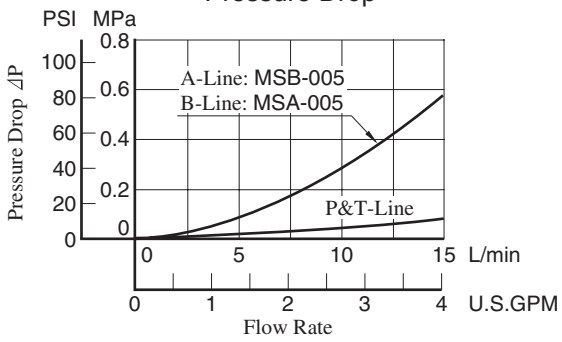
Graphic Symbols

Metre-out	Metre-in
 MSA-005-X	 MSA-005-Y
 MSB-005-X	 MSB-005-Y
 MSW-005-X	 MSW-005-Y

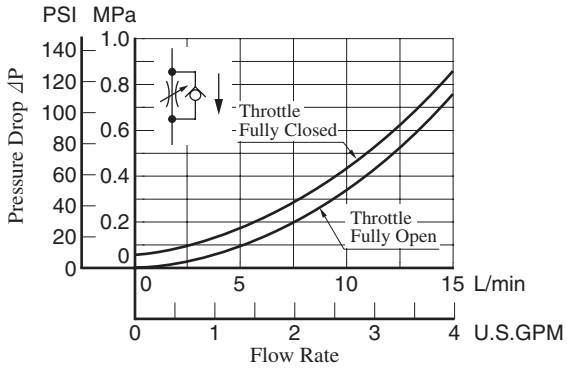
Typical Performance Characteristics

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

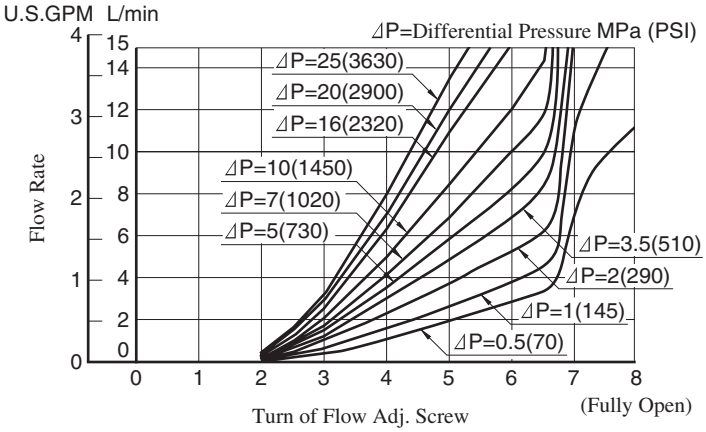
Pressure Drop



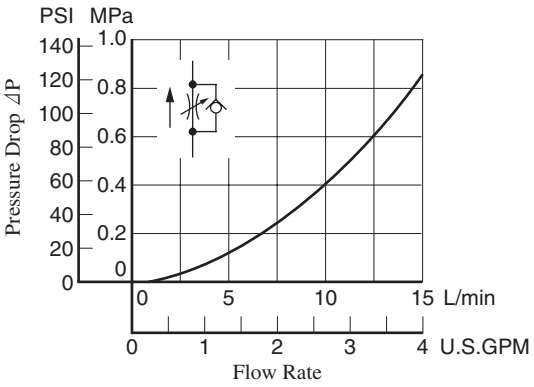
Pressure Drop for Free Flow



Metred Flow vs. Screw Position

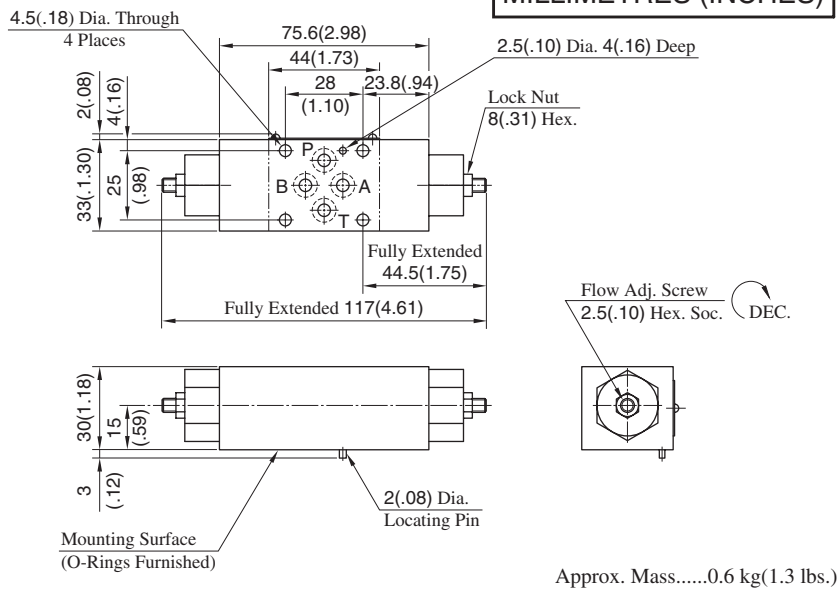


Pressure Drop at Throttle Fully Open



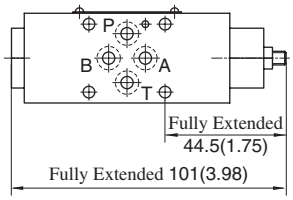
MSW-005-∗-20

DIMENSIONS IN MILLIMETRES (INCHES)



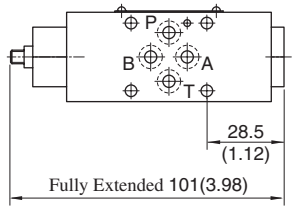
Approx. Mass.....0.6 kg(1.3 lbs.)

MSA-005-∗-20



Approx. Mass.....0.55 kg(1.2 lbs.)

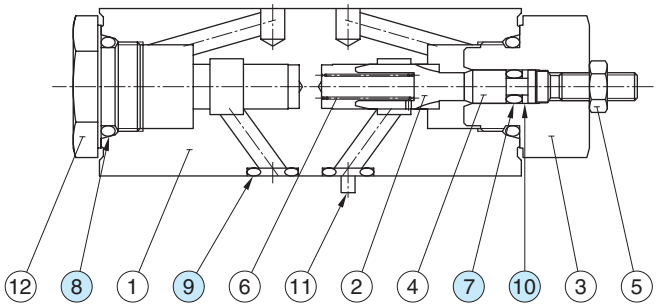
MSB-005-∗-20



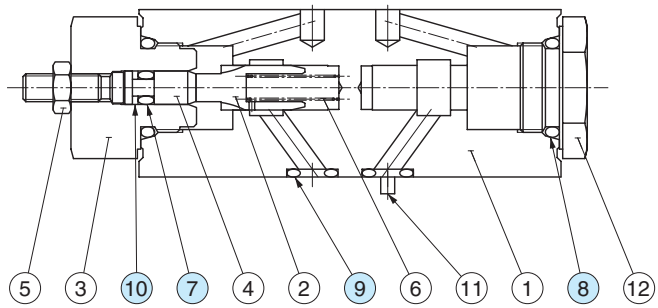
Approx. Mass.....0.55 kg(1.2 lbs.)

Spare Parts List

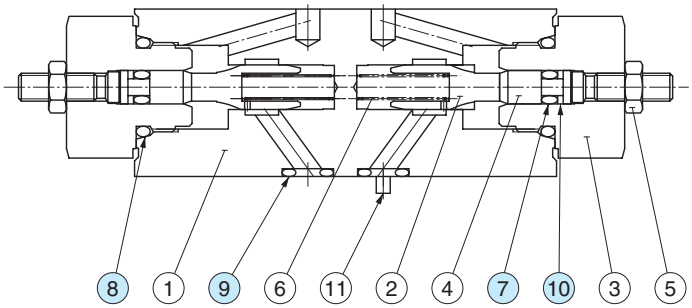
MSA-005-$\frac{X}{Y}$-20



MSB-005-$\frac{X}{Y}$-20



MSW-005-$\frac{X}{Y}$-20



List of Seals

Item	Name of Parts	Part Numbers	Qty.	
			MSA MSB	MSW
7	O-Ring	SO-NA-P3	1	2
8	O-Ring	SO-NB-P6	4	4
9	O-Ring	SO-NB-P14	2	2
10	Back Up Ring	SO-BB-P3	1	2

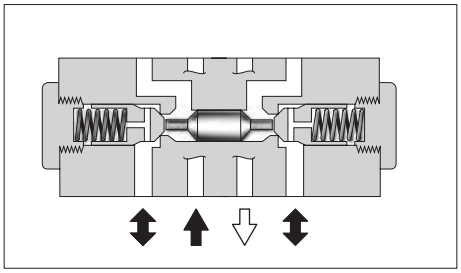
List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
MSA-005	KS-MSA-005-20
MSB-005	
MSW-005	KS-MSW-005-20

Pilot Operated Check Modular Valves

Specifications

Model Numbers	Max. Operating Pressure MPa (PSI)	Max. Flow L/min (U.S.GPM)
MPA-005-2-20 MPB-005-2-20 MPW-005-2-20	25 (3630)	15 (3.96)

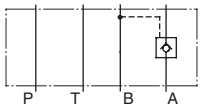


Model Number Designation

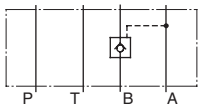
F-	MPW	-005	-2	-20	*
Special Seals	Series Number	Valve Size	Cracking Pressure MPa (PSI)	Design Number	Design Standard
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	**MPA**: Pilot Operated Check Valve for A-Line **MPB**: Pilot Operated Check Valve for B-Line **MPW**: Pilot Operated Check Valve for A&B-Lines	**005**	**2**: 0.2 (29)	**20**	Refer to ★

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

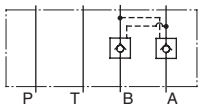
Graphic Symbols



MPA-01



MPB-01

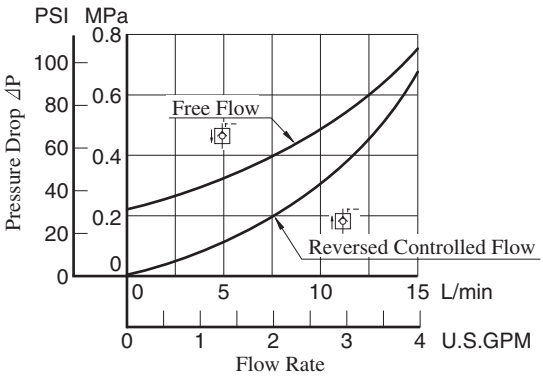


MPW-01

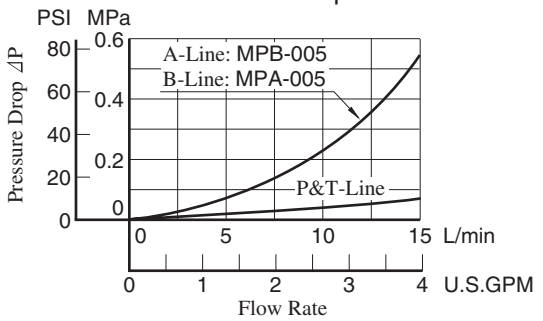
Typical Performance Characteristics

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

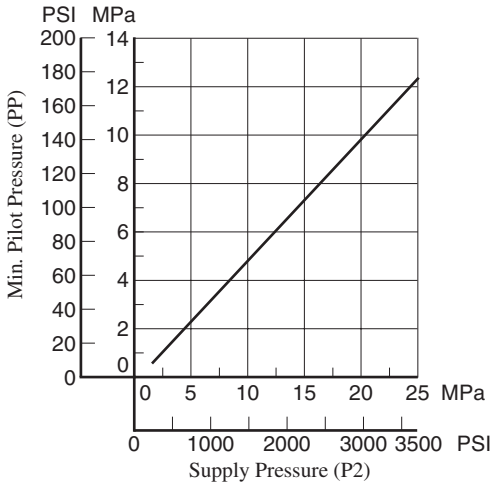
Pressure Drop for Free Flow/ Reversed Controlled Flow



Pressure Drop

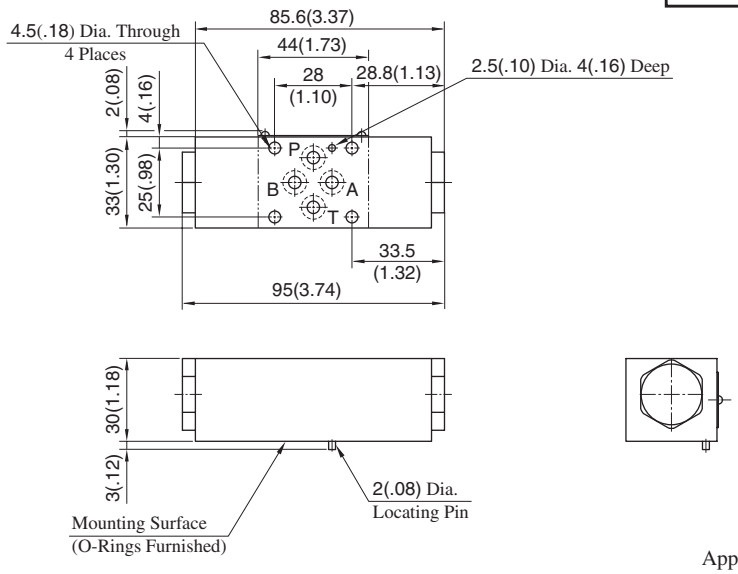


Min. Pilot Pressure



MPA-005-2-20
MPB-005-2-20
MPW-005-2-20

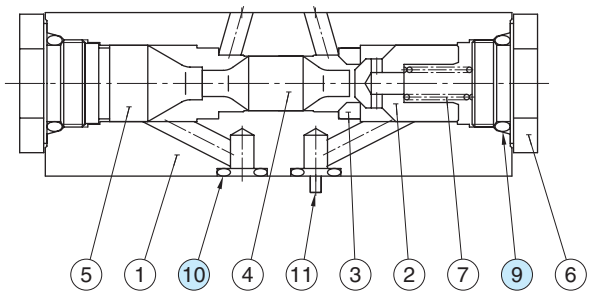
DIMENSIONS IN MILLIMETRES (INCHES)



Approx. Mass.....0.55 kg(1.2 lbs.)

Spare Parts List

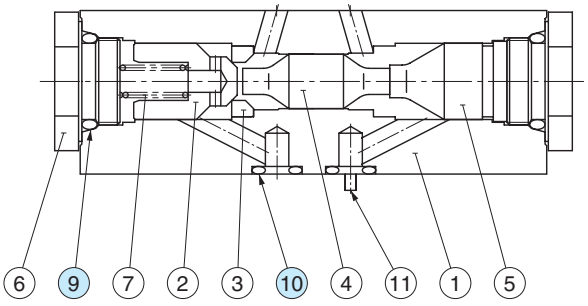
MPA-005-2-20



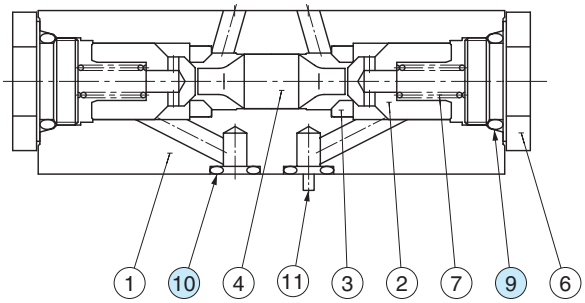
List of Seals

Item	Name of Parts	Part Numbers	Qty.	Remarks
9	O-Ring	SO-NB-P14	2	Included in Seal Kit Kit No. : KS-MPA-005-20
10	O-Ring	SO-NB-P6	4	

MPB-005-2-20



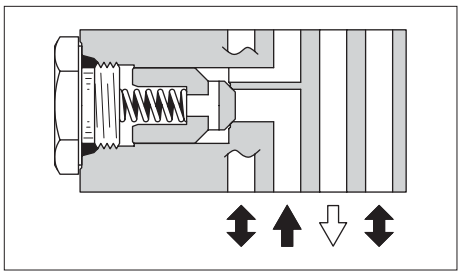
MPW-005-2-20



Check Modular Valves

Specifications

Model Number	Max. Operating Pressure MPa (PSI)	Max. Flow L/min (U.S.GPM)
MCP-005-0-20	25 (3630)	15 (3.96)

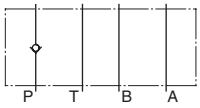


Model Number Designation

F-	MCP	-005	-0	-20	*
Special Seals	Series Number	Valve Size	Cracking Pressure MPa (PSI)	Design Number	Design Standard
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	**MCP**: Check Valve for P-Line	**005**	**0**: 0.035(5)	**20**	Refer to ★

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

Graphic Symbol

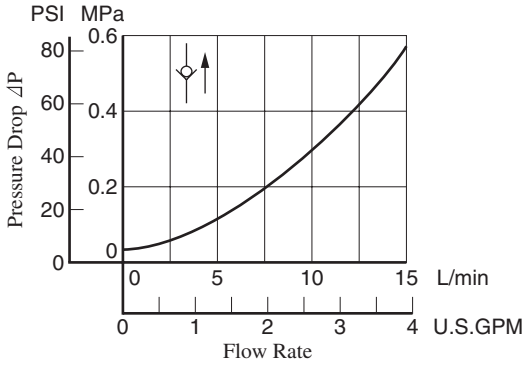


MCP-005

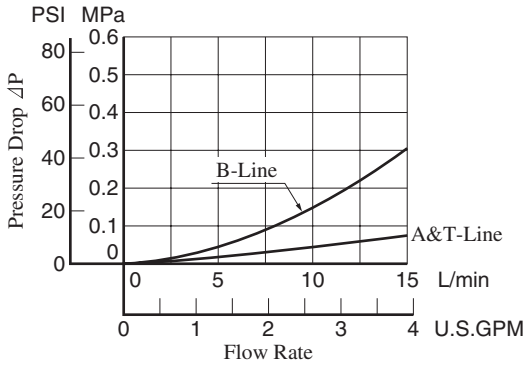
Typical Performance Characteristics

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

Pressure Drop for Free Flow

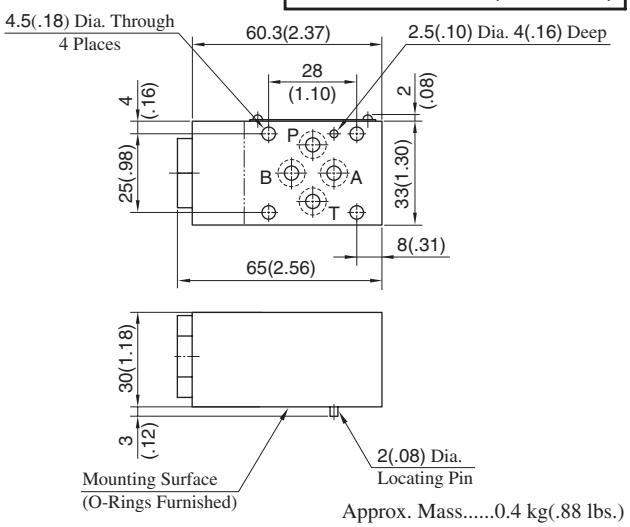


Pressure Drop



MCP-005-0-20

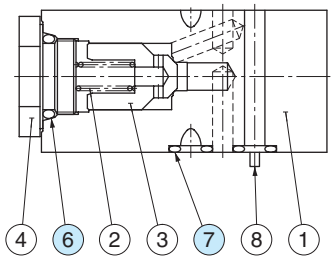
DIMENSIONS IN MILLIMETRES (INCHES)



Approx. Mass.....0.4 kg(.88 lbs.)

Spare Parts List

MCP-005-0-20



List of Seals

Item	Name of Parts	Part Numbers	Qty.	Remarks
6	O-Ring	SO-NB-P14	2	Included in Seal Kit Kit No. : KS-MPA-005-20
7	O-Ring	SO-NB-P6	4	

End Plates

Blocking plates are used for auxiliary mounting surface or for closing unnecessary circuits.

Specifications

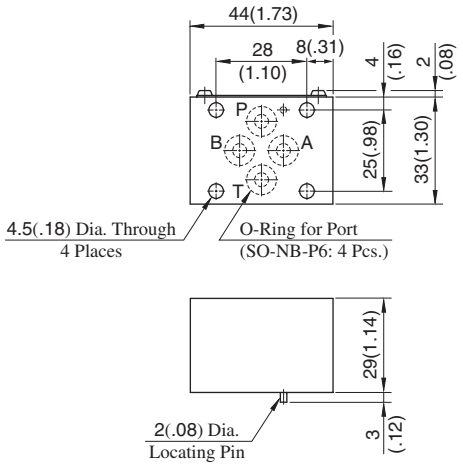
Max. Operating Pressure ---------- 25 MPa (3630 PSI)

Model Number Designation

F-	MDC	-005	-A	-20	✻
Special Seals	Series Number	Plate Size	Type of Plate	Design Number	Design Standard
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	**MDC**: End Plate	**005**	**A**: Blocking Plate	**20**	Refer to ★

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

MDC-005-A-20



DIMENSIONS IN MILLIMETRES (INCHES)

Approx. Mass.....0.3 kg(.66 lbs.)

Graphic Symbol

MDC-005-A

Base Plates For Modular Valves

Specifications

Max. Operating Pressure ---------- 25 MPa (3630 PSI)

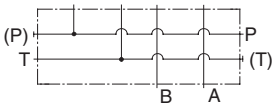
Model Number Designation

MMC	-005	-5	-20	*
Series Number	Plate Size	Number of Stations	Design Number	Design Standard
MMC: Base Plate	**005**	**1** : 1 Station **2** : 2 Stations **3** : 3 Stations **4** : 4 Stations **5** : 5 Stations	**20**	**None** : Japanese Standard "JIS" **80** : European Design Standard **90** : N.American Design Standard

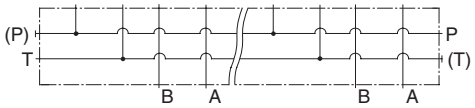
Instructions

- Port Used: Base plate has more than one pressure port "P" and tank port "T". Any one of these ports or two or more ports nay be used. However, please note that the ports marked with (P) or (T) in the drawing are normally plugged. Remove the plugs when using such ports. Make sure that ports that are not cuurently used are properly plugged.

Graphic Symbols

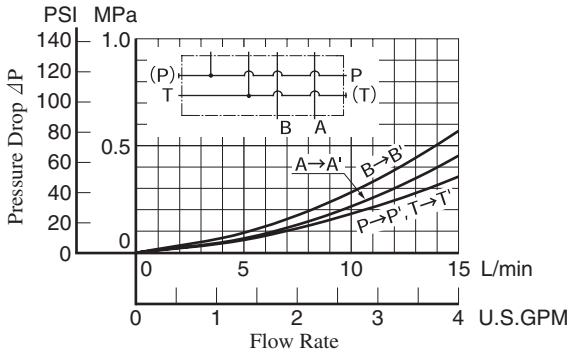


MMC-005-1



MMC-005-2-5

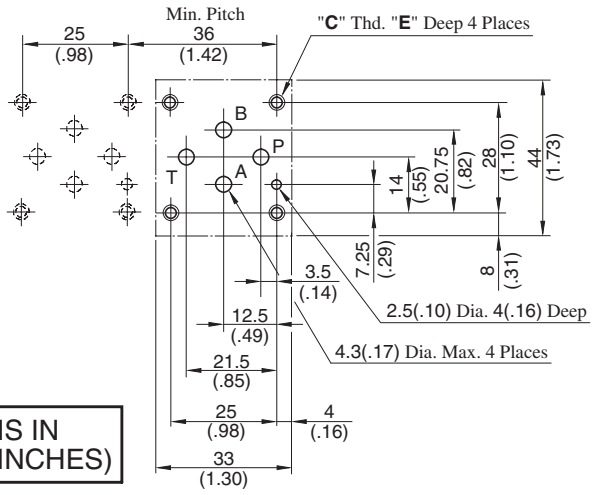
Pressure Drop



Mounting Surface Dimensions for 005 Series Modular Valve

When standard base plates (MMC-005) are not used, the mounting surface described on the right must be prepared. The mounting surface should have a good machined finish.

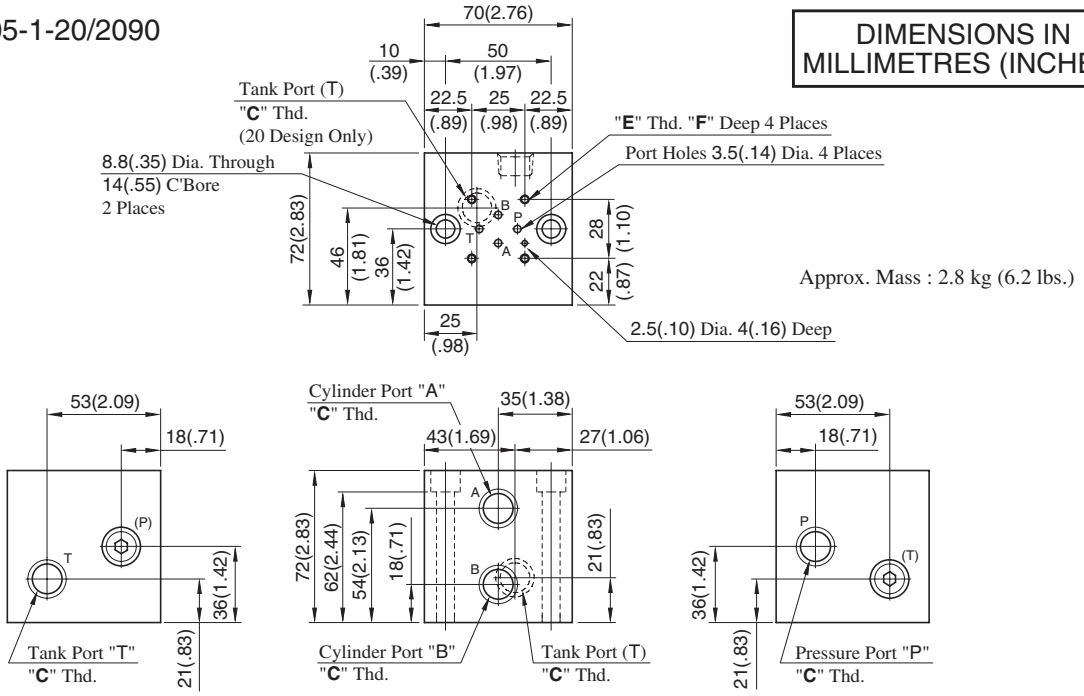
Design Std.	"C" Thd.	"E"
Japanese Std. "JIS" and European Design Std.	M4	7.5 (.30)
N. American Design Std.	No.8 - 32 UNC	10 (.39)



DIMENSIONS IN MILLIMETRES (INCHES)

MMC-005-1-20/2090

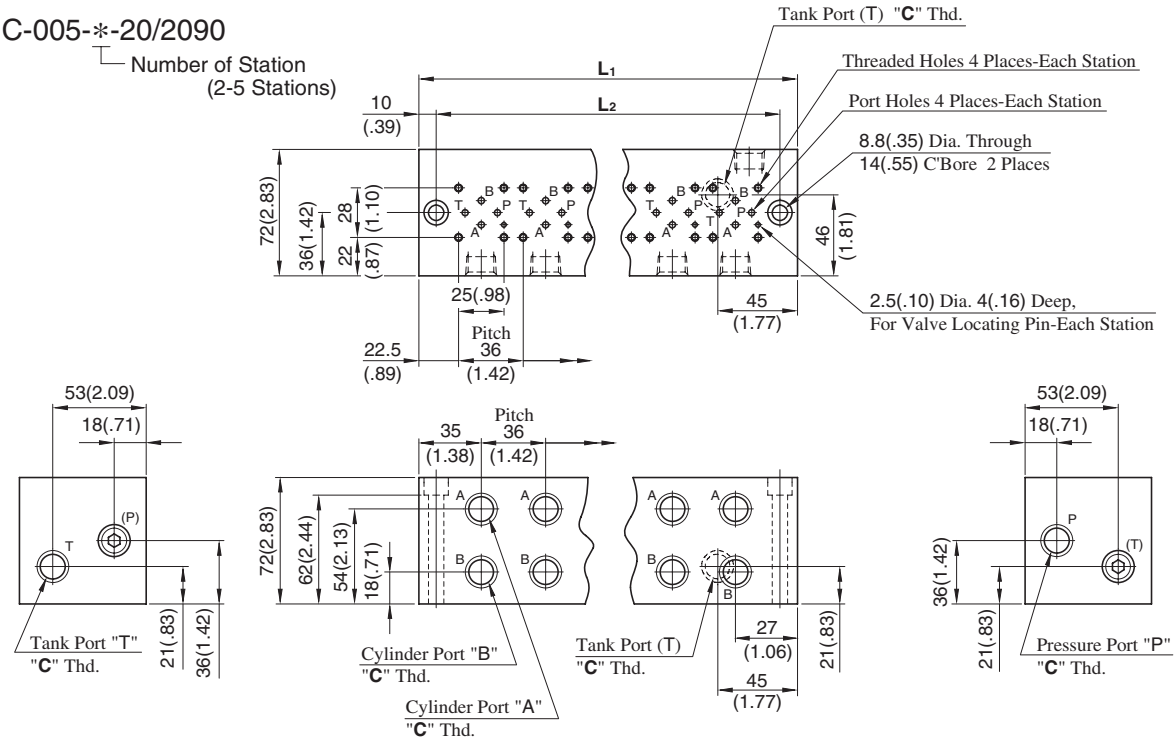
DIMENSIONS IN MILLIMETRES (INCHES)



Approx. Mass : 2.8 kg (6.2 lbs.)

MMC-005-∗-20/2090

Number of Station (2-5 Stations)



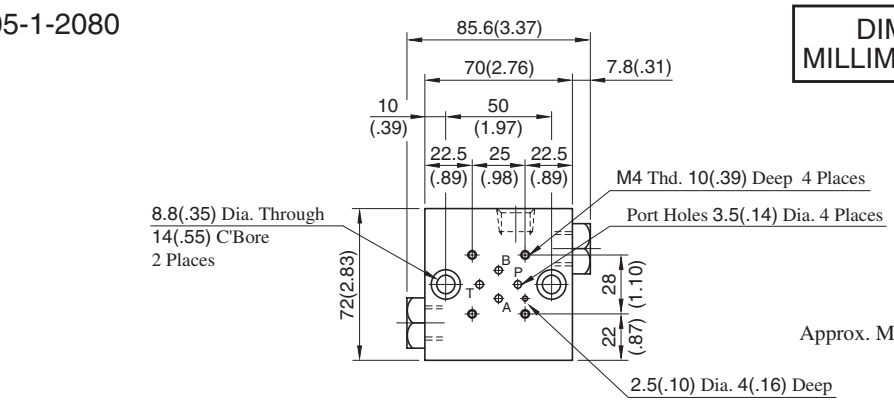
- For other dimensions, refer to the above Model MMC-005-1.

Model Numbers	Thread Size		Dimensions mm (Inches)
	"C" Thd.	"E" Thd.	F
MMC-005-∗-20	Rc 3/8	M4	8 (.31)
MMC-005-∗-2090	3/8 NPT	No. 8-32 UNC	10 (.39)

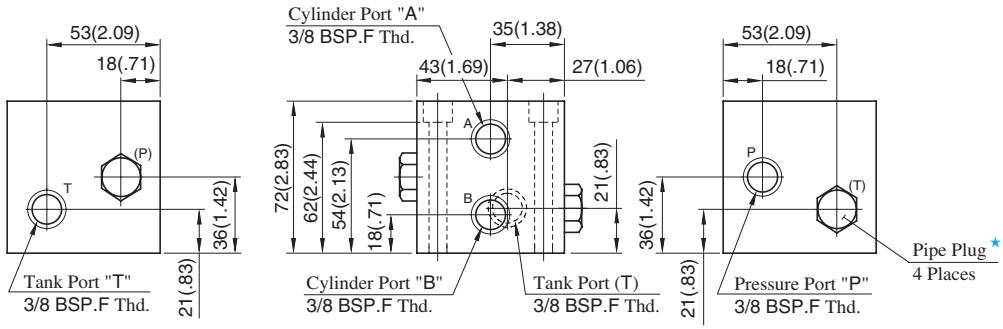
Model Numbers	Dimensions mm (Inches)		Approx. Mass kg (lbs.)
	L_1	L_2	
MMC-005-2	106 (4.17)	86 (3.39)	4.3 (9.5)
MMC-005-3	142 (5.59)	122 (4.80)	5.8 (12.8)
MMC-005-4	178 (7.01)	158 (6.22)	7.2 (15.9)
MMC-005-5	214 (8.43)	194 (7.64)	8.7 (19.2)

MMC-005-1-2080

DIMENSIONS IN MILLIMETRES (INCHES)

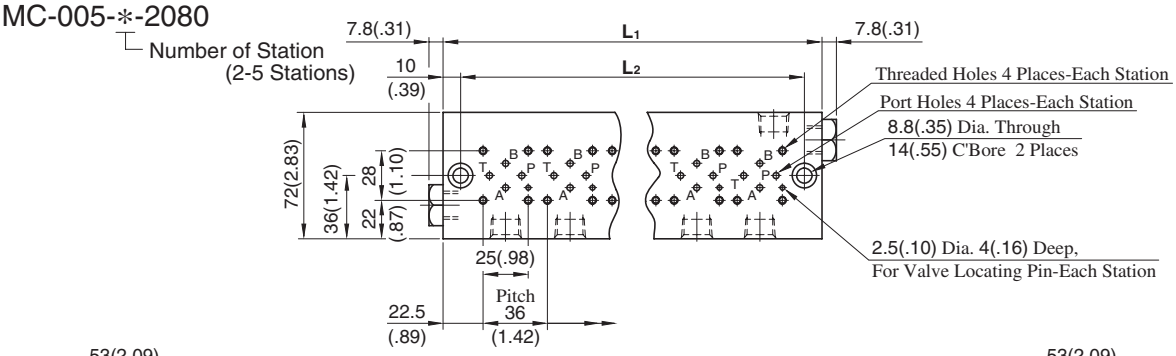


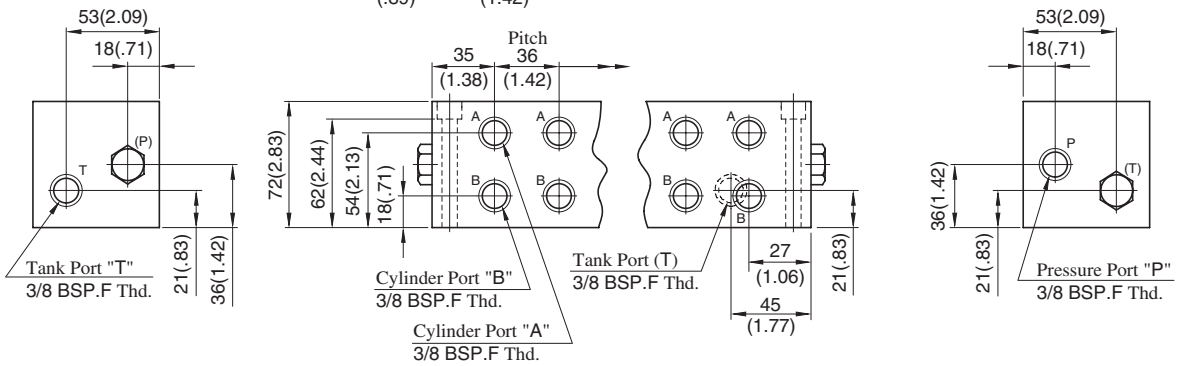
Approx. Mass : 2.8 kg (6.2 lbs.)



MMC-005-∗-2080

Number of Station (2-5 Stations)

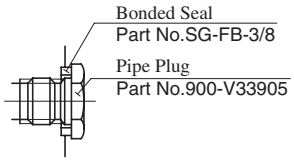




• For other dimensions, refer to the above Model MMC-005-1.

Model Numbers	Dimensions mm (Inches)		Approx. Mass kg (lbs.)
	L_1	L_2	
MMC-005-2	106 (4.17)	86 (3.39)	4.3 (9.5)
MMC-005-3	142 (5.59)	122 (4.80)	5.8 (12.8)
MMC-005-4	178 (7.01)	158 (6.22)	7.2 (15.9)
MMC-005-5	214 (8.43)	194 (7.64)	8.7 (19.2)

★ Detail of Pipe Plug



Mounting Bolt Kits

To mount the valves, four M4 bolts are used. The combination of valves varies with circuits. So, we have several mounting bolt kits suitable for different valve combinations. From the selection chart, choose a necessary bolt kit and specify it with model number when ordering.

Model Number Designation

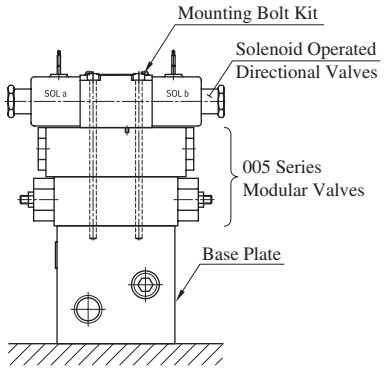
MBK	-005	-02	-20	∗
Series Number	Size of Modular Valve	Bolt Number	Design Number	Design Standard
MBK: Bolt Kits for Modular Valves	**005**	**01,02,03,05** (Refer to the following chart)	**20**	**None**: Japanese Standard "JIS" and European Design Standard **90**: N.American Design Standard

Bolt Kits Selection Chart

Model Numbers	Quantity of valves to be stacked			Approx. Mass g (1bs.)
	Solenoid Operated Directional Valve (DSG-005)	Modular Valve (MDC-005)	Modular Valve (M∗∗-005)	
MBK-005-01-20∗	1	0	1	30(.07)
	0	1		
MBK-005-02-20∗	1	0	2	40(.09)
	0	1		
MBK-005-03-20∗	1	0	3	50(.11)
	0	1		
MBK-005-05-20∗	1★	0	0	18(.04)
	0	1		

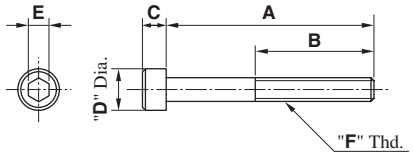
★ The solenoid operated directional valve comes with mounting bolts.

- **Bolts Kit Composition:**
  Soc. Hd. Cap Screw.....4 Pcs.
- **Tightening Torque:**
  2.5 - 3.5 Nm (22-31 in. lbs.)



Stacking Example

MBK-005-∗-20/2090



Model Numbers	Dimensions mm (Inches)					"F" Thd.
	A	B	C	D	E	
MBK-005-01-20	65 (2.56)	20 (.79)	4 (.16)	7 (.28)	3 (.12)	M4
MBK-005-02-20	95 (3.74)					
MBK-005-03-20	125 (4.92)					
MBK-005-05-20	35 (1.38)					
MBK-005-01-2090	65.1 (2-9/16)	22.4 (.88)	4.17 (.164)	6.86 (.27)	3.6 (9/64)	No. 8-32 UNC
MBK-005-02-2090	95.2 (3-3/4)					
MBK-005-03-2090	125.4 (4-15/16)					
MBK-005-05-2090	34.9 (1-3/8)					

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