

MBC-SE 1000/602 & MBC-SE 2500/602
Mult-Bloc™ Dual Safety Shutoff Valve with
Ventless Pressure Regulator or Zero Governor
Installation and Operating Instructions

SPECIFICATIONS

MBC-SE...

Series ending in S20, S22, S80, S82, S300 or S302 Two normally closed automatic safety shutoff valves with gas pressure regulator in one valve housing.

Series ending in S02 Two normally closed automatic safety shutoff valves with zero governor in one valve housing.

Body size	Flange Sizes	Thread Type	Cycle Rate
MBC-SE 1000...	1/2"	NPT	Maximum 60 cycles/hr (30 seconds on/off)
	3/4"	NPT	Vibration
	1"	NPT	Can withstand G (gravity) forces not to exceed 1 G rms and peak frequencies not greater than 2KHz. Withstands vibration as per Minimum Integrity Test in MIL-STD-810F.
	1 1/4"	NPT	Regulator Outlet Pressure Range
	1 1/2"	NPT	MBC...S02: -1 to +1"WC.
MBC-SE 2500...	1"	NPT	MBC...S20 & S22 = 1.5 to 8"WC
	1 1/4"	NPT	MBC...S80 & S82 = 2 to 32"WC
	1 1/2"	NPT	MBC...S300 or S302 = 12 to 122"WC
	2"	NPT	Regulator Vent Connection
			A vent line connection is provided, however, the regulator has a factory installed vent limiter. No venting is required when a vent limiter is accepted by the authority having jurisdiction.

Gases

Natural gas, propane, butane; other noncorrosive gases.

Maximum Operating Pressure

5 PSI (360mbar)

Maximum Close-Off Pressure

7 PSI (500 mbar)

Ambient / Fluid Temperature

-40°F to +140°F; (-40°C to +60°C) CSA

0°F to +140°F; (-18°C to +60°C) UL

Electrical Ratings available

24Vac /50-60 Hz and 110-120Vac /50-60 Hz
12Vdc and 24Vdc.

Power Consumption (all coils energized)

MBC 1000 series:

140VA during opening (first 3 seconds)

16VA holding

MBC 2500 series:

160VA during opening (first 3 seconds)

20VA holding

Electrical Connection

DIN connector with 1/2" NPT conduit connection

Enclosure Rating

NEMA Type 12

Operating Time

100 % duty cycle

Regulator Vent Connection

A vent line connection is provided, however, the regulator has a factory installed vent limiter. No venting is required when a vent limiter is accepted by the authority having jurisdiction.

Closing Time (Valve 1 & Valve 2)

< 1 second

Opening Time

V1 & V2 < 1 sec.

Materials in contact with Gas

Housing: Aluminum, Steel

Sealings on valve seats: NBR-based rubber

Mounting Position

In horizontal or vertical gas pipe.

Filter

50 micro, installed in the housing upstream V1.

Test Ports

Taps available on both sides of valve for upstream of V1, between V1 and V2, and downstream of V2.

Turndown ratio

Up to 10:1

Approvals

CSA Certified: File No. 112901

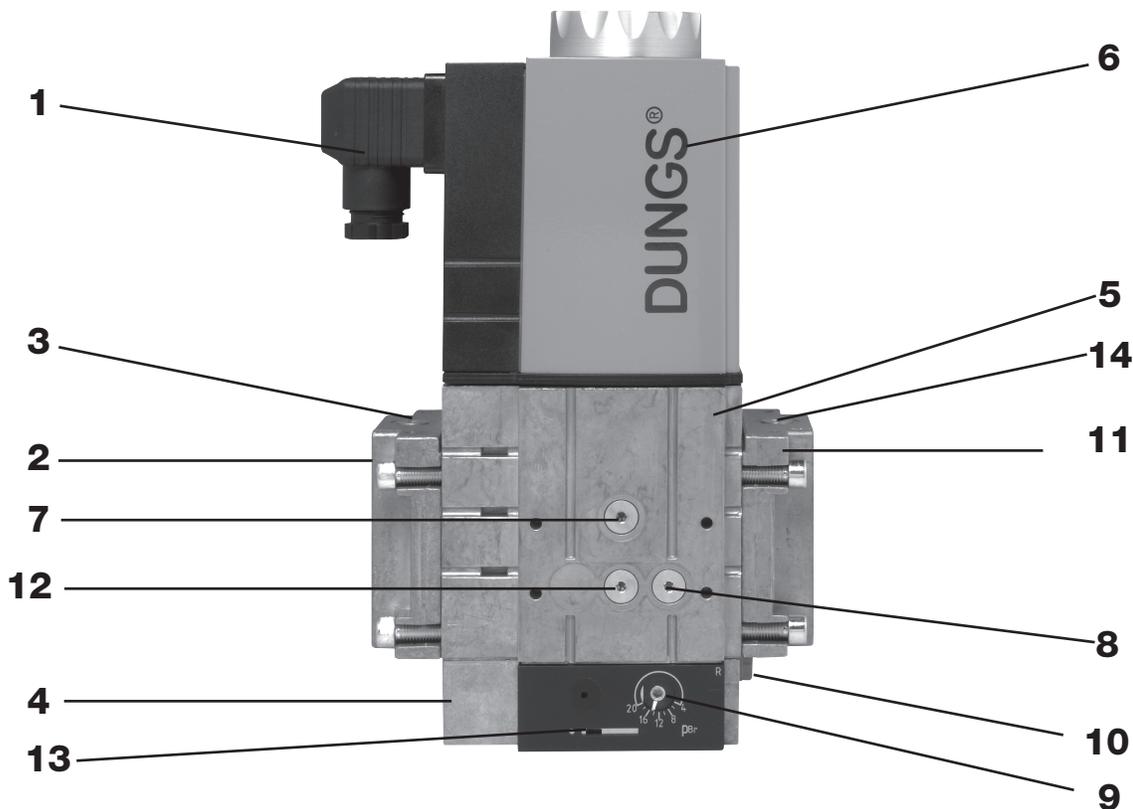
UL Listed: File No. MH 16727



ATTENTION

- Read these instructions carefully.
 - Failure to follow them and/or improper installation may cause explosion, property damage and injuries.
 - Installation must be done with the supervision of a licensed burner technician.
 - Check the ratings in the specifications to make sure that they are suitable for your application.
 - Never perform work if gas pressure or power is applied, or in the presence of an open flame.
 - Once installed, perform a complete checkout including leak testing.
- Verify proper operation after servicing.
 - The system must meet all applicable national and local code requirements such as but not limited to the following fuel gas codes: NFPA 54, IFGC (International Fuel Gas Code), or CSA B149.1 (for Canada) or the following equipment codes and standards: UL 795, UL 2200, CSD-1, NFPA 37, ANSI Z83.4/CSA 3.7, ANSI Z83.18, ANSI Z21.13/CSA 4.9, or CSA B149.3 (for Canada).

MBC-SE VALVE OVERVIEW



- | | |
|--|---|
| <p>1 Electrical DIN Connector</p> <p>2 Upstream flange</p> <p>3 Pressure connection G 1/8 upstream of filter</p> <p>4 Filter</p> <p>5 Valve body</p> <p>6 Coil</p> <p>7 Test port connection #2, G 1/8 between V1 and V2; both sides.</p> | <p>8 Test port connection #3, G 1/8 downstream of V2; both sides.</p> <p>9 Regulator outlet pressure adjustment screw; both sides.</p> <p>10 Ventless regulator vent connection is G 1/8 threaded. The brass vent limiting orifice is 0.2mm in diameter.</p> <p>11 Downstream flange</p> <p>12 Test port connection #1, G 1/8 upstream of V1; both sides.</p> <p>13 Setpoint sealing mechanism.</p> <p>14 Pressure connection G 1/8, downstream both safety shutoff valves</p> |
|--|---|

ELECTRICAL DIN CONNECTOR, WIRING, & CONDUIT RATINGS

Ratings for DIN Connector:

- Ambient Temperature Rating: -40°F to +175°F
- Electrical Ratings: 120Vac or 24Vac 50/60 Hz, or 24Vdc.
- Maximum Amperage Rating: 6.0 Amps @ 120Vac.
- Enclosure Rating: Type 12
- Electrical Wiring Connection: Screw terminals.

Required Ratings for Wire Type:

- Type: Stranded, insulated Appliance Wiring Material (AWM) "Hook-Up" wire.
- Approvals: UL Recognized Single Conductor, Thermoplastic Insulated Wire, Type AWM.
- Temperature Rating: At least 75°C (170°F).
- Voltage Rating: 300 Volts maximum / Single phase.
- Wire Size: Stranded, AWG #18 minimum ONLY. No larger than AWG #14.

Required Ratings for Conduit and Conduit Fittings:

- Temperature: At least 75°C (170°F)
- Voltage: 300 Volts minimum
- Approvals: UL Listed conduit and conduit fittings
- Size: 1/2" Conduit and 1/2" Conduit Fitting.

Select one conduit type and its suitable conduit fitting from the following table.

1/2" Conduit Type and Suitable 1/2" Conduit Fitting		
Liquid-tight, Flexible Non-Metallic Conduit (LFNC-B) Type B	ONLY with →	Liquid-tight, non-metallic fitting, Type NM (non-metallic) conduit fitting
Liquid-tight, Flexible Metallic Conduit	ONLY with →	Liquid-tight, metallic fitting, Type FLEX/MC (Flexible/Metal Clad)
Standard thickness, steel or aluminum, Flexible Metal Clad Conduit	ONLY with →	Metallic fitting, Type "squeeze", "set screw", or "screw-in"

ASSEMBLY AND WIRING (INITIAL SETUP) OF DIN CONNECTOR

Initial Setup:

1. Verify that all power to and all wires at the terminals in the nearest conduit body (panel) are disconnected before proceeding.
2. At least 4 wires (1 Safety Ground, 2 Hot and 1 Neutral) are needed for wiring. NOTE: One neutral wire can be used to power both valves.

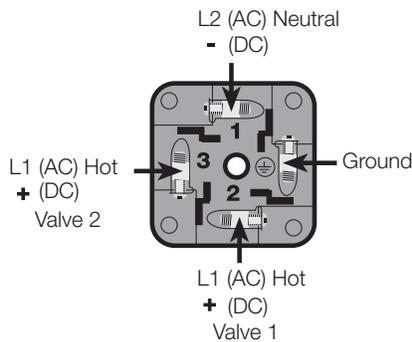
IMPORTANT: DO NOT make any terminal connections at the nearest conduit body until all terminals in the valve connector are properly wired and the valve connector is properly assembled to the 1/2" flexible conduit.

NOTE: Flexible conduit more than 3ft. long must be properly supported and secured, as specified in NFPA 70, Article 350 and 351.

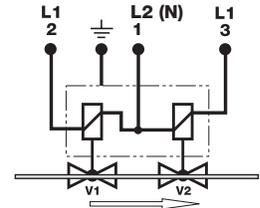
TERMINAL DESIGNATION (VAC or VDC)

MBC series ending in S22, S82, S302, and S02

DIN Connector screw terminal connections

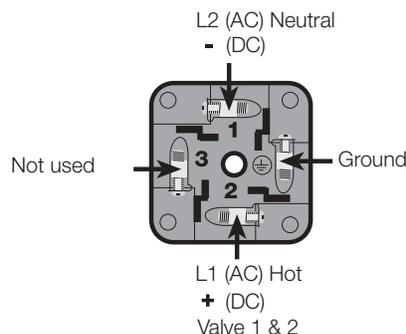


At least 4 wires (1 Safety Ground, 2 Hot and 1 Neutral) are needed or wiring. NOTE: One neutral wire can be used to power both valves.

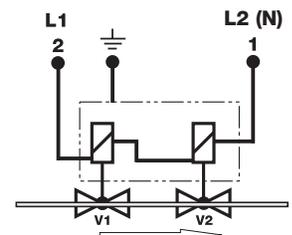


MBC series ending in S20, S80, & S300

DIN Connector screw terminal connections



At least 3 wires (1 Safety Ground, 1 Hot and 1 Neutral) are needed or wiring.

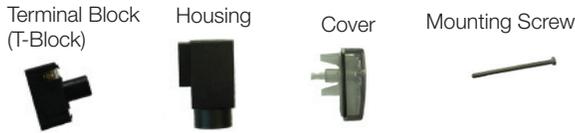


ASSEMBLY AND WIRING OF CONNECTOR

Failure to follow the exact instructions below may result in a valve connector not fitting to valve.

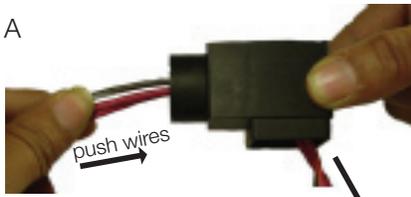
STEPS

1. After selecting the proper number of wires, push the mounting screw completely out from the valve connector and disassemble the remaining 4 parts as shown below:



2. Starting from the 1/2" NPT end of the housing, push the wires under the metal strain relief and through the housing (see FIG. A below). The GREEN (ground) wire should be placed into the far left groove when viewed as shown in FIG. B. The "Neutral (-)" should be placed into the groove next to the GREEN (ground).

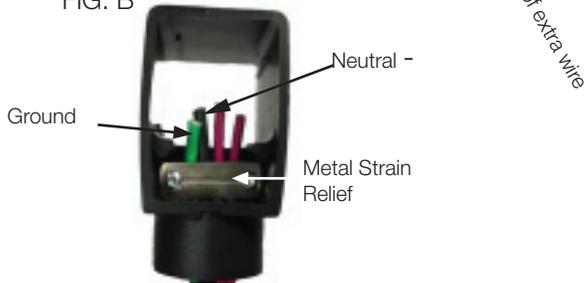
FIG. A



Strip the end of each lead 1/4" maximum

pull 3"-6" of extra wire

FIG. B



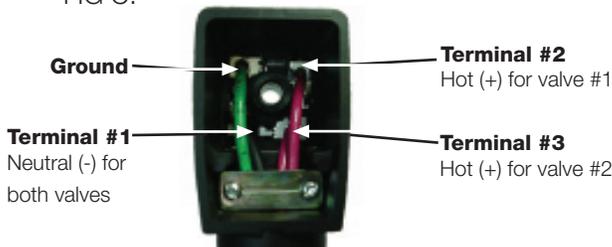
3. Continue to push the wires through the housing until there is at least an extra 3"-6" available for connecting the wires to the terminals on the T-Block (see FIG. A above).

4. Strip no more than 1/4" of insulation from each wire.

5. **Wiring to the correct terminal is critical.** The terminals are labeled next to the small terminal screws. Terminate each wire to its proper terminal on the T-block. See FIG. C to determine the proper terminals for the valve. NOTE: One neutral is used to power both valves.

The maximum torque for the terminal screws is 4.4 in-lb (0.5 Nm).

FIG. C



6. Pull the wires so that the T-Block is completely pulled into the housing. As the T-Block gets pulled into the housing, the T-Block and the wires must be properly guided into the housing by:

A) Ensuring that the ground (the flat pin of the plug) fits to the front of the housing as shown in FIG. D below, **AND**

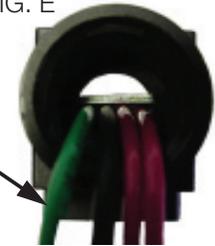
B) Ensuring that the wires lay side-by-side beneath the metal strain relief as shown in FIG. E below, **AND**

C) Organizing the wires so that they terminate on the same side of the connector under which they were routed. The wires must NOT crisscross inside the housing to the opposite side from which they are terminated. FIG. C illustrates how the wires terminate on the same side under which they were routed.

FIG. D



FIG. E



7. Tighten the screws on the metal strain relief.

The maximum torque for each metal strain relief screw is 4.4 in-lb (0.5 Nm).

8. Assemble the appropriate 1/2" flexible conduit and its suitable conduit fitting as specified in the table on page 3.

9. Route the "pig-tailed" wires from the valve connector through the 1/2" conduit and to the nearest conduit body (panel), and then screw the valve connector to the 1/2" conduit fitting (see below for proper torque).

NOTE: It may be necessary to pull the wires at the nearest conduit body to reduce any potential wire slack in the raceway as the valve connector is screwed to the 1/2" conduit fitting.

10. Assemble the cover and mounting screw to the valve connector, and mount the valve connector to the valve coil as shown below.

The maximum torque for mounting screw is 8.8 in-lb (1.0 Nm).

The maximum torque at the 1/2" NPT conduit housing connection is 60 in-lb (6.75 Nm).



11. Tighten the mounting screw.

12. Follow NEC (NFPA 70) requirements for proper termination at the nearest conduit body.

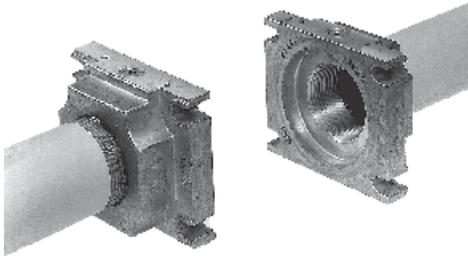
MOUNTING MBC VALVE TO GAS LINE

Setup

- Do not allow the MBC SE valve to be in direct contact with hardened masonry, concrete floors or concrete walls, or in direct contact of surfaces that exceed the valve's vibration rating.
- When replacing parts, always use new seals and o-rings that are free of debris.
- Examine the MBC SE for shipping damage. The inside of the MBC SE, the flanges, and piping must be clean and free of dirt. Remove all dirt and debris before installing the MBC SE. Failure to remove dirt/debris could result in valve damage or improper performance.
- The main gas supply must be shut off before starting the installation.

Recommended Piping Procedure

- It is best to mount the inlet flange to the inlet gas pipe before mounting the MBC SE to the inlet and outlet flange.



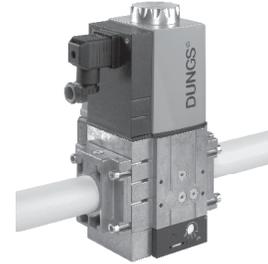
- Use new, properly reamed and threaded pipe free of chips.
- Apply good quality pipe sealant, putting a moderate amount on the male threads only. If pipe sealant lodges on the valve seat, it will prevent proper operation. If using LP gas, use pipe sealant rated for use with LP gas.
- Do not thread pipe too far. Valve distortion and/or malfunction may result from excess pipe in the valve body.
- Apply counter pressure only to the flats on the flange when screwing the pipe into the flanges.
- Do not overtighten the pipe. Follow the maximum torque values listed below.

Recommended Torque for Piping

1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	NPT pipe
375	560	750	875	940	1190	[lb-in]

Recommended Procedure for Mounting Valve to Flanges

- Remove the white protective plastic covers from the MBC SE body.
- Remove the eight M6 for MBC SE 1000 (or M8 for MBC SE 2500) socket head screws using a 5mm Allen wrench for the MBC SE 1000 and using a 6mm Allen wrench for the MBC SE 2500.
- Verify that the o-rings and the grooves are clean and in good condition.
- Install the MBC SE with the gas flow matching the direction indicated by the arrows on the casting



If the flow is not in the same direction of the arrows the valves will not operate properly.

- Verify that the surface of each flange is in good condition. If not, wipe the surface clean.
- Attach the MBC SE to the inlet and outlet flanges using the M6 (or M8) socket head screws supplied.
- Use a 5mm Allen wrench for the MBC SE 1000.
- Use a 6mm Allen wrench for the MBC SE 2500.
- Tighten the screws in a crisscross pattern.
- Do not overtighten the screws. Follow the maximum torque values below.

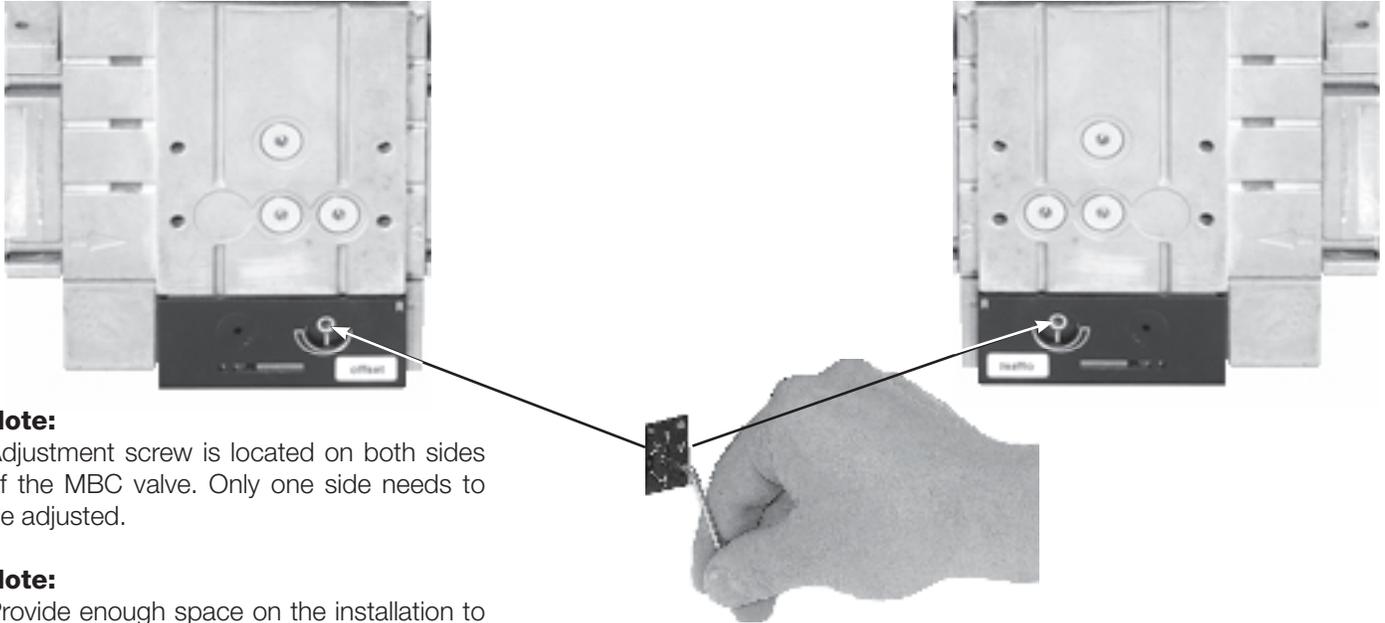
Recommended Torque

M6	M8	Screw Size
62	134	[lb-in]

- After installation is complete, perform a leak test on each flanged connection.

REGULATOR ADJUSTMENT

Use a 2.5mm hex wrench to adjust the regulator.



Note:

Adjustment screw is located on both sides of the MBC valve. Only one side needs to be adjusted.

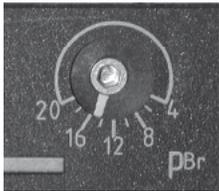
Note:

Provide enough space on the installation to allow this adjustment to be accessible for field adjusting.

Offset Adjustment for Zero Governor versions.

Outlet pressure Adjustment for pressure regulator versions.

Adjustments: There are two possible scales, and which way to turn the adjustment depends on which side of the valve is viewed.



With this view, **turn clockwise (increasing number) to increase outlet pressure.**

Note: The scale indicates approximate outlet pressure in mbar. Divide by 2.44 to get approximate outlet pressure in inches of water column.



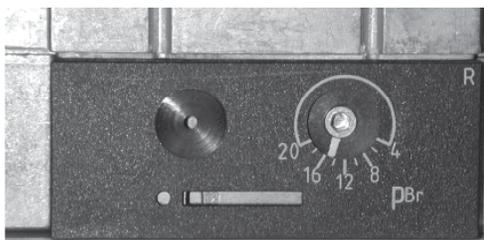
With this view, **turn counter-clockwise (increasing thickness) to increase outlet pressure.**

This scale is generic, indicating a relative value. As the line gets thicker, outlet pressure increases.



While making adjustments, monitor the outlet pressure (port 3) using a monometer. (See page 7 for location of port 3)

SEALING REGULATOR ADJUSTMENT & PROTECTIVE SLIDE



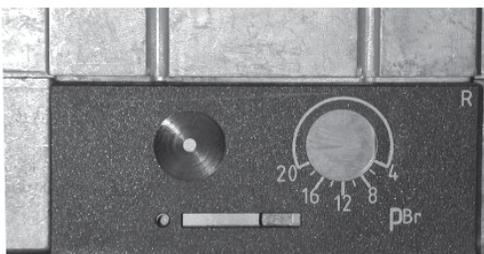
Lead seal

After setting the **offset** or the **outlet pressure**:

1. Close protective slide.
2. If desired, seal the protective slide.

Note:

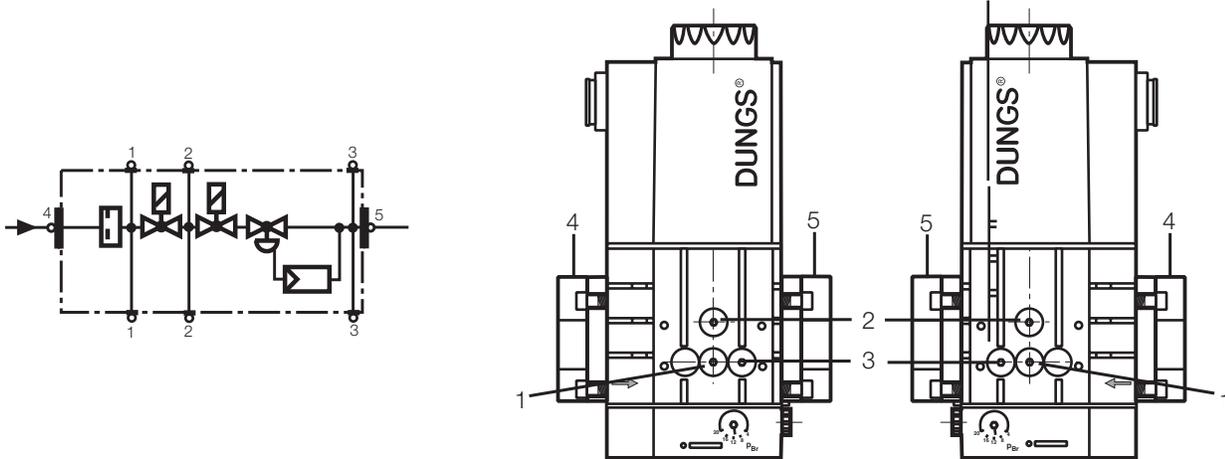
The protective slide is located on both sides of the MBC valve. Sliding one also slides the other. The protective slide is not secured. If desired, the protective slide can be sealed. Sealing one side also seals the other side.



VALVE TEST PORTS

- Ports 1 and 4 are upstream both valves.
- Port 4 is upstream the gas filter, and port 1 is downstream the gas filter
- Port 2 is between both valves.
- Ports 3 and 5 are downstream both valves.

The ports are G 1/8 type threads conforming to the standard ISO 228 (aka BSP).
The G 1/8 test nipple with gasket (part # 219-008) can be used in any of these pressure tap ports.



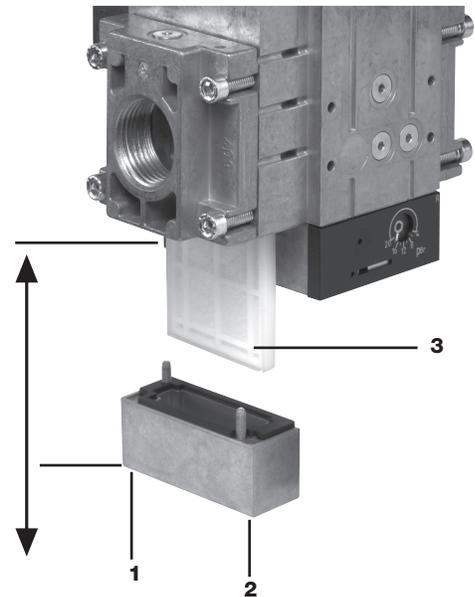
FILTER MAINTENACE AND FILTER REPLACEMENT

The filter shall be replaced under the following conditions:

1. The filter has been in service for more than one a year, or
2. The Δp between pressure connections 1 and 2 $> 2''$ In. W.C., or
3. The Δp between pressure connections 1 and 2 is twice as high compared to the last inspection.

Procedure for replacing filter

1. Interrupt upstream gas supply by closing the manual shutoff valve.
2. Remove screws 1-2.
3. Change filter insert 3
4. Tighten screws 1-2 using a small force (5Nm).
5. Open the manual shutoff valve.
6. Perform leakage and function test, $p_{max} = 5$ PSI.



Space requirements for fitting filter:

MBC-1000-....: at least 6 inches
MBC-2500-....: at least 6 & 3/4 inches

VALVE LEAKAGE TEST

This leak test procedure tests the external sealing and valve seat sealing capabilities of the MBC automatic safety shutoff valve. Only qualified personnel should perform this test.

It is required that this test be done on the initial system start-up, and then repeated at least annually, and possibly more often depending on the application, environmental parameters, and the requirements of the Authority Having Jurisdiction.

SETUP

This test requires the following:

- A) Test nipples installed in the downstream pressure tap port of each automatic safety shutoff valve to make the required 1/4" hose connection in step 3.
- B) A transparent glass of water filled at least 1 inch from the bottom.
- C) A proper leak test tube. An aluminum or copper 1/4" rigid tube with a 45° cut at the end that is then connected to a 1/4" flexible hose of some convenient length provides for a more accurate leakage measurement. However, a 45° cut at the end of the 1/4" flexible hose will suffice, but it will not likely be as accurate as the rigid tube.
- D) For detecting external leakages, an all purpose liquid leak detector solution or a soapy water solution is required.

LEAK TEST PROCEDURE

Use the illustration A below as a reference.

External Leak Test:

1. With the upstream ball valve open, the downstream ball valve closed and both valves energized, apply an all purpose liquid leak detector solution to any accessories mounted to the safety valve, and to all gas piping and gas components downstream the upstream ball valve manifold up to and including the inlet gas piping for each automatic safety shutoff valve. The presence of bubbles indicates a leak, which needs to be rectified before proceeding.

Internal Valve Seat #1 Leak Test:

1. After completing the External Leak Test, de-energize the valves.
2. Close the upstream and downstream manual ball valve.
3. Using a screwdriver, slowly open the V1 test nipple (port 3) by turning it counter-clockwise to depressurize the volume between the two valves, and then connect the 1/4" flexible hose to the test nipple.
4. Slowly open the upstream manual ball valve, and then provide for some time to allow potential leakage to charge the test chamber before measuring the valve seat leakage.
5. Immerse the 1/4 in. tube vertically 1/2 in. (12.7 mm) below the water surface. If bubbles emerge from the 1/4" tube and after the leakage rate has stabilized, count the number of bubbles appearing during a 10 second period. (See chart below for allowable leakage rates.)

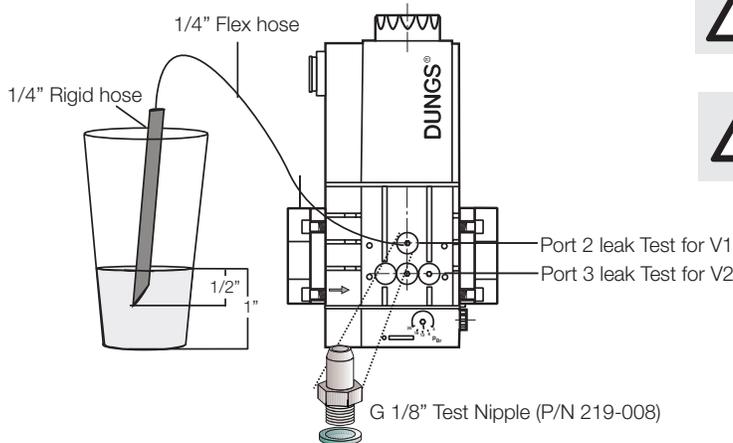
Internal Valve Seat #2 Leak Test:

6. Repeat the same procedure above for leak testing valve V2, except only energize terminal 2 on the DIN connector to open valve 1, and measure the leakage out port 3. See TERMINAL DESIGNATION on page 3 for details.

After completing the above tests proceed as follows:

7. Verify that the downstream manual ball valve is closed, and both automatic safety shutoff valves are de-energized.
8. Remove the flexible hose, and close all test nipples. With the upstream manual ball valve open, energize both automatic safety shutoff valves.
9. Use soapy water to leak test all test nipples to ensure what there are no leaks.
10. If no leaks are detected, de-energize all automatic safety shutoff valves, and open the downstream manual ball-valve.

Illustration A



If leakage values are exceeded, replace valve immediately.



If leak testing the gas piping system, so not exceed 5 PSI.

Allowable Valve Seat Leakage* for up to 5 PSI inlet	Allowable Leakage*	# of Bubbles in 10 sec		
		AIR	Natural Gas	LP
MBC SE 1000/602	235 cc/hr	5	6	4
MBC SE 2500/602	235 cc/hr	5	6	4

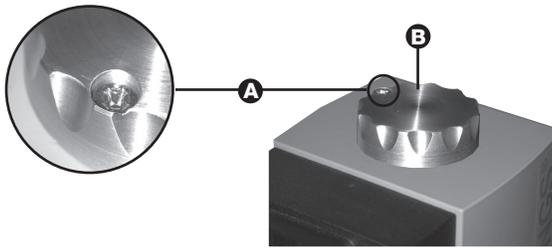
*Based on air, and test conditions per UL 429 Section 29. (Air or inert gas at a pressure of 1/4 psig and also at a pressure of one and one-half times maximum operating pressure differential, but not less than 1/2 psig. This test shall be applied with the valve installed in its intended position.) Volume of bubble defined in Table 2 of FCI 70-2-1998.

COIL REPLACEMENT

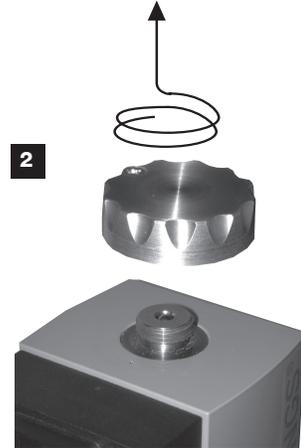
Replacing a coil for MBC-SE1000 and MBC-SE 2500

1. Remove power to coil.
2. Close upstream manual shutoff valve.
3. Loosen locking screw A by turning counter-clockwise.
4. Remove knob B.
5. Lift coil from valve body and insert new coil.
6. Replace knob B, tighten by hand.
7. Tighten locking screw A.

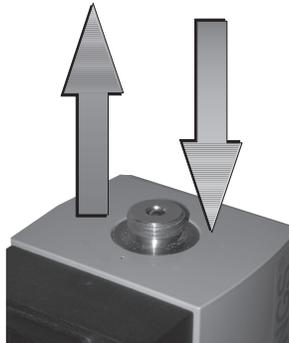
1



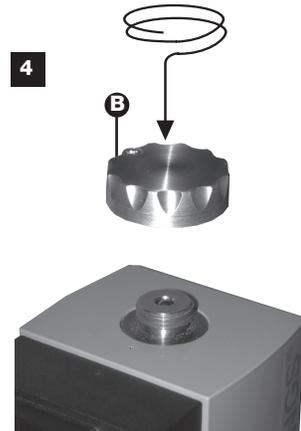
2



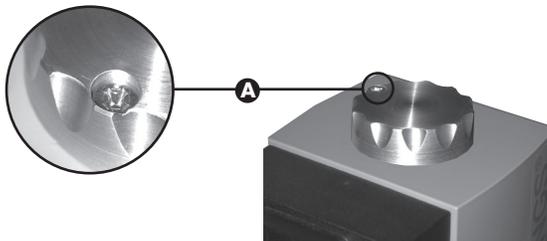
3



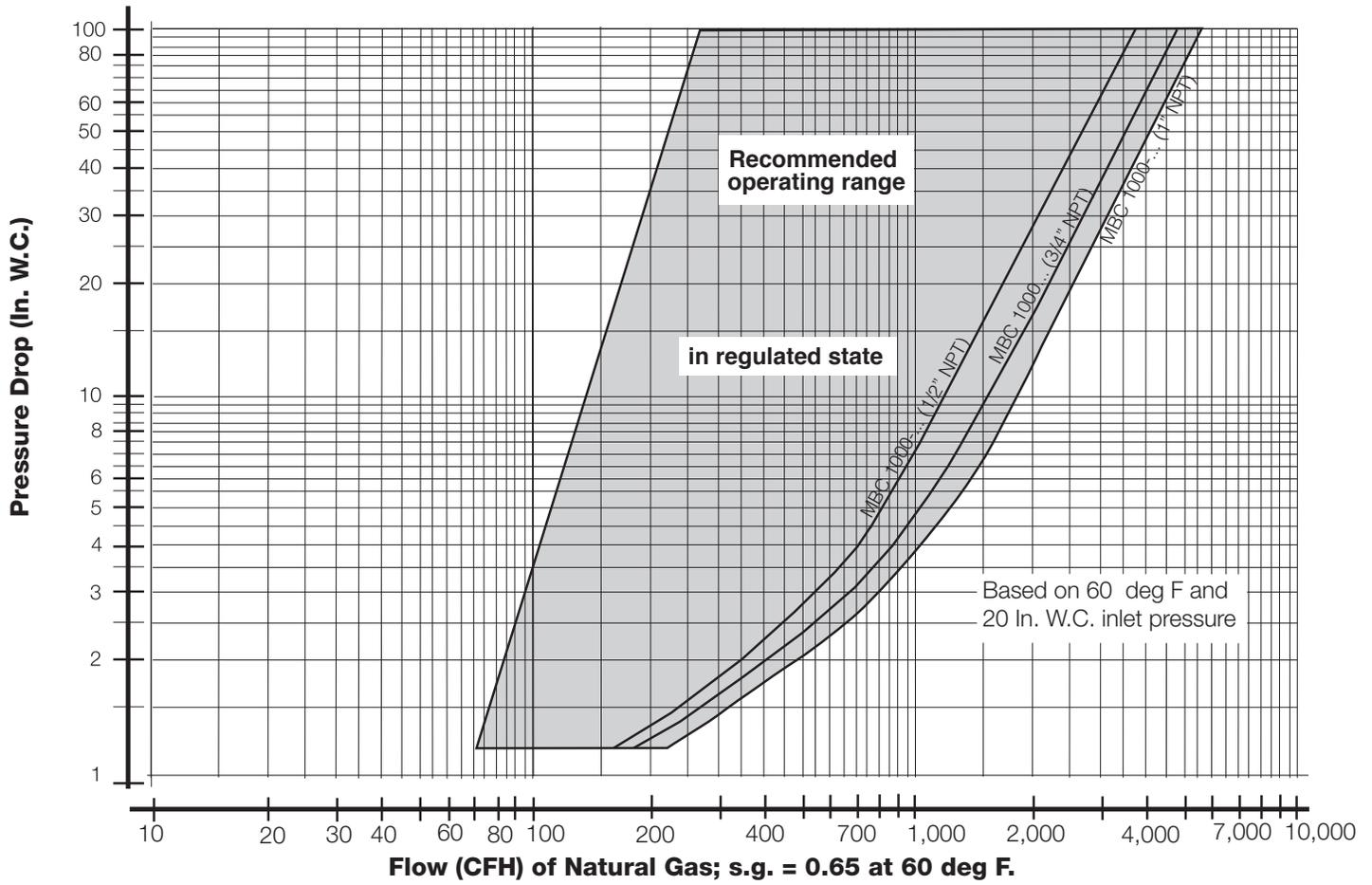
4



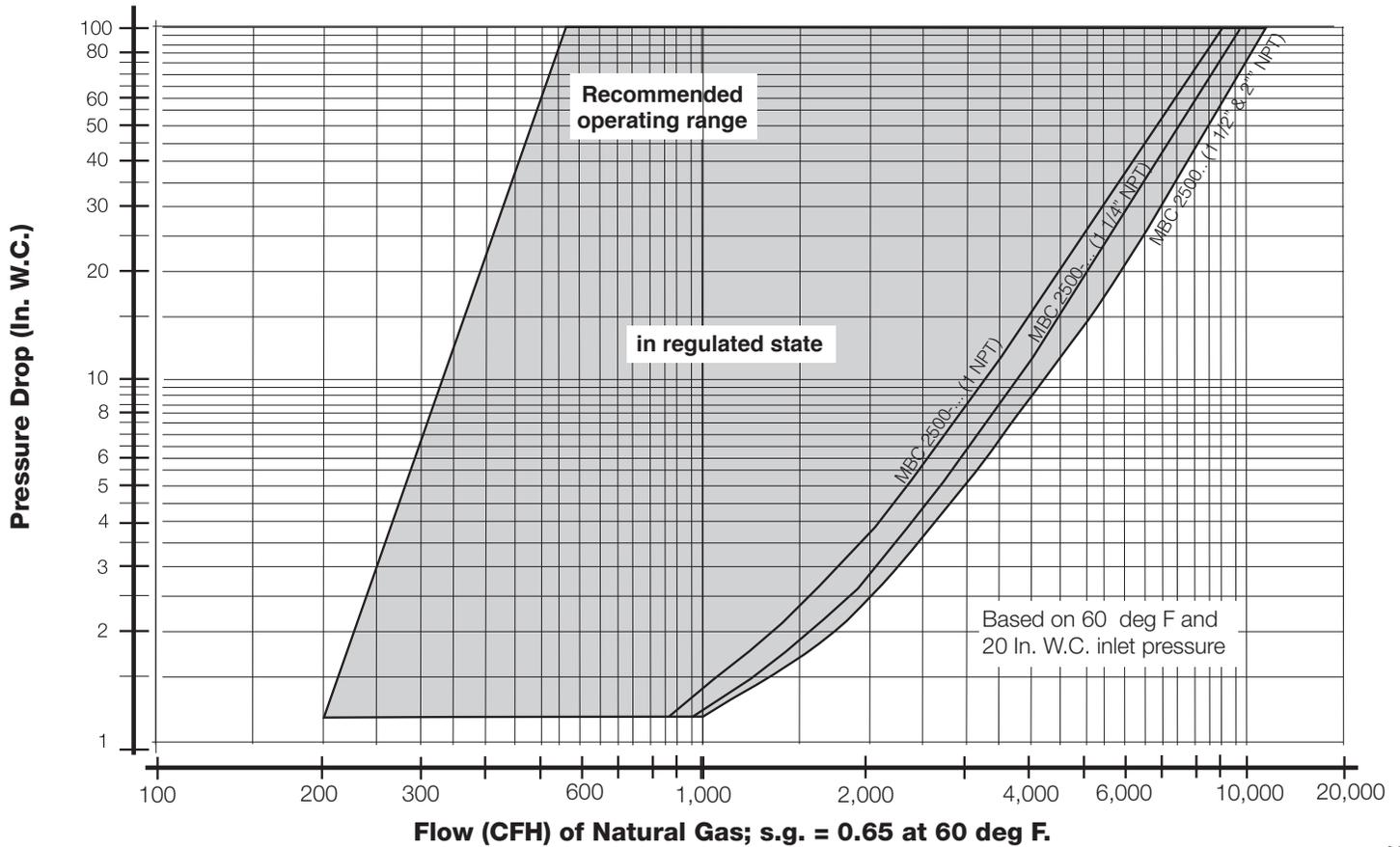
5



MBC-SE 1000 WITH PRESSURE REGULATOR FLOW CURVE



MBC-SE 2500 WITH PRESSURE REGULATOR FLOW CURVE



FLOW CURVES FOR MBC-SE ... S02 ZERO GOVERNOR SERIES

The flow curves on page 10 apply to the MBC series ending in S20, S22, S80, S82, S300, and S302 (positive pressure regulator series) while in the regulated state. These flow curves can be used to size the MBC series ending in S02 (zero governor series) when estimating approximate flow and drop, however, the actual flow and drop will depend on the specific application, which mainly depends on the negative pressure generated by the downstream blower or gas engine.

PRESSURE DROP FOR OTHER GASES

To determine the pressure drop when using a gas other than natural gas, use the flow formula below and f value located in the chart below to determine the "corrected" flow rate in CFH through the valve for the other gas used. For example, when using propane, divide the volume (CFH) of propane required for the application by the calculated value f (f = 0.66 for propane). Use this "corrected" flow rate and the flow curve on the next page to determine pressure drop for propane.

$$\dot{V}_{\text{gas used}} = \dot{V}_{\text{Natural Gas}} \times f$$

Use this formula to calculate the f factor for other gases not listed on the table.

$$f = \sqrt{\frac{\text{Spec. gravity of Natural Gas}}{\text{Spec. gravity of gas used}}}$$

Type of gas used	Density [kg/m ³]	sg	f
Natural gas	0.81	0.65	1.00
Butane	2.39	1.95	0.58
Propane	1.86	1.50	0.66
Air	1.24	1.00	0.80

PAINTING VALVE

- It is not recommended that this valve be painted. Painting covers date codes and other labels that identify this valve.
- If the valve needs to be painted, a paint free of volatile organic compounds (VOC's) must be used. VOC's can damage valve o-rings, resulting in external gas leakage over time.
- During the painting process, use measures that will allow the valve's date code and other labeling information to be legible after the paint is dry.

PROTECTION FROM RADIANT HEAT

- Radiant heat must be considered as a heat source that could result in an ambient temperature higher than the rating of this valve.
- Provide proper shielding to protect against radiant heat.

Replacement Coils

Valve Description	120Vac	24Vac	12Vdc	24Vdc
MBC...1000	250-371	250-680	251-136	TBD
MBC...2500	250-175	250-681	TBD	TBD

Accessories

Accessories/Adapters	P/N
DIN-Electrical Connector	D246 699
1/4" NPT port 1 or port 2 adapter (reduced port)	D225 047
1/2" NPT port 2 pilot gas adapter (reduced port)	D225 043
G 1/8" Test nipple for leak or pressure testing	D219 008
Port 3 Pressure switch mounting adapter	D214 975

Replacement Parts

Valve Description	Flange Size	NPT Flange P/N	Flange o-ring and bolt kit P/N	Filter Replacement
MBC...1000	1/2"	222-371	224-093*	241 916
MBC...1000	3/4"	222-368	224-093*	241 916
MBC...1000	1"	221-999	224-093*	241 916
MBC...2500	1"	222-369	224-094**	242 072
MBC...2500	1 1/4"	222-370	224-094**	242 072
MBC...2500	1 1/2"	222-003	224-094**	242 072
MBC...2500	2"	221-997	224-094**	242 072

* Includes two o-rings for flanges and two sets of bolts (one set of four bolts for each flange).

** Includes two o-rings for flanges and four sets of bolts (two sets of M8 X 35 mm bolts and two sets of M8 X 40 mm bolts). Use the M8 X 35 mm bolts, and discard the M8 X 40mm bolts.