Table of Contents

Table of Contents .................................. Page 1
Approvals ........................................ Page 1
Attention ....................................... Page 1
Specification .................................. Page 2
Mounting ....................................... Page 3
Painting Valve .............................. Page 4
Protection from Radiant Heat .......... Page 4
Electrical DIN Connector Ratings .. Page 4
Electrical DIN Connector assembly & wiring . Page 5
MBC Overview & Impulse Lines .......... Page 7
Outlet Pressure Adjustment .......... Page 9
Changing coil ................................ Page 10
Internal Filter .............................. Page 12
Test Ports .................................... Page 13
Valve Leakage Decay Test ............. Page 14

Valve Leakage Bubble Test (Altern. method) . Page 15
Flow Curve .................................. Page 16
Pressure Drop for other Gases ........ Page 17
Accessories & Replacement .......... Page 18

Approvals

UL Listed / Recognized Component:
File No. MH16727 to UL 429

CSA Certified File No. 157406 to
ANSI Z21.21 / CSA 6.5 with C/I marking
ANSI Z21.18 / CSA 6.3

FM 7400 Approved

Commonwealth of Massachusetts Approved Product Approval code G1-1107-35

Attention

The installation and maintenance of this product must be done under the supervision of an experienced and trained specialist. Never perform work if gas pressure or power is applied, or in the presence of an open flame.

Please read the instruction before installing or operating. Keep the instruction in a safe place. You find the instruction also at www.dungs.com If these instructions are not heeded, the result may be personal injury or damage to property.

Any adjustment and application-specific adjustment values must be made in accordance with the appliance-/boiler manufacturers instructions.

The installation and maintenance of this product must be done under the supervision of an experienced and trained specialist. Never perform work if gas pressure or power is applied, or in the presence of an open flame.

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Any adjustment and application-specific adjustment values must be made in accordance with the appliance-/boiler manufacturers instructions.

Check the ratings in the specifications to make sure that they are suitable for your application.

On completion of work on the safety valve, perform a leakage and function test.

This product is intended for installations covered by, but not limited to, the following fuel gas codes and standards: NFPA 54, IFGC (International Fuel Gas Code), or CSA B149.1 (for Canada) or the following equipment codes and standards: CSD-1, UL 795, NFPA 37, ANSI Z83.4/CSA 3.7, ANSI Z83.18, ANSI Z21.13/CSA 4.9, or CSA B149.3 (for Canada).

Explanation of symbols

1, 2, 3 ... = Action
* = Instruction
Specification

**MBC** - Two normally closed safety shutoff valves with integrated servo regulator in one housing. Fast opening, fast closing.

### Safety Valve & Regulator Max. Operating Pressure

MOP = 5 PSI (138 in. W.C.)

**Recommended Inlet Pressure for optimal performance of the regulator**

- S22/S22: \( p_i = 6 - 138 \text{ in. W.C.} \)
- S302: \( p_i = 14 - 138 \text{ in. W.C.} \)
- S02 & N: \( p_i = 4 - 41 \text{ in. W.C.} \)

*Regulator complies with ANSI Z21.18/CSA 6.3 for up to 5 PSI. Inlet pressures higher than recommended inlet pressures are possible provided the appliance complies with the applicable performance requirements.

### Regulator Outlet Pressure Ranges

- S22: \( p_o = 1.6 - 8 \text{ in. W.C.} \)
- S82: \( p_o = 2 - 32 \text{ in. W.C.} \)
- S302: \( p_o = 12 - 122 \text{ in. W.C.} \)
- S02 & N: \( p_o = 0 \pm 0.8 \text{ in. W.C.} \)

### Ambient Temperature

- **(CSA)**
  - -40 °F ... +140 °F
  - (-40 °C ... +60 °C)
- **(UL)**
  - +5 °F ... +140 °F
  - (-15 °C ... +60 °C)

### Gases

Dry, natural gas, propane, butane; other noncorrosive gases. A "dry" gas has a dew point lower than +15 °F and its relative humidity is less than 60%.

### Materials in contact with Gas

Housing: Aluminium, Steel, free of nonferrous metals. Sealings on valve seats: NBR-based rubber.

### Electrical Ratings

- 110 - 120 VAC / 50 - 60 Hz;
- 24 VAC / 50 - 60 Hz; 12 VDC, 24 VDC

**Operating time**

100 % duty cycle

**Cycle Rate**

Maximum 60 cycles/hr (30 s on/off)

**Electrical Connection**

DIN-connector with 1/2"NPT conduit connection for UL Versions.

Order separately for CSA Versions

**Power Consumption**

Power Consumption with all coils energized

see table below

### Vent Limiting Device and Vent Line Connection

The MBC has an internal, factory installed vent limiter re ANSI Z21.18/CSA 6.3. Venting required unless otherwise accepted by the authority having jurisdiction.

**Power Consumption Table**

<table>
<thead>
<tr>
<th>Valve Body Size</th>
<th>Rated voltage</th>
<th>Inrush ( P_{\text{max}} ) [VA] for ( t = 3 \text{ s} )</th>
<th>Inrush current peak (A)</th>
<th>Holding ( P_{\text{max}} ) [VA] Operation</th>
<th>Recommended power of supply transformer (VA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBC 1000</td>
<td>12 VDC</td>
<td>140</td>
<td>20.1</td>
<td>16</td>
<td>DC battery</td>
</tr>
<tr>
<td>MBC 2500</td>
<td>160</td>
<td></td>
<td>20.1</td>
<td>20</td>
<td>DC battery</td>
</tr>
<tr>
<td>MBC 4000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MBC 1000</td>
<td>24 VDC</td>
<td>130</td>
<td>13.4</td>
<td>16</td>
<td>DC battery</td>
</tr>
<tr>
<td>MBC 2500</td>
<td>160</td>
<td></td>
<td>13.4</td>
<td>20</td>
<td>DC battery</td>
</tr>
<tr>
<td>MBC 4000</td>
<td>160</td>
<td>14</td>
<td>30</td>
<td>DC battery</td>
<td></td>
</tr>
<tr>
<td>MBC 1000</td>
<td>24 VAC*</td>
<td>120</td>
<td>14.7</td>
<td>20</td>
<td>250</td>
</tr>
<tr>
<td>MBC 2500</td>
<td>160</td>
<td></td>
<td>13.9</td>
<td>20</td>
<td>300</td>
</tr>
<tr>
<td>MBC 4000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MBC 1000</td>
<td>110/120 VAC*</td>
<td>120</td>
<td>3.1</td>
<td>16</td>
<td>250</td>
</tr>
<tr>
<td>MBC 2500</td>
<td>180</td>
<td></td>
<td>3.0</td>
<td>20</td>
<td>300</td>
</tr>
<tr>
<td>MBC 4000</td>
<td>160</td>
<td></td>
<td>2.4</td>
<td>25</td>
<td>300</td>
</tr>
</tbody>
</table>

*Inrush supply should compensate for the inrush current, and wire gauge should be considered. In order to absorb voltage spikes during inrush, an electrolytic capacitor (4700 µF) between MBC and transformer is recommended.

**Filter**

Installed in the housing upstream V1

50 micron

**Enclosure Rating**

NEMA Type 12 / IP54

**Classification of Valve V1 and V2**

Safety Shutoff Valve: UL 429, FM 7400

ANSI Z21.21 • CSA 6.5 C/I Valves

**Closing Time (Valve 1 & Valve 2)**

< 1 s

**Opening Time (Valve 1 & Valve 2)**

< 1 s

**Power Consumption**

- MBC 1000
  - 110/120 VAC*
    - Inrush \( P_{\text{max}} \) [VA] for \( t = 3 \text{ s} \): 120
    - Inrush current peak (A): 3.1
    - Holding \( P_{\text{max}} \) [VA] Operation: 16
    - Recommended power of supply transformer (VA): 250

- MBC 2500
  - 110/120 VAC*
    - Inrush \( P_{\text{max}} \) [VA] for \( t = 3 \text{ s} \): 180
    - Inrush current peak (A): 3.0
    - Holding \( P_{\text{max}} \) [VA] Operation: 20
    - Recommended power of supply transformer (VA): 300

- MBC 4000
  - 110/120 VAC*
    - Inrush \( P_{\text{max}} \) [VA] for \( t = 3 \text{ s} \): 160
    - Inrush current peak (A): 2.4
    - Holding \( P_{\text{max}} \) [VA] Operation: 25
    - Recommended power of supply transformer (VA): 300

*Power supply should compensate for the inrush current, and wire gauge should be considered. In order to absorb voltage spikes during inrush, an electrolytic capacitor (4700 µF) between MBC and transformer is recommended.
Setup
1. Examine the MBC valve for shipping damage.
2. The main gas supply must be shut off before starting the installation.
3. The inside of the MBC valve, the flanges, and piping must be clean and free of dirt. Remove all dirt and debris before installing the MBC valve. Failure to remove dirt / debris could result in valve damage or improper performance.

Recommended Procedure to Mount the Flanges
1. Unpack the MBC valve and remove the socket cap head bolts from white plastic cover.
   For MBC 1000: use 5 mm hex wrench for M6 bolts
   For MBC 2500/4000: use 6 mm hex wrench for M8 bolts
2. Verify the o-rings and the grooves are clean and in good condition.
3. Clean the mounting surface of the flanges.
4. Mount the flanges to the MBC valve with the pressure tap in the orientation shown in the picture.
5. Tighten the bolts in a crisscross pattern. See table for recommended torque!

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

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 components (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.
- Painting the valve may damage valve o-rings, resulting in external gas leakage over time.

Recommended Piping Procedure

- 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 a parallel jaw wrench only to the flats on the flange when connecting to pipe.
- Do not overtighten the pipe. Follow the maximum torque values listed below.

Recommended Torque for Piping

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>M3</th>
<th>M6</th>
<th>M8</th>
<th>Screw Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2”</td>
<td>375</td>
<td>560</td>
<td>750</td>
<td>[lb-in]</td>
</tr>
<tr>
<td>3/4”</td>
<td>475</td>
<td>620</td>
<td>875</td>
<td>[lb-in]</td>
</tr>
<tr>
<td>1”</td>
<td>575</td>
<td>875</td>
<td>940</td>
<td>[lb-in]</td>
</tr>
<tr>
<td>1 1/4”</td>
<td>675</td>
<td>1090</td>
<td>1190</td>
<td>[lb-in]</td>
</tr>
<tr>
<td>1 1/2”</td>
<td>775</td>
<td>1190</td>
<td>1390</td>
<td>[lb-in]</td>
</tr>
<tr>
<td>2”</td>
<td>875</td>
<td>1390</td>
<td>1590</td>
<td>[lb-in]</td>
</tr>
</tbody>
</table>

On completion of work on the MBC valve, perform a leakage test. (See “Valve Leakage Test”)

Alterations, Modifications or Repairs

For safety-related components, devices and systems, any liability of DUNGS, i.e. product liability for any kind of consequential damage as well as liability for defects, will cease to exist if alterations, modifications or repairs are made to these safety-related components, devices and systems by unauthorized specialist staff or with spare parts which have not been specially permitted for use in these safety-related components, devices and systems.
Electrical DIN Connector Ratings

Ambient Temperature Rating: -40°F to +175°F
Electrical Ratings: 120VAC, 24VAC 50/60 Hz, 12 VDC or 24VDC.
Maximum Amperage Rating: 6.0 Amps @ 120VAC.
Enclosure Rating: Type 12
Electrical Wiring Connection: Screw terminals.
Required Wire Specifications:
Type: Stranded, insulated Appliance Wiring Material (AWM) “Hook-Up” wire.

DIN Connector screw terminal connections

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.

<table>
<thead>
<tr>
<th>1/2” Conduit Type and Suitable 1/2” Conduit Fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid-tight, Flexible Non-Metallic Conduit (LFNC-B) Type B</td>
</tr>
<tr>
<td>Liquid-tight, Flexible Metallic Conduit</td>
</tr>
<tr>
<td>Standard thickness, steel or aluminum, Flexible Metal Clad Conduit</td>
</tr>
</tbody>
</table>

Initial Setup:
1. Verify that all power to 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.
Electrical DIN Connector assembly & wiring

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:

![Diagram of connector parts]

Terminal Block (T-Block)  Housing  Cover  Mounting Screw

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).

![Diagram of wires being pushed through the housing]

Fig. A

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 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.

![Diagram of connector terminals]

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,

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

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.

![Diagram of wires being organized]

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.

![Diagram of connector with cover mounted]

Fig. C

**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.
**MBC Overview & Impulse Lines**

**Impulse lines must be ordered separately**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electrical connection for valves (DIN EN 175 301-803) black</td>
</tr>
<tr>
<td>2</td>
<td>Input flange</td>
</tr>
<tr>
<td>3</td>
<td>Pressure connection G 1/8 upstream of filter</td>
</tr>
<tr>
<td>4</td>
<td>Filter</td>
</tr>
<tr>
<td>5</td>
<td>Label / Serial number</td>
</tr>
<tr>
<td>6</td>
<td>Cover</td>
</tr>
<tr>
<td>7</td>
<td>Test point connection G 1/8 upstream of V1, possible on both sides</td>
</tr>
<tr>
<td>8</td>
<td>Test point connection G 1/8 downstream of V2, optional</td>
</tr>
<tr>
<td>9</td>
<td>Regulator Outlet Pressure Adjustment</td>
</tr>
<tr>
<td>10</td>
<td>Vent connection / Vent limiter G 1/8 (breathing port)</td>
</tr>
<tr>
<td>11</td>
<td>G 1/8 pressure connection Burner pressure $p_{br}$ (optional in some models)</td>
</tr>
<tr>
<td>12</td>
<td>Output flange</td>
</tr>
<tr>
<td>13</td>
<td>Test point connection G 1/8 downstream of V1 and upstream V2, possible on both sides.</td>
</tr>
</tbody>
</table>
External Impulse line (option)

Assembly Instructions

- Impulse line $p_{\text{min}}$ must correspond to $\geq$ DN 4 (1/8’’), PN 1 and they must be made of steel.
- Route Impulse line so that no condensate can flow back to the MBC...SE. See Fig. 2
- Secure Impulse line to prevent them from being ripped out and deformed. Keep Impulse line short!
- Test Impulse line for external leakage. Use leakage spray only if necessary. Test pressure: $p_{\text{max}} = 40$” W.C.

Other materials for Impulse lines are only permitted after a certification with the burner / boiler.

- Close internal Impulse line with grub screw. See Fig. 1

**External Impulse line (option)**

**Assembly Instructions**

- Impulse line $p_{\text{min}}$ must correspond to $\geq$ DN 4 (1/8”), PN 1 and they must be made of steel.
- Route Impulse line so that no condensate can flow back to the MBC...SE. See Fig. 2
- Secure Impulse line to prevent them from being ripped out and deformed. Keep Impulse line short!
- Test Impulse line for external leakage. Use leakage spray only if necessary. Test pressure: $p_{\text{max}} = 40$” W.C.

**MBC 1000/2500**

Fig. 1

**MBC 4000**

Close this port with grub screw if using external feedback

**MBC...SE**

Recommended Installation of Impulse lines when used (optional)

External Impulse line (option)

Assembly Instructions

- Impulse line $p_{\text{min}}$ must correspond to $\geq$ DN 4 (1/8’’), PN 1 and they must be made of steel.
- Route Impulse line so that no condensate can flow back to the MBC...SE. See Fig. 2
- Secure Impulse line to prevent them from being ripped out and deformed. Keep Impulse line short!
- Test Impulse line for external leakage. Use leakage spray only if necessary. Test pressure: $p_{\text{max}} = 40$” W.C.

Other materials for Impulse lines are only permitted after a certification with the burner / boiler.

- Close internal Impulse line with grub screw. See Fig. 1

**MBC 1000/2500**

Fig. 1

**MBC 4000**

Close this port with grub screw if using external feedback

1 external feedback
2 breathing port

**MBC...SE**

Recommended Installation of Impulse lines when used (optional)
Outlet Pressure Adjustment

MBC...SE S22/82/302
- Open protective slide located at the bottom of the valve.
- See Fig. 1 & 2 for adjustments.

1. Make adjustments while the valve is energized and flame established.
2. Using a 2.5 mm Metric Allen key, adjust the outlet pressure to the gas regulator for the application.
   Turning the adjustment towards lower numbers decreases the outlet pressure.
   Turning the adjustment towards higher numbers increases the outlet pressure.
3. Verify that the outlet pressure and the products of combustion are within the operating range as specified by the original equipment manufacturer.

MBC...SE S02 & MBC N
1. Open protective slide located at the bottom of the valve.
2. See Fig. 1 & 2 for low fire adjustments.
3. See Fig. 3 for high fire adjustments

NOTE: There will be a slight delay between the adjustments and the response of the flue gas measuring equipment.

NOTE: Making high fire adjustments can affect the low fire setting, and vice versa. Therefore, modulate the equipment up and down at least three times to double check the low fire and high fire emissions after making adjustments.

High Fire setting using Shutter flange
1. With valve energized and flame established, drive the appliance to high fire.
2. Use a slotted screwdriver to adjust the gas/air ratio concentration for the application.
   Turn the adjustment towards the – symbol to decrease gas flow.
   Turn the adjustment towards the + symbol to increase gas flow.
3. Verify that products of combustion are within the operating range as specified by the original equipment manufacturer.

Low Fire setting using MBC regulator
1. With valve energized and flame established, adjust the fan speed to the minimum firing rate for the appliance.
   - It is important to only adjust the low fire gas / air ratio concentration for the application while the appliance is operating at its minimum firing rate.
   - The minimum negative signal to zero governor must be at least -0.2 ”WC.
     This can be measured at the test port downstream both safety shutoff valves with the blower on and running at the minimum firing rate RPM.
   - **NOTE:** Both safety shutoff valves must be closed to read this signal pressure. This will be a negative pressure/vacuum signal.
2. Using a 2.5mm Metric Allen key, adjust the offset pressure to the gas / air ratio concentration for the application.
   Turn the adjustment towards the – symbol to decrease the outlet pressure.
   Turn the adjustment towards the + symbol to increase the outlet pressure.
3. Verify that products of combustion are within the operating range as specified by the original equipment manufacturer.

Read all instructions in this manual before installing. Perform steps in the order given. Have installed and serviced/inspected by a qualified service technician, at least annually. Failure to comply could result in severe personal injury, death or substantial property damage.

A calibrated flue gas analyzer must be utilized to properly adjust appliances featuring DUNGS MBC controls. Failure to properly apply a flue gas analyzer can result in carbon monoxide emissions causing severe personal injury, death or substantial property damage.

Failure to follow all instructions can result in carbon monoxide emissions causing severe personal injury or death.
Changing coil

MBC-1000/2500
1. Shut off gas supply and disconnect power supply!
2. Undo locking screw A, Fig. 1
3. Remove cover B, Fig. 2
4. Exchange solenoid, Fig. 3

Always observe solenoid No. and voltage!

5. Replace cover B, tighten by hand, Fig. 4
6. Screw in locking screw A to stop, Fig. 5
MBC-4000

1. Shut off gas supply and disconnect power supply!
2. Undo locking screw A, Fig. 1.
3. Remove cover B, Fig. 2.
4. Carefully lift off solenoid cover, Fig. 3.
5. Disconnect grounding and PCB connectors, Fig. 4.
6. Replace solenoid, Fig. 5.

Note:
Coil V1 wire connection
black/white
Coil V2 wire connection
red/blue
Replacement solenoid is complete assembled.

8. Reattach cover B, tighten securely by hand only, Fig. 6.
9. Tighten lock screw A as far as the stop, Fig. 7.
Internal Filter

Inspect the filter at least once a year.

**Change the filter**, if \( \Delta p \) between pressure taps 1 and 4 is twice as high compared to the last inspection.

| 1. Interrupt gas supply: close upstream ball valve |
| 2. Remove screws 1-2 |
| 3. Change filter insert 3 |
| 4. Screw in screws 1-2 without using any force and fasten 22 in. lbs (2.5 Nm). |
| 5. Perform leakage and function test, \( p_{\text{max}} = 5 \) PSI |

**Change the filter**, if \( \Delta p \) between pressure taps 1 and 4 > 4" W.C. See page 13 “Pressure taps”.

Space requirements for fitting filter:

- MBC-1000-...: 6"
- MBC-2500-...: 7"
- MBC-4000-...: 9"

For production date codes May 2007 or newer, this feature is present.
Test Ports

The G ¼ ISO 228 taps are available on both sides upstream V1, between V1 and V2, downstream V2, and on both flanges. The G ¼ test nipple (P/N 219008) can be screwed in any of these pressure tap ports.

Pressure taps

MBC-1000/2500...

MBC-4000...

1, 2, 4, 5
G 1/8 Screw plug
Pressure Switch Connection

3
G 1/8 Screw plug
Pressure Switch Connection optional with P/N 214975

6, 7
Vent nozzle G 1/8
Valve Leakage Decay Test

This test method is an alternative to bubble tightness testing in case there is no manually operated shutoff valve installed downstream of the MBC.

Preparation for leak testing:
1) Ensure that the appliance is not in operation.
2) This test requires:
   • A manometer capable of reading +/- 0.1"WC.
   • A stopwatch.
   • A hose barb connection that fits to manometer and the valve test port.
3) The manual shutoff valve upstream of the MBC must remain open during this test. In addition, the manual shutoff valve downstream of the MBC, if installed, must remain open during this test.
4) The test also requires the ability to open and close safety valve #1 and safety valve #2 independently using the voltage as indicated on the coil.

Procedure for Testing Valve #1
1) Connect a manometer to Port 2 on the side of the MBC
2) Determine the test time according the valve size, as indicated on table 1.
3) Energize valve 2 by powering terminal 3 with the voltage indicated on the coil housing. Ensure that terminal #1 is connected to Neutral and that the safety ground is also connected to ground.
4) Mark the pressure reading on the manometer, which should be zero.
5) With a stopwatch ready, de-energize valve 2 and immediately start the timer. Watch the manometer for pressure change.
6) As soon as the test time expires, determine the amount of pressure rise. Reference table 2 for action to be taken.

Procedure for Testing Valve #2
1) Connect a manometer to Port 2 on the side of the MBC
2) Determine the test time according the valve size, as indicated on table 1.
3) Energize valve 1 by powering terminal 2 with the voltage indicated on the coil housing. Ensure that terminal #1 is connected to Neutral and that the safety ground is also connected to ground.
4) Mark the pressure reading on the manometer, which should be equal to the inlet pressure to the valve.
5) With a stopwatch ready, de-energize valve 1 and immediately start the timer. Watch the manometer for pressure change.
6) As soon as the test time expires, determine the amount of pressure change. Reference table 2 for action to be taken.

After completing the above tests:
1) Remove the manometer, and close Port 2.
2) Use soapy water to leak test all connections including Port 2 to ensure that there are no leaks.

Leakage rates according to UL 429 and ANSI Z21.21

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Test Time (s)</th>
<th>Allowable Leakage (cc/hr)</th>
<th>Maximum Pressure Drop (in. W.C.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBC 1000</td>
<td>4.0</td>
<td>235.0</td>
<td>2.0</td>
</tr>
<tr>
<td>MBC 2500</td>
<td>5.0</td>
<td>305.0</td>
<td>2.0</td>
</tr>
<tr>
<td>MBC 4000</td>
<td>6.0</td>
<td>470.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Analysis of test results

<table>
<thead>
<tr>
<th>Pressure drop / rise (in. W.C.)</th>
<th>Acceptable</th>
<th>Test results</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 or less</td>
<td>Yes</td>
<td>Pass</td>
</tr>
<tr>
<td>More than 2.0</td>
<td>No</td>
<td>Fail - Immediately replace valve</td>
</tr>
</tbody>
</table>
Valve Leakage Bubble Test (Altern. method)

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 startup, and then repeated at least annually. 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 4.
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 below as a reference.
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 the “External Leakage Test Areas” indicated in the illustration below, to any accessories mounted to the safety valve, and to all gas piping and gas components downstream the equipment isolation valve, and the inlet and outlet gas piping of the automatic safety shutoff valve. The presence of bubbles indicates a leak, which needs to be rectified before proceeding.
2. Then, de-energize the burner system and verify that both automatic safety shutoff valves are closed.
3. Close the upstream and downstream manual ball valve.
4. Using a screwdriver, slowly open the V1 test nipple (port 2) by turning it counter clockwise to depressurize the volume between the two valves, and connect the 1/4” flexible hose to the test nipple.
5. 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.
6. Immerse the 1/4” 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.)
7. Repeat the same procedure for valve V2 (port 3).
(Energize terminal 2 on the DIN connector to open valve 1)

After completing the above tests proceed as follows:
8. Verify that the downstream manual ball valve is closed, and both automatic safety shutoff valves are de-energized.
9. Remove the flexible hose, and close all test nipples.
10. With the upstream manual ball valve open, energize both automatic safety shutoff valves.
11. Use soapy water to leak test all test nipples to ensure that there are no leaks.
12. If no leakage is detected, de-energize all automatic safety shutoff valves, and open the downstream manual ball valve.

⚠️ If leakage values are exceeded, replace valve immediately.

<table>
<thead>
<tr>
<th>Type</th>
<th>Allowable Valve Seat Leakage* up to 7 PSI inlet</th>
<th># of Bubbles in 10 s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Air</td>
</tr>
<tr>
<td>MBC 1000</td>
<td>235 cc/hr</td>
<td>5</td>
</tr>
<tr>
<td>MBC 2500</td>
<td>305 cc/hr</td>
<td>7</td>
</tr>
<tr>
<td>MBC 4000</td>
<td>470 cc/hr</td>
<td>10</td>
</tr>
</tbody>
</table>

*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.
Flow Curve

MBC-1000-...

Curves for equipment selection (in regulated state) with micro filter

MBC-2500-...

Based on 60 °F
14.65 psia, dry

Flow (CFH) of natural gas; s.p. 0.65 at 60 °F

Flow (CFH) of natural gas; s.p. 0.65 at 60 °F
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 table 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.

Determining equivalent flow through valves using another gas

\[ V_{\text{gas used}} = V_{\text{Natural gas}} \times f \]

\[ f = \frac{\text{Density of Natural gas}}{\text{Density of gas used}} \]

<table>
<thead>
<tr>
<th>Type of gas</th>
<th>Density [kg/m²]</th>
<th>s.g.</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>0.81</td>
<td>0.65</td>
<td>1.00</td>
</tr>
<tr>
<td>Butane</td>
<td>2.39</td>
<td>1.95</td>
<td>0.58</td>
</tr>
<tr>
<td>Propane</td>
<td>1.86</td>
<td>1.50</td>
<td>0.66</td>
</tr>
<tr>
<td>Air</td>
<td>1.24</td>
<td>1.00</td>
<td>0.80</td>
</tr>
</tbody>
</table>
### Accessories & Replacement

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; NPT port 1 or port 2 adapter (reduced port)</td>
<td>225047</td>
</tr>
<tr>
<td>1/2&quot; NPT pilot/vent adapter (reduced port)</td>
<td>225043</td>
</tr>
<tr>
<td>G 1/8&quot; Test nipple with gasket</td>
<td>219008</td>
</tr>
<tr>
<td>Gasket for G 1/8&quot; Test nipple</td>
<td>171260</td>
</tr>
<tr>
<td>Port 3 pressure switch mounting adapter</td>
<td>273777</td>
</tr>
<tr>
<td>DUNGS DIN Connector</td>
<td>210319</td>
</tr>
<tr>
<td>Burkert DIN Connector for UL Listing</td>
<td>253731</td>
</tr>
<tr>
<td>Conduit Adapter (M20 to 1/2&quot; NPT)</td>
<td>240671</td>
</tr>
<tr>
<td>MBC 1000 replacement filter</td>
<td>241916</td>
</tr>
<tr>
<td>MBC 2500 replacement filter</td>
<td>242072</td>
</tr>
<tr>
<td>MBC 4000 replacement filter</td>
<td>245624</td>
</tr>
</tbody>
</table>

### Valve Description

<table>
<thead>
<tr>
<th>Valve Description</th>
<th>Flange</th>
<th>NPT P/N</th>
<th>O-ring and bolt kit P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBC 1000</td>
<td>1/2&quot;</td>
<td>222371</td>
<td>224093</td>
</tr>
<tr>
<td></td>
<td>3/4&quot;</td>
<td>222368</td>
<td>224093</td>
</tr>
<tr>
<td></td>
<td>1&quot;</td>
<td>221999</td>
<td>224093</td>
</tr>
<tr>
<td></td>
<td>1 1/4&quot;</td>
<td>231718</td>
<td>224093</td>
</tr>
<tr>
<td></td>
<td>1 1/2&quot;</td>
<td>244021</td>
<td>224093</td>
</tr>
<tr>
<td>MBC 2500/4000</td>
<td>1&quot;</td>
<td>222369</td>
<td>224094</td>
</tr>
<tr>
<td></td>
<td>1 1/4&quot;</td>
<td>222370</td>
<td>224094</td>
</tr>
<tr>
<td></td>
<td>1 1/2&quot;</td>
<td>222003</td>
<td>224094</td>
</tr>
<tr>
<td></td>
<td>2&quot;</td>
<td>221997</td>
<td>224094</td>
</tr>
</tbody>
</table>

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

** Includes four bolts and one o-ring.

### Shutter Flanges

<table>
<thead>
<tr>
<th>Part description</th>
<th>MBC 1000</th>
<th>MBC 2500 / MBC 4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; NPT Flange set (with o-ring and 4 screws)</td>
<td>255132</td>
<td>256791</td>
</tr>
<tr>
<td>1.5&quot; NPT Flange set (with o-ring and 4 screws)</td>
<td>NA</td>
<td>255133</td>
</tr>
</tbody>
</table>

### Replacement Coils

<table>
<thead>
<tr>
<th>Valve</th>
<th>110/120 VAC</th>
<th>24 VAC</th>
<th>12 VDC</th>
<th>24 VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBC 1000</td>
<td>250371</td>
<td>250680</td>
<td>251136</td>
<td>252191</td>
</tr>
<tr>
<td>MBC 2500</td>
<td>250175</td>
<td>250681</td>
<td>251226</td>
<td>252192</td>
</tr>
<tr>
<td>MBC 4000</td>
<td>252613</td>
<td>not available</td>
<td>not available</td>
<td>252193</td>
</tr>
</tbody>
</table>

Printed wiring board is not replaceable

We reserve the right to make any changes in the interest of technical progress.