OTS Pumps & Compressors

Metal Bellows Vacuum Pumps and Compressors
Off-The-Shelf Solutions to Your Toughest Pumping Applications
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features, Descriptions and Applications</td>
<td>1</td>
</tr>
<tr>
<td>Vacum Pumps and Compressors</td>
<td>2-8</td>
</tr>
<tr>
<td>MB-21 MB-41</td>
<td>2</td>
</tr>
<tr>
<td>MB-118 MB-158</td>
<td>3</td>
</tr>
<tr>
<td>MB-111 MB-151</td>
<td>4</td>
</tr>
<tr>
<td>MB-302</td>
<td>5</td>
</tr>
<tr>
<td>MB-601</td>
<td>6</td>
</tr>
<tr>
<td>MB-602</td>
<td>7</td>
</tr>
<tr>
<td>MODEL PWSC 28823-7</td>
<td>8</td>
</tr>
<tr>
<td>High Temperature Models</td>
<td>9-11</td>
</tr>
<tr>
<td>MB-118HT MB158HT</td>
<td>9</td>
</tr>
<tr>
<td>MB-302HT</td>
<td>10</td>
</tr>
<tr>
<td>MB-601HT</td>
<td>11</td>
</tr>
<tr>
<td>Off The Shelf Parts</td>
<td>12</td>
</tr>
<tr>
<td>Double Containment Pumps and Compressors</td>
<td>13</td>
</tr>
<tr>
<td>High Pressure Models</td>
<td>14</td>
</tr>
<tr>
<td>Making the Correct Pump Selection</td>
<td>15</td>
</tr>
</tbody>
</table>
Standard MET BEL® vacuum pumps and compressors are frequently modified to meet unique customer requirements. Customized applications may include all metal construction, ability to withstand extreme operating temperatures, or such special electrical characteristics as explosion proof motors, variable speed motors, DC motors and various voltage requirements. SAMB also offers double containment units for radioactive, toxic, and rare gas applications.

Whether they are off-the shelf or specially designed for a particular application, Met Bel pumps share these common features:

- **Long Life** – uniform, symmetrical welds that assure long life
- **Stainless Steel** – all wetted surfaces made from corrosion resistant 300 Series stainless steel except for the valve assembly gaskets which are either Teflon or Viton (all metal surfaces available on request)
- **No Maintenance** – no wearing surfaces and no lubrication required
- **Hermetically Sealed** – hermetically sealed welded bellows that provide positive containment. Every pump is pressure tested to assure leak-tight integrity, with certification to mass spectrometer leak testing available
- **Infinite Number of Cycles** – bellows and valves designed with stress levels below defined endurance limits of materials allowing for an infinite number of cycles
- **Sealed Ball Bearings** – motor and drive assembly containing permanently lubricated and sealed ball bearings
- **Positive Bellows Displacement** – eccentric between the bearings and the motor shaft that provides motion for positive bellows displacement

**Applications**

- Gas analysis, analytical instrumentation sampling
- Nuclear radiation monitoring
- High voltage electronics cooling and wave guide pressurization
- High temperature engine exhaust analysis
- Ambient air sampling
- Radioactive, toxic, costly gas processing
- Research and laboratory experiments providing contaminant free samples
- Commercial aircraft potable water pressurization system
- Semiconductor process gas handling

**Note:**

Performance curves in this catalog are based on:

- Atmospheric pressure at the inlet for pressure curves and
- Atmospheric pressure at the discharge for vacuum curves.

For other conditions see Page 16
# Vacuum Pumps And Compressors

## SPECIFICATIONS

<table>
<thead>
<tr>
<th>MB-21</th>
<th>MB-41</th>
</tr>
</thead>
</table>

### General
- **Housing Body**: Cast Aluminum
- **Bellows**: AM-350 Stainless Steel
- **All other wetted surfaces**: 300 Series Stainless Steel except for Valve Assembly
- **Bearings**: Teflon Valve Gaskets and Viton O-Rings
- **Weight**: Permanently Lubricated Ball Type 6 lbs.
- **Port Connections**: 1/8 N.P.T.

### Electrical
- **Standard**: 115V 50/60 Hz.
- **Current at 115V/60hz**: 2.3 Amps (max)
- **Motor Specification**: 1/40 H.P. Shaded Pole Induction Motor with Ball Bearings and Thermal Overload Protection
- **Operating Speed @ 60 Hz**: 3000 R.P.M.
- **Insulation**: Class B

### Optional Features:
- 240V 50 Hz., D.C. Motors, Viton Valve Gaskets, VCR Fittings

### Flow Diagrams
- Flows depicted are at 60Hz. Flows at 50 Hz are 5/6 of 60 Hz flows.

## Design Pressure Rating

<table>
<thead>
<tr>
<th>Pressure (kPa)</th>
<th>MB-41</th>
<th>MB-21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Flow (SCFM)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Flow (LPM)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Vacuum Pumps And Compressors

- Flows depicted are at 60Hz. Flows at 50 Hz are 5/6 of 60 Hz flows.
**MB-118**  **MB-158**

## SPECIFICATIONS

### General
- **Housing Body**: Cast Aluminum
- **Bellows**: AM-350 Stainless Steel
- **All other wetted surfaces**: 300 Series Stainless Steel except for Valve Assembly
- **Viton Valve Gaskets**
- **Bearings**: Permanently Lubricated Ball Type
- **Weight**: 14 lbs.
- **Port Connections**: 1/4 N.P.T.

### Electrical
- **Standard**: 115V 50/60 Hz.
- **Current at 115V/60Hz**: 1.4 Amps (max)
- **Motor Specification**: 1/10 H.P.
- **Operating Speed @ 60 Hz**: 1725 R.P.M.
- **Insulation**: Class B

**Optional Features**: 230V 50 Hz., D.C. Motors, Teflon Valve Gaskets, Aluminum O-Ring Seals, VCR Fittings

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Flows depicted are at 60Hz. Flows at 50 Hz are 5/6 of 60 Hz flows.

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MB-111 MB-151

SPECIFICATIONS

General
- Housing Body: Cast Aluminum
- Bellows: AM-350 Stainless Steel
- All other wetted surfaces: 300 Series Stainless Steel except for Valve Assembly
- Teflon Valve Gaskets and Viton O-Rings
- Bearings: Permanently Lubricated Ball Type
- Weight: 24 lbs.
- Port Connections: 1/4 N.P.T.

Electrical
- Standard: 115/230V 50/60 Hz.
- Current at 115V/60Hz: 5.4 Amps (max)
- Motor Specification: 1/4 H.P. Single Phase
- Operating Speed @ 60 Hz: 1725 R.P.M.
- Insulation: Class B


Flows depicted are at 60Hz. Flows at 50 Hz are 5/6 of 60 Hz flows.
MB-302

SPECIFICATIONS

General
Housing Body: Cast Aluminum
Bellows: AM-350 Stainless Steel
All other wetted surfaces: 300 Series Stainless Steel except for Valve Assembly
Bearings: Teflon Valve Gaskets and Viton O-Rings
Weight: 26 lbs.
Port Connections: 3/8 N.P.T.

Electrical
Standard: 115/230V 50/60 Hz.
Current at 115V/60Hz: 6.6 Amps (max)
Motor Specification: 1/2 H.P. Single Phase
Operating Speed @ 60 Hz: 3450 R.P.M.
Insulation: Class B


Flows depicted are at 60Hz. Flows at 50 Hz are 5/6 of 60 Hz flows.
**MB-601**

### SPECIFICATIONS

#### General
- **Housing Body**: Cast Aluminum
- **Bellows**: AM-350 Stainless Steel
- **All other wetted surfaces**: 300 Series Stainless Steel except for Valve Assembly
- **Bellow Gaskets and O-Rings**: Teflon and Viton
- **Bearings**: Permanently Lubricated Ball Type
- **Weight**: 48 lbs.
- **Port Connections**: 3/8 N.P.T.

#### Electrical
- **Standard**: 115/230V 50/60 Hz.
- **Current at 115V/60 Hz**: 6.6 Amps (max)
- **Motor Specification**: 3/4 H.P. Single Phase
- **Operating Speed @ 60 Hz**: 1725 R.P.M.
- **Insulation**: Class B

#### Optional Features:
- Explosion Proof Motor
- Polyphase Motor
- Totally Enclosed Fan Cooled (TEFC) Motor
- Variable Speed Motor
- VCR Fittings
- Viton Valve Gaskets
- Aluminum O-Ring Seals
- High Pressure Models (See Page 15)

Flows depicted are at 60Hz. Flows at 50 Hz are 5/6 of 60 Hz flows.
**MB-602**

### SPECIFICATIONS

#### General
- **Housing Body**: Cast Aluminum
- **Bellows**: AM-350 Stainless Steel
- **All other wetted surfaces**: 300 Series Stainless Steel except for Valve Assembly
- **Bearings**: Permanently Lubricated Ball Type
- **Weight**: 30 lbs
- **Port Connections**: 3/8 N.P.T.

#### Electrical
- **Standard**: 115/230V 50/60 Hz.
- **Current at 115V/60 Hz**: 6.6 Amps (max)
- **Motor Specification**: 1/2 H.P. Single Phase
- **Operating Speed @ 60 Hz**: 3450 R.P.M.
- **Insulation**: Class B

**Optional Features**: Explosion Proof Motor, Polyphase Motor, Totally Enclosed Fan Cooled (TEFC) Motor, VCR Fittings, Viton Valve Gaskets

Flows depicted are at 60Hz. Flows at 50 Hz are 5/6 of 60 Hz flows.
MODEL PWSC 28823-7

SPECIFICATIONS

General
Bellows
AM-350 Stainless Steel
All other wetted surfaces
300 Series Stainless Steel except for Valve Assembly
Pump Housing, Cap, and Connecting Rods
Teflon Valve Gaskets, Silicone O-rings
Bearings
Permanently Lubricated Ball Type
Port Connections
MS33649 with Series Connected Manifold
Overhaul & Maintenance
Available to ATA 100 Specifications
Manual
Weight
12.0 lbs.

Electrical
Power
115/200 V 400 Hz., 3 Phase, 600 Watts maximum power consumption
Motor Specification
Designed in conformance with MIL-M-7969 and is self cooling with direct acting automatic reset thermal protector
Operating Speed @400 Hz.
3600 R.P.M.

Optional Features: Custom Electrical Connectors, Custom Manifolds

DUPLICITY PUMPS OPERATED IN SERIES/PARALLEL
PLUMBING A MET BEL® DUPLEX VACUUM PUMP COMPRESSOR IN SERIES

Any MET BEL® Duplex Vacuum Pump/Compressor can be connected in series and operated as a two-stage pump. This results in a lower absolute inlet pressure when operated as a vacuum pump and a higher flow at maximum rated pressure when operated as a compressor (see flow curves). To do this, connect the outlet port of the first stage to the inlet port of the second stage with a manifold. For compressor operation, connect service line to the outlet port of the second stage. For vacuum operation, connect the service line to the inlet port of the first stage.

Caution: Never operate with the outlet port of the second stage fully closed. This will cause extremely high pressure build up in the second stage that can damage the pump. It is recommended that a relief valve set at 40 PSIG be used in the outlet line to prevent this over pressurization.
MB-118HT MB158HT

**SPECIFICATIONS**

**General**
- **Housing Body**: Nickel Plated Cast Iron and Aluminum
- **Bellows**: AM-350 Stainless Steel
- **All other wetted surfaces**: 300 Series Stainless Steel except for Valve Assembly, Teflon Valve Gaskets
- **Bearings**: Permanently Lubricated and Shielded, Heat Stabilized Ball Type
- **Weight**: 26 lbs.
- **Ambient Temp**: 392°F Max for Pump Head/105°F Max for Motor
- **Port Connections**: 1/4 N.P.T.

**Electrical**
- **Standard**: 115/230V 50/60 Hz.
- **Current at 115V/60 Hz**: 5.4 Amps (max)
- **Motor Specification**: 1/4 H.P.
- **Operating Speed @ 60 Hz**: 1725 R.P.M.
- **Insulation**: Class B

**Optional Features**: Explosion Proof Motor, Totally Enclosed Fan Cooled (TEFC) Motor, Shaft Lengths to 8”

Flows depicted are at 60Hz. Flows at 50 Hz are 5/6 of 60 Hz flows.
**MB-302HT**

### SPECIFICATIONS

#### General
- **Housing Body**: Nickel Plated Cast Iron and Aluminum
- **Bellows**: AM-350 Stainless Steel
- **All other wetted surfaces**: 300 Series Stainless Steel except for Valve Assembly
- **Teflon Valve Gaskets and Viton O-Rings**
- **Bearings**: Permanently Lubricated and Shielded, Heat Stabilized Ball Type
- **Weight**: 37 lbs.
- **Ambient Temp**: 392°F Max for Pump Head/105°F Max for Motor
- **Port Connections**: 3/8 N.P.T.

#### Electrical
- **Standard**: 115/230V 50/60 Hz.
- **Current at 115V/60 Hz**: 7.4 Amps (max)
- **Motor Specification**: 1/2 H.P. Single Phase ODP - Open Drip Proof Motor
- **Operating Speed @ 60 Hz**: 1725 R.P.M.
- **Insulation**: Class B

#### Optional Features:
- Explosion Proof Motor
- Polyphase Motor
- Totally Enclosed Fan Cooled (TEFC) Motor

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**Design Pressure Rating**

![Design Pressure Rating Graph](image)

Flows depicted are at 60Hz. Flows at 50 Hz are 5/6 of 60 Hz flows.

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**Flows**

<table>
<thead>
<tr>
<th>Pressure (kPa)</th>
<th>Flow (SCFM)</th>
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<tbody>
<tr>
<td>0</td>
<td>3.0</td>
</tr>
<tr>
<td>10</td>
<td>2.5</td>
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<td>20</td>
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<td>30</td>
<td>1.5</td>
</tr>
<tr>
<td>40</td>
<td>1.0</td>
</tr>
<tr>
<td>50</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Vacuum (kPa)**

<table>
<thead>
<tr>
<th>Vacuum (inches of Hg)</th>
<th>Flow (LPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3.0</td>
</tr>
<tr>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>10</td>
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<td>15</td>
<td>1.5</td>
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<tr>
<td>20</td>
<td>1.0</td>
</tr>
<tr>
<td>25</td>
<td>0.5</td>
</tr>
</tbody>
</table>

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**Dimensions**

![Dimensions](image)
### MB-601HT SPECIFICATIONS

#### General
- **Housing Body**: Nickel Plated Cast Iron and Aluminum
- **Bellows**: AM-350 Stainless Steel
- **All other wetted surfaces**: 300 Series Stainless Steel except for Valve Assembly
- **Bolts**: Teflon Valve Gaskets, Viton O-Rings
- **Bearings**: Permanently Lubricated and Shielded, Heat Stabilized Ball Type
- **Weight**: 61 lbs.
- **Ambient Temp**: 392°F Max for Pump Head/105°F Max for Motor
- **Port Connections**: 3/8 N.P.T.

#### Electrical
- **Standard**: 115/230V 50/60 Hz.
- **Current at 115V/60 Hz**: 6.6 Amps (max)
- **Motor Specification**: 3/4 H.P. Single Phase ODP - Open Drip Proof
- **Operating Speed @ 60 Hz**: 1725 R.P.M.
- **Insulation**: Class B

**Optional Features:** Explosion Proof Motor, Polyphase Motor, Totally Enclosed Fan Cooled (TEFC) Motor

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Flows depicted are at 60Hz. Flows at 50 Hz are 5/6 of 60 Hz flows.
STANDARD MODELS
ADAPTATIONS of STANDARDS
CUSTOM DESIGNS

Whatever your application requires, SAMB stands ready to help you find a solution. Our Sales and Engineering Personnel will help you select a standard pump, resolve a modification to a standard or define a custom design to meet your needs. Custom designs are available for system pressures below 50 torr and high pressure models to 100 psi.

CALL METAL BELLOWS FOR ASSISTANCE

Sales personnel will assist you in resolving your needs. If your application requires a special system, we will put you directly in touch with the proper technical specialist.

MET BEL® pump replacement parts are also available. For further information call (781)784-1400.

Pumps will pass a reasonable amount of condensation but will be damaged by significant amounts of liquid.

### MET BEL® SPECIFICATIONS

<table>
<thead>
<tr>
<th>MODEL</th>
<th>BELLOWS UNITS</th>
<th>REPLACEMENT DRIVER</th>
<th>VALVE ASSEMBLY</th>
<th>QUANTITY PER PUMP</th>
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<tbody>
<tr>
<td>MB-21</td>
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<td>27456</td>
<td>2</td>
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<td>MB-602</td>
<td>29217**</td>
<td>29582</td>
<td>31722</td>
<td>2</td>
</tr>
</tbody>
</table>

** Bellows Unit - Bellows, valve terminal and drive terminal

Motor Assemblies - due to the number of models, call (781) 784.1400 for the latest replacement motor model for your pump type.

* Bellows Unit - Bellows, eccentric, bearing, driver terminal and valve terminal

** Bellows Unit - Bellows, valve terminal and drive terminal
## Specifications

### General
- **Pressure Shell**: 300 Series Stainless Steel
- **All other wetted surfaces**: 300 Series Stainless Steel with either Aluminum
- **Bellows**: O-Rings, Teflon Valve Gaskets, or Viton Valve Gaskets
- **Bearings**: AM-350 S.S. (347 S.S Optional)
- **Port Connections**: Permanently Lubricated Ball Type
  - 300 series Stainless Steel Tubing (Length Optional up to 18”)
  - or VCR Weld Glands

### Electrical
- **Motor Specification**: As Required by Application
- **Power Rating**: 1/4 H.P. to 1 1/2 H.P.
- **Operating Speed @ 60 Hz.**: 1725 R.P.M.
- **Insulation**: As Required by Application

### Performance
- **Vacuum**: 28 inches Hg (maximum, duplex, low pressure)
- **Pressure**: 85 PSIG (maximum, MB-601, high pressure)
- **Flow**: 5 SCFM Free Flow (maximum, MB-601)

### Optional Features
- **Explosion Proof Motor**
- **Special Electrical Insulation (Radiation Resistant) and Voltages**
- **Leak Detector Port Location Optional**
- **Pedestal Mount**

### Features and Benefits
Met Bel Double Containment Pumps and Compressors solve unique containment problems where radioactive gases are involved or where loss of gas could be hazardous or costly. Using secondary bellows as leak-tight seals, they are used primarily in nuclear industrial applications to control, contain, and distribute the flow of such gases as xenon, krypton, hydrogen, and tritium.

In addition to the conventional inlet-outlet construction of typical compressors, double containment pumps and compressors have third port connections to a vacuum leak detector that monitors the integrity of the pumping system. They are available in both single and duplex design, leak tight to less than 2x10⁻⁸ scc/sec He. Should the bellows rupture due to excessive pressure or contamination, the vacuum would be lost.

This would cause a pressure switch or leak detector to be triggered, setting off an alarm and shutting down the system. The pumped gas does not escape.
### General
- **Housing Body**: Cast Aluminum
- **Bellows**: AM-350 Stainless Steel
- **All other wetted surfaces**: 300 Series Stainless Steel with either Aluminum
- **Bearings**: O-Rings, Teflon Valve Gaskets, or Viton Valve Gaskets
- **Port Connections**: Permanently Lubricated
- **Ball Type**: 1/4 or 3/8 NPT

### Electrical
- **Motor Specification**: 115/230V 50/60Hz
- **Power Rating**: 1/4 H.P. to 1 1/2 H.P.
- **Operating Speed @ 60 Hz.**: 1725 R.P.M.
- **Insulation**: Class B

### Performance
- **Discharge Pressure**: 100 PSIG (maximum, MB-601)
- **Flow**: 5 SCFM Free Flow (maximum, MB-601)

### Optional Features
- Various Motor Types and Voltages
- Duplex Model – one or two high pressure stages
- VCR Fittings

### Features and Benefits
Designed to solve unique pressure problems where contaminant free samples must be processed with leak-tight integrity, these compressors operate at pressures much higher than standard models. They are available in both single and duplex design; leak tight to less than $2 \times 10^{-18}$ scc/sec He.
When neither the inlet nor the discharge is at atmospheric pressure, a rough sizing of the pump can be determined.

Example:

- Required discharge pressure 12 PSIG
- Required inlet pressure is 10 in Hg.
- Required flow is 1 SCFM

**Step 1.** Eliminate all pumps that will not produce sufficient flow, i.e. pumps smaller than the MB-302 will not produce 1 SCFM at 10” Hg not to mention the further constraint of 12 PSIG at the discharge.

**Step 2.** Select either the MB-302 or the MB-602.

**Step 3.** Selecting the MB-602 draw a vertical line on the pressure curve graph from 12 PSIG to the point where the line intersects the MB-602 flow curve. Read horizontally to flow = 4.4 SCFM

**Step 4.** On the vacuum curve graph draw a line from 4.4 SCFM parallel to the MB-602 flow curve.

**Step 5.** Draw a vertical line from 10” Hg intersecting new vacuum flow curve. Read horizontally to flow of approximately 1.3 SCFM

Note: When results are marginal check with the factory before ordering.