Booster Regulator/Air Tank

Increase factory air pressure by up to 4 times! Air-only operation requires no power supply, reduces heat generation, and allows easy installation.

**New**

Renewed model with pressure increase ratio 2 to 4 times (VBA11A)

**No power supply or wiring needed**

There is no need to install dedicated electrical wiring.

**Low heat generation**

Very little heat is generated because no electricity is used, and there is no impact on cylinders, solenoid valves, etc.

**Easy installation**

Simply insert the unit in the air line. Requires far less space than installing the compressor.

**Air-only operation**

Operation is safe because no electricity is used.

Booster Regulator/Series VBA

Air Tank/Series VBAT

Series VBA/VBAT
**Booster Regulator Series VBA**

**Improved service life**
- Doubled that of the conventional model
  - Floating piston structure (PAT. PEND)*
  - Grease retaining groove*
    - Except VBA10A, 11A

**Improved reliability**
- Built-in mesh filter at IN port
  - Prevents operation failure due to foreign matter.

**Anti-condensation**
- Integrated air-feeding tube with the main tube
  - Mitigates condensation caused by cooling during exhaust expansion.

**Reduced noise**
- Reduced by 13 dB (A) compared with the conventional model
  - Metal noise reduced by a bumper on the impact part of the switch valve
  - Exhaust noise reduced by a high-noise reduction silencer

**1/8” gauge ports**
- Allows use of standard fittings for remote pressure monitoring, etc.
  - Gauge ports changed from 1/16” to 1/8” (VBA1□A, 2□A)

**Features**
- **Air-operated type**
  - VBA22A
  - VBA42A

- **Max. operating pressure 1.6 MPa**
  - VBA43A

- **Fourfold pressure increase type**
  - NEW
  - VBA11A

**NEW**
- Elbow silencer added* (Option)
  - Space saving when installed has been realised.
    - Except VBA2□A, 4□A

---

*SMC*
Perfect fit with a booster regulator

This is an air tank to which a booster regulator can be connected compactly. It can be used alone as a tank. The pressure vessel law is different from country to country, so as an air tank suitable to a country needs to be confirmed.

Extensive product lineup

To meet a variety of usage environment and pressure specifications, models are available in carbon steel (SS400), and in four sizes ranging from 5 liters to 38 liters.

<table>
<thead>
<tr>
<th>Model</th>
<th>VBAT05A</th>
<th>VBAT10A</th>
<th>VBAT20A</th>
<th>VBAT38A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank capacity (L)</td>
<td>5</td>
<td>10</td>
<td>20</td>
<td>38</td>
</tr>
<tr>
<td>Max. operating pressure (MPa)</td>
<td>2.0</td>
<td>2.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Material</td>
<td>Carbon steel</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How to Order

**Booster Regulator**

**Series VBA**

**VBA 40A**

**Body size**

- 10A: 1/4", Handle-operated type
- 20A: 3/8", Handle-operated type
- 40A: 1/2", Handle-operated type
- 42A: 1/2", Air-operated type
- 43A: 1/2", Max. operating pressure 1.6 MPa
- 11A: 1/4", Handle-operated type

**Pressure increase ratio**: Twice

**Pressure increase ratio**: 2 to 4 times

**Thread type**

- **Symbol**: F, N, T
- **Thread type**: Rc, G, NPT, NPTF

**Port size**

- 02: 1/4"
- 03: 3/8"
- 04: 1/2"

**Applicable series**

- 02: VBA11A
- 03: VBA21A
- 04: VBA41A

**Option**

- **Symbol**: G, N, S, GN, GS, LN, LS, GLN, GLS, Z
- **Option**: Pressure gauge, Silencer, Elbow silencer, Pressure gauge, High-noise reduction silencer, Elbow high-noise reduction silencer

**Combination of Thread Type and Options**

<table>
<thead>
<tr>
<th>Body size</th>
<th>Thread type</th>
<th>Option</th>
<th>Semi-standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>10A</td>
<td>F</td>
<td>G</td>
<td>-</td>
</tr>
<tr>
<td>11A</td>
<td>F, N, T</td>
<td>G</td>
<td>-</td>
</tr>
<tr>
<td>20A</td>
<td>F</td>
<td>F, G, N, S, GN, GS, LN, LS, GLN, GLS</td>
<td>-</td>
</tr>
<tr>
<td>22A</td>
<td>F, N, T</td>
<td>F, G, N, S, GN, GS, LN, LS, GLN, GLS</td>
<td>-</td>
</tr>
<tr>
<td>40A</td>
<td>F, N, T</td>
<td>F, G, N, S, GN, GS, LN, LS, GLN, GLS</td>
<td>-</td>
</tr>
<tr>
<td>42A</td>
<td>F, N, T</td>
<td>F, G, N, S, GN, GS, LN, LS, GLN, GLS</td>
<td>-</td>
</tr>
<tr>
<td>43A</td>
<td>F, N, T</td>
<td>F, G, N, S, GN, GS, LN, LS, GLN, GLS</td>
<td>-</td>
</tr>
</tbody>
</table>

**Air Tank Compatibility Chart**

<table>
<thead>
<tr>
<th>Air tank</th>
<th>VBAT05A</th>
<th>VBAT10A</th>
<th>VBAT20A</th>
<th>VBAT38A</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBA11A</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VBA21A</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VBA41A</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
## Standard Specifications

<table>
<thead>
<tr>
<th>Fluid</th>
<th>VBA10A-02</th>
<th>VBA20A-03</th>
<th>VBA40A-04</th>
<th>VBA22A-03</th>
<th>VBA42A-04</th>
<th>VBA43A-04</th>
<th>VBA11A-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressed air</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pressure increase ratio</strong></td>
<td>Twice</td>
<td></td>
<td></td>
<td></td>
<td>Air-operated</td>
<td>2 to 4 times</td>
<td></td>
</tr>
<tr>
<td><strong>Pressure adjustment mechanism</strong></td>
<td>Handle-operated with relief mechanism Note 1</td>
<td>Air-operated</td>
<td>Handle-operated with relief mechanism Note 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Max. flow rate</strong> (Note 2) (L/min (ANR))</td>
<td>230</td>
<td>1000</td>
<td>1900</td>
<td>1000</td>
<td>1900</td>
<td>1600</td>
<td>70</td>
</tr>
<tr>
<td><strong>Set pressure range (MPa)</strong></td>
<td>0.2 to 2.0</td>
<td>0.2 to 1.0</td>
<td>1.0</td>
<td>0.2 to 1.0</td>
<td>0.2 to 1.6</td>
<td>0.2 to 2.0</td>
<td></td>
</tr>
<tr>
<td><strong>Supply pressure range (MPa)</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.1 to 1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Proof pressure (MPa)</strong></td>
<td>3</td>
<td>1.5</td>
<td></td>
<td>2.4</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Port size (Rc)</strong> (IN/OUT: 2 locations)</td>
<td>1/4</td>
<td>3/8</td>
<td>1/2</td>
<td>3/8</td>
<td>1/2</td>
<td>1/4</td>
<td></td>
</tr>
<tr>
<td><strong>Pressure gauge port size (Rc)</strong> (IN/OUT: 2 locations)</td>
<td>1/8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ambient and fluid temperature (°C)</strong></td>
<td>2 to 50 (No freezing)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>Horizontal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lubrication</strong></td>
<td>Grease (Non-lube)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight (kg)</strong></td>
<td>0.84</td>
<td>3.9</td>
<td>8.6</td>
<td>3.9</td>
<td>8.6</td>
<td>8.6</td>
<td>0.89</td>
</tr>
</tbody>
</table>

Note 1) If the OUT pressure is higher than the set pressure by the handle, excess pressure is exhausted from the back of the handle.

Note 2) Flow rate at IN= OUT = 0.5 MPa. The pressure varies depending on the operating conditions. Refer to “Flow-rate Characteristics” on pages 3 and 4.

## Options/Part No.

### Pressure Gauge, Silencer (When thread type is Rc or G.)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBA10A-02</td>
<td>Pressure gauge G G27-20-01</td>
</tr>
<tr>
<td>VBA20A-03</td>
<td>Silencer N AN200-02</td>
</tr>
<tr>
<td>VBA40A-04</td>
<td>High-noise reduction silencer S ANA1-02</td>
</tr>
<tr>
<td>VBA42A-04</td>
<td>—</td>
</tr>
<tr>
<td>VBA22A-04</td>
<td>—</td>
</tr>
<tr>
<td>VBA43A-04</td>
<td>—</td>
</tr>
<tr>
<td>VBA11A-02</td>
<td>—</td>
</tr>
</tbody>
</table>

Note 1) In the case of options GN, two pressure gauges and one silencer are included in the same container as accessories.

Note 2) KT-VBA22A-7 is a pressure gauge with fitting. (Please order two units when using with IN and OUT.)

### Pressure Gauge, Silencer (When thread type is NPT or NPTF.)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBA10A-02</td>
<td>Pressure gauge G G27-20-01</td>
</tr>
<tr>
<td>VBA20A-03</td>
<td>Silencer N AN200-02</td>
</tr>
<tr>
<td>VBA40A-04</td>
<td>High-noise reduction silencer S —</td>
</tr>
<tr>
<td>VBA22A-03</td>
<td>Elbow for silencer L KT-VBA10A-18N</td>
</tr>
<tr>
<td>VBA42A-04</td>
<td>—</td>
</tr>
<tr>
<td>VBA22A-04</td>
<td>—</td>
</tr>
<tr>
<td>VBA43A-04</td>
<td>—</td>
</tr>
<tr>
<td>VBA11A-02</td>
<td>—</td>
</tr>
</tbody>
</table>

Note 1) In the case of options GN, two pressure gauges and one silencer are included in the same container as accessories.

Note 2) KT-VBA22A-7N, KT-VBA22A-8N are pressure gauges with fittings. (Please order two units when using with IN and OUT.)

Note 3) Pressure unit on the pressure gauge: psi

## Related Products/Part No.

### Mist Separator, Exhaust Cleaner

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>For VBA10A-02</td>
<td>Mist separator AM250C-02</td>
</tr>
<tr>
<td>For VBA20A-03</td>
<td>Mist separator AM250C-02</td>
</tr>
<tr>
<td>For VBA40A-04</td>
<td>Mist separator AM250C-02</td>
</tr>
<tr>
<td>For VBA22A-03</td>
<td>Exhaust cleaner AM310C-03</td>
</tr>
<tr>
<td>For VBA42A-04</td>
<td>Exhaust cleaner AM310C-03</td>
</tr>
<tr>
<td>For VBA43A-04</td>
<td>Exhaust cleaner AM310C-03</td>
</tr>
</tbody>
</table>

Note) Refer to page 12 for air tanks, Best Pneumatics No. 5 for mist separators and Best Pneumatics No. 6 for exhaust cleaners. Refer to the separate operation manual for the connection method.

## Design

### Caution

1. **System configuration**
   - The IN port of the booster regulator has metallic mesh to prevent dust from entering the booster regulator. However, it cannot remove dust continuously or separate drainage. Make sure to install a mist separator (AM series) on the inlet side of the booster regulator.
   - The booster regulator has a sliding part inside, and it generates dust. Also, install an air purification device such as an air filter or a mist separator on the outlet side as necessary.
   - Connect a lubricator to the outlet side, because the accumulated oil in the booster regulator may result in a malfunction.

2. **Exhaust air measures**
   - Provide a dedicated pipe to release the exhaust air from each booster regulator. If exhaust air is converged into a pipe, the back pressure that is created could cause improper operation.
   - Depending on the necessity, install a silencer or an exhaust cleaner on the exhaust port of the booster regulator to reduce the exhaust noise.

3. **Maintenance space**
   - Allow the sufficient space for maintenance and inspection.
The time required to charge pressure in the tank from 0.7 MPa to 0.95 MPa at 0.5 MPa supply pressure:

\[ \frac{P_2}{P_1} = 1.4 \quad \text{or} \quad \frac{P_2}{P_1} = 1.9 \]

With the pressure increase ratio from 1.4 to 1.9, the charge time of 23 – 6 = 17 sec. (t) is given by the graph. Then, the charge time (T) for a 10 L tank:

\[ T = t \times \frac{V}{10} = 17 \times \frac{10}{10} = 17 \text{ (s)}. \]

The time required to charge pressure in the tank from 0.8 MPa to 1.0 MPa at 0.5 MPa supply pressure:

\[ \frac{P_2}{P_1} = 1.6 \quad \text{or} \quad \frac{P_2}{P_1} = 2.0 \]

With the pressure increase ratio from 1.6 to 2.0, the charge time of 11.5 – 3.8 = 7.7 sec. (t) is given by the graph. Then, the charge time (T) for a 100 L tank:

\[ T = t \times \frac{V}{10} = 7.7 \times \frac{100}{10} = 77 \text{ (s)}. \]

The time required to charge pressure in the tank from 0.8 MPa to 1.0 MPa at 0.5 MPa supply pressure:

\[ \frac{P_2}{P_1} = 1.6 \quad \text{or} \quad \frac{P_2}{P_1} = 2.0 \]

With the pressure increase ratio from 1.6 to 2.0, the charge time of 3.5 – 1.1 = 2.4 sec. (t) is given by the graph. Then, the charge time (T) for a 100 L tank:

\[ T = t \times \frac{V}{10} = 2.4 \times \frac{100}{10} = 24 \text{ (s)}. \]
VBA43A

Flow-rate Characteristics

Outlet pressure (MPa) vs. Outlet air flow rate (L/min (ANR))

Pressure Characteristics

Outlet pressure (MPa) vs. Inlet pressure (MPa)

Charge Characteristics

Charge time per 10 L (s) vs. Pressure increase ratio $P_2/P_1$

- The time required to charge pressure in the tank from 0.8 MPa to 1.0 MPa at 0.5 MPa supply pressure:
  $$P_2/P_1 = 0.8/0.5 = 1.6, \quad P_2/P_1 = 1.0/0.5 = 2.0$$

With the pressure increase ratio from 1.6 to 2.0, the charge time of 4.5 – 1.3 = 3.2 sec. (t) is given by the graph. Then, the charge time (T) for a 100 L tank:

$$T = t \times \frac{V}{10} = 3.2 \times \frac{100}{10} = 32 \text{ (s)}.$$ 

VBA11A

Flow-rate Characteristics

Outlet pressure (MPa) vs. Outlet air flow rate (L/min (ANR))

Pressure Characteristics

Outlet pressure (MPa) vs. Inlet pressure (MPa)

Charge Characteristics

Charge time per 10 L (s) vs. Pressure increase ratio $P_2/P_1$

- The time required to charge pressure in the tank from 1.0 MPa to 1.5 MPa at 0.5 MPa supply pressure:
  $$P_2/P_1 = 1.0/0.5 = 2.0, \quad P_2/P_1 = 1.5/0.5 = 3.0$$

With the pressure increase ratio from 2.0 to 3.0, the charge time of 147 – 58 = 89 sec. (t) is given by the graph. Then, the charge time (T) for a 10 L tank:

$$T = t \times \frac{V}{10} = 89 \times \frac{10}{10} = 89 \text{ (s)}.$$ 

Pulsation/Pulsation is decreased with a tank.

If the outlet capacity is undersized, pulsation may occur.

VBAT05A

Max. pulsation range (MPa) vs. Capacity (L)

VBAT10A, 20A, 38A

Max. pulsation range (MPa) vs. Capacity (L)

Conditions:
- Inlet pressure: 0.5 MPa
- Outlet set pressure: 1.0 MPa
- Flow rate: Between 0 and max. flow rate

- Performance of air tank
  - Alleviates the pulsation generated on the outlet side.
  - When air consumption exceeds air supply during intermittent operation, required air will be accumulated in the tank for use. This does not apply for continuous operation.
Sizing can be achieved with the SMC Pneumatic System Energy Saving Program Ver. 4.0.06, which can be downloaded from the SMC website: http://www.smcworld.com/

Necessary conditions:
- \( D \) [mm]: Cylinder bore size
- \( L \) [mm]: Cylinder stroke
- \( W \) [mm/s]: Cylinder operating speed
- \( C \) [pc.:]: Number of cylinders
- \( T_c \) [s]: Cylinder operating time
- \( T_s \) [s]: Cylinder stop time
- \( P_2 \) [MPa]: Inlet pressure
- \( P_3 \) [MPa]: Note 1): Tank charge pressure
- \( C \) [pc.]: Number of cylinders
- \( T_c \) [s]: Time to charge (Time to charge from \( P_1 \) to \( P_2 \))
- \( T_s \) [s]: Time to charge (Time to charge from \( P_2 \) to \( P_3 \))

Other conditions:
- \( Q \) [L/min (ANR)]: Required air flow rate
- \( Q_b \) [L/min (ANR)]: Outlet air flow rate of booster regulator
- \( C \) [pc.]: Cylinder double-acting: 2, single-acting: 1
- \( T_c \) [s]: Cylinder operating time
- \( T_s \) [s]: Cylinder stop time
- \( K \) [pc.]: Number of booster regulators
- \( P_2 \) [MPa]: Note 2): Tank charge pressure

Note 1) \( P_2 \) is the necessary supply pressure to a cylinder, and set the pressure below the lower limit of pressure inside the tank.

Note 2) \( P_3 \) is the output pressure of the booster regulator, which is also the upper limit of charge pressure to the tank.

Judgement of charge time:
- \( T = \text{Time to charge} \leq \text{Stop time} \ T_s \)

Calculate time \( T \) from air flow rate \( Q \):
\[
T = \frac{\pi D^2 W}{4 x 10^6} \times 0.5 x 2/60 = 4.6 \times (0.1 - 0.8) = 3.5 \ [\text{s}]
\]

Select booster regulator size from flow-rate characteristics table.

Select the tank capacity over \( V \).

Obtain the tank capacity \( V \):
\[
V = \frac{(Q - Q_b) x (T_c x K /60)}{P_2 - P_1} \times 9.9
\]

Select the tank model, which can be directly connected to the booster regulator.

Calculate time \( T \) from charge characteristics table.

Judgement of charge time:
- \( T \leq T_s \)

Increase number of booster regulators \( Z \) to decrease \( T \).

Avoid pulsed air (Max. 0.05 MPa)

Select the tank from the table below.

When running continuously for longer periods of time, confirm the life expectancy. When the life expectancy is shorter than required, select a larger sized booster regulator.
Working Principle

The IN air passes through the check valve to booster chambers A and B. Meanwhile, air is supplied to drive chamber B via the governor and the switching valve. Then, the air pressure from drive chamber B and booster chamber A are applied to the piston, boosting the air in booster chamber B. As the piston travels, the boosted air is pushed via the check valve to the OUT side. When the piston reaches to the end, the piston causes the switching valve to switch, so that drive chamber B is in the exhaust state and drive chamber A is in the supply state respectively. Then, the piston reverses its movement, this time, the pressures from booster chamber B and drive chamber A boosts the air in booster chamber A and sends it to the OUT side. The process described above is repeated to continuously supply highly pressurized air from the IN to the OUT side. The governor establishes the outlet pressure by handle operation and pressure adjustment in the drive chamber by feeding back the outlet pressure.

VBA10A, 20A, 40A, 43A

Air-operated type

VBA22A, 42A

Circuit Example

• When only some of the machines in the plant require high-pressure air, booster regulators can be installed for only the equipment that requires it. This allows the overall system to use low-pressure air while accommodating machines requiring high-pressure air.

• When charging a tank or the like from a source at atmospheric pressure, a circuit with a check valve can be used to reduce the charge time by allowing air to pass through the check valve up to the inlet pressure.

Initially, inlet pressure \( P_1 \) passes through the check valve, fills \( P_2 \), and results in \( P_1 = P_2 \).

• When the actuator output is insufficient but space limitations prohibit switching to a larger cylinder diameter, a booster regulator can be used to increase the pressure. This makes it possible to boost the output without replacing the actuator.

• When a certain level of output is required but the cylinder size must be kept small so that the driver remains compact.

Operating pressure:
0.5 MPa

Bore size: ø100

Output ≈ 3850 N

VBA11A

Operating pressure:
0.8 MPa

Bore size: ø80

Output ≈ 4000 N

• When only one side of the cylinder is used for work, booster regulators can be installed only on the lines that require them to reduce the overall air consumption volume.
**Series VBA**

### Warning

1. Warning concerning abnormal outlet pressure
   - If there is a likelihood of causing an outlet pressure drop due to unforeseen circumstances such as equipment malfunction, thus leading to a major problem, take safety measures on the system side.
   - Because the outlet pressure could exceed its set range if there is a large fluctuation in the inlet pressure, leading to unexpected accidents, take safety measures against abnormal pressures.
   - Operate the equipment within its maximum operating pressure and set pressure range.

2. Residual pressure measures
   - Connect a 3-port valve to the OUT side of the booster regulator if the residual pressure must be released quickly from the outlet pressure side for maintenance, etc. (Refer to the diagram below.) The residual outlet pressure side cannot be released even if the 3-port valve is connected to the IN side because the check valve in the booster regulator will activate.

   ![Diagram of 3-port valve connection](image)

   - After operation is finished, release the supply pressure at the inlet. This stops the booster regulator from moving needlessly and prevents operating malfunctions.

   ![Diagram of residual pressure release](image)

### Caution

1. Check the specifications.
   - Consider the operating conditions and operate this product within the specification range that is described in this catalogue.

2. Selection
   - Based on the conditions (such as pressure, flow rate and cycle time) required for the outlet side of the booster regulator, check the selection procedures described in this catalog or model selection software for size selection of the booster regulator.
   - Since the booster regulator is a compressor powered by the air, it consumes the air. The air consumption is approximately 1.2 times (pressure increase ratio 2) or 2.7 times (pressure increase ratio 4) larger than the outlet side volume.
   - Therefore, the booster regulator requires a supply capacity of the inlet side volume that is approximately 2.2 times (pressure increase ratio 2) or 3.7 times (pressure increase ratio 4) larger than the outlet side volume.
   - Set the pressure of the VBA11A (pressure increase ratio 4) to 2 or more. When the VBA11A is used at a pressure increase ratio of 2 or less, the internal operating pressure becomes the minimum operating pressure or less and the switching valve may remain at the intermediate position, causing a restart failure.
   - Set the pressure increase ratio of the VBA11A (pressure increase ratio 4) to 2 or more. When the VBA11A is used at a pressure increase ratio of 2 or less, the internal operating pressure becomes the minimum operating pressure or less and the switching valve may remain at the intermediate position, causing a restart failure.
   - When operating the booster regulator continuously for longer periods of time, particularly confirm its service life.
   - The service life of the booster regulator depends on not the operation hours but the operating cycles (piston sliding distance). The operating cycles (piston sliding distance) depend on the outlet flow of the booster regulator. Thus, when more outlet flow of the booster regulator is used, its service life becomes shorter.

### Design

### Caution

1. 1. Transporting
   - When transporting this product, hold it lengthwise with both hands. Never hold it by the black handle that protrudes from the center because the handle could become detached from the body, causing the body to fall and leading to injury.

2. Installation
   - Install this product so that the silver-coloured tie-rods and cover are placed horizontally. If mounted vertically, it may result in a malfunction.
   - Because the piston cycle vibration is transferred, use the following mounting bolts (VBA1: M5; VBA2, 4: M10) and tighten them with the specified torque (VBA1: 3 N·m; VBA2, 4: 24 N·m).
   - If the transmission of vibration is not preferred, insert an isolating rubber material before installation.
   - Mount the pressure gauge with a torque of 7 to 9 N·m.

### Piping

1. Flushing
   - Use an air blower to flush the piping to thoroughly remove any cutting chips, cutting oil, or debris from the piping inside, before connecting them. If they enter the inside of the booster regulator, they could cause the booster regulator to malfunction or its durability could be affected.

2. Piping size
   - To bring the booster regulator's ability into full play, make sure to match the piping size to the port size.

### Air Supply

1. Quality of air source
   - Connect a mist separator to the inlet side near the booster regulator. If the quality of the compressed air is not thoroughly controlled, the booster regulator could malfunction (without being able to boost) or its durability could be affected.
   - If dry air (atmospheric pressure dew point: –17°C or less) is used, the life expectancy may be shortened because dry air will accelerate evaporation of grease inside.

### Operating Environment

1. Installation location
   - Do not install this product in an area that is exposed to rainwater or direct sunlight.
   - Do not install in locations influenced by vibrations. If it must be used in such an area due to unavoidable circumstances, please contact SMC beforehand.

---

**Design**

**Mounting**

**Piping**

**Air Supply**

**Operating Environment**

---

**Selection**

---

**Caution**

---
Handling

⚠️ Caution

1. Setting the pressure on the handle-operated type
   • If air is supplied to the product in the shipped state, the air will be released.
   Set the pressure by quickly pulling up on the governor handle, releasing the lock, and rotating the handle in the direction of the arrow (+).
   • There is an upper and lower limit for the handle rotation. If over-rotating the handle even after reaching to the limit, the internal parts may be damaged. If the handle suddenly feels heavy while being turned, stop turning the handle.
   • Once the setting is completed, push the handle down and lock it.
   • To decrease the outlet pressure, after the pressure has been set, rotate the handle in the direction of the arrow (–). The residual air will be released from the area of the handle, due to the relief construction of the governor.
   • To reset the pressure, first reduce the pressure so that it is lower than the desired pressure; then, set it to the desired pressure.

2. Setting the pressure on the air-operated type (VBA22A, 42A)
   • Connect the outlet pipe of the pilot regulator for the remote control to the pilot port (P). (Refer to the diagram below.)
   • Refer to the graph below for the relationship between the pilot pressure and outlet pressure.
   • The AR20 and AW20 are recommended for the pilot regulator.

3. Draining
   • If this product is used with a large amount of drainage accumulated in the filter, mist separator or tank, the drainage could flow out, leading to equipment malfunction. Therefore, drain the system once a day. If it is equipped with an auto drain, check its operation once a day.

4. Exhaust
   • Exhausing time from E port may be longer for a booster regulator which is set to switch in longer hour intervals. This is not an abnormal phenomenon.

5. Maintenance
   • Life expectancy varies depending on the quality of air and the operating conditions. Signs that the unit is reaching the end of its service life include the following:
     • Constant bleed from under the handle.
     • Air exhaust noise can be heard from the booster regulator at 10 to 20 second intervals even when there is no air consumption on the outlet side.
   Conduct maintenance earlier than scheduled in such cases.
   • When maintenance is required, confirm the model and lot number of the booster regulator, and please contact SMC for maintenance kit.
   • Conduct maintenance according to the specified maintenance procedure by individuals possessing enough knowledge and experiences in maintaining pneumatic equipment.
   • The list of replacement parts and kit number are shown on page 9, and the figure shows the position of the parts.
**Series VBA**

**Construction/Replacement Parts**

VBA10A

VBA11A

VBA20A, 22A, VBA40A, 42A, 43A

Air-operated type

VBA22A, 42A

---

**Replacement Parts/Kit No.**

Place an order with the following applicable kit number.

<table>
<thead>
<tr>
<th>Model</th>
<th>VBA10A</th>
<th>VBA20A</th>
<th>VBA40A</th>
<th>VBA22A</th>
<th>VBA42A</th>
<th>VBA43A</th>
<th>VBA11A</th>
</tr>
</thead>
</table>

The kit includes the parts from ① to ⑦ and a grease pack.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>VBA10A</th>
<th>VBA20A</th>
<th>VBA40A</th>
<th>VBA22A</th>
<th>VBA42A</th>
<th>VBA43A</th>
<th>VBA11A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Piston seal</td>
<td>2</td>
<td></td>
<td>2 large</td>
<td>1 small</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Governor assembly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Check valve</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Gasket</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Rod seal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Mounting screw</td>
<td></td>
<td>8</td>
<td>12</td>
<td>8</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Cover C assembly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Grease pack</td>
<td>1</td>
<td></td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

* The grease pack has 10 g of grease.
* Make sure to refer to the procedure for maintenance.
### Dimensions

#### VBA10A-02

<table>
<thead>
<tr>
<th>Component</th>
<th>Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN side gauge port</td>
<td>7 x 28</td>
</tr>
<tr>
<td>OUT side gauge port</td>
<td>60 x 70</td>
</tr>
<tr>
<td>EXH port</td>
<td>150 x 40</td>
</tr>
<tr>
<td>IN port</td>
<td>4 x ø5.5</td>
</tr>
<tr>
<td>OUT port</td>
<td>4 x ø5.5</td>
</tr>
</tbody>
</table>

(Optional silencer: 4 x ø5.5)

#### VBA11A-02

<table>
<thead>
<tr>
<th>Component</th>
<th>Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN side gauge port</td>
<td>7 x 28</td>
</tr>
<tr>
<td>OUT side gauge port</td>
<td>60 x 70</td>
</tr>
<tr>
<td>EXH port</td>
<td>150 x 40</td>
</tr>
<tr>
<td>IN port</td>
<td>4 x ø5.5</td>
</tr>
<tr>
<td>OUT port</td>
<td>4 x ø5.5</td>
</tr>
</tbody>
</table>

(Optional silencer: 4 x ø5.5)

#### VBA20A-03

<table>
<thead>
<tr>
<th>Component</th>
<th>Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN port</td>
<td>43 x 46</td>
</tr>
<tr>
<td>OUT port</td>
<td>4 x ø12</td>
</tr>
<tr>
<td>EXH port</td>
<td>98 x 46</td>
</tr>
</tbody>
</table>

(Optional silencer: 4 x ø5.5)

#### VBA40A-04

<table>
<thead>
<tr>
<th>Component</th>
<th>Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN port</td>
<td>43 x 62</td>
</tr>
<tr>
<td>OUT port</td>
<td>4 x ø12</td>
</tr>
<tr>
<td>EXH port</td>
<td>130 x 150</td>
</tr>
</tbody>
</table>

(Optional silencer: 4 x ø5.5)
**Dimensions**

**VBA22A-03**

- **IN side gauge port**: Rc 1/8
- **OUT side gauge port**: Rc 1/8
- **Pressure gauge (Option)**: 3.2
- **EXH port**: Rc 3/8

**VBA42A-04**

- **IN side gauge port**: Rc 1/2
- **OUT side gauge port**: Rc 1/2
- **Pressure gauge (Option)**: 40

**VBA43A-04**

- **IN side gauge port**: Rc 1/2
- **OUT side gauge port**: Rc 1/2
- **Pressure gauge (Option)**: 40

**Made to Order**

1. **Copper-free/Fluorine-free**

   The inner or outer copper parts material has been changed to stainless steel or aluminum. The fluorine resin parts have been changed to general resin.

2. **CE explosion-proof directive (ATEX) compliant**

   Ozone resistance is strengthened through the use of fluororubber (diaphragm) and hydrogenated NBR (valve, rod seal) for the rubber parts of the seal material.

3. **Ozone resistant**

   For detailed dimensions, specifications and lead times, please contact SMC.
Air Tank
Series VBAT

How to Order

- Compact connections are possible with booster regulators.
- It can be used alone as a tank.

<table>
<thead>
<tr>
<th>Tank internal capacity</th>
<th>Symbol</th>
<th>Internal capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>05</td>
<td>5 L</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10 L</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>20 L</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>38 L</td>
<td></td>
</tr>
</tbody>
</table>

Material

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Carbon steel (SS400)</td>
</tr>
</tbody>
</table>

Accessories

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Accessories</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>RV</td>
<td>Safety valve (Set pressure: 1 MPa)</td>
<td>VBAT20A</td>
</tr>
<tr>
<td></td>
<td>Drain valve</td>
<td>VBAT38A</td>
</tr>
<tr>
<td>SV</td>
<td>Safety valve (Set pressure: 2 MPa)</td>
<td>VBAT05A</td>
</tr>
<tr>
<td></td>
<td>Drain valve</td>
<td>VBAT10A</td>
</tr>
</tbody>
</table>

Thread type

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Thread type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rc</td>
</tr>
<tr>
<td>F</td>
<td>G</td>
</tr>
</tbody>
</table>

Made to Order
(For details, refer to page 13.)

CE certified product
(Self-declaration document attached)
Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>VBAT05A-SV-Q</th>
<th>VBAT10A-SV-Q</th>
<th>VBAT20A-RV-Q</th>
<th>VBAT38A-RV-Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tank capacity (L)</td>
<td>5</td>
<td>10</td>
<td>20</td>
<td>38</td>
</tr>
<tr>
<td>Max. operating pressure (MPa)</td>
<td>2.0</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN port size</td>
<td>3/8</td>
<td>1/2</td>
<td>3/4</td>
<td>3/4</td>
</tr>
<tr>
<td>OUT port size</td>
<td>3/8</td>
<td>1/2</td>
<td>1/2</td>
<td>3/4</td>
</tr>
<tr>
<td>Ambient and fluid temperature (°C)</td>
<td>0 to 75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>6.6</td>
<td>10</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>Material</td>
<td>Carbon steel (SS400)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paint</td>
<td>Outside: Silver paint, Inside: Rustproof paint</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note) The accessories and options are included in the same container.

Warning

1. Operating pressure
   - Operate this product below the maximum operating pressure. If it is necessary, take appropriate safety measures to ensure that the maximum operating pressure is not exceeded.
   - When the tank alone is used
     Use a pressure switch or a safety valve to ensure that the maximum operating pressure is not exceeded.

2. Connection
   - Connect a filter or a mist separator to the OUT side of the tank. Because the inner surface of the tank is untreated, there is a possibility of dust flowing out to the outlet side.
   - A VBA booster regulator can be connected directly with the tank accessories as indicated combinations below.

Caution

1. Accessories
   - Refer to the operation manual (VBAT-M1, M2, M3, M4) regarding combining booster regulators with older model air tanks.
   - The accessories are secured by bands to the feet of the air tank. Once removed, make sure not to lose them.

2. Installation
   - Install the tank away from people. It is dangerous if the accumulated air inside the tank were to seep out.
   - Do not mount the air tank on a moving part or a place with vibration.
   - When connecting a booster regulator with the tank, refer to the operation manual first, which is provided with the air tank before assembling.
   - Refer to the operation manual regarding mounting methods when using long bolts.
   - To mount the air tank on a floor surface, use the four holes to secure the tank with bolts or anchor bolts.

Caution

1. Operative conditions
   - Consider the operating conditions and operate this product within the specification range.
   - When using the air tank with a booster regulator, refer to “Sizing” on page 5 or SMC Pneumatic System Energy Saving Program.

Maintenance

1. Inspection
   - The use of pressure vessels could lead to an unexpected accident due to external damage or internal corrosion caused by drainage. Therefore, make sure to check periodically for external damage, or the extent of internal corrosion through the port hole. An ultrasonic thickness indicator may also be used to check for any reduction in material thickness.

2. Draining
   - If this product is used with a large amount of drainage, the drainage could flow out, leading to equipment malfunction or corrosion inside the tank. Therefore, drain the system once a day.
**Dimensions**

**VBAT05A-Q**  
Material: Carbon steel  
Connected to VBA10A, 11A

The length may be longer than the specification if the plugs mounted on the tank are not fit to the end. The length of G thread type is about 6 mm longer due to plug type differences.

**VBAT10A-Q**  
Material: Carbon steel  
Connected to VBA10A, 11A

The length may be longer than the specification if the plugs mounted on the tank are not fit to the end. The length of G thread type is about 6 mm longer due to plug type differences.

**Connected to VBA20A**

* The length may be longer than the specification if the plugs mounted on the tank are not fit to the end. The length of G thread type is about 6 mm longer due to plug type differences.

**Connected to VBA22A**

* When option G (pressure gauge) is selected
**Series VBAT**

**Dimensions: CE Certified Product**

**VBAT20A-Q**  
**Material: Carbon steel**  
**Connected to VBA20A, 40A**

- The length may be longer than the specification if the plugs mounted on the tank are not fit to the end. The length of G thread type is about 6 mm longer due to plug type differences.

- Booster regulator IN port  
  - Connected to VBA20A, 40A

**VBAT38A-Q**  
**Material: Carbon steel**  
**Connected to VBA20A, 40A**

- The length may be longer than the specification if the plugs mounted on the tank are not fit to the end. The length of G thread type is about 6 mm longer due to plug type differences.

**Booster regulator model**  
- VBA20A  
- VBA40A  
- VBA22A  
- VBA42A

**Connected to VBA22A, 42A**

<table>
<thead>
<tr>
<th>Booster regulator model</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBA20A</td>
<td>481</td>
<td>394</td>
<td>Rc 3/8</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>VBA40A</td>
<td>520</td>
<td>429.8</td>
<td>Rc 1/2</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>VBA22A</td>
<td>444</td>
<td>394</td>
<td>Rc 3/8</td>
<td>469</td>
<td>—</td>
</tr>
<tr>
<td>VBA42A</td>
<td>477</td>
<td>429.8</td>
<td>Rc 1/2</td>
<td>493</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: When option G (pressure gauge) is selected.
1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications. Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or determines its specifications. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment. The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.
   1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the drivers have been confirmed.
   2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
   3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions:
   1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
   2. Installation on equipment in conjunction with atomic energy, railways, air ports or shipping vessels, or in places or equipment unsuitable for the standard specifications described in the product catalogue.
   3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
   4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

**Caution:**
Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

**Warning:**
Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

**Danger:**
Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

---

**Safety Instructions**
These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1, and other safety regulations.

---

**Limited warranty and Disclaimer/Compliance Requirements**
The product is provided for use in manufacturing industries. The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.

---

**Compliance Requirements**
1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

---

**SMC Corporation (Europe)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Phone Number</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>+43 2262628260</td>
<td><a href="http://www.smc.at">www.smc.at</a></td>
</tr>
<tr>
<td>Belgium</td>
<td>+32 (0)33551464</td>
<td><a href="http://www.smcneumatics.be">www.smcneumatics.be</a></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>+359 29744492</td>
<td><a href="mailto:office@smc.bg">office@smc.bg</a></td>
</tr>
<tr>
<td>Croatia</td>
<td>+385 13736874</td>
<td><a href="mailto:office@smc.hr">office@smc.hr</a></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>+420 541424611</td>
<td><a href="mailto:office@smc.cz">office@smc.cz</a></td>
</tr>
<tr>
<td>Denmark</td>
<td>+45 70525200</td>
<td><a href="mailto:office@smcdk.com">office@smcdk.com</a></td>
</tr>
<tr>
<td>Estonia</td>
<td>+372 6510370</td>
<td><a href="mailto:smc.mmc@smcneo.com">smc.mmc@smcneo.com</a></td>
</tr>
<tr>
<td>Finland</td>
<td>+358 205715931</td>
<td><a href="mailto:smc@smc.fi">smc@smc.fi</a></td>
</tr>
<tr>
<td>France</td>
<td>+33 (0)164761000</td>
<td><a href="mailto:contact@smc-france.fr">contact@smc-france.fr</a></td>
</tr>
<tr>
<td>Germany</td>
<td>+49 (0)61034020</td>
<td><a href="http://www.smc-neumatics.de">www.smc-neumatics.de</a></td>
</tr>
<tr>
<td>Greece</td>
<td>+30 210 2717265</td>
<td><a href="mailto:smc@smc.gr">smc@smc.gr</a></td>
</tr>
<tr>
<td>Hungary</td>
<td>+36 22511390</td>
<td><a href="mailto:office@smc.hu">office@smc.hu</a></td>
</tr>
<tr>
<td>Ireland</td>
<td>+353 (0)14039000</td>
<td><a href="mailto:sales@smcpneumatics.ie">sales@smcpneumatics.ie</a></td>
</tr>
<tr>
<td>Italy</td>
<td>+39 (0)2927111</td>
<td>smcitalia.it</td>
</tr>
<tr>
<td>Latvia</td>
<td>+371 67817700</td>
<td><a href="mailto:info@smc.lv">info@smc.lv</a></td>
</tr>
<tr>
<td>Lithuania</td>
<td>+370 5 2308118</td>
<td><a href="http://www.smc.lt">www.smc.lt</a></td>
</tr>
<tr>
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