Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Pressure increase ratio</th>
<th>Fluid</th>
<th>Proof pressure</th>
<th>Max. supply pressure</th>
<th>Set pressure range</th>
<th>Ambient and fluid temperature</th>
<th>Lubrication</th>
<th>Installation</th>
<th>Pressure adjustable mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBA1110</td>
<td>MAX. 2</td>
<td>Compressed air</td>
<td>VBA1110</td>
<td>3.0MPa</td>
<td>0.2 to 2.0MPa</td>
<td>2 to 50°C (No condensation)</td>
<td>Not required</td>
<td>Horizontal</td>
<td>Relieving style</td>
</tr>
<tr>
<td>VBA1111</td>
<td>MAX. 4</td>
<td></td>
<td>VBA1111</td>
<td>1.5MPa</td>
<td>0.2 to 1.0MPa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VBA2000</td>
<td></td>
<td></td>
<td>VBA2000</td>
<td>0.85</td>
<td>0.2 to 2.0MPa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VBA4100</td>
<td></td>
<td></td>
<td>VBA4100</td>
<td>3.8</td>
<td>0.2 to 1.0MPa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VBA4200</td>
<td></td>
<td></td>
<td>VBA4200</td>
<td>7.5</td>
<td>0.2 to 1.0MPa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model

<table>
<thead>
<tr>
<th>Model</th>
<th>Handle operated style</th>
<th>Air operated style</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBA1110-02</td>
<td>VBA1111-02</td>
<td>VBA2100-03</td>
</tr>
<tr>
<td>VBA2100-03</td>
<td></td>
<td>VBA4100-04</td>
</tr>
<tr>
<td>VBA4220-03</td>
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<td>VBA4200-04</td>
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</tbody>
</table>

Max. flow (l/min (ANR))

<table>
<thead>
<tr>
<th>Model</th>
<th>Handle operated style</th>
<th>Air operated style</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBA1110</td>
<td>400</td>
<td>60</td>
</tr>
<tr>
<td>VBA2100</td>
<td>1000</td>
<td>1900</td>
</tr>
<tr>
<td>VBA4100</td>
<td>1900</td>
<td>7.5</td>
</tr>
<tr>
<td>VBA4200</td>
<td>7.5</td>
<td>0.1 to 0.5MPa</td>
</tr>
</tbody>
</table>

Note: Flow conditions VBA1110: IN=OUT=1.0MPa, VBA1111, VBA2100, VBA4100: IN=OUT=0.5MPa

Accessory (Option)/Part Numbers

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gauge</td>
<td>G27-20-R1-2pcs.</td>
</tr>
<tr>
<td>Silencer</td>
<td>G27-10-R1-X209-2pcs.</td>
</tr>
<tr>
<td>Gauge</td>
<td>G27-10-R1-X209-2pcs.</td>
</tr>
<tr>
<td>Silencer</td>
<td>G27-10-R1-X209-2pcs.</td>
</tr>
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</table>

How to Order

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Pressure increase ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.0MPa</td>
</tr>
<tr>
<td>1</td>
<td>1 times</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Port size</th>
<th>Symbol</th>
<th>Part size</th>
</tr>
</thead>
<tbody>
<tr>
<td>F02</td>
<td>G1/4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Body size</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>G</td>
</tr>
<tr>
<td>1/8</td>
<td>N</td>
</tr>
</tbody>
</table>

Related Products

<table>
<thead>
<tr>
<th>Description</th>
<th>Model</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mist separator</td>
<td>AM250-02</td>
<td>P.4.6-1</td>
</tr>
<tr>
<td>Exhaust cleaner</td>
<td>AM250-04/06</td>
<td></td>
</tr>
<tr>
<td>Air tank (Note)</td>
<td>AM550-06/10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM550-06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM550-06/10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM550-06/10</td>
<td></td>
</tr>
</tbody>
</table>

Note: Contact SMC for Air Tanks which comply to European Pressure Vessel Directive 97/23/EC
The required time to increase tank pressure from 0.8MPa to 1.0MPa at 0.5MPa supply pressure is calculated as follows.  

\[
\frac{P_2}{P_1} = \frac{1.6}{1.0} = 2.0
\]

With the pressure increase ratio from 1.6 to 2.0, the time of 65–16 = 49 sec (t) is given for 10 l tank by the graph. Then, the charging time (T) for a 10 l tank, 

\[
T = \frac{t \times 10}{10} = 49 \times \frac{10}{10} = 49(s).
\]

The required time to increase tank pressure from 1.0MPa to 1.5MPa at 0.5MPa supply pressure is calculated as follows.  

\[
\frac{P_2}{P_1} = \frac{1.5}{1.0} = 3.0
\]

With the pressure increase ratio from 2 to 3, the time of 170–60–110 sec (t) is given for 10 l tank by the graph. Then, the charging time (T) for a 10 l tank, 

\[
T = \frac{t \times 10}{10} = 110 \times \frac{10}{10} = 110(s).
\]
Pulsation is decreased by using tank. If secondary capacity is undersized, pulsation may occur.

5 Litre tank

10, 20 & 38 Litre tank

Size Selection

Provide necessary conditions on selection.

Calculate momentary flow Q.

Select booster regulator size from flow characteristic table.

Judgement of flow rate Qb < Q

Select tank with the capacity over V.

Calculate charge time T from charge characteristics table.

Judgement of charge time T ≤ Ts

Select tank from table below.

Refer to p.1.13-2 for flow rate characteristics table.

END
**Construction/Principle**

**VBA1111**

- **Governor**
- **Drive chamber A**
- **Drive chamber B**
- **IN (Primary side)**
- **Booster chamber A**
- **Booster chamber B**
- **Piston**
- **Switching valve**
- **E (Secondary side)**
- **Check valve**
- **OUT (Secondary side)**

**VBA1110, 2100, 4100**

- **Governor**
- **Drive chamber A**
- **Drive chamber B**
- **IN (Primary side)**
- **Booster chamber A**
- **Booster chamber B**
- **Inlet port**
- **Piston rod**
- **Switching valve**
- **E (Secondary side)**
- **Check valve**
- **OUT (Secondary side)**

The IN air passes to the check valve to pressure boosting chambers A and B. Meanwhile, air is supplied to actuating chamber via the governor and the switching valve. Then, the air from chamber B and boosting chamber A is applied to the piston, boosting the air in chamber B. As the piston travels, the boosted air is pushed via the check valve to the OUT side. When the piston reaches the end, the piston causes the switching valve to switch so that chamber B is in the exhaust state and chamber A is in the supply. Then, the piston reverses its movement, this time, the pressures from chamber B and chamber A boost the air in pressure boosting chamber A and send 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 secondary pressure.

---

**Warning**

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

2. **Handling**
   - **Pressure setting**
     - Do not exceed the set pressure when turning the governor handle (VBA 1110) or supplying pilot pressure (VBA 4100). If the primary pressure rises, the secondary pressure will also rise, possibly exceeding the maximum operating pressure.

---

**Precautions on design**

1. **Warning concerning abnormal secondary pressure**
   - If there is a likelihood of causing a secondary pressure drop due to unforeseen circumstances such as equipment malfunction, thus leading to a major problem, safety measures must be provided on the system side.
   - Because the secondary pressure could exceed its set range if there is a large fluctuation in the primary pressure, and lead to unexpected accidents, provide safety measures against abnormal pressures.
   - Operate the equipment by maintaining its maximum operating pressure and set pressure range.

2. **Residual pressure measures**
   - Connect a 3 port valve to the OUT side of the booster valve if the residual pressure must be released quickly from the secondary pressure side, such as when servicing the equipment (refer to the diagram below). The residual secondary pressure cannot be released if the 3 port valve is connected to the IN side because the check valve in the booster valve will activate.

3. **Exhaust air measures**
   - Provide a dedicated pipe to release the exhaust air from each booster valve. If exhaust air is converged into a pipe, the back pressure that is created could cause improper operation.
   - Install as necessary a silencer or an exhaust cleaner on the exhaust port of the booster valve to reduce the exhaust sound.

4. **Space for service access**
   - Provide a sufficient space for performing maintenance and inspection.

---

**Caution**

1. **Verify the specifications.**
   - Consider the operating conditions and operate this product within the specification range that is described in this manual.

2. **Based on the requirements (pressure, flow rate, tact time, etc.) of the secondary side of the booster valve, select the size of the booster valve in accordance with the selection procedure described in this manual.**

---

**Piping**

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

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

---

**Source air**

1. **Quality of source air**
   - Connect a mist separator to the primary side near the booster valve. If the quality of the compressed air is not thoroughly controlled, the booster valve could malfunction (without being able to boost) or its durability could be affected.

---

**Environment**

1. **Operating Environment**
   - Do not install this product in an area that is exposed to water or direct sunlight.
   - Do not install it in an area that is exposed to vibrations. If it must be used in such an area due to unavoidable circumstances, contact SMC beforehand.
Caution

1. Setting the pressure on the handle operated style (VBA1110, VBA1311)
   - 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, and rotating it in the direction of the arrow (+).
   - After completing the pressure setting, push the handle in.
   - After the pressure has been set, the secondary pressure will be released from the area of the handle, due to the relief construction of the handle.
   - 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 style (VBA2200, VBA4200)
   - Connect the secondary pipe of the pilot regulator for remote operation to the pilot port (P). (Refer to the diagram below.)
   - Refer to the diagram below for the pilot pressure and the secondary pressure.
   - The recommended pilot regulators are AR2000 and AW2000.

Regulator for pilot

2 times of pilot pressure is secondary pressure.
At 0.4MPa at primary pressure
Pilot pressure
0.2MPa to 0.4MPa
Secondary pressure
0.4MPa to 0.8MPa

Draining
- If this product is used with a large amount of drainage accumulated in the filter, mist separator, or the 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.

Exhaust air
- After operating this product for an extended time in the set state, if the booster valve is switched, it could take a longer period of time to discharge the air from the E port. This symptom is normal.

Applications

1. When certain equipment requires a higher pressure than the plant’s line pressure.
2. When the lower limit pressure for equipment must be ensured due to the fluctuation and reduction of the plant’s line pressure.
3. When the actuator lacks power output for some reason but it is not feasible to replace it with a large bore cylinder due to space constraints.
4. In spite of diverse pressure conditions of the end user, equipment that achieves the specified high power output must be provided.
5. When a small cylinder size is desired while ensuring sufficient power, in order to achieve a compact drive unit.

Initially, primary pressure (P) passes through the check valve, fills P2, and results in P1=P2.

When the pressure in one chamber of the cylinder must be boosted.

Diagram example

Energy and cost saving booster regulator for factory.

Diagram:

- Initial state: Pressure (P) enters the system, fills P2, and results in P1=P2.
- Draining: Pressure is released from the area of the handle.
- Exhaust air: After operating the product, the booster valve is switched, allowing for the discharge of air from the E port.

Applications:

1. When the hydraulic pressure of an air-hydro unit must be raised.
2. When the pressure must be raised in an explosion-proof environment.
3. To boost the pressure by remote operation, using an air operated type.

Graph:

- Operating pressure: 0.5MPa
- Cylinder bore size: ø100
- Output: 3850N
- Operating pressure: 0.8MPa
- Cylinder bore size: ø80
- Output: 3850N

Diagram:

- Initially, primary pressure (P) enters the system, fills P2, and results in P1=P2.
- Without check valve by-pass, the system is released.
- Shortening time: Pressure is reduced, allowing for faster operation.

Diagram outline:

- Diagram showing the pressure and flow paths within the booster regulator system.
Booster Regulator  VBA1110 to 4200

**Handle operated style VBA1110-02, VBA1111-02**

![Diagram of Booster Regulator]

- **Model**: VBA1100-03, VBA4100-04
- **Port size**
  - RC (PT) 1/8
- **Dimensions**
  - A: 300
  - B: 170
  - C: 53
  - D: 118
  - E: 98
  - F: 46
  - G: 43
  - H: 60
  - J: 18
  - K: 15
  - L: 31
  - øM: 16

![Diagram of Booster Regulator]
### Air operated style VBA2200-03, VBA4200-04

**Model**

- **Port size**
  - RC(PT) 3/8
  - RC(PT) 1/2

**Dimensions**

<table>
<thead>
<tr>
<th>Model</th>
<th>Port size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBA2200-03</td>
<td>RC(PT) 3/8</td>
<td>300</td>
<td>126.5</td>
<td>63</td>
<td>118</td>
<td>98</td>
<td>46</td>
<td>43</td>
<td>60.5</td>
<td>18</td>
<td>15</td>
<td>—</td>
<td>RC1/16</td>
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<tr>
<td>VBA4200-04</td>
<td>RC(PT) 1/2</td>
<td>404</td>
<td>167</td>
<td>96</td>
<td>150</td>
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<td>62</td>
<td>90</td>
<td>17</td>
<td>15</td>
<td>20</td>
<td>—</td>
</tr>
</tbody>
</table>

---

### Air Tank Precautions

**Be sure to read before handling.**

Refer to p.0-26 and 0-27 for Safety Instructions and common precautions on the products mentioned in this catalogue, and refer to p.1.0-2 and 1.0-3 for precautions on every series.

---

### Design

**Warning**

1. **Operating pressure**
   - Operate this product at or below the maximum operating pressure. If it is necessary, take appropriate safety measures to ensure that the maximum operating pressure is not exceeded.

2. **Applicability**
   - The air tank must be designed in compliance with the regulations in Europe. Therefore, verify the regulations of the country in question before operating this product.

3. **Connection**
   - Connect a filter or a mist separator to the OUT side of the tank. Because the inner wall of the tank is untreated, there is a possibility of dust flowing out to the secondary side.

### Selection

**Caution**

1. **Consider the operating conditions and operate this product within its specification range.**
2. **Follow the size selection procedure indicated on p.1.14-3 to select the size of the air tank if it will be used with a booster valve connected to it.**

### Installation

**Caution**

1. **Accessories**
   - The accessories are secured by bands to the feet of the tank. Once removed, make sure not to lose them.

2. **To connect a booster valve to the tank, refer to the operation manual that is provided with the air tank before assembly.**

3. **To mount the air tank on a floor surface, use the four holes to secure the tank with bolts or anchor bolts.**

### Maintenance and Inspection

**Warning**

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.