**Compact Vacuum Unit**

**Ejector/Vacuum Pump System**

**ZB Series**

- **Response time of the valve:** 5 ms
- **Vacuum response time:** 28 ms
- **Energy-saving**
- **Air consumption:** 17% reduced*
- **Vacuum pressure reached:** 21% increased*

*(Shortened by 25% compared with other SMC products)*

- **Vacuum breaking time:** 14 ms
- **Conditions:** Needle flow rate set to 10 L/min, when the pressure reaches atmospheric pressure, with supply pressure 0.5 MPa, vacuum piping size ø4/ø2.5 x 50 mm

- **Compact/Lightweight**
- **Weight:** 46 g
- **Single unit weight**

**All-in-One**

Supply valve, release valve, vacuum break flow adjustment needle, suction filter, and silencer

- **Vacuum break flow adjustment needle:** 10 mm
- **Suction filter:** Nominal filtration rating: 30 µm
- **Silencer (Built-in):**

**With vacuum pressure switch**

**Can copy to up to 10 switches simultaneously.**

The settings of the master sensor (source of copy) can be copied to the slave sensors.

**Reduction in setting work**

**Prevention of mistakes in setting**

**Copy**

Slave side → 1 unit
2 units
10 units

**ZK2**
**ZQ**
**ZR**
**ZB**
**ZA**
**ZX**
**ZM**
**ZL**
**ZH**
**ZH-X267**
**ZHP**
**ZU**
**VOD-V**
Unit with release pressure supply port can be selected.

Air pressure and release pressure can be adjusted separately. Release pressure can be adjusted to suit the workpiece.

Release response time is shortened by 25% by the port open to atmosphere.

Having the R port of the supply valve open to atmosphere allows instant vacuum break with the pump system and controls excessive increase of the release pressure.

Prevents incorrect vacuum break (exhaust interference).

Installing individual exhaust ports prevents incorrect vacuum break due to exhaust interference when used as a manifold. Individual exhaust port specification for which piping can be connected is also available.
**Easy maintenance**

Simple installation and removal without the use of screws

- Replacement of filter element
- Replacement of sound absorbing material

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**Applicable to the latching type valve**

Latching type can be selected for the supply valve. (Nozzle sizes: ø0.3 and ø0.4 only)
Reduces power consumption by reducing energization time when generating vacuum, and prevents workpieces being dropped if there is an instantaneous power cut due to lightning etc. (when the air supply is not stopped).

---

**Construction which reduces discharge of dust with the vacuum break air**

This product has a construction with the vacuum pressure path and release pressure path separated, which reduces the amount of dust collected by the suction filter discharged to the atmosphere.

---

**Application Example**

**Variations**

<table>
<thead>
<tr>
<th>Model</th>
<th>Nozzle size</th>
<th>Supply valve</th>
<th>Release valve</th>
<th>Pressure sensor</th>
<th>Manifold stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum pump system</td>
<td>ZB00</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1 to 12 stations</td>
</tr>
<tr>
<td>Ejector</td>
<td></td>
<td>ø0.3</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ø0.4</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ø0.5</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ø0.6</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

---

**Fine adjustment of the vacuum break**

It can be adjusted from 1 to 14.5 L/min (ANR).

- With the supply pressure 0.5 MPa

---

**Unit either with pressure sensor or vacuum pressure switch can be selected.**

With pressure sensor

With vacuum pressure switch
Compact Vacuum Unit

ZB Series

How to Order Single Unit

Vacuum Pump System

ZB 00 2 0 - K1 5 L - P1 - C4

Ejector

ZB 04 1 1 - K1 5 L - P1 - C4

1 Nominal Nozzle Size

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Nominal nozzle size</th>
<th>Applicable supply valve and standard supply pressure</th>
<th>Large flow (N.C.)</th>
<th>Latching</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>ø0.3</td>
<td>(0.35 MPa)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>03</td>
<td>ø0.4</td>
<td>(0.35 MPa)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>04</td>
<td>ø0.5</td>
<td>(0.35 MPa)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>05</td>
<td>ø0.6</td>
<td>(0.5 MPa)</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Note 1) Vacuum pump system only

2 Body Type

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Body specification</th>
<th>Port specification (Note 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single unit</td>
<td>PV, PD</td>
</tr>
<tr>
<td>2</td>
<td>Single unit</td>
<td>PV, PD common port (PV = PD)</td>
</tr>
<tr>
<td>3</td>
<td>For manifold</td>
<td>PV, PD individual port (PV ≠ PD)</td>
</tr>
<tr>
<td>4</td>
<td>For manifold</td>
<td>No distinction</td>
</tr>
</tbody>
</table>

Note 2) Names of the ports and functions are as follows.
- PV: Air pressure SUP port (Ejector)
- PD: Vacuum pressure SUP port (Vacuum pump system)
- PV: Release pressure SUP port (For the unit with PD port, select the model with a release valve for 4.)
- Specify the port specification of the body for manifold with the manifold model number.

3 Exhaust Type

<table>
<thead>
<tr>
<th>0</th>
<th>For vacuum pump system (Without silencer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Silencer exhaust (Individual exhaust)</td>
</tr>
<tr>
<td>2</td>
<td>Port exhaust (Individual exhaust)</td>
</tr>
</tbody>
</table>

4 Combination of Supply Valve and Release Valve (Note 3)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Supply valve</th>
<th>Release valve</th>
<th>Applicable body type</th>
<th>Ejector</th>
<th>Pump system</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PV = PD</td>
<td>PV ≠ PD</td>
</tr>
<tr>
<td>K1</td>
<td>Normally closed</td>
<td>Normally closed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J1</td>
<td>Normally closed</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td>Latching (Positive common)</td>
<td>Normally closed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>Latching (Positive common)</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Vacuum break by port open to atmosphere

Note 3) Refer to Table 1 on page 192 for the part number of supply valve and release valve of each specification. Latching type is applicable only to the ejector nozzle sizes ø0.3 and ø0.4.

5 Rated Voltage

<table>
<thead>
<tr>
<th>5</th>
<th>24 VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>12 VDC</td>
</tr>
</tbody>
</table>

6 Supply Valve/Release Valve Electrical Entry (Note 4)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Electrical Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>L-type plug connector With lead wire</td>
</tr>
<tr>
<td>LO</td>
<td>L-type plug connector Without connector</td>
</tr>
<tr>
<td>M</td>
<td>M-type plug connector With lead wire (Note 5)</td>
</tr>
<tr>
<td>MO</td>
<td>M-type plug connector Without connector (Note 5)</td>
</tr>
</tbody>
</table>

Note 4) All with light and surge suppressor. Lead wire length is 300 mm for the models with lead wire. For other lead wire length, select a model without connector and include the connector assembly part number in Table 2 on page 192.

Note 5) M- and MO-type connectors cannot be selected for models with pressure sensor or pressure switch for vacuum.

7 Manual Override (Note 6)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Manual Override</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Non-locking push type</td>
</tr>
<tr>
<td>B</td>
<td>Locking type (Tool required) Semi-standard</td>
</tr>
</tbody>
</table>

Note 6) Latching type (supply valve) has the push-locking type only, but either the push type or the locking type can be selected for the release valve.
![Compact Vacuum Unit ZB Series](image)

### Pressure Sensor/Vacuum Pressure Switch Specifications

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Type</th>
<th>Pressure range [kPa]</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Without pressure sensor/vacuum pressure switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>Pressure sensor</td>
<td>0 to −101</td>
<td>Output: 1 to 5 V, accuracy: ±2% F.S. or less&lt;sup&gt;Note 7&lt;/sup&gt;</td>
</tr>
<tr>
<td>P3</td>
<td>−100 to 100</td>
<td>Output: 1 to 5 V, accuracy: ±2% F.S. or less&lt;sup&gt;Note 7&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>EA</td>
<td>Vacuum pressure switch</td>
<td>0 to −101</td>
<td>NPN 2 outputs, With unit switching function&lt;sup&gt;Note 8&lt;/sup&gt;</td>
</tr>
<tr>
<td>EAP</td>
<td>PNP 2 outputs, S unit only&lt;sup&gt;Note 9&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBM</td>
<td>With unit switching function&lt;sup&gt;Note 8&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBP</td>
<td>SI unit only&lt;sup&gt;Note 9&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FA</td>
<td>With unit switching function&lt;sup&gt;Note 8&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAM</td>
<td>SI unit only&lt;sup&gt;Note 9&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAP</td>
<td>With unit switching function&lt;sup&gt;Note 8&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FB</td>
<td>SI unit only&lt;sup&gt;Note 9&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBM</td>
<td>With unit switching function&lt;sup&gt;Note 8&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBP</td>
<td>SI unit only&lt;sup&gt;Note 9&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>Note 7</sup> Only the lead wire length 3 m is available for the pressure sensor.
<sup>Note 8</sup> The unit switching function is not available in Japan due to a new measurement law.
<sup>Note 9</sup> Fixed unit: kPa

### Lead Wire with Connector for Vacuum Pressure Switch

- **Nil**: Without lead wire with connector (No need to specify for pressure sensor type.)
- **G**: Lead wire with connector and connector cover, Lead wire length 2 m

### Vacuum (V) Port<sup>Note 11</sup>

- **C2**:Straight ø2 one-touch fitting Metric size
- **C4**:Straight ø4 one-touch fitting Metric size
- **N1**:Straight ø1/8" one-touch fitting Inch size
- **N3**:Straight ø5/32" one-touch fitting Inch size
- **L2**:Elbow ø2 one-touch fitting Metric size
- **L4**:Elbow ø4 one-touch fitting Metric size
- **LN1**:Elbow ø1/8" one-touch fitting Inch size
- **LN3**:Elbow ø5/32" one-touch fitting Inch size

<sup>Note 10</sup> The filter included in this product is of an simple type, and will become clogged quickly in environments with high quantities of dust or particulates. Please make additional use of an air suction filter of the ZFA, ZFB or ZFC series.
<sup>Note 11</sup> Be sure to hold the filter case when connecting and disconnecting the tube for the elbow type.

### Warning

The filter case of this suction filter is made of nylon. Contact with alcohol or similar chemicals may cause it to be damaged. Also, do not use the filter when these chemicals are present in the atmosphere.
**How to Order the Product**

1. **Single unit**
   - Select the body type 1 or 2 referring to 
   - Body type on page 1.
   - (Example shows body type 1.)
   - **Example** ZB04[T1]-K15L-P1-C4

2. **Manifold**
   - Refer to “How to Order Manifold” and select the body type 3 referring to 
   - Body type on page 1. Pre-fix "∗" to the part number for the single unit(s) to be mounted as a manifold.
   - (Without "∗", they will be shipped as a spare part and will not be mounted as a manifold.)
   - The blanking plate assembly (Model: ZB1-BP2-A) can be mounted at portions where the single unit is not mounted.
   - When ordering the product to be assembled into the base, specify an asterisk (∗) indicating the assembly. (If an asterisk (∗) is not specified, the product is not assembled into the base and is shipped separately.)
   - **Example** ZB08-01 .............. 1
     - ZB05[T1]-K15L-C4-4 (Stations 1 to 4)
     - ZB05[T1]-K15L-L4-3 (Stations 5 to 7)
     - ZB1-BP2-A .............. 1 (Stations 8)

**Manifold Maximum Simultaneous Operating Stations**

<table>
<thead>
<tr>
<th>Ejector model</th>
<th>Supply valve type</th>
<th>Large flow (N.C.)</th>
<th>Latching</th>
<th>Large flow (N.C.)</th>
<th>Latching</th>
<th>Large flow (N.C.)</th>
<th>Latching</th>
<th>Large flow (N.C.)</th>
<th>Latching</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZB03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZB04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZB05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZB06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rc1/8</td>
<td>12</td>
<td>10</td>
<td></td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPT1/8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G1/8</td>
<td>Supply from one side</td>
<td>12</td>
<td>10</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supply from both sides</td>
<td>12</td>
<td>10</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M5 x 0.8</td>
<td>Supply from one side</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supply from both sides</td>
<td>12</td>
<td>10</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note** These values are obtained under the standard supply pressure.
Specifications

General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>-5 to 50°C (No condensation)</td>
</tr>
<tr>
<td>Fluid</td>
<td>Air</td>
</tr>
<tr>
<td>Vibration resistance Note 1)</td>
<td>30 m/s² (Without sensor/switch)</td>
</tr>
<tr>
<td>Impact resistance Note 2)</td>
<td>150 m/s² (Without sensor/switch)</td>
</tr>
</tbody>
</table>

Supply Valve/Release Valve Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Large flow type (N.C.)</th>
<th>Latching type</th>
<th>Release valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply valve/release valve model</td>
<td>ZB1-VQ110U-□</td>
<td>ZB1-VQ120U-□</td>
<td>ZB1-VQ110L-L</td>
</tr>
<tr>
<td>Applicable system</td>
<td>Ejector (N.C.)</td>
<td>Pump system (N.C.)</td>
<td>Ejector Note 1)</td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>0.55 MPa</td>
<td>0.1 MPa</td>
<td>0.55 MPa</td>
</tr>
<tr>
<td>Minimum operating pressure</td>
<td>0.1 MPa</td>
<td>-0.1 MPa</td>
<td>0.1 MPa</td>
</tr>
<tr>
<td>Response time</td>
<td>5 ms or less</td>
<td>5 ms or less</td>
<td>5 ms or less</td>
</tr>
<tr>
<td>Rated coil voltage</td>
<td>24 VDC</td>
<td>12 VDC</td>
<td>12 VDC</td>
</tr>
<tr>
<td>Electrical entry</td>
<td>L-type plug connector (With light/surge voltage suppressor)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1) Latching type is applicable only to the ejector nozzle sizes ø0.3 and ø0.4
Note 2) Inrush: 3.1 W (10 ms after energized); Holding: 0.7 W
Note 3) M-type can also be selected when the ejector or the pump system is selected without pressure sensor/vacuum pressure switch.

Ejector Specifications Note 1)

<table>
<thead>
<tr>
<th>Model</th>
<th>ZB03</th>
<th>ZB04</th>
<th>ZB05</th>
<th>ZB06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply valve type</td>
<td>Large flow (N.C.)</td>
<td>Latching</td>
<td>Large flow (N.C.)</td>
<td>Large flow (N.C.)</td>
</tr>
<tr>
<td>Nozzle size (mm)</td>
<td>0.3</td>
<td>0.4</td>
<td>0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>Supply pressure range Note 2) (MPa)</td>
<td>0.2 to 0.55</td>
<td>0.3 to 0.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard supply pressure (MPa)</td>
<td>0.35</td>
<td>0.4</td>
<td>0.35</td>
<td>0.45</td>
</tr>
<tr>
<td>Air consumption (L/min (ANR))</td>
<td>3.5</td>
<td>4</td>
<td>6.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Maximum suction flow (L/min (ANR))</td>
<td>2</td>
<td>3.5</td>
<td>4.5</td>
<td>7</td>
</tr>
<tr>
<td>Maximum vacuum pressure (kPa)</td>
<td>-86</td>
<td>-90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1) These values are representative values, and may vary depending on the atmospheric pressure (weather, height above sea level, etc.).
Note 2) The maximum operating pressure is 0.5 MPa when using the product either with pressure sensor or vacuum pressure switch.

Weight

<table>
<thead>
<tr>
<th>Single Unit</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZB□1/2/□K1□ (Single unit, without sensor)</td>
<td>46</td>
</tr>
<tr>
<td>ZB□3/□K1□ (One station for manifold, without sensor)</td>
<td>40</td>
</tr>
</tbody>
</table>

Pressure Sensor/Vacuum Pressure Switch

<table>
<thead>
<tr>
<th>Pressure sensor/vacuum pressure switch model</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZB1-PS-□A</td>
<td>5</td>
</tr>
<tr>
<td>(Except pressure sensor, cable portion)</td>
<td></td>
</tr>
<tr>
<td>ZB1-ZS-□□□-A</td>
<td>14</td>
</tr>
<tr>
<td>(Except vacuum pressure switch, lead wire assembly with connector)</td>
<td></td>
</tr>
</tbody>
</table>

Calculation of weight for the manifold type

Example) 5-station manifold with pressure sensors

40 g x 5 pcs. + 5 g x 5 pcs. + 41 g = 226 g
Ejector Exhaust Characteristics/Flow Rate Characteristics

**Nozzle Size ø0.3 Supply Valve, Large Flow Type (N.C.)/ZB03**

**Exhaust Characteristics**

- Vacuum pressure [kPa]
- Air consumption [L/min (ANR)]
- Suction flow [L/min (ANR)]

**Flow Rate Characteristics**

- Supply pressure [MPa]: 0.35 MPa

**Nozzle Size ø0.4 Supply Valve, Large Flow Type (N.C.)/ZB04**

**Exhaust Characteristics**

- Vacuum pressure [kPa]
- Air consumption [L/min (ANR)]
- Suction flow [L/min (ANR)]

**Flow Rate Characteristics**

- Supply pressure [MPa]: 0.35 MPa

**Nozzle Size ø0.5 Supply Valve, Large Flow Type (N.C.)/ZB05**

**Exhaust Characteristics**

- Vacuum pressure [kPa]
- Air consumption [L/min (ANR)]
- Suction flow [L/min (ANR)]

**Flow Rate Characteristics**

- Supply pressure [MPa]: 0.35 MPa

**Nozzle Size ø0.6 Supply Valve, Large Flow Type (N.C.)/ZB06**

**Exhaust Characteristics**

- Vacuum pressure [kPa]
- Air consumption [L/min (ANR)]
- Suction flow [L/min (ANR)]

**Flow Rate Characteristics**

- Supply pressure [MPa]: 0.5 MPa
Nozzle Size ø0.3 Supply Valve, Latching Type/ZB03□□-Q1

- Exhaust Characteristics
- Flow Rate Characteristics (Supply pressure: 0.4 MPa)

Nozzle Size ø0.4 Supply Valve, Latching Type/ZB04□□-Q2

- Exhaust Characteristics
- Flow Rate Characteristics (Supply pressure: 0.45 MPa)

Vacuum Pump System Flow Rate Characteristics/ZB00

- The graph shows the suction flow rate characteristics of the vacuum pump system at different vacuum pressures.

Release Flow Rate Characteristics (Ejector/Pump System)

- The graph shows the flow rate characteristics with various supply pressures when the vacuum break flow adjustment needle is opened from the fully close state.

How to Read Flow Rate Characteristics Graph

Flow rate characteristics are expressed in ejector vacuum pressure and suction flow. If suction flow changes, the vacuum pressure will also be changed. Normally this relationship is expressed in ejector standard operating pressure use. In graph, Pmax is max. vacuum pressure and Qmax is maximum suction flow. The values are specified according to catalog use. Changes in vacuum pressure are expressed in the below order.

1. When ejector suction port is covered and made airtight, suction flow becomes zero and vacuum pressure is at maximum value (Pmax).
2. When suction port is opened gradually, air can flow through, (air leakage), suction flow increases, but vacuum pressure decreases. (condition P1 and Q1)
3. When suction port is opened further and fully opened, suction flow moves to maximum value (Qmax), but vacuum pressure is near zero (atmospheric pressure).

As described above, the vacuum pressure changes when the suction flow changes. In other words, when there is no leakage from the vacuum (V) port, the vacuum pressure can reach its maximum, but as the amount of leakage increases, the vacuum pressure decreases. When the amount of leakage and the max. suction flow become equal, the vacuum pressure becomes almost zero.

In the case when ventirative or leaky work should be adsorbed, please note that vacuum pressure will not rise.
### Pressure Sensor/Vacuum Pressure Switch Specifications

#### Pressure Sensor/ZB1-PS□-A (Refer to the PSE series in Best Pneumatics No. 8 and Operation Manual for details.)

<table>
<thead>
<tr>
<th>Model (Refer to the standard model number for the sensor unit on page 192.)</th>
<th>ZB1-PS1-A (PSE541)</th>
<th>ZB1-PS3-A (PSE543)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated pressure range</td>
<td>0 to –101 kPa</td>
<td>–100 to 100 kPa</td>
</tr>
<tr>
<td>Proof pressure</td>
<td>500 kPa</td>
<td></td>
</tr>
<tr>
<td>Output voltage</td>
<td>1 to 5 VDC</td>
<td></td>
</tr>
<tr>
<td>Output impedance</td>
<td>Approx. 1 kΩ</td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>10 to 24 VDC±10%, Ripple (p-p) 10% or less</td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>15 mA or less</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±2% F.S. (Ambient temperature: 25°C)</td>
<td></td>
</tr>
<tr>
<td>Linearity</td>
<td>±0.4% F.S. or less</td>
<td></td>
</tr>
<tr>
<td>Repeat accuracy</td>
<td>±0.2% F.S. or less</td>
<td></td>
</tr>
<tr>
<td>Effect of power supply voltage</td>
<td>±0.8% F.S. or less</td>
<td></td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>±2% F.S. or less (Ambient temperature: based on 25°C)</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Resin</td>
<td></td>
</tr>
<tr>
<td>Pressure sensing section</td>
<td>Sensor pressure receiving area: Silicon, O-ring: HNBR</td>
<td></td>
</tr>
<tr>
<td>Lead wire</td>
<td>Oil-resistant vinyl cabtire cable (2.7 x 3.2 mm (elliptic), Cross section: 0.15 mm², 3 cores, 3 m, Insulator O.D.: 0.9 mm)</td>
<td></td>
</tr>
</tbody>
</table>

#### Vacuum Pressure Switch/ZB1-ZS□□□□-A (Refer to the ZSE/ISE10 series in Best Pneumatics No. 8 and Operation Manual for details.)

<table>
<thead>
<tr>
<th>Model (Refer to the standard model number for the switch unit on page 192.)</th>
<th>ZB1-ZSE□□□□-A (ZSE10)</th>
<th>ZB1-ZSF□□□□-A (ZSE10F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated pressure range</td>
<td>0 to –101 kPa</td>
<td>–100 to 100 kPa</td>
</tr>
<tr>
<td>Proof pressure</td>
<td>500 kPa</td>
<td></td>
</tr>
<tr>
<td>Minimum unit setting</td>
<td>0.1 kPa</td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24 VDC±10%, Ripple (p-p) 10% or less (with power supply polarity protection)</td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>40 mA or less</td>
<td></td>
</tr>
<tr>
<td>Switch output</td>
<td>NPN or PNP open collector 2 outputs (Select)</td>
<td></td>
</tr>
<tr>
<td>Maximum load current</td>
<td>80 mA</td>
<td></td>
</tr>
<tr>
<td>Maximum applied voltage</td>
<td>28 V (with NPN output)</td>
<td></td>
</tr>
<tr>
<td>Residual voltage</td>
<td>2 V or less (with load current of 80 mA)</td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>2.5 ms or less (Response time selections with anti-chattering function: 20, 100, 500, 1000, 2000 ms)</td>
<td></td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Repeat accuracy</td>
<td>±0.2% F.S. ±1 digit</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>Variable (0 or above) (Note 1)</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>Window comparator mode</td>
<td></td>
</tr>
<tr>
<td>Humidity range</td>
<td>Operating/Stored: 35 to 85% RH (No condensation)</td>
<td></td>
</tr>
<tr>
<td>Withstand voltage</td>
<td>1000 VAC for 1 minute between live parts and enclosure</td>
<td></td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>±2% F.S. (at 25°C in an operating temperature range of –5 and 50°C)</td>
<td></td>
</tr>
<tr>
<td>Lead wire</td>
<td>Oil-resistant vinyl cabtire cable (Cross section: 0.15 mm² (AWG26), 5 cores, 2 m, Insulator O.D.: 1.0 mm)</td>
<td></td>
</tr>
</tbody>
</table>

Note 1) If the applied voltage fluctuates around the set value, the hysteresis must be set to a value more than the fluctuating width, otherwise chattering will occur.

Note 2) Refer to “General Specifications” on page 187 for the specifications not shown in the table.

### Description (Vacuum Pressure Switch)

- **Output (OUT1) display (Green)**: Lights up when OUT1 is turned ON.
- **Output (OUT2) display (Red)**: Lights up when OUT2 is turned ON.
- **LED display**: Displays the current pressure, set mode and error code.
- **button (UP)**: Selects the mode or increases the ON/OFF set-value.
- **button (DOWN)**: Selects the mode or decreases the ON/OFF set-value.
- **button (SET)**: Use for changing the mode or setting the set-value.

### Internal Circuit and Wiring Example

#### Pressure Sensor

```
[1 kΩ]
Brown DC (+)
[Black OUT]
(Analog output)
[Blue DC (–)]

Main circuit

[12 VDC]

Load

12 VDC to

+ 24 VDC

500 kPa

NPN (2 outputs)

Max. 28 V, 80 mA

Residual voltage: 2 V or less

Blue DC (–)...
```

**Button Functions**

- **Brown DC (+)**: The FUNC terminal is connected when using the copy function. (Refer to the Operation Manual.)

#### Vacuum Pressure Switch

```
[1 kΩ]
Brown DC (+)
[Black OUT]
(Analog output)
[Blue DC (–)]

Main circuit

[12 VDC]

Load

12 VDC to

+ 24 VDC

500 kPa

NPN (2 outputs)

Max. 28 V, 80 mA

Residual voltage: 2 V or less

Blue DC (–)...
```

**Button Functions**

- **Brown DC (+)**: The FUNC terminal is connected when using the copy function. (Refer to the Operation Manual.)
Construction

Component Parts

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Valve body assembly</td>
<td>Resin/HNBR</td>
<td>White</td>
</tr>
<tr>
<td>2</td>
<td>Needle assembly</td>
<td>Resin/Brass/NBR</td>
<td>White</td>
</tr>
<tr>
<td>3</td>
<td>Body</td>
<td>Resin</td>
<td>White</td>
</tr>
<tr>
<td>4</td>
<td>Nozzle</td>
<td>Aluminum</td>
<td>Vacuum pump system: Spacer</td>
</tr>
<tr>
<td>5</td>
<td>Diffuser</td>
<td>Aluminum</td>
<td>Vacuum pump system: None</td>
</tr>
<tr>
<td>6</td>
<td>Silencer cover</td>
<td>Resin</td>
<td>White</td>
</tr>
</tbody>
</table>

Replacement Parts

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Model (Refer to page 192.)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Supply valve</td>
<td>ZB1-VQ110U-□□□□□□□□</td>
<td>Refer to Table 1 on page 192 for applicable part number.</td>
</tr>
<tr>
<td>8</td>
<td>Release valve</td>
<td>ZB1-VQ110-□□□□□□□□</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>V-port assembly</td>
<td>ZB1-VPN3-□-A</td>
<td>With fitting and filter element (page 192)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Case material: Special clear nylon)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>One-touch fitting</td>
<td>KJ□□□-C1</td>
<td>It is required when replacing the fitting only.</td>
</tr>
<tr>
<td>11</td>
<td>Filter element</td>
<td>ZB1-FE3-A</td>
<td>Nominal filtration rating: 30 µm, 10 pcs. in 1 set</td>
</tr>
<tr>
<td>12</td>
<td>Sound absorbing material</td>
<td>ZB1-SE1-A</td>
<td>10 pcs. in 1 set</td>
</tr>
<tr>
<td>13</td>
<td>Pressure sensor assembly</td>
<td>ZB1-PSC-A</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Vacuum pressure switch assembly</td>
<td>ZB1-ZS□□□□□□□□-A</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Manifold base assembly</td>
<td>ZB□□□□□□□□□□□□□□□</td>
<td>Refer to “Manifold” in “How to Order the Product” on page 186 for change in the number of stations.</td>
</tr>
</tbody>
</table>

How to Replace the Filter

When adsorption performance decreases or when there is delay in response time due to clogging of the filter, stop the operation and replace the filter with a new one.

1) Hold the V-port assembly with your fingers, turn it 45 degrees in the counterclockwise direction and pull it out. For the straight type fitting, it can be removed with a hexagon wrench (width across flats: 2) by inserting it until it touches the end and turning it 45 degrees in the counterclockwise direction. (When using a wrench, do not turn it more than 45 degrees by force as this will damage the hexagon hole which is made of resin.)

2) Remove the filter element from the removed filter case, and mount a new filter element into the case.

3) Confirm that the gasket at the V-port assembly mounted part of the body is not displaced and that it has no foreign matter stuck to it.

4) Insert the tab of the V-port assembly along the groove, and rotate it approx. 45 degrees in the clockwise direction while pressing it gently until it stops. (Mount the filter case in the direction specified in the figure. If it is mounted with the tab downwards, it will interfere with the floor when the unit is installed on the floor.)
How to Order Replacement Parts

7 Supply valve (ZB1) Release valve

Table 1 Combination of the supply valve and the release valve
- The applicable supply valve specification varies depending on the nozzle size of the ejector.
- The symbols in the table correspond to the supply valves/release valves stated on the right.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Ejector</th>
<th>Pump system</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1</td>
<td>N.C.</td>
<td>ZB03</td>
</tr>
<tr>
<td>J1</td>
<td>Latch</td>
<td>ZB04</td>
</tr>
<tr>
<td>Q1</td>
<td>Latch</td>
<td>ZB05</td>
</tr>
<tr>
<td>Q2</td>
<td>Latch</td>
<td>ZB06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZB07</td>
</tr>
</tbody>
</table>

Table 2 Connector assembly

- Lead wire length (mm)

<table>
<thead>
<tr>
<th>Applicable valve</th>
<th>Lead wire length</th>
</tr>
</thead>
<tbody>
<tr>
<td>14A (1), (3), (4)</td>
<td>Nil</td>
</tr>
<tr>
<td>13A (2) (Latching)</td>
<td>300</td>
</tr>
</tbody>
</table>

Table 3 Supply valve/release valve accessories

<table>
<thead>
<tr>
<th>Supply valve/release valve model</th>
<th>Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZB1-VQ110U</td>
<td>Mounting screw (M1.7 x 15) 2 pcs.</td>
</tr>
<tr>
<td>ZB1-VQ110U-B</td>
<td>Mounting screw (M1.7 x 22) 2 pcs.</td>
</tr>
<tr>
<td>ZB1-VQ110L</td>
<td>Mounting screw (M1.7 x 22) 2 pcs.</td>
</tr>
<tr>
<td>ZB1-VQ120U</td>
<td>Mounting screw (M1.7 x 15) 2 pcs.</td>
</tr>
<tr>
<td>ZB1-VQ120U-B</td>
<td>Mounting screw (M1.7 x 22) 2 pcs.</td>
</tr>
<tr>
<td>ZB1-VQ110U-L</td>
<td>Mounting screw (M1.7 x 15) 2 pcs.</td>
</tr>
<tr>
<td>ZB1-VQ110U-B-L</td>
<td>Mounting screw (M1.7 x 22) 2 pcs.</td>
</tr>
</tbody>
</table>

9 V-port assembly

ZB1 - VPN3 - C2 - A

One-touch fitting
- Metric size
- Inch size
- Body type: Only for the combination of the elbow type body and the ø4 one-touch fitting, add the suffix “-N” to the part number.

KJL04-C1-N

10 Filter element (10 pcs. in 1 set)

ZB1 - FE3 - A
- Nominal filtration rating using suction filter: 30 µm

12 Sound absorbing material (10 pcs. in 1 set)

ZB1 - SE1 - A

192
Compact Vacuum Unit  

**ZB Series**

### Dimensions: Single Unit

#### ZB\[10\] \[20\]

**Ejector/Vacuum pump system**
- Silencer exhaust, With supply valve/release valve, 
  Without sensor/switch

#### ZK2

**Vacuum pump system**
- ZB0020-K1
  - Port open to atmosphere

#### Port type

<table>
<thead>
<tr>
<th>Port type</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
<td>4.1</td>
<td>78.5</td>
</tr>
<tr>
<td>C4</td>
<td>7.5</td>
<td>81.9</td>
</tr>
<tr>
<td>N1</td>
<td>7.4</td>
<td>81.8</td>
</tr>
<tr>
<td>N3</td>
<td>7.5</td>
<td>81.9</td>
</tr>
<tr>
<td>L2</td>
<td>8.4</td>
<td>82.8</td>
</tr>
<tr>
<td>L4</td>
<td>8.3</td>
<td>82.7</td>
</tr>
<tr>
<td>LN1</td>
<td>8.3</td>
<td>82.7</td>
</tr>
</tbody>
</table>

#### Notes

1. Without port for PV=PD specification
2. When this product is used as an ejector, do not block the exhaust port when mounting. When the product is mounted so that the exhaust port side will be against a wall, use a spacer to secure a clearance of at least 1 mm. (Refer to page 200 for details.)
3. No exhaust port for pump system
4. The dotted line shows the configuration of the latching type and the manual lock type.
5. The dotted line shows the manual lock type.
6. For L-type plug connector
7. For M-type plug connector
8. It has 3 lead wires for the latchtype.
9. Refer to page 197 for the dimensions for the various vacuum (V) ports.
Compact Vacuum Unit  ZB Series

Dimensions: Manifold

**ZZB□-3□□-M5**

*ZZB31-K□□□-□□□-

Ejector
Silencer exhaust,
With supply valve/release valve,
Without sensor/switch,
PV, PD common port (PV = PD)

**ZZB□-S□□□-M5**

*ZZB31-K□□□-□□□-

Ejector
Silencer exhaust,
With supply valve/release valve,
Without sensor/switch,
PV, PD common port (PV = PD)

```
<table>
<thead>
<tr>
<th>Port type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>29</td>
<td>32</td>
<td>43</td>
<td>39</td>
</tr>
<tr>
<td>L2</td>
<td>21.6</td>
<td>31.8</td>
<td>52.2</td>
<td>62.4</td>
</tr>
</tbody>
</table>
```

**ZZB□-S□□□-M5**

*ZZB31-K□□□-□□□-

Ejector/Vacuum pump system
Silencer exhaust, With supply valve/release valve,
With pressure sensor, PV, PD individual port (PV ≠ PD)

```
<table>
<thead>
<tr>
<th>Port type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>29</td>
<td>32</td>
<td>43</td>
<td>39</td>
</tr>
<tr>
<td>L2</td>
<td>21.6</td>
<td>31.8</td>
<td>52.2</td>
<td>62.4</td>
</tr>
</tbody>
</table>
```

**ZZB□-S□□□-M5**

*ZZB31-K□□□-□□□-

Ejector/Vacuum pump system
Silencer exhaust, With supply valve/release valve,
With pressure sensor, PV, PD individual port (PV ≠ PD)

```
<table>
<thead>
<tr>
<th>Port type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>29</td>
<td>32</td>
<td>43</td>
<td>39</td>
</tr>
<tr>
<td>L2</td>
<td>21.6</td>
<td>31.8</td>
<td>52.2</td>
<td>62.4</td>
</tr>
</tbody>
</table>
```

**ZZB□-S□□□-M5**

*ZZB31-K□□□-□□□-

Ejector/Vacuum pump system
Silencer exhaust, With supply valve/release valve,
With pressure sensor, PV, PD individual port (PV ≠ PD)

```
<table>
<thead>
<tr>
<th>Port type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>29</td>
<td>32</td>
<td>43</td>
<td>39</td>
</tr>
<tr>
<td>L2</td>
<td>21.6</td>
<td>31.8</td>
<td>52.2</td>
<td>62.4</td>
</tr>
</tbody>
</table>
```
**Dimensions: Manifold**

**ZZB□□-□□□□□□□□□□**

*ZZB□□-□□□□□□□□□□*

Ejector/Vacuum pump system
Silencer exhaust,
With supply valve/release valve,
With vacuum pressure switch,
PV, PD individual port (PV ≠ PD)

* Refer to page 197 for the dimensions for the various vacuum (V) ports.

**Ejector/Manifold**

**ZZB□□-□□□□□□□**

**Vacuum pump system/Manifold**

<table>
<thead>
<tr>
<th>Port type</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
<td>4.1</td>
<td>103.6</td>
</tr>
<tr>
<td>C4</td>
<td>7.5</td>
<td>107</td>
</tr>
<tr>
<td>N1</td>
<td>7.4</td>
<td>106.9</td>
</tr>
<tr>
<td>N3</td>
<td>7.5</td>
<td>107</td>
</tr>
<tr>
<td>L2</td>
<td>8.4</td>
<td>107.9</td>
</tr>
<tr>
<td>L4</td>
<td>8.3</td>
<td>107.8</td>
</tr>
<tr>
<td>LN1</td>
<td>8.3</td>
<td>107.8</td>
</tr>
<tr>
<td>LN3</td>
<td>8.3</td>
<td>107.8</td>
</tr>
</tbody>
</table>

**Port (mm)**

<table>
<thead>
<tr>
<th>L1</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>29</td>
<td>39.2</td>
<td>49.4</td>
<td>59.6</td>
<td>69.8</td>
<td>80</td>
<td>90.2</td>
<td>100.4</td>
<td>110.6</td>
<td>120.8</td>
<td>131</td>
<td>141.2</td>
</tr>
<tr>
<td>L2</td>
<td>21.6</td>
<td>31.8</td>
<td>42</td>
<td>52.2</td>
<td>62.4</td>
<td>72.6</td>
<td>82.8</td>
<td>93</td>
<td>103.2</td>
<td>113.4</td>
<td>123.6</td>
<td>133.8</td>
</tr>
</tbody>
</table>

**Output (OUT1) display (Green)**

**Output (OUT2) display (Red)**

**LED display**

**S button (SET)**

**Connector terminal**

**Vacuum (V) port**

**Supply valve**

**Release valve**

**Vacuum break flow adjustment needle**

**Exhaust**

**Manual override**

**Port open to atmosphere**

**Port open to atmosphere**

**Vacuum pressure switch**

**Air pressure SUP (PV) port**

**Vacuum pressure SUP (PD) port**

**2 x ø3.2 mounting hole**

**2 x 1/8, M5 thread depth 5**

**Vacuum pressure switch**

**Output (OUT2) display (Red)**

**LED display**

**button (UP)**

**button (DOWN)**

**2 x ø3.2 mounting hole**

**2 x 1/8, M5 thread depth 5**

**Exhaust**

**Manual override**

**Port open to atmosphere**

**Port open to atmosphere**

**Vacuum pressure switch**

**Vacuum pressure switch**
Compact Vacuum Unit  ZB Series

Dimensions

V-port dimensions

- Straight type
  C2: Straight ø2 one-touch fitting
  Applicable tube O.D.: ø2
  8.7  
  4.1  

  N1: Straight ø1/8" one-touch fitting
  Applicable tube O.D.: ø1/8"
  7.4  
  12.7  

- Elbow type
  L2: Elbow ø2 one-touch fitting
  Applicable tube O.D.: ø2
  8.4  
  5.4  

  L4: Elbow ø4 one-touch fitting
  Applicable tube O.D.: ø4
  12.7  
  20  

  LN1: Elbow ø1/8" one-touch fitting
  Applicable tube O.D.: ø1/8"
  8.3  
  4.6  

  LN3: Elbow ø5/32" one-touch fitting
  Applicable tube O.D.: ø5/32"
  8.3  
  4.6  

Common dimensions of the individual EXH port

ZB 2-

Bracket mounting dimensions for single unit
Bracket part number for single unit: ZB1-BK1-A
* Mounting screw (M2 x 14, with washer) 2 pcs., M2 nut 2 pcs. included

Mounting the right side of the unit to the outside

Mounting the left side of the unit to the inside

ZK2  ZQ  ZR  ZB  ZA  ZX  ZM  ZL  ZH  ZH  ZH  ZH  ZHP  ZU  VQD-V

SMC
Supply Valve/Release Valve

**Caution**

1. **How to use the latching-type supply valve**
   
   Our latching-type solenoids are fitted with a self-detraining mechanism. Its construction features an armature inside the solenoid which is set or reset using spontaneous energization (20 ms or greater). Therefore, continuous energization is not required.

   **<Special care must be taken for the latching type.>**
   
   1. Avoid using this product with a circuit which electrifies both the set and reset signals simultaneously.
   2. The minimum energization time required for self-detraining is 20 ms.
   3. Contact SMC when using this product in locations where there are vibration levels of 30 m/s² or above or highly magnetic fields. No problems arise in normal usage or locations.
   4. This supply valve retains the reset position (stops generation of vacuum) at the time of shipment. However, it may alter to the set position during transportation or due to vibration when mounting the supply valve. Therefore, confirm the home position either manually or with power supply prior to use.

   If the supply valve is latching type, continuous energization is not necessary because it maintains the switching position with momentary energization for at least 20 msec. Depending on the conditions, continuous energizing may cause operation failure such as ON operation failure due to operation voltage increase due to coil temperature rise.

   When continuous energizing is necessary, the energizing time shall be 10 minutes or shorter. Before the next operation, the solenoid shall be de-energized (both A side and B side OFF) for longer than the energized time. Duty ratio shall be 50% or less.

2. **Avoid energizing the supply valve/release valve for long periods of time.**

   If a supply valve/release valve is energized for a long period of time, the coil will get hot and the performance may be reduced. Additionally, the peripheral equipment in close proximity may also be badly affected. Use a latching-type supply valve when the supply valve/release valve is energized continuously or when the duration of the energization is longer than the non-energized period each day so that periods of energization can be shortened. But, do not energize the coil on both A and B sides simultaneously when using the latching type.

   Continuous energization of the supply valve/release valve shall be 10 minutes or shorter in duration and the energization period shall be shorter than the non-energized period. Duty ratio shall be 50% or less.

   Take measures for any heat radiation so that the temperature is within the range of supply valve/release valve general specifications when the valve is mounted on the control panel. Please pay special attention to any temperature increases when a manifold type with 3 stations or more is energized continuously or when 3 individual units are placed in close proximity.

---

**How to Use the Supply Valve/Release Valve Plug Connector**

**Caution**

Wiring Specifications

Wiring should be connected as shown below. Connect with the power supply respectively.

- **N.C.**
  - A-C ON (Set)
  - B-C ON (Reset)
  - SOL (–) Black
  - C (+) Red

- **Latching type (DC positive common)**
  - A-C ON (Set)
  - B-C ON (Reset)
  - SOL (–) Black
  - C (+) Red
  - COM. (+) White

---

**Light/Surge Voltage Suppressor of the Supply Valve/Release Valve**

**Caution**

In the latching type, the set side and the reset side energization are indicated by two colors – orange and green.

---

**Note** In case of the latching type
Handling of the V-Port Assembly

⚠️ Caution

1. The construction of the V-port assembly is such that it can be attached or detached at a touch.
   When mounting or removing, turn the case completely until it reaches the position where it cannot turn any further. Otherwise, the V port may come off or be damaged.

2. If it is mounted on the floor, remove the manifold base once from the installation position and lift the body to perform mounting and removal work so that the mounting and removal work can be performed more easily.

3. If the one-touch fitting is the straight type, a hexagon wrench (width across flats: 2 mm) can be used.
   The hexagon hole is resin, so it can be broken if excess torque is applied. Do not apply torque of 0.15 N·m or more. Do not apply any more torque when it reaches the position where it cannot be turned further.

4. When inserting or removing a tube into or out of the one-touch fitting, hold the one-touch fitting body with your fingers.

   Otherwise, excessive force can be applied to the V-port assembly or one-touch fitting assembly, causing air leakage or damage, etc.

 Especially if load is applied in the bending direction against the axial direction of the filter case, the case may be broken.

Piping to the Manifold Base

⚠️ Caution

1. For the PV port of the manifold base, use a fitting whose maximum bore size of the outside dimension is smaller than 12 mm.
   Otherwise, the exterior of the fitting will interfere with the manifold base installation face.
   Recommended fittings: KQ2S06-01S, KQ2S04-01S

2. When mounting or removing the fittings, etc. to and from the manifold base, hold the manifold base with a wrench.
   If the ejector/vacuum pump system is held, it may cause air leakage or damage to the product.

3. The tightening torque for each thread is shown below.
   • 1/8 (PV port): 3 to 5 N·m
   After tightening by hand, increase the tightening by 2 to 3 turns with a proper tightening tool.
   • M5 (PV, PD port): After tightening by hand, increase the tightening by about 1/6 turn with a tightening tool.

Ejector Exhaust

⚠️ Caution

1. The exhaust resistance should be as small as possible to obtain the full ejector performance.
   There should be no shield around the exhaust port for the silencer exhaust specification. For the port exhaust specification, the back pressure increase should be 0.005 MPa (5 kPa) at maximum, as exhaust resistance is generated with some piping bore sizes and piping lengths. As a guide, keep the length not more than 1000 mm when the tube inside diameter is 4.

2. If the sound absorbing material is clogged, it will cause a reduction in the ejector performance.
   In particular, if it is used in a dusty environment, not only the suction filter, but also the silencer can be clogged. It is recommended to replace the sound absorbing material periodically referring to the figure below.

Replacement Procedure
   1) Turn the body upside down. Apply a watchmaker’s screwdriver or your finger to the notch, and slide the silencer cover in the direction indicated by the △ mark.
   2) It makes a click sound and the hook is disconnected. Put your nail to the part A and remove the cover.
   3) Catch the sound absorbing material and pull it out using a watchmaker’s screwdriver.
   4) Insert a new sound absorbing material, and mount the cover by the reverse procedure of the disassembly procedure for reassembly. (Refer to page 191 for the replacement parts number.)

Operating Supply Pressure

⚠️ Caution

1. Use the product within the specified supply pressure range.
   Operation over the specified supply pressure range can cause damage to the product. Especially for the vacuum pump system with the adsorption nozzle, the pressure inside the product can increase due to the release pressure. Use the proper pressure and make sure that the adsorption part is not clogged.
**ZB Series**

**Specific Product Precautions 3**

Be sure to read this before handling the products. Refer to back page 50 for Safety Instructions and pages 49 to 51 for Vacuum Equipment Precautions.

---

### Caution

1. **Single Unit**
   - Do not block the exhaust port of the ejector when the single unit ejector is mounted.
   - When the product is mounted so that the exhaust port side will be against a wall, use a spacer to secure a clearance of at least 1 mm. (Fig. 1)
   - For the single unit, PV port and PD port are oriented downward. When it is installed on a working table, use a bracket for single unit (Fig. 2) or secure a space for piping underneath the ports. (Fig. 3)
   - Bracket part number for single unit: ZB1-BK1-A
     - Two mounting screws (M2 x 14, with washer) and two M2 nuts are included.
   - Recommended fittings: KQ2H04-M5, KQ2L04-M5, KQ2W04-M5

   ![Fig. 1](image1)

   ![Fig. 2](image2)

   ![Fig. 3](image3)

   **Proper tightening torque N·m**
   - 0.075 to 0.096

### Warning

1. The suction filter case is made using a special clear nylon. Do not use it in an atmosphere where it may come in contact with alcohol or other chemical agents.

### Caution

1. **Manifold**
   - When increasing or decreasing the number of manifold stations, order the manifold base (①) exclusive for the required number of stations and the required number of single units of the body type 3 valve (②).
   - Refer to “How to Order” (pages from 184 to 186) for the part numbers for placing an order. The part number for the manifold base is different between the sensor/switch non-mountable base and sensor/switch mountable base.
   - When mounting, check that none of the gaskets, etc. is missing, and tighten the screws to the specified torque shown below. If the tightening torque is exceeded, the body can be broken.

   - **For the manifold with pressure sensor/vacuum pressure switch**
     - Order the manifold base (①) exclusive for the required number of stations and the required number of single units of the body type 3 valve (②), pressure sensor (③) or vacuum pressure switch (④).
     - In this case, the pressure sensor/vacuum pressure switch is tightened together with the single unit (②). (Refer to the figure below.)

   ![Fig. 2](image4)

   - **Take care not to drop the O-ring when mounting (③) and (④).**

---

*ZB Series Specific Product Precautions 3*

Be sure to read this before handling the products. Refer to back page 50 for Safety Instructions and pages 49 to 51 for Vacuum Equipment Precautions.

---

**Single Unit**

1. **Caution**
   - Do not block the exhaust port of the ejector when the single unit ejector is mounted.
   - When the product is mounted so that the exhaust port side will be against a wall, use a spacer to secure a clearance of at least 1 mm. (Fig. 1)
   - For the single unit, PV port and PD port are oriented downward. When it is installed on a working table, use a bracket for single unit (Fig. 2) or secure a space for piping underneath the ports. (Fig. 3)
   - Bracket part number for single unit: ZB1-BK1-A
     - Two mounting screws (M2 x 14, with washer) and two M2 nuts are included.
   - Recommended fittings: KQ2H04-M5, KQ2L04-M5, KQ2W04-M5

   ![Fig. 1](image1)

   ![Fig. 2](image2)

   ![Fig. 3](image3)

   **Proper tightening torque N·m**
   - 0.075 to 0.096

**Warning**

1. The suction filter case is made using a special clear nylon. Do not use it in an atmosphere where it may come in contact with alcohol or other chemical agents.

---

**Caution**

1. **Manifold**
   - When increasing or decreasing the number of manifold stations, order the manifold base (①) exclusive for the required number of stations and the required number of single units of the body type 3 valve (②).
   - Refer to “How to Order” (pages from 184 to 186) for the part numbers for placing an order. The part number for the manifold base is different between the sensor/switch non-mountable base and sensor/switch mountable base.
   - When mounting, check that none of the gaskets, etc. is missing, and tighten the screws to the specified torque shown below. If the tightening torque is exceeded, the body can be broken.

   - **For the manifold with pressure sensor/vacuum pressure switch**
     - Order the manifold base (①) exclusive for the required number of stations and the required number of single units of the body type 3 valve (②), pressure sensor (③) or vacuum pressure switch (④).
     - In this case, the pressure sensor/vacuum pressure switch is tightened together with the single unit (②). (Refer to the figure below.)

   ![Fig. 2](image4)

   - **Take care not to drop the O-ring when mounting (③) and (④).**

---

*ZB Series Specific Product Precautions 3*

Be sure to read this before handling the products. Refer to back page 50 for Safety Instructions and pages 49 to 51 for Vacuum Equipment Precautions.

---

**Single Unit**

1. **Caution**
   - Do not block the exhaust port of the ejector when the single unit ejector is mounted.
   - When the product is mounted so that the exhaust port side will be against a wall, use a spacer to secure a clearance of at least 1 mm. (Fig. 1)
   - For the single unit, PV port and PD port are oriented downward. When it is installed on a working table, use a bracket for single unit (Fig. 2) or secure a space for piping underneath the ports. (Fig. 3)
   - Bracket part number for single unit: ZB1-BK1-A
     - Two mounting screws (M2 x 14, with washer) and two M2 nuts are included.
   - Recommended fittings: KQ2H04-M5, KQ2L04-M5, KQ2W04-M5

   ![Fig. 1](image1)

   ![Fig. 2](image2)

   ![Fig. 3](image3)

   **Proper tightening torque N·m**
   - 0.075 to 0.096

**Warning**

1. The suction filter case is made using a special clear nylon. Do not use it in an atmosphere where it may come in contact with alcohol or other chemical agents.

---

**Caution**

1. **Manifold**
   - When increasing or decreasing the number of manifold stations, order the manifold base (①) exclusive for the required number of stations and the required number of single units of the body type 3 valve (②).
   - Refer to “How to Order” (pages from 184 to 186) for the part numbers for placing an order. The part number for the manifold base is different between the sensor/switch non-mountable base and sensor/switch mountable base.
   - When mounting, check that none of the gaskets, etc. is missing, and tighten the screws to the specified torque shown below. If the tightening torque is exceeded, the body can be broken.

   - **For the manifold with pressure sensor/vacuum pressure switch**
     - Order the manifold base (①) exclusive for the required number of stations and the required number of single units of the body type 3 valve (②), pressure sensor (③) or vacuum pressure switch (④).
     - In this case, the pressure sensor/vacuum pressure switch is tightened together with the single unit (②). (Refer to the figure below.)

   ![Fig. 2](image4)

   - **Take care not to drop the O-ring when mounting (③) and (④).**
ZB Series
Specific Product Precautions 4
Be sure to read this before handling the products. Refer to back page 50 for Safety Instructions and pages 49 to 51 for Vacuum Equipment Precautions.

— Vacuum Break Flow Adjustment Needle —

⚠️ Caution

1. The flow rate characteristics show the representative values of the product itself. They may change depending on piping, circuit and pressure conditions, etc. The flow rate characteristics and the number of rotations of the needle vary due to the range of the specifications of the product.

2. The needle has a retaining mechanism, so it will not turn further when it reaches the rotation stop position.

3. Do not tighten the handle with tools such as nippers. This can result in breakage due to idle turning.

— How to Use Pressure Sensor Assembly —

⚠️ Caution

1. Do not drop, bump or apply excessive impact (980 m/s²) when handling. Even if the sensor body is not damaged, the sensor may suffer internal damage that will lead to malfunction.

2. The tensile strength of the power cord is 35 N, and pulling it with a greater force can cause failure. Hold the body when handling the product.

3. Do not allow repeated bending or stretching forces to be applied to lead wires. Wiring arrangements in which repeated bending stress or stretching force is applied to the lead wires can cause broken wires. If the lead wire can move, fix it near the body of the product. The recommended bending radius of the lead wire is 6 times the outside diameter of the sheath, or 33 times the outside diameter of the insulation material, whichever is larger.

— Blanking Plate Assembly —

⚠️ Caution

1. When mounting the blanking plate assembly, tighten it with the torque shown below.

2. The blanking plate assembly can be used for either the pressure sensor/vacuum pressure switch mountable base or non-mountable base.

3. Mount the blanking plate assembly so that the gasket does not protrude from the plate.

**Proper tightening torque N·m**

0.075 to 0.096

— How to Use Vacuum Pressure Switch Assembly —

⚠️ Caution

1. Do not drop, bump or apply excessive impact (100 m/s²) when handling. Even if the sensor body is not damaged, the sensor may suffer internal damage that will lead to malfunction.

2. The tensile strength of the power cord is 35 N, and pulling it with a greater force can cause failure. Hold the body when handling the product.

3. Do not allow repeated bending or stretching forces to be applied to lead wires. Wiring arrangements in which repeated bending stress or stretching force is applied to the lead wires can cause broken wires. If the lead wire can move, fix it near the body of the product. The recommended bending radius of the lead wire is 6 times the outside diameter of the sheath, or 33 times the outside diameter of the insulation material, whichever is larger.

— Connection —

⚠️ Caution

1. Incorrect wiring can cause the switch to be damaged or malfunction. Connections should only be made when the power supply is turned off.

2. Do not attempt to insert or pull out the connector from the switch while the power is on. Otherwise, it may cause switch output malfunction.

3. Malfunctions stemming from noise may occur if the wire is installed in the same route as that of power or high-voltage cable. Wire the switch independently.

4. Be sure to connect the ground terminal F.G. to ground when using a commercially available switch-mode power supply.
How to Use Vacuum Pressure Switch Assembly

**Warning**

1. The structure of pressure switches is not intended to prevent explosion. Never use in an atmosphere of flammable gas or explosive gas.

**Caution**

1. The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in your system.
2. Do not use the switches in locations where static electricity would be problematic; it may result in the system failure and trouble.

**Caution**

1. Do not attempt to insert or pull out the connector from the switch while the power is on. Otherwise, it may cause switch output malfunction.

Set Pressure Range and Rated Pressure Range

**Caution**

Set the pressure to a value within the rated pressure range.

Set pressure range is the range within which the pressure can be set. Rated pressure range is the pressure range within which the specifications of the switch (accuracy, linearity, etc.) can be satisfied. Values outside of this range can be set as long as they are within the set pressure range, but the specifications cannot be guaranteed.

<table>
<thead>
<tr>
<th>Switch</th>
<th>Pressure range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>–100 kPa</td>
</tr>
<tr>
<td>For vacuum ZB1-ZSE</td>
<td>–101 kPa</td>
</tr>
<tr>
<td></td>
<td>–105 kPa</td>
</tr>
<tr>
<td>For compound pressure ZB1-ZSF</td>
<td>–100 kPa</td>
</tr>
<tr>
<td></td>
<td>–105 kPa</td>
</tr>
</tbody>
</table>

*Rated pressure range of switch
*Set pressure range of switch*