Vacuum Equipment

- Slim Vacuum Ejectors
  - Series EP (Small) ................................................. 948
  - Series EM/EL (Medium) ........................................... 962
  - Series ES (Subminiature) ........................................ 976

※ Specifications in this catalogue may be changed for product performance upgrade without notice.
So that please separately inquire to manufacturer when purchasing the product.
Series **EP**

**EP Vacuum ejector**

- COMPACT STRUCTURE—SLIM TYPE (10MM), LIGHT WEIGHT (88g).
- HIGH VACUUM VALUE (~600MMHG) AT LOW PRESSURE (3kg/cm²)
- LOW NOISE (BLOCKED IN TWO LAYERS)
- VARIOUS FUNCTIONS
  - LED 3 DIGIT VACUUM SWITCH
  - SOLENOID VALVE (VACUUM, BREAK)

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**How to order**

![EP schematic diagram]

1. **Nozzle Diameter**
   - 05: Ø0.5mm
   - 07: Ø0.7mm
   - 10: Ø1.0mm

2. **Body and Exhaust Type**
   - Unit: S - silence exhaust
   - Model: M - silence collecting exhaust at both sides
   - MA - silence individual exhaust

3. **Diameter of Connecting Pipe**
   - Classification: Compressed Air—Supplying Port / Vacuum—Generating Port
     - Unit: S / M (individual)
     - Model: M (both side) / MA (individual)

4. **Number of Station**
   - Blank: for unit
   - Mount: M Type only
   - Maximum number of stations (depending on the nozzle diameter)
   - 01 Rotation: 0.5 rotations
   - 02 Rotation: 0.7 rotations
   - 08 Rotation: 1.0 rotations

5. **Specification of Electronic Valve**
   - Classification: for supplying air / for breaking vacuum
     - V1: N.C. / N.C.
     - V2: N.O. / N.C.
     - V3: N.O. / –
     - V4: N.C. / –

6. **Voltage**
   - 1: AC110V
   - 5: DC24V (standard)

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6: DC12V
   - For non-standard type, please contact us.

5: Vacuum Switch
   - Voltage of power supply: DC24V
     - Blank: No Switch
     - N2: NPN 2-points & analog output
     - For PNP Type, please contact us.

7: Electrical Entry
   - Connector type
     - Blank: 0.6M lead wire
     - C: 2M lead wire

8: Check Valve
   - Blank: Without check valve
     - H: With check valve
## Series EP

### Specification

<table>
<thead>
<tr>
<th>Type</th>
<th>Nozzle diameter (mm)</th>
<th>Max. suction flow l/min (ANR)</th>
<th>Air consumption l/min (ANR)</th>
<th>Standard air pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5</td>
<td>5</td>
<td>12</td>
<td>0.45MPa (64psi)</td>
</tr>
<tr>
<td></td>
<td>0.7</td>
<td>11</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>22</td>
<td>46</td>
<td></td>
</tr>
</tbody>
</table>

### Ejector

- **Fluid**: air
- **Max. operating pressure**: 0.6MPa (87psi)
- **Max. vacuum pressure**: 85KPa (~640mmHg) (~12.3psi)
- **Supply pressure range**: 0.3 ~ 0.6MPa (43.5 ~ 87psi)
- **Operating temperature range**: 0 ~ 60°C (32 ~ 140°F)
- **Suction filter**: polyethylene crystalline (30μm)
- **Weight (g lbs)**: manifold block: left 144g, right 142g, unit type: 86g, 0.194 lbs

### Valve

- **Operating method**: N.C / N.O direct operation
- **Main valve**: poppet
- **Effective orifice (CV value)**: 0.18mm² (Cv 0.01)
- **Operating pressure**: 0.3 ~ 0.6MPa (43.5 ~ 87psi)
- **Electrical entry**: plug connector
- **Power consumption**: below 0.8 (attaching lamp)
- **Regular voltage**: DC12V, DC24V / AC110V, AC220V

### Vacuum switch

- **Power supply voltage**: 12 ~ DC24V ± 10%
- **Current consumption**: 50mA
- **Sensor switch output setting point**: 2
- **Output method**: NPN/PNP open collector
- **Setting pressure range**: ~101.2 ~ 110KPa
- **Control range**: below 2% F.S. (fixed)
- **Indication of operation**: LED (3digit red)
- **Precision**: ±0.25%FS (0 ~ 50°C)
- **Responding time**: below 2.5ms
- **Internal pressure**: 0.2 MPa (29.0psi)

### Color of lead wire

- **Brown**: DC(+)
- **Black**: switch output 1
- **White**: switch output 2
- **Blue**: DC(−)
- **Orange**: analoge output
Series EP

Components

Solenoid valve to break vacuum
- This part positively detaches transferred object from PAD (If electric power is on, air to break vacuum is opened).

Vacuum pressure switch (3 Digit)
- Set vacuum pressure, view display output screen.
- If the set vacuum is obtained, LED red (or green) light is on (N.O.) or off (N.C.) and the output power is off (Connector 4 Pin).

Screw to adjust the quantity of breaking fluid
- Adjust breaking air to promptly put transferred object on the right position.
  - Turn right: breaking air is decreased.
  - Turn left: breaking air is increased.

Inhalation

Exhaust

Compressor

Supply

Filter Regulator
- Standard pressure secure fluid quantity or pressure
- Be sure to use filter below 5m in front of the supplying port (foreign substance is the main cause of malfunction).

Screason
- This part reduces the exhausting noise of compressed air that is drained outwards through vacuum generator.
- In the case of abnormal noise, it is necessary to replace part after inspection.

Filter for Vacuum
- This part prevents dust inhaled through PAD from entering into vacuum generator.
- Regular inspection or replacement is necessary.

PAD
- This part is placed on the transferred product to secure air tight space and it can be absorbed by vacuum sucking force.
The relation between vacuum pressure and inhaled fluid quantity is generally indicated by the fluid property. The vacuum pressure change is also indicated if inhaled fluid quantity changes. The indication refers to a relation of standard pressure from now on. As shown in the diagram, Pmax and Qmax represent max vacuum pressure and max inhaled fluid quantity. The above values are indicated in the catalog.

Method to change the vacuum pressure
1) When the inhaling hole is closed, and it is air-tight, the inhaled fluid quantity could be zero and vacuum pressure reaches Pmax.
2) In the event that the inhaling hole is adjusted to gradually open so as to let air pass (air emission), resulting in the increase of the inhaled fluid quantity, and vacuum pressure drops (the state of P1 and Q1).
3) When opening all inhaling holes, inhaled fluid quantity becomes maximum(Qmax) and the vacuum pressure drops, almost 0 (atmospheric pressure). In similar method, in event that inhaled fluid quantity changes, the vacuum pressure also changes. Thus, in event that no leakage in the vacuum port (vacuum piping) occurs, the vacuum pressure is maximized, but as leakage quantity increases, it drops and in event that leakage quantity is same to maximum inhaled fluid quantity, the vacuum pressure gets almost 0.

When attaching ventilation to work with leakage, take care that vacuum pressure is not too high.

Cautions for use
For unsatisfactory performance or trouble, inspect the product as follows. In event that trouble still remains after this action, be sure to consult the manufacturer,
1. Low vacuum performance owing to insufficient supplying air quantity countermeasure:
   a. Confirmation of supplying air quantity is needed.
   b. Make the pipe length as short as possible.
   c. Make the fitting size as large as possible.
   d. In event that the supplied air port is one a sided type, it is necessary to use both sides.
2. Low performance owing to large piping resistance countermeasure:
   a. Make the pipe length as short as possible.
   b. Make the fitting size as large as possible.
   c. Check whether exhaustion port is blocked by internal and external influence.
   d. Reduce the number of station in the manifold to use.
   e. Use individual exhaust for each station.
**Series EP**

**Cautions for selecting vacuum equipment**

To cope with power failure, select normal open or magnet retention function for the supply valve.

Use a valve with a synthetic effective cross section that is 3 times large than that of the nozzle diameter for vacuum transfer valve.  
Ex) In event of nozzle 1.0  
Effective cross section  
\[0.52 \times 0.785 mm^2 \times 3 \times 3 = 2.35 mm^2\]

- Confirmation of the suction transference of work is needed by vacuum switch.  
- For heavy substance or hazardous substance, confirm gauge as well.  
- For unfavorable surrounding environment attach a filter before pressure switch.

For break valve, select 2/3 port valve of low vacuum specification. Use needle valve to adjust broken fluid quantity.

**Cautions for vacuum circuit and assembled equipment**

<table>
<thead>
<tr>
<th>Number of ejector and pad</th>
<th>Number of vacuum pump and pad</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram 1" /></td>
<td><img src="image2" alt="Diagram 2" /></td>
</tr>
<tr>
<td>Ideal condition: one pad is provided for one ejector.</td>
<td>Ideal condition: one pad is provided for one line.</td>
</tr>
</tbody>
</table>
| When attaching several pads to one ejector, water leakage at one work allows vacuum pressure to drop all other works as well. Perform the following measures,  
- Reduce the fluctuating pressure of suction and non suction by needle valve.  
- Install vacuum maintaining valve at each pad in order to eliminate the influence by other pad when erroneous attachment occurs. | When attaching several pads to one vacuum line, perform the following measures  
- Reduce the fluctuating pressure of suction and non suction by the needle valve.  
- Stabilize the setting by installing a tank and vacuum decreasing/increasing valve (vacuum control valve).  
- Install and attach vacuum maintaining valve at each pad. |
Series EP

Unit type

Manifold type

Components

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>sector body</td>
<td>nylon</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>operator body</td>
<td>nylon</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>tension bolt</td>
<td>C3604 nickel plating</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>screw to adjust fluid quantity</td>
<td>AL nickel plating</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>filter cover Ass'y</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>diffuser Ass'y</td>
<td>AL alumite</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>vacuum valve</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>break valve</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>poppet valve Ass'y</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>check valve</td>
<td>NSR</td>
<td></td>
</tr>
</tbody>
</table>

No. | Description          | Material     | Part number   |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>suction filter (for unit)</td>
<td>polyethylene</td>
<td>EP-033-001</td>
</tr>
<tr>
<td>2</td>
<td>silencer (for unit)</td>
<td>polyethylene</td>
<td>EP-064-060</td>
</tr>
<tr>
<td>3</td>
<td>silencer (for manifold)</td>
<td>polyethylene</td>
<td>EP-064-080</td>
</tr>
<tr>
<td>4</td>
<td>vacuum pressure switch</td>
<td>--</td>
<td>VPS-C-N-P</td>
</tr>
<tr>
<td>5</td>
<td>bolt (manifold type)</td>
<td>chrome steel</td>
<td>M3X0.5X* L</td>
</tr>
</tbody>
</table>

- Bolt size for mounting manifold

<table>
<thead>
<tr>
<th>Number of station</th>
<th>Type A M10x0.5</th>
<th>Type B M10x1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 stations</td>
<td>25L</td>
<td>18L</td>
</tr>
<tr>
<td>3 stations</td>
<td>30L</td>
<td>30L</td>
</tr>
<tr>
<td>4 stations</td>
<td>40L</td>
<td>40L</td>
</tr>
<tr>
<td>4 stations</td>
<td>50L</td>
<td>50L</td>
</tr>
<tr>
<td>5 stations</td>
<td>55L</td>
<td>55L</td>
</tr>
<tr>
<td>6 stations</td>
<td>65L</td>
<td>65L</td>
</tr>
<tr>
<td>8 stations</td>
<td>85L</td>
<td>85L</td>
</tr>
</tbody>
</table>

- Manifold block only

EPM 08 M

1 Manifold station 2 Body and exhaustion type

<table>
<thead>
<tr>
<th>Station</th>
<th>Classification</th>
<th>Supply &amp; Exhaust</th>
<th>Type of Mounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>J02</td>
<td>MA</td>
<td>standard</td>
</tr>
<tr>
<td>02</td>
<td>J02</td>
<td>MA</td>
<td>standard</td>
</tr>
<tr>
<td>03</td>
<td>J02</td>
<td>MA</td>
<td>standard</td>
</tr>
</tbody>
</table>

www.TPCpage.com
www.TPCpneumatics.com
Series EP

Dimensions / Unit type

Switch type

Circuit Diagram EX1

V2 type
- Supplying Valve: N.C Type
- Brake Valve: N.C Type

Vacuum Valve

Brake Valve

Screw to adjust the broken fluid quantity
Vacuum suction port

6.8 (Mount hole)

Vacuum pressure switch

Air supply valve

Vacuum brake valve

Non-switch type

Circuit Diagram EX1

V2 type
- Supplying Valve: N.C Type
- Brake Valve: N.C Type

Vacuum Valve

Brake Valve

Screw to adjust the broken fluid quantity
Vacuum suction port

6.8 (Mount hole)

Vacuum brake valve

Air supply valve

6.8 (Mount hole)

6.8 (Mount hole)

6.8 (Mount hole)

6.8 (Mount hole)

6.8 (Mount hole)

6.8 (Mount hole)

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6.8 (Mount hole)

6.8 (Mount hole)

6.8 (Mount hole)

6.8 (Mount hole)

6.8 (Mount hole)
Series EP

Dimensions / Manifold type

Collective exhaust (for silencer at both sides)

<table>
<thead>
<tr>
<th>Dimensions</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Station</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>L1</td>
<td>27</td>
<td>37</td>
<td>47</td>
<td>57</td>
<td>67</td>
<td>77</td>
<td>87</td>
<td>97</td>
</tr>
<tr>
<td>L2</td>
<td>44</td>
<td>54</td>
<td>64</td>
<td>74</td>
<td>84</td>
<td>94</td>
<td>104</td>
<td>114</td>
</tr>
</tbody>
</table>

Maximum Number of Station for Nozzle Diameter

<table>
<thead>
<tr>
<th>Nozzle Diameter</th>
<th>Maximum Number of Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.5</td>
<td>8 Station</td>
</tr>
<tr>
<td>Ø0.7</td>
<td>6 Station</td>
</tr>
<tr>
<td>Ø1.0</td>
<td>4 Station</td>
</tr>
</tbody>
</table>

Screw to adjust the broken fluid quantity (W4x0.7)
Vacuum suction port (Ø5x0.8)

2-Air supply port (One touch fitting ø8)
2-Pilot exhaust port (One touch fitting ø4)
2-ø3.4 hole (Mount hole)
**Series EP**

**Dimensions / Manifold type**

**Individual exhaust (for Silencer)**

**EP □ MA06 - □ □ □ □ □ □ □ □**

**Screw to adjust the broken fluid quantity (M6x0.7)**

**Vacuum suction port (M6x0.8)**

**Vacuum pressure switch**

**Dimensions (Unit : mm)**

<table>
<thead>
<tr>
<th>Number of Station</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>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>25</td>
<td>35</td>
<td>45</td>
<td>55</td>
<td>65</td>
<td>75</td>
<td>85</td>
<td>95</td>
</tr>
<tr>
<td>L2</td>
<td>32</td>
<td>42</td>
<td>52</td>
<td>62</td>
<td>72</td>
<td>82</td>
<td>92</td>
<td>102</td>
</tr>
</tbody>
</table>

*The number of station can be increased upon request. Your inquiry is welcomed anytime.*
Vacuum Equipment

When the ejector and vacuum pumps are adapted, and work is sucked, during the suction procedure, the suction (exhaustion) responding time and vacuum pressure are changed based on the piping condition and kinds of work. In this case, it is preferred that the product could be used as vacuum system provided with high efficiency as appropriate vacuum equipment is selected.

Order to select

1. To select pad:
   1) Get the diameter of the pad
   2) Get the theoretical Lift force.

2. To select the vacuum transfer valve of an ejector
   1) Get the responding time
   2) Quantity of water leakage in suction work
   3) Size of vacuum supplying valve of ejector with water leakage
   4) Size of vacuum supplying valve of ejector (without water leakage)

1. Pad selection
   1) How to get the diameter of pad
      Lift calculation of pad is adapted so as to obtain the diameter of pad.
      Confirm by actual suction test if necessary.
      The calculation value is just for reference.
      Things which will be checked,
      • What pad diameter is usable,
      → It is preferred to select size less than pad diameter and terminal of work attaching surface by more than 10, so that air leakage during suction can be prevented.
      • Is there air leakage caused by tolerance of work suction surface?
      → To get the tolerance of suction surface or work, so that air passes, set the fluid quantity at the side of vacuum.
      • What about the transference direction and attachment direction of work?
      → Consider the following safety rate when calculating impellent force based on the horizontal and vertical attaching position.

Example Work mass 1kg 1 unit standard type
   Horizontal movement can be performed with 5 Pads
   If it is calculated by the diameter of pad (vacuum pressure? 60kpa)

※ Calculation expression-based method
   \[ \Phi D = \sqrt{\frac{4}{\pi} \times \frac{1}{P} \times \frac{W}{n} \times s \times 1000} \]

2. Method to get the theoretic lift force
   (SI unit)
   \[ 10 = -60 \times A \times 0.1 \times \frac{1}{4} \]
   \[ A = 6.7, \text{cm}^2 \div 5 = 1.34 \]
   \[ \Phi D = \sqrt{\frac{4}{\pi} \times A \times \frac{W}{n} \times \text{Lift force}} \]
   \[ \Phi D = \sqrt{\frac{1.34 \times 4}{\pi}} = 1.3 \text{cm} \]

2. Selection of vacuum transfer valve of ejector
   How to get the suction responding time for suction and transferring work by pad, getting the suction responding time is needed (after the operation of supplying valve, the time required for vacuum pressure in the pad to reach vacuum pressure necessary for suction)
**Series EP**

- vacuum pressure and responding time after the operation of supplying valve (transference valve)

![Graph showing vacuum pressure and time](image)

- \( P_v \): final vacuum pressure
- \( T_1 \): time required to reach the 63% of final vacuum pressure \( P_v \)
- \( T_2 \): time required to reach the 95% of final vacuum pressure \( P_v \)

**Calculating by expression method**

It is possible to obtain the suction response time \( T_1, T_2 \) based on expression:

**Suction response time**

- \( T_1 = \frac{\sqrt{2} \times 60}{Q} \)
- \( T_2 = 3 \times T_1 \)

**Pipe volume**

- For ejector, \( Q_1 = \frac{\pi}{4} \times D^2 \times L \times v \times Q_2 \)
- \( Q_1 \): Maximum inhaled fluid quantity of ejector

- \( D \): Inner diameter of pipe (mm)
- \( L \): Length from ejector and transfer valve to Pad
- \( v \): Pipe volume from ejector and transfer valve to Pad
- \( Q_2 \): Maximum fluid quantity by piping system from ejector and transfer valve to Pad.

Among \( Q, Q_1, Q_2 \), the least fluid quantity.

**Selective graph method**

- Get the pipe volume of tube.
- Get the pipe volume from ejector, and transfer valve of vacuum pump to pad by selective graph.

**How to**

- \( Ex \): How to get the volume of the tube with a diameter of 4mm and a length of 1m.

**Select order**

At the extended line of left axis, horizontal pipe volume of nearly 0.015L is obtained based on the intersection of the tube with vertical length of 1m and inner diameter of 4mm.

- Get the effective cross section of pipe.

**Select order**

Ex) For the tube size \( \varnothing 4, 1m \)

**Select order**

At the extended line of left axis, horizontal effective cross section of nearly 6.1mm² is obtained based on the intersection of the tube with a vertical length of 1m and an inner diameter of 4mm.

- The suction responding time:
  - With a selective graph, obtain the suction responding time \( T_1, T_2 \) which indicates the duration from operation of supplying valve (transfer valve) which controls the ejector to reach a designated vacuum pressure.
**How to**

Maximum suction fluid quantity of vacuum ejector 07 is 12L/min(ANR). Pipe volume of the pipe system is 0.015L. Under this condition, getting the suction responding time required to drain the pressure in the pipe system up to 63% of final vacuum pressure (T1) is needed.

**Select order**

With the intersection of maximum inhaling quantity of vacuum ejector, 12L/min(ANR) and pipe volume, 0.015L, it is needed to obtain the suction responding time T1 required to reach 63% of maximum vacuum pressure. (1) in the selected graph → (2) T1, approximately 0.23 second

Ex) By using valve with effective cross section of 18mm² and intersection of 3L, it is possible to obtain the exhaustion responding time T2 required to reach 95% of final vacuum pressure, (3) In the selected graph → (4)

**Select order**

By using valve with effective cross section of 6.1mm² and intersection of pipe volume 3L, it is possible to obtain the exhaustion responding time T2 required to reach 95% of final vacuum pressure. (T2, approximately 22 seconds)

**Quantity of water leakage when the suction of work is performed**

Get the quantity of water leakage:
For a sucking ejector, because pad sucks work and inhales atmosphere based on varying kinds of work, it is impossible to obtain the vacuum pressure in the pad drops and pressure required for suction.
To suck work in this specification, considering the quantity of water leakage from work and selecting the size of vacuum transfer valve of the ejector.
Series EP

Vacuum Digital pressure switch

**Specification**

<table>
<thead>
<tr>
<th>Type</th>
<th>VPS-N2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid</td>
<td>Air</td>
</tr>
<tr>
<td>Range of applied temperature °C (°F)</td>
<td>-20 ~ 80°C (-4~176°F) (automatic temperature)</td>
</tr>
<tr>
<td>Range of set pressure</td>
<td>0 ~ 100 kPa (0~14.5 psig)</td>
</tr>
<tr>
<td>Internal Pressure</td>
<td>0.2 MPa (29 psig)</td>
</tr>
<tr>
<td>Voltage</td>
<td>DC 24V±10%</td>
</tr>
<tr>
<td>Current Consumption</td>
<td>Below 17 mA (DC24V ON)</td>
</tr>
<tr>
<td>Output</td>
<td>set (Out 1: red, 2: green)</td>
</tr>
<tr>
<td>Width of control</td>
<td>Below 3% F.S. (fixed)</td>
</tr>
<tr>
<td>number of set points</td>
<td>2 point</td>
</tr>
<tr>
<td>Operation indicating lamp</td>
<td>Variable type by push button</td>
</tr>
<tr>
<td>precision</td>
<td>±0.5% F.S. based on 0<del>55°C (32</del>131°F), 25°C (77°F) standard</td>
</tr>
<tr>
<td>Display</td>
<td>LED (3Digit)</td>
</tr>
</tbody>
</table>

**Example of wiring in the internal circuit**

**How to set pressure**

1. Press Model Key + Up key (longer than 3 seconds)
   - Display screen: "A-L"
   - Step 1: After 3 seconds, output mode 1: "A-L"
   - Step 2: Press down or up key (convert to desired set pressure, range 0~100)
   - "-60" press down: "-60" press up: "-60"
   - Step 3: Press Model Key (Setting pressure)
   - Input completed: "-60"
   - Step 4: Press Model Key + Up key
   - Output mode 2: "A-H"
   - Step 5: Repeat step 2, 3
   - "-90" set pressure reached: "-90"
   - Step 6: Press Up Key + Down key
   - Initial state: "-0"

**Dimensions**

**How to Order**

- Switch of Vacuum Pressure
- Output Method: NPN: output & analog output
- Method to Pull out Switch Lead Wire
  - *connector type C: Length of lead wire~2M*

- VPS N1 C

- 3 Digit Display
- Down button
- Up button
- MODE button
**Series EP**

**During attaching**

1. **Warning**
   Do not block the exhaustion hole of the ejector.

**While attaching**

1. **Cautions**
   1. Linear piping should be performed with shortest length at both vacuum side and supplying side.
   2. A large size effective cross section of piping should be provided at the exhaustion of the ejector.
   3. No damage or loss by bending on the piping.

**Environment when in use**

1. **Warning**
   1. It is preferred that the product should not be adapted at place in which corrosive gas, chemical, sea water, water, vapor, etc. are provided.
   2. The use of the product in an explosive environment should be avoided.
   3. The use of the product cohere with vibration or shock should be avoided. It is needed to check the specification of each series.
   4. It is needed to protect the product with protective cover in environment of light input.
   5. When heat source is nearby, it is needed to block the radiant heat.
   6. When water, oil, welding spectrum are supposed to be attached, it is needed to provide protective measure for the place.
   7. When it takes long time to change, it is needed to protect against heat. With the above protection, installing the environment of vacuum unit could stay within the temperature range of vacuum unit specification.

**Repair and inspection**

1. **Warning**
   1. Regular removal should be performed so that the foreign substance is not inputted into suction filter, silencer and pad. If not, blocking the mesh of filter, silencer and pad could result. In particular, it is preferred to select filter with large capacity of fluid quantity for a place with much dust.

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**Common cautions for installing vacuum equipment**

**Warning**

1. Perform a safety check to prepare against a possible accident caused by a reduction of vacuum pressure due to power failure or trouble of air source. In event that vacuum pad loses suction force because of reduction of vacuum power, failure could result during transportation.
2. Vacuum specification is needed for vacuum transfer valve and vacuum break valves. Always use valve with vacuum specification.
3. Select ejector with appropriate inhaling quantity, (when water leakage occurs). Defective suction may occur due to insufficient inhaled fluid quantity.
4. Difficulty could occur when setting vacuum switch when inhaled fluid quantity is larger than necessary. Select appropriate ejector.
5. When more than 2 pads are adapted and piped to one ejector, and in addition when one pad is separated from work, detach the other pad from work because vacuum pressure could decrease.
6. Make sure to pipe tube using enough effective cross section. In addition, for vacuum piping, select pipe with effective cross section through which maximum inhale fluid quantity of ejector. Pay attention so as to prevent any unnecessary tube parts or water leakage in the piping.

**Design · Selection**

- Provide piping design suitable for air consumption of each ejector for air supplying side.
- Reduce the pressure reinforcement of ejector to increase the effective cross section of tube, pipe nipple, valve and so on. In addition, design the air source based on maximum air consumption of ejector and air consumption of other air circuit.

**Cautions**

Move to for related equipments such as direction control equipment, driving equipment, etc., (refer to the cautions in each catalog).