Vacuum suction nozzle
OVEM-...-1P/1N

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Operating instructions
8038307
1407a
[8038309]

Original: de

Vacuum suction nozzle OVEM-...-1P/1N

1 Product description
1.1 Overview

1.2 Features

<table>
<thead>
<tr>
<th>Features</th>
<th>Code</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum suction nozzle</td>
<td>OVLM</td>
<td>Vacuum suction nozzle with vacuum solenoid valve ON/OFF and manual override</td>
</tr>
<tr>
<td>Nominal width of laval nozzle</td>
<td>-05</td>
<td>0.45 mm</td>
</tr>
<tr>
<td></td>
<td>-07</td>
<td>0.7 mm</td>
</tr>
<tr>
<td></td>
<td>-10</td>
<td>0.95 mm</td>
</tr>
<tr>
<td></td>
<td>-14</td>
<td>1.4 mm</td>
</tr>
<tr>
<td></td>
<td>-20</td>
<td>2.0 mm</td>
</tr>
<tr>
<td>Vacuum type</td>
<td>-H</td>
<td>High vacuum</td>
</tr>
<tr>
<td></td>
<td>-L</td>
<td>High suction volume</td>
</tr>
<tr>
<td>Housing size/width</td>
<td>-B</td>
<td>20 mm wide, ISO standard</td>
</tr>
<tr>
<td></td>
<td>-BN</td>
<td>20 mm wide, NPT</td>
</tr>
</tbody>
</table>

Fig. 2 Overview of variants

2 Fast commissioning with factory setting

The vacuum suction nozzle is available with the following factory settings:
- Switching characteristics of the electrical output: threshold value comparator
- Switching element function of the electrical output: NO (normally open)
- Additional factory settings ➜ Chapter 12.1

1. Mount the vacuum suction nozzle ( ➜ Chapter 5.1).
2. Connect the vacuum suction nozzle pneumatically ( ➜ Chapter 5.2).
3. Connect the vacuum suction nozzle electrically ( ➜ Chapter 5.3).

The vacuum suction nozzle can be placed in operation.

If you do not wish to use the factory settings, you can teach a switching point for the switching output ( ➜ Chapter 6.2).

The factory settings are not reproducible.

Fig. 1 Control sections and connections

1 Solenoid valve, ejector pulse (E)
2 Solenoid valve, vacuum ON/OFF (V)
3 Supply port
4 Exhaust port / silencer
5 Vacuum port
6 Replaceable filter element
7 Housing with mounting holes
8 Slide for changing the filter
9 Filter housing with inspection window
10 Flow control screw for adjusting the intensity of the ejector pulse
11 EDIT button(1)
12 LED for switching output – out(1)
13 LED for switching input – vacuum on/off
14 LED for switching input – ejector pulse
15 Plug for electrical connection (M12)

1) LED and EDIT button not present on models without vacuum sensor

3 Function and application

The OVEM vacuum suction nozzle is intended for use to generate vacuum and is only intended for use inside buildings.

The vacuum generated is used together with a suction gripper to create a force that can grip a workpiece so that it can be transported. The vacuum suction nozzle is available with a variety of pneumatic and electric switching functions.

The taught setpoint value for the generated vacuum is monitored via an integrated vacuum sensor (-1P, -1N). If the setpoint value is reached or if it is not reached due to malfunctions (e.g. leakage, dropped workpiece), the vacuum sensor emits an electrical signal and the LED indicates whether or not the taught setpoint was reached.

The supply of compressed air for vacuum generation is controlled by an integrated solenoid valve. The solenoid valve can be supplied with two different switching functions, NC and NO. The vacuum is generated as soon as compressed air is applied to the vacuum suction nozzle and the voltage is switched on (NC: -OE, -CN) or off (NO: -CE, -CN) as defined by the switching function of the solenoid valve [2]. The integrated solenoid valve [1] can be used to control and generate an ejector pulse to release the workpiece safely from the suction cup and to purge the vacuum rapidly.
3.1 Switching output and switching inputs

The vacuum is monitored with the aid of a piezoresistive sensor element. The vacuum sensor converts pneumatic pressure values and supplies electrical signals. When the taught switching point is reached, the vacuum sensor closes a circuit, supplying an electrical signal. This signal can be used for control functions.

The vacuum suction nozzle can be connected to higher-level systems by means of a switching output (-1P, -1N) and switching inputs. The switching output is configured as normally open. The output's switching function is defined as a threshold value comparator.

The input signals determine the actuation of the solenoid valves for control of the compressed air and the ejector pulse.

![Switching characteristics of switching inputs](image)

<table>
<thead>
<tr>
<th>Code</th>
<th>Switching output</th>
<th>Switching inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1P</td>
<td>Switching output</td>
<td>Switching inputs</td>
</tr>
<tr>
<td></td>
<td>Positive switching</td>
<td>Positive switching</td>
</tr>
<tr>
<td>-1N</td>
<td>Switching output</td>
<td>Switching inputs</td>
</tr>
<tr>
<td></td>
<td>Negative switching</td>
<td>Negative switching</td>
</tr>
</tbody>
</table>

3.2 Switching point and hysteresis

Threshold value comparator

![Settings for switching points SP, hysteresis Hy and function reserve FR](image)

Note

The switching point is determined from the teach pressure and the functional reserve. A function reserve (35% of the teach pressure) is deducted from the teach pressure (SP = TP – 0.35*TP). For example, with a teach pressure of –0.5 bar, a switching point of –0.33 bar is set.

The hysteresis has a fixed value.

4 Requirements for product use

Note

Improper handling can result in malfunctions.

- Make sure that the specifications shown below are always observed.
- Compare the maximum values specified in these operating instructions with your actual application (e.g. operating media, pressures, forces, torques, temperatures, masses, speeds, operating voltages, flow rates).
- Take into consideration the ambient conditions at the location of use.
- Comply with the regulations of the workers' compensation trade association, the German Technical Control Board (TÜV), of the VDE or relevant national regulations.

5 Installation

It can be mounted in any position. Mount the vacuum suction nozzle and connect its tubing in such a way that no condensation from the compressed air lines can gather in the device.

Note

An unfavourable mounting position can result in increased sound pressure.

- During installation, make sure that the exhaust can flow without hindrance.

5.1 Mechanical

Direct mounting

![Direct mounting](image)
Mount the vacuum suction nozzle at the intended position with two screws (size of the mounting screws Fig. 8), assembly torque max. 2.5 Nm. We recommend the use of corresponding washers.

Mounting with accessories

The required accessories are listed in Accessories.

H-rail mounting

4. Mount the H-rail mounting on the back cover of the vacuum suction nozzle with 4 screws, size M3, with max. assembly torque 0.8 Nm.
5. Hook the vacuum suction nozzle onto the H-rail and press in the direction of the arrow.
6. Secure the vacuum suction nozzle to the H-rail with screw 1, fastening it with max. torque 1 Nm.

Mounting bracket

Mount the vacuum suction nozzle at the intended position with two screws (size of the mounting screws Fig. 8), assembly torque max. 2.5 Nm. We recommend the use of corresponding washers.

Common supply manifold

The vacuum suction nozzle can also be mounted on a common supply manifold with up to 8 positions. Information on mounting Mounting instructions OABM-P-...

5.2 Pneumatic

- Connect the QS push-in connectors (-QS, -QO, -PL, -PO) with a corresponding hose.
- Usage of the type PUN hose is recommended.
- When selecting the tubing for tubing connection on a vacuum suction nozzle with threaded ports (-GN, -GO), be mindful of the minimum internal diameter for tubing stated in Fig. 11.

<table>
<thead>
<tr>
<th>Type</th>
<th>OVEM-05 GN/GO</th>
<th>OVEM-07 GN/GO</th>
<th>OVEM-10 GN/GO</th>
<th>OVEM-14/-20 GN/GO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube length</td>
<td>&lt; 0.5 m</td>
<td>&lt; 0.5 m</td>
<td>&lt; 0.5 m</td>
<td>&lt; 0.5 m</td>
</tr>
<tr>
<td></td>
<td>&lt; 2 m</td>
<td>&lt; 2 m</td>
<td>&lt; 2 m</td>
<td>&lt; 2 m</td>
</tr>
</tbody>
</table>

Minimum tube internal diameter [mm]

<table>
<thead>
<tr>
<th>Port 1</th>
<th>Compressed air</th>
<th>1</th>
<th>2</th>
<th>1.5</th>
<th>2</th>
<th>2</th>
<th>3</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port 2</td>
<td>Vacuum</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5.5</td>
<td>6</td>
</tr>
<tr>
<td>Port 3</td>
<td>Exhaust air</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5.5</td>
<td>6</td>
</tr>
</tbody>
</table>

Fig. 8 Size of mounting screws

If required, you can extend the pneumatic silencer for OVEM-07/-10/-14/-20 with a pneumatic silencer extension (Chapter 11 Accessories).

5.3 Electric

Warning

Use only power sources which guarantee reliable electrical isolation of the operating voltage in accordance with IEC/EN 60204-1. Also observe the general requirements for PELV power circuits in accordance with IEC/EN 60204-1.

Note

Long signal lines reduce the resistance to interference.
- Make sure that the signal lines are always shorter than 30 m.
- Make sure that the operating voltage supply is 24 V DC ±15 %.
  The solenoid coils and electrical components could be damaged if the maximum permitted switching voltage is exceeded.
- Connect the cable socket to the plug connector.
- Wire the vacuum suction nozzle as shown in Fig. 12.

Plug connector M12x1, 5-pin2)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable colours 1)</th>
<th>Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brown (BN)</td>
<td>Supply voltage +24 V DC</td>
</tr>
<tr>
<td>2</td>
<td>White (WH)</td>
<td>Switching input for vacuum ON/OFF</td>
</tr>
<tr>
<td>3</td>
<td>Blue (BU)</td>
<td>0 V</td>
</tr>
<tr>
<td>4</td>
<td>Black (BK)</td>
<td>Switching output (Out) 3)</td>
</tr>
<tr>
<td>5</td>
<td>Grey (GY)</td>
<td>Switching input for ejector pulse ON/OFF</td>
</tr>
</tbody>
</table>

1) Using the plug socket with cable as specified in Accessories.
2) Max. assembly torque 0.3 Nm.
3) Pin 4 not used in types without vacuum sensor

Fig. 12 Pin allocation

Circuit diagrams

OVEM-...-1P

OVEM-...-1N

OVEM without vacuum sensor

Fig. 13 Circuit diagrams for vacuum suction nozzle
6 Commissioning
- Observe the transport area of the workpiece and make sure that:
  - Nobody is positioned underneath the workpiece
  - There are no objects within the transporting path of the workpiece (e.g. by means of a protective screen).
- Avoid long tubing and large volumes between the suction grippers and the vacuum suction nozzle.
  A large volume leads to long evacuation times and possibly incorrect settings on the vacuum sensor.
- Take into account accelerations, external influences, etc. on the workpiece when setting the required holding force.

→ Note
Unintentional pressing of the Edit button (for longer than two seconds) may cause a modification of the preset switching pressure.
- Make sure that the Edit button is only pressed intentionally. Otherwise a switching pressure of 0 bar would be set if there was no operating pressure, for example.

→ Note
To prevent damage to the EDIT button, actuate the EDIT button with a blunt object only.

6.1 Building up the vacuum:
1. Pressurize the vacuum suction nozzle with an operating pressure at the supply port \( \text{[1]} \).
2. Switch on the operating voltage.
3. Energise the switching input for vacuum ON/OFF.

→ The solenoid valve \( [2] \) (-CN, -CE) is opened (or closed in the case of -OE, -ON). The compressed air flows through the vacuum suction nozzle and generates a corresponding vacuum at the vacuum port \( [5] \). The vacuum can be set by changing the operating pressure.

6.2 Setting the vacuum sensor:
The setting of the vacuum sensor for monitoring the vacuum depends on the application.
The vacuum generator is preset at the factory (factory settings → Chapter 12.1). These settings can be adapted to the application quickly by teaching a switching point.

Teaching a switching point:
1. Switch on the operating voltage.
2. Set the desired teach pressure (e.g. object gripped).
3. Press and hold the EDIT button \( [1] \) > 2 sec.

→ The LED Out \( [1] \) lights up.
4. Release the EDIT button \( [1] \)

→ The current teach point (TP) minus the function reserve is saved as the switching point (SP) and is applied for the switching output.
5. Carry out a test run, varying the pressure to check whether the vacuum suction nozzle's switching output switches as desired.

6.3 Setting the ejector pulse (-OE, -CE):
The vacuum suction nozzle must be in its initial position.
The workpiece must be held reliably against the suction gripper by the vacuum generated.
The intensity of the ejector pulse can be adjusted.
You can set the intensity of the ejector pulse by adjusting the flow control screw \( [30] \).
   → The ejector pulse channel is now closed. No ejector pulse is generated.
2. Unscrew the flow control screw until the required intensity of the ejector pulse is reached.
3. Test the settings of the ejector pulse before commissioning.

6.4 Reducing the vacuum:
OVEM.....-CE/-OE
When the solenoid valve for ejector pulse \( [1] \) is switched on, an ejector pulse is generated.

→ The vacuum port \( [5] \) is pressurized. The workpiece detaches itself from the suction gripper.

→ Note
When large suction cups are used, flow resistance in the suction cup as the cup lifts away from the workpiece can cause the build-up of a vacuum independent of the device. This might mean that the workpiece being set down does not detach from the suction cup, even when the ejector pulse is set to a long duration. Therefore, switch on the solenoid valve for ejector pulse \( [1] \) shortly before the suction cup is lifted away, to ensure that the ejector pulse is active as the suction cup lifts away.

7 Operation

→ Note
The last saved settings are retained in the event of a power failure.

7.1 Manual override

Fig. 14 Operating the manual override

The manual override can be used to switch the solenoid valve manually when it is not being actuated or not supplied with power. The manual override is non-locking (automatic reset).
- Press down the plunger of the manual override with a blunt pin.
- The solenoid valve is brought into the switching status.
- Remove the pin.
The plunger of the manual override and the solenoid valve move to their initial position.

7.2 Vacuum suction nozzle status display

<table>
<thead>
<tr>
<th>LED</th>
<th>Status</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out</td>
<td>Off</td>
<td>Switching point not reached</td>
</tr>
<tr>
<td></td>
<td>Lights up</td>
<td>Switching point is reached</td>
</tr>
<tr>
<td></td>
<td>Flashes</td>
<td>Teach procedure is started</td>
</tr>
<tr>
<td>Vacuum On/Off</td>
<td>CE/CN</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Lights up</td>
<td>Solenoid valve for vacuum ON/OFF is switched, vacuum is generated</td>
</tr>
<tr>
<td></td>
<td>OE/ON</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Lights up</td>
<td>Solenoid valve for vacuum ON/OFF is switched, no vacuum is generated</td>
</tr>
<tr>
<td>Eject</td>
<td>Off</td>
<td>Solenoid valve for ejector pulse is not switched, no ejector pulse generated</td>
</tr>
<tr>
<td></td>
<td>Lights up</td>
<td>Solenoid valve for ejector pulse is switched, an ejector pulse is generated</td>
</tr>
</tbody>
</table>

Fig. 15 Vacuum suction nozzle status display

8 Service
- Switch off the following energy sources before cleaning the exterior of the device:
  - operating voltage
  - compressed air
- If necessary, clean the outside of the vacuum suction nozzle.
  Permissible cleaning agents are soap suds (max. +60 °C) and all non-abrasive agents.
- Check whether the air filter is contaminated.
Cleaning the air filter:

1. Vent the vacuum suction nozzle.
3. Pull the filter out.
   (Use a screwdriver to help to bring out the filter, if necessary)
5. Push the filter [2] into its housing using the slide [1].
6. Push in the slide [1].

9 Fault clearance

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece does not release from the suction cup</td>
<td>A vacuum has built up when lifting large suction cups quickly</td>
<td>Increase the intensity of the ejector pulse</td>
</tr>
<tr>
<td>Workpiece does not release from the suction cup</td>
<td>Tubing used between the suction cup and vacuum suction nozzle is wrongly sized (tube is too long and/or tube internal diameter is too small)</td>
<td>Replace hose, for hose requirements ➔ Chapter 5.2</td>
</tr>
<tr>
<td>No LED display for switching inputs</td>
<td>Supply voltage not applied or no permitted operating voltage</td>
<td>Switch on supply voltage / maintain permitted operating voltage range</td>
</tr>
<tr>
<td>No LED display for switching output</td>
<td>Pressure failure</td>
<td>Eliminate pressure failure</td>
</tr>
<tr>
<td>LED display or switching output does not react in accordance with the settings made</td>
<td>Vacuum suction nozzle operated with impermissible medium</td>
<td>Replace the vacuum suction nozzle and operate only with compressed air</td>
</tr>
<tr>
<td>No control signal</td>
<td>Device defective</td>
<td>Replace the device</td>
</tr>
<tr>
<td>No LED display for switching output</td>
<td>Connections swapped (incorrect polarity)</td>
<td>Wire the device in accordance with the connection arrangement</td>
</tr>
<tr>
<td>No control signal</td>
<td>Device defective</td>
<td>Replace the device</td>
</tr>
<tr>
<td>No control signal</td>
<td>Device defective</td>
<td>Replace the device</td>
</tr>
<tr>
<td>Device defective</td>
<td>Device defective</td>
<td>Replace the device</td>
</tr>
<tr>
<td>Device defective</td>
<td>Device defective</td>
<td>Replace the device</td>
</tr>
</tbody>
</table>

10 Disassembly

1. Switch off the following sources of energy before dismantling:
   - operating voltage
   - compressed air.
2. Disconnect the electrical and pneumatic connections to the vacuum suction nozzle.
3. Remove the vacuum suction nozzle.

11 Accessories

<table>
<thead>
<tr>
<th>Designation</th>
<th>OVEM-05</th>
<th>OVEM-07/10</th>
<th>OVEM-14/20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecting cable M12x1, 5-pin, 2.5 m</td>
<td>NEBU-M12G5-K-2.5-LES</td>
<td>NEBU-M12G5-K-2.5-LES</td>
<td></td>
</tr>
<tr>
<td>Connecting cable M12x1, 5-pin, 5 m</td>
<td>NEBU-M12G5-K-5-LES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H-rail mounting</td>
<td>OABM-H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting bracket</td>
<td>HRM-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silencer extension</td>
<td>–</td>
<td>UOMS-16</td>
<td>UOMS-14</td>
</tr>
<tr>
<td>Common supply manifold</td>
<td>OABM-P-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OABM-P-6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OABM-P-8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blanking plug</td>
<td>DASC-G1-P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 16 Removing/installing the filter

Fig. 17 Fault clearance

Fig. 18 Accessories

Fig. 19 Technical data

12.1 Factory setting

<table>
<thead>
<tr>
<th>OVEM-…</th>
<th>Out</th>
<th>Switching point (SP)</th>
<th>–0.4 bar</th>
<th>(Fixed hysteresis (HYS))</th>
<th>20 mbar</th>
</tr>
</thead>
</table>

1) Both solenoid valves are actuated
2) The product is intended for use in industrial environments. Measures for interference suppression may need to be implemented in residential areas.
3) % FS = % of the final value in the measuring range (full-scale)
4) Technical feature only relevant for types with vacuum sensor

Fig. 19 Technical data

Fig. 20 Factory setting
### 12.2 Circuit symbols

<table>
<thead>
<tr>
<th>Symbol with vacuum sensor (-1P/-1N)</th>
<th>without vacuum sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>-QO/-GO-CN...</td>
<td></td>
</tr>
<tr>
<td>-QS/-GN-CN...</td>
<td></td>
</tr>
<tr>
<td>-QO/-GO-ON...</td>
<td></td>
</tr>
<tr>
<td>-QS/-GN-ON...</td>
<td></td>
</tr>
<tr>
<td>-QO/-GO-CE...</td>
<td></td>
</tr>
<tr>
<td>-QS/-GN-CE...</td>
<td></td>
</tr>
<tr>
<td>-QO/-GO-OE...</td>
<td></td>
</tr>
<tr>
<td>-QS/-GN-OE...</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 21 Circuit symbols for the functions