

## Vacuum generators

**FESTO**



# Vacuum generators OVEM

Key features

## At a glance

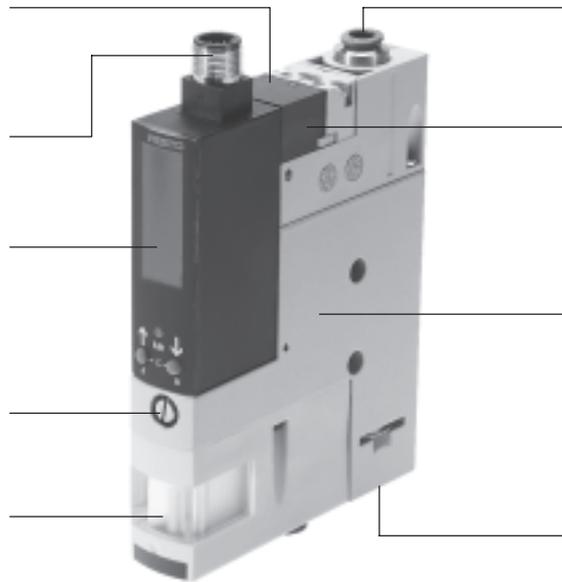
Accelerated vacuum reduction for placing the workpiece safely, through the use of an integrated solenoid valve to control the ejector pulse

Central electrical connection with M12 plug

Monitoring and visualization of the vacuum by means of a vacuum switch with LCD display (inchHg)

Adjustment of the ejector impulse via a flow control screw

An integrated filter prevents soiling of the vacuum generator



Quick and secure installation thanks to a QS fitting

Fast vacuum build-up through integrated solenoid valve for controlling the compressed air supply

Pressure drop is prevented by an integrated non-return valve

Maintenance-free operation and reduced noise level through integrated, open silencer

## The innovative vacuum generator

### Wide range of configuration options

The modular vacuum generator series OVEM offers a wide range of individual selectable functions, making it possible to achieve a solution for the most varied of applications.

- 3 nominal sizes  
0.45 ... 0.95 mm
- Integrated solenoid valve for controlling the ejector pulse

- Integrated solenoid valve for controlling the compressed air using two different switching functions
  - NC – normally closed
  - NO – normally open

### Space-saving

All functions are compactly integrated in one unit.

- No protruding elements such as e.g. valves or vacuum switches
- Space-optimised installation is possible as all the control elements can be accessed from one side

### Process reliability

- Permanent monitoring of the entire vacuum system via a vacuum switch with LCD display to reduce downtimes (condition monitoring)
- Prevention of pressure loss by means of an integrated air-saving function in conjunction with an integrated non-return valve

### Cost-effective

- Short switching times thanks to integrated solenoid valves
  - Vacuum ON/OFF
  - Ejector pulse
- Quick, precise and safe placement of the workpiece via the ejector pulse
- Cost saving through integrated air-saving function
- Cost saving through preventive maintenance/service thanks to maintenance indicator

### User-friendly

- Simple installation with M12 plug and QS fittings
- Simple mounting via screws
- All control elements on one side
- Vacuum is displayed numerically and as a bar chart on the LCD display
- Important parameters and diagnostic information are displayed on the LCD display
- Quiet operation due to integrated silencers

### Easy to maintain

- Integrated filter with inspection window for maintenance display
- Reduced soiling of the vacuum generator thanks to an open silencer

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## Operational principle of OVEM

### Vacuum ON/OFF

The compressed air supply is controlled by an integrated solenoid valve. The solenoid valve can be supplied in two different switching functions NC/NO.

- NC – normally closed:  
The vacuum is generated when the vacuum generator is pressurised with compressed air and the solenoid valve has been switched.
- NO – normally open:  
The vacuum is generated when the vacuum generator is pressurised with compressed air and the solenoid valve is in the normal position.

### Ejector pulse

With a second integrated solenoid valve, an ejector pulse is activated and generated after the vacuum is switched off to release the workpiece safely from the suction cup and to reduce the vacuum quickly.

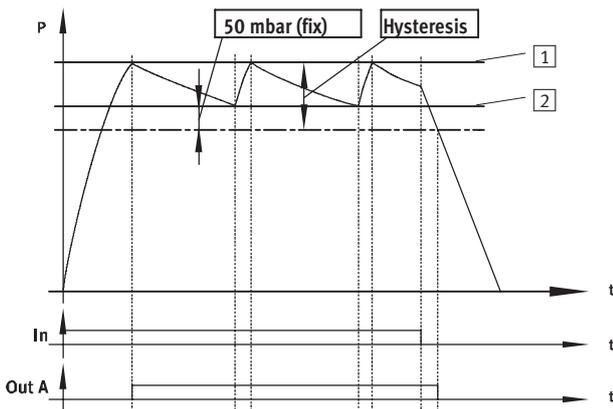
### Vacuum switch

The set reference value for the generated vacuum is monitored by an integrated vacuum switch. If the reference value is reached or if it is not reached due to malfunctions (e.g. leak, dropped workpiece), the vacuum switch emits an electrical signal. Vacuum monitoring is the basis for the vacuum generator's air-saving function.

### Switching outputs/Switching input

The vacuum generator can be connected to higher-level systems by means of two digital switching outputs and one digital switching input. The switching outputs can be configured as normally open or normally closed contacts. The switching function of the outputs can be stipulated as a threshold or window comparator.

## Air-saving function LS (-CE, -OE)



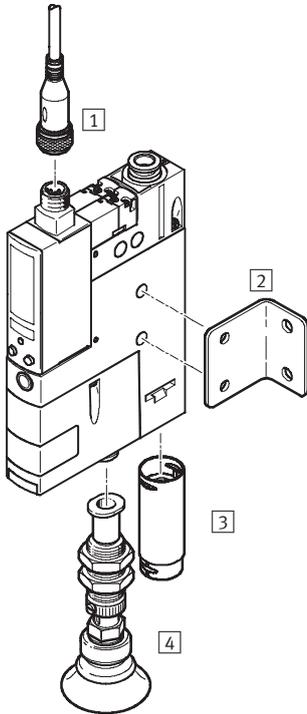
If the desired threshold **1** is reached for the vacuum, vacuum generation is automatically switched off. A non-return valve prevents the reduction of the vacuum. Nonetheless, a leak (due to e. g. rough workpiece surfaces) will slowly reduce

the vacuum. If the pressure drops below the set threshold value **2** vacuum generation is switched on automatically. Vacuum is generated until the set threshold value **1** is reached again.

# Vacuum generators OVEM

Peripherals overview

**Peripherals overview**



| Mounting attachments and accessories |                                | OVEM |       | → Page/<br>Internet |
|--------------------------------------|--------------------------------|------|-------|---------------------|
|                                      |                                | 05   | 07/10 |                     |
| 1                                    | Connecting cable<br>NEBU-M12G5 | ■    | ■     | nebu                |
| 2                                    | Mounting bracket<br>HRM-1      | ■    | ■     | hrm-1               |
| 3                                    | Silencer extension<br>UOMS-1/4 | -    | ■     | uoms                |
| 4                                    | Suction gripper<br>- ESG       | ■    | ■     | esg                 |
| -                                    | Suction cup holder<br>ESH      | ■    | ■     | esh                 |
| -                                    | Suction cup<br>ESS             | ■    | ■     | ess                 |

# Vacuum generators OVEM

Type codes

|                                                   |                                            |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
|---------------------------------------------------|--------------------------------------------|------|---|----|---|---|---|---|---|---|----|---|----|---|---|---|----|--|
|                                                   |                                            | OVEM | - | 10 | - | H | - | B | N | - | QO | - | CE | - | N | - | 2P |  |
| <b>Type</b>                                       |                                            |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| OVEM                                              | Vacuum generator                           |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| <b>Nominal size of Laval nozzle [mm]</b>          |                                            |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| 05                                                | 0.45                                       |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| 07                                                | 0.7                                        |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| 10                                                | 0.95                                       |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| <b>Ejector characteristic</b>                     |                                            |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| H                                                 | High vacuum                                |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| <b>Housing width</b>                              |                                            |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| B                                                 | Grid dimension 20 mm                       |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| <b>Type</b>                                       |                                            |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| N                                                 | NPT/inch                                   |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| <b>Pneumatic connections</b>                      |                                            |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| QO                                                | P-V via QS fitting,<br>R via open silencer |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| <b>Normal position of the vacuum generator</b>    |                                            |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| ON                                                | NO, normally open (vacuum generation)      |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| OE                                                | NO, normally open with ejector pulse       |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| CN                                                | NC, normally closed (vacuum generation)    |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| CE                                                | NC, normally closed with ejector pulse     |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| <b>Electrical connection</b>                      |                                            |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| N                                                 | M12 plug (5-pin)                           |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| <b>Vacuum sensor, electrical switching output</b> |                                            |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |
| 2P                                                | 2 switching outputs PNP                    |      |   |    |   |   |   |   |   |   |    |   |    |   |   |   |    |  |

## Vacuum generators OVEM

Technical data

**Function**

NC, normally closed:

- Silencer, open
- Ejector pulse, silencer open

NO, normally open:

- Silencer, open
- Ejector pulse, silencer open

 Temperature range  
0 ... +50 °C

 Operating pressure  
2 ... 8 bar



| General technical data       |       |                                 |         |         |
|------------------------------|-------|---------------------------------|---------|---------|
| Type                         |       | OVEM-05                         | OVEM-07 | OVEM-10 |
| Nominal size of Laval nozzle | [mm]  | 0.45                            | 0.7     | 0.95    |
| Ejector characteristic       |       | High vacuum/Standard H          |         |         |
| Pneumatic connection 1       |       | QS-1/4                          | QS-5/16 | QS-5/16 |
| Vacuum port                  |       | QS-5/16                         | QS-5/16 | QS-5/16 |
| Pneumatic connection 3       |       | Open silencer, integrated       |         |         |
| Integrated function          | ON/CN | On-off valve, electrical        |         |         |
|                              |       | Vacuum switch                   |         |         |
|                              |       | Filter                          |         |         |
| Integrated function          | OE/CE | On-off valve, electrical        |         |         |
|                              |       | Ejector pulse, electrical       |         |         |
|                              |       | Flow control                    |         |         |
|                              |       | Vacuum switch                   |         |         |
|                              |       | Air-saving function, electrical |         |         |
|                              |       | Non-return valve                |         |         |
|                              |       | Filter                          |         |         |
| Type of mounting             |       | Via through-holes               |         |         |
|                              |       | With female thread              |         |         |
|                              |       | Via accessories                 |         |         |
| Mounting position            |       | Any                             |         |         |

| Operating and environmental conditions  |       |                                                                  |         |         |
|-----------------------------------------|-------|------------------------------------------------------------------|---------|---------|
| Type                                    |       | OVEM-05                                                          | OVEM-07 | OVEM-10 |
| Operating pressure                      | [bar] | 2 ... 8                                                          |         |         |
| Operating medium                        |       | Filtered compressed air, unlubricated, grade of filtration 40 µm |         |         |
| Ambient temperature                     | [°C]  | 0 ... +50                                                        |         |         |
| Temperature of medium                   | [°C]  | 0 ... +50                                                        |         |         |
| CE mark (see declaration of conformity) |       | In accordance with EU EMC directive                              |         |         |
| Certification                           |       | C tick                                                           |         |         |

# Vacuum generators OVEM

Technical data

| Performance data – High vacuum                                         |         |    |     |    |         |     |     |     |         |     |     |     |
|------------------------------------------------------------------------|---------|----|-----|----|---------|-----|-----|-----|---------|-----|-----|-----|
| Type                                                                   | OVEM-05 |    |     |    | OVEM-07 |     |     |     | OVEM-10 |     |     |     |
| Normal position of the vacuum generator                                | ON      | OE | CN  | CE | ON      | OE  | CN  | CE  | ON      | OE  | CN  | CE  |
| Max. vacuum [%]                                                        | 93      |    |     |    |         |     |     |     |         |     |     |     |
| Operating pressure for max. vacuum [bar]                               | 5.1     |    |     |    | 4.1     |     |     |     | 3.5     |     |     |     |
| Max. suction rate with respect to atmosphere [l/min]                   | 6       |    |     |    | 16      |     |     |     | 19      |     |     |     |
| Suction rate at $p_1 = 6$ bar [l/min]                                  | 5.9     |    |     |    | 15.1    |     |     |     | 16.8    |     |     |     |
| Pressurisation time <sup>1)</sup> for 1 l volume, at $p_1 = 6$ bar [s] | 4.8     | 2  | 4.8 | 2  | 1.9     | 0.4 | 1.9 | 0.4 | 1.2     | 0.2 | 1.2 | 0.2 |
| Noise level at $p_1 = 6$ bar db(A)                                     | 51.1    |    |     |    | 57.8    |     |     |     | 72.8    |     |     |     |

1) Time required to build up vacuum to  $-0.05$  bar.

| Technical data – Vacuum switch                          |                                           |
|---------------------------------------------------------|-------------------------------------------|
| <b>Mechanical</b>                                       |                                           |
| Measured variable                                       | Relative pressure                         |
| Measuring principle                                     | Piezoresistive                            |
| Pressure measuring range [bar]                          | $-1 \dots 0$                              |
| Accuracy FS <sup>1)</sup> [%]                           | 3                                         |
| Reproducibility of switching point FS <sup>1)</sup> [%] | 0.6                                       |
| Setting option                                          | Via display and keys                      |
| Threshold value setting range [bar]                     | $-0.999 \dots 0$                          |
| Hysteresis setting range [bar]                          | $-0.9 \dots 0$                            |
| Type of display                                         | 4-character alphanumeric, backlit LCD     |
| Indicating range [inchHg]                               | $-29.5 \dots 0$                           |
| Switching status display                                | Optical                                   |
| Switching position display                              | LCD                                       |
| <b>Electrical</b>                                       |                                           |
| Electrical connection                                   | Plug M12x1, 5-pin                         |
| Switching output                                        | 2x PNP                                    |
| Standard switching input                                | IEC 61131-2                               |
| Switching element function                              | NO contact<br>NC contact                  |
| Switching function                                      | Window comparator<br>Threshold comparator |
| Operating voltage range [V DC]                          | $20.4 \dots 27.6$                         |
| Max. output current [mA]                                | 100                                       |
| Residual current [mA]                                   | 0.1                                       |
| Voltage drop [V]                                        | $\leq 1.5$                                |
| Protection against short circuit                        | Yes                                       |
| Protection against overloading                          | Yes                                       |
| Protection against polarity reversal                    | For all electrical connections            |
| Protection class                                        | IP65                                      |
| Electrical protection class                             | III                                       |

1) FS = % of the measuring range final value (full scale)

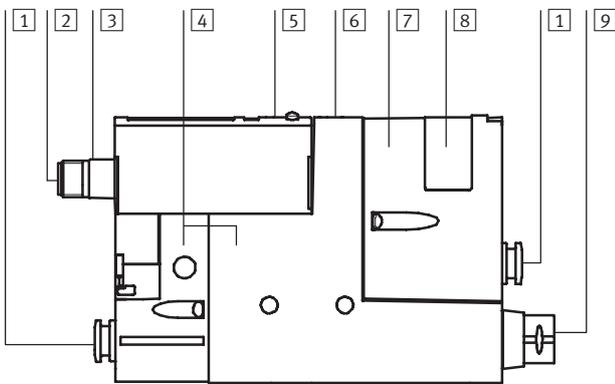
## Vacuum generators OVEM

Technical data

| Technical data Solenoid valve           |                                                      |    |        |    |
|-----------------------------------------|------------------------------------------------------|----|--------|----|
| Normal position of the vacuum generator | ON                                                   | OE | CN     | CE |
| Valve function                          | Open                                                 |    | Closed |    |
| Duty cycle [%]                          | 100 in conjunction with reduction of holding current |    |        |    |
| Inductive protective circuit            | Adapted to MZ, MY, ME coils                          |    |        |    |
| Switch-on suppression                   | Yes                                                  |    |        |    |
| Manual override                         | Non-detenting                                        |    |        |    |
|                                         | Additionally via operating buttons                   |    |        |    |

### Materials

Sectional view

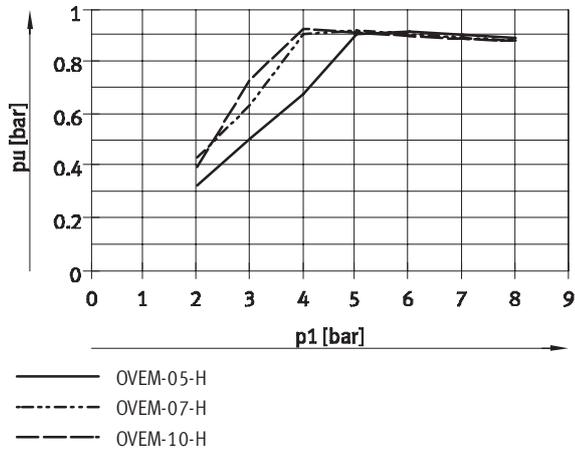


| Vacuum generator OVEM-05/07/10                                       |                                                        |
|----------------------------------------------------------------------|--------------------------------------------------------|
| 1                                                                    | Fitting<br>Nickel plated brass                         |
| 2                                                                    | Plug contacts<br>Gold-plated brass                     |
| 3                                                                    | Plug housing<br>Nickel plated brass                    |
| 4                                                                    | Housing<br>Die-cast aluminium,<br>reinforced polyamide |
| 5                                                                    | Key pad<br>Thermoplastic polyurethane<br>elastomer     |
| 6                                                                    | Adjusting screw<br>Steel                               |
| 7                                                                    | Filter housing<br>Reinforced polyamide                 |
| 8                                                                    | Inspection window<br>Polymer                           |
| 9                                                                    | Silencers<br>Wrought aluminium alloy,<br>PU foam       |
| -                                                                    | Jet nozzle<br>Wrought aluminium alloy                  |
| -                                                                    | Receiver nozzle<br>Polyacetate                         |
| -                                                                    | Filter<br>Fabric, polyamide, sintered steel            |
| -                                                                    | Seals<br>Nitrile rubber                                |
| Note on materials<br>Contains paint wetting impairment<br>substances |                                                        |

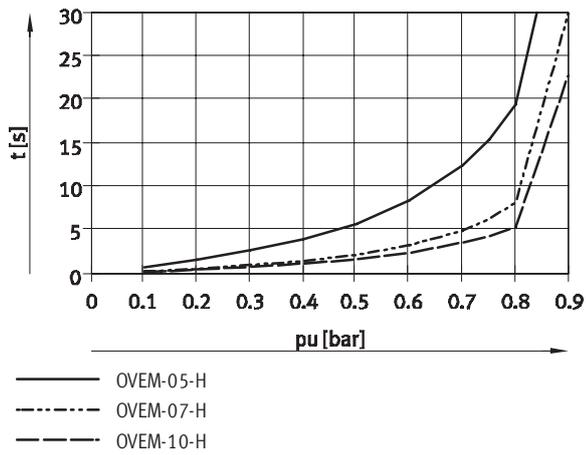
# Vacuum generators OVEM

Technical data

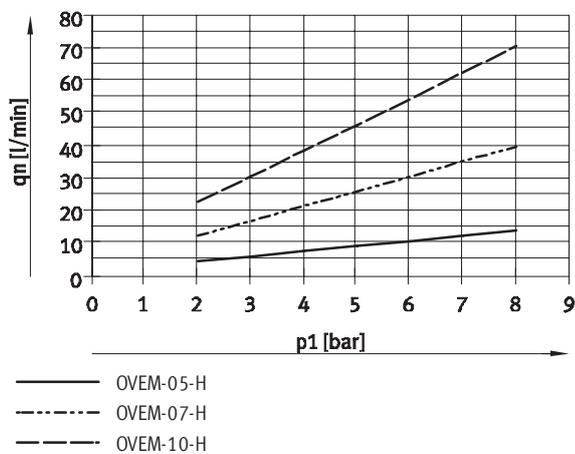
Vacuum  $p_u$  as a function of operating pressure  $p_1$



Evacuation time  $t$  as a function of vacuum  $p_u$  for 1 l volume at 6 bar operating pressure



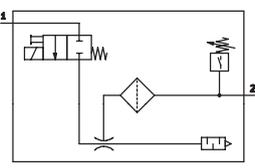
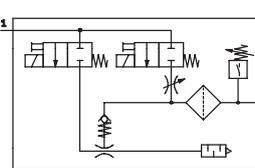
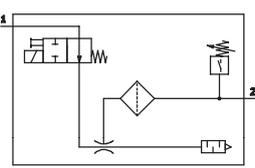
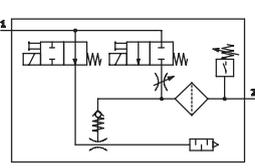
Air consumption  $q_n$  as a function of operating pressure  $p_1$





# Vacuum generators OVEM

Technical data

| Ordering data and weights                                                           |                                      |                   |            |          |                         |
|-------------------------------------------------------------------------------------|--------------------------------------|-------------------|------------|----------|-------------------------|
| Circuit symbol                                                                      | Description                          | Nominal size [mm] | Weight [g] | Part No. | Type                    |
| <b>Normally closed</b>                                                              |                                      |                   |            |          |                         |
|    | With open silencer                   | 0.45              | 317        | 539 992  | OVEM-05-H-BN-QO-CN-N-2P |
|                                                                                     |                                      | 0.7               | 322        | 539 993  | OVEM-07-H-BN-QO-CN-N-2P |
|                                                                                     |                                      | 0.95              | 322        | 539 994  | OVEM-10-H-BN-QO-CN-N-2P |
|                                                                                     |                                      |                   |            |          |                         |
|    | With ejector pulse and open silencer | 0.45              | 325        | 539 989  | OVEM-05-H-BN-QO-CE-N-2P |
|                                                                                     |                                      | 0.7               | 331        | 539 990  | OVEM-07-H-BN-QO-CE-N-2P |
|                                                                                     |                                      | 0.95              | 331        | 539 991  | OVEM-10-H-BN-QO-CE-N-2P |
|                                                                                     |                                      |                   |            |          |                         |
| <b>Normally open</b>                                                                |                                      |                   |            |          |                         |
|   | With open silencer                   | 0.45              | 317        | 539 986  | OVEM-05-H-BN-QO-ON-N-2P |
|                                                                                     |                                      | 0.7               | 322        | 539 987  | OVEM-07-H-BN-QO-ON-N-2P |
|                                                                                     |                                      | 0.95              | 322        | 539 988  | OVEM-10-H-BN-QO-ON-N-2P |
|                                                                                     |                                      |                   |            |          |                         |
|  | With ejector pulse and open silencer | 0.45              | 325        | 539 983  | OVEM-05-H-BN-QO-OE-N-2P |
|                                                                                     |                                      | 0.7               | 331        | 539 984  | OVEM-07-H-BN-QO-OE-N-2P |
|                                                                                     |                                      | 0.95              | 331        | 539 985  | OVEM-10-H-BN-QO-OE-N-2P |
|                                                                                     |                                      |                   |            |          |                         |

# Vacuum generators OVEM

Ordering data – Modular products

| M Mandatory data        |             |                |            | O Options             |             |                                       |            |                                            |  |
|-------------------------|-------------|----------------|------------|-----------------------|-------------|---------------------------------------|------------|--------------------------------------------|--|
| Module No.              |             | Laval nozzle   |            | Housing size/width    |             | Normal position of the vacuum ejector |            | Vacuum switch, electrical switching output |  |
| Vacuum generator        |             | Vacuum type    |            | Pneumatic connections |             | Electrical connection                 |            |                                            |  |
| 539 075                 | OVEM        | 05<br>07<br>10 | H          | BN                    | QO          | ON<br>OE<br>CN<br>CE                  | N          | 2P                                         |  |
| <b>Ordering example</b> |             |                |            |                       |             |                                       |            |                                            |  |
| <b>539 075</b>          | <b>OVEM</b> | <b>- 05</b>    | <b>- H</b> | <b>- BN</b>           | <b>- QO</b> | <b>- ON</b>                           | <b>- N</b> | <b>- 2P</b>                                |  |

| Ordering table |                                            |                                                                      |      |               |
|----------------|--------------------------------------------|----------------------------------------------------------------------|------|---------------|
| Size           |                                            | Condi-<br>tions                                                      | Code | Enter<br>code |
| M              | Module No.                                 | 539 075                                                              |      |               |
|                | Vacuum generator                           | Vacuum generator with vacuum valve on/off and manual override        | OVEM | OVEM-         |
|                | Laval nozzle [mm]                          | 0.45                                                                 | -05  |               |
|                |                                            | 0.7                                                                  | -07  |               |
|                |                                            | 0.95                                                                 | -10  |               |
|                | Vacuum type                                | High vacuum                                                          | -H   | -H            |
|                | Housing size/width [mm]                    | 20 (inch design)                                                     | -BN  | -BN           |
|                | Pneumatic connections                      | Supply/vacuum port with QS fittings, exhaust port with open silencer | -QO  | -QO           |
|                | Normal position of the vacuum ejector      | NO, normally open (vacuum generation)                                | -ON  |               |
|                |                                            | NO, normally open (vacuum generation) with ejector pulse             | -OE  |               |
|                |                                            | NC, normally closed (no vacuum generation)                           | -CN  |               |
|                |                                            | NC, normally closed (no vacuum generation) with ejector pulse        | -CE  |               |
|                | Electrical connection                      | M12 plug (5-pin)                                                     | -N   | -N            |
| O              | Vacuum switch, electrical switching output | Switching output 2x PNP                                              | -2P  |               |

Transfer order code