Installation of VAV-Compact Retrofit with ZDMS-..

LMVAX-D3-MP
NMVAX-D3-MP
ZDMS-..

VAV-Compact Retrofit for utilisation of existing VAV devices made by various manufacturers.
• for various air velocities
• for round and rectangular units

General Information

Application
The VAV-Compact Retrofit solution was designed for the retooling of existing VAV-/CAV units. The replacement of VAV control devices from a wide variety of manufacturers, including pneumatic solutions, is exceptionally simple. The ZTH-GEN service tool or the Belimo PC-Tool (MFT-P) is used for the adaptation of the VAV-Compact Retrofit to the existing VAV unit and the air velocity.

To be noted
If the existing pick-up device is to continue to be used, then the unit and the pick-up device must be checked and cleaned if necessary, because otherwise the control function/accuracy cannot be ensured.

Installation instruction
This installation instruction describes the application of the VAV-Compact Retrofit ...-D3-MP. For the more detailed description of the VAV controller, we refer to the separate product information VAV-Compact (NMV-D3-MP); to the product information ZDMS-.. for the pick-up device and to the product information of the ZTH-GEN for the adjustment tool and to the operating instruction PC-Tool – VAV-Compact D2 and D3 Module, see www.belimo.eu. Belimo Automation AG can at any time implement changes and improvements without prior notification. For the current edition of the operating instruction, see www.belimo.eu.

Safety notes

⚠️ The device must not be used outside the specified field of application, especially not in aircraft or in any other airborne means of transport.

• It may only be installed by suitably trained personnel. Any legal regulations or regulations issued by authorities must be observed during installation.
• The device may only be opened at the manufacturer's site. It does not contain any parts that can be replaced or repaired by the user.
• The cable must not be removed from the device.
• When calculating the torque required, the specifications supplied by the damper manufacturers (cross-section, construction, place of installation), and the ventilation conditions must be observed.
• The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Selection

Actual status VAV unit
The replacement controller required should be defined on the basis of the existing VAV unit. The setting data should be arrived at as well.

Mechanical
• Torque
• Spindle form / dimensions
• Unit dimensions (for the selection of the pick-up device)
• Angle of rotation
• Position of end stops

Settings / control
• $V_{nom}$, $V_{max}$, $V_{min}$ (possibly $V_{mid}$)
• Direction of rotation
• Mode (0 ... 10V / 2 ... 10V)
• Calibration value / $\Delta p$ @ $V_{nom}$
• Override control (no / yes (how))
Selection of Retrofit VAV controller

The following types are available as a basis:

- **LMV-D3-MP Retrofit** (5 Nm, spindle clamp)  
  Ordering designation: LMVA-7D0101V0K
- **LMV-D3-MP-F Retrofit** (5 Nm, form fit 8x8 mm)  
  Ordering designation: LMVA-7E0F01V0K
- **NMV-D3-MP Retrofit** (10 Nm, spindle clamp)  
  Ordering designation: NMVA-7D0G01V0K
- **NMV-D3-MP-F Retrofit** (10 Nm, form fit 8x8 mm)  
  Ordering designation: NMVA-7E0F01V0K
- For round units DN 100, 125, 160, 200 and 250:  
  NMV-D3-MP Retrofit with TypeList for ZDMS-..  
  Ordering designation: NMV-D3-RE

Additional versions can be obtained through any Belimo representative.

Selection of pick-up device

The following pick-up devices are available, for which the length in mm is indicated by the number in the respective type designation (e.g. ZDMS-160: \( l = 160 \) mm). The objective is to obtain a differential pressure as great as possible for \( V_{\text{nom}} \) (use the longest rod possible). If an insufficiently large differential pressure arises in the lower volumetric range, then a second pick-up device can be utilised. See in this connection also the product information documentation ZDMS-..  

Ordering designation:

- ZDMS-100
- ZDMS-125
- ZDMS-160
- ZDMS-200
- ZDMS-250

Dismounting the existing VAV controller

**Electrical connection**

1. In the control cabinet, undo supply/signal cable to the outgoing terminals

   **Caution:** Observe and note connection sequence

2. Undo supply/signal cable to the VAV controller

   **Caution:** Observe and note connection sequence

**Mechanical components**

1. Dismounting the existing pick-up device (if necessary)

2. Dismounting the controller
Installation of the new pick-up device

Measured value recording

The installation position and the inflow of the pick-up device are of decisive importance for measuring accuracy. If the measurement recording is positioned in an area of turbulence or if no sufficiently wide-ranging flow takes place, then measurement inaccuracies could occur under certain circumstances.

Placement

A Measurement site
B Maximum hose length 3 m per measurement line

Drill an opening in the duct; hole size: 20 mm Ø

Installation of the pick-up device in the duct

Screw the pick-up device tightly

Note
For additional information on the ZDMS and its positioning, see the documentation Product information ZDMS-..
Installation of the new VAV controller

Adjusting the angle of rotation limiter

The two mechanical end stops for angle of rotation limiting must be tailored to the conditions of the VAV unit and are therefore to be adjusted very carefully. The dismantled actuator is used as an orientation aid for placing the end stops.

Note
Incorrect settings can lead to damage to the damper blade and to a diminishment of the quality of the control.

Attaching hoses to the controller and pick-up device

Caution: Observe connection (+/−)!

Electrical connection of the new VAV controller

The VAV controller ..MVAX-D3-MP is equipped with a 4-wire connecting cable. An electrical connection socket should be used for ensuring a permanent connection with the existing installation.

Cable connection

The connection is made using the connecting cable mounted to the VAV-Compact device.

Notes
– Supply via safety isolating transformer!
– Connections 1, 2 (AC/DC 24V) and 5 (MP signal) must be routed to accessible terminals (room temperature controller, floor distributor, control cabinet, etc.), in order to enable access with the ZTH-GEN or with the PC-Tool for diagnostic and service work.

<table>
<thead>
<tr>
<th>No.</th>
<th>Designation</th>
<th>Wire colour</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>− I</td>
<td>black</td>
<td>− I</td>
</tr>
<tr>
<td>2</td>
<td>+ −</td>
<td>red</td>
<td>+ −</td>
</tr>
<tr>
<td>3</td>
<td>Y</td>
<td>white</td>
<td>Reference signal VAV/CAV</td>
</tr>
<tr>
<td>5</td>
<td>U</td>
<td>orange</td>
<td>− MP bus connection</td>
</tr>
</tbody>
</table>

AC/DC 24V supply

For additional information, see the documentation Product information VAV-Compact (.MV-D3-MP)
Parameterisation

Setting parameters The following parameters are to be adjusted in relation to the VAV unit or to the room, respectively:

- \( V_{\text{min}} \) Minimum volumetric flow
- \( V_{\text{max}} \) Maximum volumetric flow
- Mode Control signal \( Y \) (0 ... 10V / 2 ... 10V)
- Direction of rotation Opening damper \( \text{cw} \) (clockwise) or \( \text{ccw} \) (counterclockwise)

In order to adapt the controller to the unit, the calibration value \( \Delta p @ V_{\text{nom}} \) must be determined and entered. This can be carried out by customers authorised by Belimo using the Belimo tools MFT-P (PC-Tool) or ZTH-GEN (Service tool).

Initial situation / procedure

- Pick-up device remains, \( \Delta p @ V_{\text{nom}} \) known
  → The calibration value \( \Delta p @ V_{\text{nom}} \) can be programmed directly with the ZTH-GEN or the MFT-P into the controller
  (Caution: Unit and pick-up device must be checked and cleaned beforehand)

- Pick-up device is replaced by ZDMS-..
- Round units, unit diameter = length of ZDMS-..
- NMV-D3-RE is used
  → The TypeList function can be used for the parameterisation (see page 6)

- Pick-up device is replaced by ZDMS-..
- Round units, unit diameter ≠ length of ZDMS-..
  → The calibration value \( \Delta p @ V_{\text{nom}} \) for different air velocities can be obtained from the following table

<table>
<thead>
<tr>
<th>Units [mm]</th>
<th>Pick-up device</th>
<th>( V ) [m/s]</th>
<th>( \Delta p @ V_{\text{nom}} ) [Pa]</th>
<th>( V_{\text{nom}} ) [m³/h]</th>
<th>( V_{\text{nom}} ) [l/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>ZDMS-100</td>
<td>15</td>
<td>208</td>
<td>424</td>
<td>118</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>133</td>
<td>393</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>94</td>
<td>283</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>47</td>
<td>198</td>
<td>55</td>
</tr>
<tr>
<td>125</td>
<td>ZDMS-125</td>
<td>15</td>
<td>203</td>
<td>663</td>
<td>184</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>132</td>
<td>530</td>
<td>147</td>
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<td></td>
<td>10</td>
<td>94</td>
<td>442</td>
<td>123</td>
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<tr>
<td></td>
<td></td>
<td>7</td>
<td>47</td>
<td>309</td>
<td>86</td>
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<tr>
<td>160</td>
<td>ZDMS-160</td>
<td>15</td>
<td>197</td>
<td>1086</td>
<td>302</td>
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<tr>
<td></td>
<td></td>
<td>12</td>
<td>127</td>
<td>869</td>
<td>241</td>
</tr>
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<td></td>
<td>10</td>
<td>87</td>
<td>714</td>
<td>201</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>45</td>
<td>434</td>
<td>121</td>
</tr>
<tr>
<td>200</td>
<td>ZDMS-200</td>
<td>15</td>
<td>205</td>
<td>1696</td>
<td>471</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>128</td>
<td>1357</td>
<td>377</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>87</td>
<td>1131</td>
<td>314</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>44</td>
<td>679</td>
<td>189</td>
</tr>
<tr>
<td>250</td>
<td>ZDMS-250</td>
<td>15</td>
<td>200</td>
<td>2651</td>
<td>736</td>
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<td></td>
<td></td>
<td>12</td>
<td>128</td>
<td>2121</td>
<td>589</td>
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<td></td>
<td></td>
<td>10</td>
<td>89</td>
<td>1767</td>
<td>491</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>44</td>
<td>1060</td>
<td>295</td>
</tr>
</tbody>
</table>

- Pick-up device is replaced by ZDMS-..
- Round units, unit diameter ≠ length of ZDMS-..
- \( \Delta p @ V_{\text{nom}} \) can be determined by measurement
  →Generate \( V_{\text{nom}} \) and carry out \( \Delta p \) measurement on the pick-up device
  →Entered measured value using the Belimo Tool

- Pick-up device is replaced by ZDMS-..
- Rectangular and round units, unit diameter ≠ length of ZDMS-..
- Only a \( V_{\text{actual}} = V_{\text{nom}} \) can be measured
  →Carry out reference measurement of the current volumetric flow
  Active calibration with Belimo PC-Tool
M4-VAV-Compact Retrofit ZDMS-..  
Subject to changes  www.belimo.eu

Parameterization with Belimo Service tool (ZTH-GEN)

**ZTH-GEN preparation**
- Expert and Advanced options enabled (Configuration menu)
- OEM number entered

An OEM number is required in order to be able to enter the calibration value $\Delta p$ @ $V_{nom}$ and $V_{nom}$. Please contact this your local Belimo representative.

For further information, see documentation ZTH-GEN.

**Procedure**

1. **Device identification**
   - Type
   - Position
   - Type Designation
   - Type Firmware
   - Type Serial number

2. **Data, settings**
   - Volume
   - Setpoint
   - $\Delta p$
   - Position
   - Stage
   - Mode
   - Expert
   - Direction of rotation
   - Set to original values?
   - Vmin
   - Vmax
   - Vnom
   - $\Delta p$ @ Vnom
   - Address

3. **Option, range**
   - Start
   - Option, range
   - Mode
   - Expert
   - Direction of rotation
   - Set to original values?
   - Vmin

4. **Volume**
   - 125 m$^3$/h
   - 124 m$^3$/h

5. **Volume**
   - 164 Pa
   - 65%

6. **Mode**
   - 0…10V
   - new
   - 2…10V

7. **Direction of rotation**
   - cw
   - ccw

8. **Set to original values?**
   - No
   - Yes

9. **Vmin**
   - 10 m$^3$/h
   - new
   - 25 m$^3$/h
   - Vmax
   - 250 m$^3$/h
   - new
   - 200 m$^3$/h
   - Vnom
   - 250 m$^3$/h
   - new
   - 300 m$^3$/h
   - $\Delta p$ @ Vnom
   - 240 Pa
   - new
   - 182 Pa

10. **Address**
    - PP
    - new
    - MP4

11. **Vnom...Vmax**

When applying the NMV-D3-RE with ZDMS-.., the TypeList function can be used for parameterisation.

**TypeList function**

- Pull out the RJ plug
- Connect RJ plug
- Start function
- Press
- TypeList is read
- Name of the TypeList
  - Type#1 / Type#2 / ...

- Select type
  - Type#1 / Type#2 / ...

- Name of the TypeList
  - Type#1 / Type#2 / ...

- Write
  - Type#1 / Type#2 / ...

- Write OK
  - Type#1 / Type#2 / ...

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**Parameterisation with Belimo PC-Tool (MFT-P)**

**Preparation MFT-P**
- Enable code has been entered (enablement of calibration function and $V_{nom}$ box)
- Please contact your local Belimo representative for the enable code

**Settings**
- Input of $V_{nom}$, $V_{max}$, $V_{min}$
- Mode
- Direction of rotation

**A) Passive calibration:**
- $\Delta p$ @ $V_{nom}$ known
  - Click on [Calibrate] box
  - Select method [Without air]
  - Enter $\Delta p$ @ $V_{nom}$
  - Click on [Write $\Delta p$ @ $V_{nom}$]
  - Click on [Write]

**B) Active calibration:**
- $\Delta p$ @ $V_{nom}$ not known
  - A reference volumetric flow measurement must be carried out.
  - Simulation tab – select Actuator OPEN
  - As soon as the actuator is open → select [STOP] and switch over to the Configuration tab
  - Click on [Calibrate]
  - Carry out reference measurement of the current air volume
  - Check/enter $V_{nom}$
  - Enter $V_{ref}$ (value of the reference measurement carried out)
  - Click on [Calibrate]
  - Click on [Write $\Delta p$ @ $V_{nom}$]
  - Click on [Write]

**Adapting the actuator (angle of rotation)**
An adaption is made to modify the actuator to match the available damper angle of rotation, e.g. 60°. This procedure should be carried out at the time of commissioning after each adjustment to the angle of rotation limitation.
- Switch on the 24V supply
- Press the 'Adaption' push-button. The actuator now moves to the CLOSE...OPEN...setpoint position.
Functional check

After the adjustment has been completed, it is recommended that a functional check be carried out on the VAV/CAV unit. The VAV controller is set to the desired operating mode with the ZTH-GEN and a setpoint/actual value comparison is made.

ZTH-GEN Stage selection

<table>
<thead>
<tr>
<th>Volume</th>
<th>400 m³/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
<td>&gt;Vmax&lt;</td>
</tr>
</tbody>
</table>

Available stages CLOSED / $V_{\text{min}}$ / $V_{\text{max}}$ / Motor stop / OPEN

If the setpoint is not achieved

Possible reasons:

- No volumetric flow or negative $\Delta p$ value, respectively:
  - Pressure hoses incorrectly connected
  - Direction of rotation set incorrectly
  - Fire damper closed
  - Ventilator does not run
- Actual volumetric flow is too low:
  - Supply pressure too low (supply pressure control, FU setting, air performance too low)
  - Damper spindle is mounted with an offset (damper cannot be opened all the way)

Extended energy-savings measure

Single room control

Extended energy savings measures and comfort enhancements can be achieved through the utilisation of the BELIMO single room controller CR24.. and through the integration of the VAV system in a Fan Optimiser System

You will find more detailed information on these components and systems at the BELIMO web site www.belimo.eu or consult your local BELIMO representative.