TYPE COMPACT, DYNAMIC

WITH SERVICE INTERFACE AND BUS COMMUNICATION FACILITY

Compact device for use with VAV terminal units
- Controller, differential pressure transducer, and actuator are fitted together in one casing
- Volume flow rates $V_{\text{min}}$ and $V_{\text{max}}$ are factory set as parameters
- Ideal for carrying out service from the switch cabinet or control panel
- Change of parameters using adjustment devices
- Suitable for constant and variable volume flows as well as for $V_{\text{min}}/V_{\text{max}}$ switching
- Bus communication is possible due to the following interfaces: MP bus, LonWorks, Modbus RTU, KNX

COMPACT CONTROLLER
LMV-D3-MP-F

Application

- Electronic volume flow controllers of Type Compact are compact, all-in-one control devices for VAV terminal units
- Dynamic differential pressure transducer, electronic controller, and actuator are fitted together in one casing
- Suitable for different control tasks depending on how the input for the setpoint value signal is used
- The output signals (voltage signals or data points) of the room temperature controller, central BMS, air quality controller or similar units control variably control the volume flow
- Switches or relays allow for local overrides (depending on controller variant)
- Volume flow rate actual value is available as a linear voltage signal or data point
- Controller parameters are factory set

Standard filtration in comfort air conditioning systems allows for use of the controller in the supply air without additional dust protection. Since a partial volume flow is passed through the transducer in order to measure the volume flow rate, please note:

- With heavy dust levels in the room, suitable extract air filters must be provided.
- If the air is polluted with fluff or sticky particles or contains aggressive media, Compact controllers cannot be used

Description

Parts and characteristics
Sensor for dynamic differential pressure measurements
Mechanical stops for limiting the damper blade positions
Actuators with overload protection
Release button to allow for manual operation

TECHNICAL INFORMATION

Function

Functional description

VAV terminal units control the volume flow in a closed loop, i.e. measurement – comparison – control.

The volume flow rate is determined by measuring the differential pressure (effective pressure). For this purpose the VAV terminal unit is fitted with a differential pressure sensor.

The integral differential pressure transducer transforms the effective pressure into a voltage signal, which is then analysed by the microprocessor of the controller. The volume flow rate actual value is available as a data point or voltage signal. The factory setting is such that a 10 V DC voltage signal always corresponds to the nominal volume flow rate \( V_{	ext{nom}} \).

The volume flow rate setpoint value comes from a higher-level controller (e.g. room temperature controller, air quality controller, central BMS), either as a voltage signal or as a data point, or from local switch contacts. Variable volume flow control results in a value between \( V_{\text{min}} \) and \( V_{\text{max}} \). It is possible to override the room temperature control, e.g. by a complete shut-off of the duct.

The controller compares the volume flow rate setpoint value to the actual value and controls the integral actuator accordingly.

Volume flow control

- The volume flow controller works independent of the duct pressure
- Differential pressure fluctuations do not result in permanent volume flow rate changes
- To prevent the control from becoming unstable, a dead band is allowed within which the damper blade does not move.

Principle of operation – Easy and Compact controllers

1. Differential pressure transducer
2. Actuator
3. Volume flow controller
4. Setpoint value signal
Variants, MP bus/Analogue, LonWorks, Modbus RTU

Any attachments are to be defined with the order code of the VAV terminal unit.

**Compact controllers for VAV terminal units**

<table>
<thead>
<tr>
<th>Order code detail</th>
<th>Part number</th>
<th>Type</th>
<th>Type of VAV terminal unit</th>
</tr>
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<tbody>
<tr>
<td>BC0</td>
<td>A00000043143</td>
<td>LMV-D3L-MP-F</td>
<td>①</td>
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<tr>
<td></td>
<td>A00000043141</td>
<td>LMV-D3-MP-F</td>
<td>②</td>
</tr>
<tr>
<td>BC0</td>
<td>A00000043140</td>
<td>LMV-D3-MP</td>
<td>④⑧</td>
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<tr>
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<td>A00000043142</td>
<td>NMV-D3-MP</td>
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<tr>
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<td>2 x LMV-D3-MP</td>
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</tr>
<tr>
<td>BL0</td>
<td>M466ES7</td>
<td>LMV-D3LON</td>
<td>②④</td>
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<td>NMV-D3LON</td>
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<td>BM0-J6</td>
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<td>A00000044862</td>
<td>NMV-D3-MOD-J6</td>
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<td>BM0-J6</td>
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<td>2 x LMV-D3-MOD-J6</td>
<td>⑦</td>
</tr>
<tr>
<td>XB0</td>
<td>M466DC1</td>
<td>227V-024-10</td>
<td>②③④</td>
</tr>
<tr>
<td></td>
<td>M466DC1</td>
<td>2 x 227V-024-10</td>
<td>⑥</td>
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<tr>
<td>LN0</td>
<td>M466EG7</td>
<td>GLB181.1E/3</td>
<td>②③④</td>
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<tr>
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<td>M466EG7</td>
<td>2 x GLB181.1E/3</td>
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<td>LK0</td>
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<td>GLB181.1E/KN</td>
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<td>A00000043586</td>
<td>2 x GLB181.1E/KN</td>
<td>⑤</td>
</tr>
</tbody>
</table>

① LVC
② TVR
③ TVJ, TVT
④ TZ-Silenzio, TA-Silenzio, TVZ, TVA
⑤ TVM
⑥ TVR, replacement part for LMV-D3-MP-F

**Application**

- Electronic volume flow controller LMV-D3L-MP-F, LMV-D3-MP, LMV-D3-MP-F or NMV-D3-MP as Compact controller
- Variable air or constant air volume flow control
- The flow rate is measured using the dynamic measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC
- MP bus interface: Up to eight users can be addressed on an MP bus (LAN). This allows for the integration with higher-level systems (LonWorks, EIB-
Konex, Modbus RTU and BACnet); as an alternative, a DDC controller with MP bus interface can control the Compact controller.

- Controller with NFC technology, i.e. settings and operating values can be read out using a smartphone app

**Construction**

- LMV-D3L-MP-F for LVC
- LMV-D3-MP-F for TVR
- NMV-D3-MP for TVJ, TVT
- LMV-D3-MP for TZ-Silenzio, TA-Silenzio, TVZ, TVA
- 2 × LMV-D3-MP for TVM

**Useful additions**

- AT-VAV-B: Adjustment device

**Signal voltage range**

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.1 V DC)

**Operating modes**

**E:** Single and **M:** Master

- $V_{min}$: minimum volume flow rate
- $V_{max}$: maximum volume flow rate

**S:** Slave

- $V_{min}$: 0 %
- $V_{max}$: Volume flow rate ratio to the master controller

**F:** Constant value

- $V_{min}$: constant volume flow rate
- $V_{max}$: 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

**Commissioning**

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use on the analog interface
- If the MP bus interface is used, additional commissioning steps are required

**Compact controller LMV-D3L-MP-F**
### Supply voltage

- **AC**
  - 24 V AC ± 20 %, 50/60 Hz
- **DC**
  - 24 V DC −10/+20 %

### Power rating

- **AC**
  - 3.5 VA max.
- **DC**
  - 2 W max.

### Torque

- 5 Nm

### Running time for 90°

- 120 – 150 s

### Setpoint value signal input

- 0 – 10 V DC, $R_a > 100 \text{kΩ}$

### Actual value signal output

- 0 – 10 V DC, 0.5 mA max.

### IEC protection class

- III (protective extra-low voltage)

### Protection level

- IP 54

### EC conformity

- EMC to 2014/30/EU, low voltage to 2014/35/EU

### Weight

- 0.5 kg

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**Compact controllers LMV-D3-MP and LMV-D3-MP-F**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply voltage (AC)</strong></td>
<td>24 V AC ± 20 %, 50/60 Hz</td>
</tr>
<tr>
<td><strong>Supply voltage (DC)</strong></td>
<td>24 V DC −10/+20 %</td>
</tr>
<tr>
<td><strong>Power rating (AC)</strong></td>
<td>4 VA max.</td>
</tr>
<tr>
<td><strong>Power rating (DC)</strong></td>
<td>2 W max.</td>
</tr>
<tr>
<td><strong>Torque</strong></td>
<td>5 Nm</td>
</tr>
<tr>
<td><strong>Running time for 90°</strong></td>
<td>110 – 150 s</td>
</tr>
<tr>
<td><strong>Setpoint value signal input</strong></td>
<td>0 – 10 V DC, $R_a &gt; 100 \text{kΩ}$</td>
</tr>
<tr>
<td><strong>Actual value signal output</strong></td>
<td>0 – 10 V DC, 0.5 mA max.</td>
</tr>
<tr>
<td><strong>IEC protection class</strong></td>
<td>III (protective extra-low voltage)</td>
</tr>
<tr>
<td><strong>Protection level</strong></td>
<td>IP 54</td>
</tr>
<tr>
<td><strong>EC conformity</strong></td>
<td>EMC according to 2014/30/EU</td>
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<td><strong>Weight</strong></td>
<td>0.5 kg</td>
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</tbody>
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**Compact controller NMV-D3-MP**
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage (AC)</td>
<td>24 V AC ±20 %, 50/60 Hz</td>
</tr>
<tr>
<td>Supply voltage (DC)</td>
<td>24 V DC −10/+20 %</td>
</tr>
<tr>
<td>Power rating (AC)</td>
<td>5 VA max.</td>
</tr>
<tr>
<td>Power rating (DC)</td>
<td>3 W max.</td>
</tr>
<tr>
<td>Torque</td>
<td>10 Nm</td>
</tr>
<tr>
<td>Running time for 90°</td>
<td>110 – 150 s</td>
</tr>
<tr>
<td>Setpoint value signal input</td>
<td>0 – 10 V DC, $R_h &gt; 100$ kΩ</td>
</tr>
<tr>
<td>Actual value signal output</td>
<td>0 – 10 V DC, 0.5 mA max.</td>
</tr>
<tr>
<td>IEC protection class</td>
<td>III (protective extra-low voltage)</td>
</tr>
<tr>
<td>Protection level</td>
<td>IP 54</td>
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<tr>
<td>EC conformity</td>
<td>EMC according to 2014/30/EU</td>
</tr>
<tr>
<td>Weight</td>
<td>0.7 kg</td>
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</tbody>
</table>

Compact controller LMV-D3L-MP-F
Compact controller LMV-D3-MP
① VAV-Compact
② Gear release button
③ Connections for differential pressure sensor
④ Service socket
⑤ Blade shaft clamp
⑥ Rotation stop
⑦ Indicator lights
⑧ Connecting cable

BC0, BP*, B1*, Characteristic of the setpoint value signal

![Diagram showing volume flow and setpoint value signal]

1 0 – 10 V DC
2 2 – 10 V DC
Volume flow rate setpoint value

\[ \dot{V}_{\text{setpoint}} = \frac{w}{10} (\dot{V}_{\text{max}} - \dot{V}_{\text{min}}) + \dot{V}_{\text{min}} \]

BC0, BP*, B1*

Volume flow rate actual value

\[ \dot{V}_{\text{actual}} = \frac{U_5}{10} \dot{V}_{\text{nom}} \]

BC0, BL0, BP*, B1*
Volume flow rate actual value

\[ V_{\text{actual}} = \frac{U_5 - 2}{8} V_{\text{nom}} \]

BC0, BL0, BP*, B1*, BB*

BC0, Connecting cable core identification

<table>
<thead>
<tr>
<th>BK</th>
<th>RD</th>
<th>WT</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>⊥</td>
<td>~</td>
<td>w</td>
<td>5</td>
</tr>
<tr>
<td>⊥</td>
<td>~</td>
<td>w</td>
<td>U5/MP</td>
</tr>
</tbody>
</table>

1 ⊥, ~: Ground, neutral
2 ~, +: Supply voltage
3 w: Setpoint value signal and override control
5 U5/MP: Actual value signal and communication

Compact: LMV-D3-MP, LMV-D3-MP-F, NMV-D3-MP, LMV-D3L-MP-F

BC0, Variable volume flow control and override control, voltage signal 0 – 10 V DC

Switch functions
S1 Room temperature control
S3 Maximum volume flow rate \( V_{\text{max}} \)
S4 Damper blade CLOSED (only with supply voltage 24 V AC)
S5 Damper blade OPEN (only with supply voltage 24 V AC)
All OPEN: Minimum volume flow rate \( V_{\text{min}} \)

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007
Compact: LMV-D3-MP, LMV-D3-MP-F, NMV-D3-MP, LMV-D3L-MP-F

**BC0, Variable volume flow control and override control, voltage signal 2 – 10 V DC**

Switch functions
S1 Room temperature control
S2 Shut-off CLOSED
S3 Maximum volume flow rate \( V_{\text{max}} \)
S4 Damper blade CLOSED (only with supply voltage 24 V AC)
S5 Damper blade OPEN (only with supply voltage 24 V AC)
All OPEN: Minimum volume flow rate \( V_{\text{min}} \)

When combining several override controls the switches must be interlocked to prevent short-circuits.

Diode: e.g. 1N 4007

Compact: LMV-D3-MP, LMV-D3-MP-F, NMV-D3-MP, LMV-D3L-MP-F

**BC0, Dual duct terminal units Type TVM**
**Application**
- Electronic volume flow controller LMV-D3LON or NMV-D3LON as Compact controller
- Variable air or constant air volume flow control
- The flow rate is measured using the dynamic measurement principle
- Voltage range for the actual value signal 2 – 10 V DC
- Volume flow controller with LonMark certification
- LonWorks interfaces for the transmission of standard network variables
- Functional profiles: Node-Object #0, Damper-Actuator-Object #8110, Open-Loop-Sensor-Object #1 and Thermostat-Object #8060
- The Thermostat-Object #8060 enables individual room control
- A plug-in for all LNS-based network integration tools (LNS version 3.3 and higher) is available for configuration

**Construction**
- BL0
  - LMV-D3LON for TVR, TZ-Silenzio, TA-Silenzio, TVZ, TVA
  - NMV-D3LON for TVJ, TVT

**Useful additions**
- AT-VAV-B: Adjustment device

**Signal voltage range**
- Actual value signal
  - 2: 2 – 10 V DC

**Commissioning**
- A trained LonWorks systems integrator must carry out the integration into the overall system

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### Compact controller LMV-D3LON

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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</thead>
<tbody>
<tr>
<td>Supply voltage (AC)</td>
<td>24 V AC ± 20 %, 50/60 Hz</td>
</tr>
<tr>
<td>Supply voltage (DC)</td>
<td>24 V DC ±10/+20 %</td>
</tr>
<tr>
<td>Power rating (AC)</td>
<td>5.5 VA max.</td>
</tr>
<tr>
<td>Power rating (DC)</td>
<td>3 W max.</td>
</tr>
<tr>
<td>Torque</td>
<td>5 Nm</td>
</tr>
<tr>
<td>Running time for 90°</td>
<td>110 – 150 s</td>
</tr>
<tr>
<td>Communication</td>
<td>LonWorks-Transceiver FTT-10A, free topology, twisted pair</td>
</tr>
<tr>
<td>Actual value signal output</td>
<td>2 – 10 V DC, max. 0.5 mA</td>
</tr>
<tr>
<td>IEC protection class</td>
<td>III (protective extra-low voltage)</td>
</tr>
<tr>
<td>Protection level</td>
<td>IP 54</td>
</tr>
<tr>
<td>EC conformity</td>
<td>EMC according to 2014/30/EU</td>
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<td>Weight</td>
<td>0.5 kg</td>
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### Compact controller NMV-D3LON
<table>
<thead>
<tr>
<th>Feature</th>
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<tbody>
<tr>
<td>Supply voltage (AC)</td>
<td>24 V AC ± 20 %, 50/60 Hz</td>
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<tr>
<td>Supply voltage (DC)</td>
<td>24 V DC −10/+20 %</td>
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<tr>
<td>Power rating (AC)</td>
<td>6 VA max.</td>
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<tr>
<td>Power rating (DC)</td>
<td>3.5 W max.</td>
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<tr>
<td>Torque</td>
<td>10 Nm</td>
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<tr>
<td>Running time for 90°</td>
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<tr>
<td>Communication</td>
<td>LonWorks-Transceiver FTT-10A, free topology, twisted pair</td>
</tr>
<tr>
<td>Actual value signal output</td>
<td>2 – 10 V DC, max. 0.5 mA</td>
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<tr>
<td>IEC protection class</td>
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<td>Protection level</td>
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<td>EMC according to 2014/30/EU</td>
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<tr>
<td>Weight</td>
<td>0.7 kg</td>
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Compact controller LMV-D3LON
Compact controller NMV-D3LON
① VAV-Compact
② Gear release button
③ Connections for differential pressure sensor
④ Service socket
⑤ Blade shaft clamp
⑥ Rotation stop
⑦ Indicator lights and LonWorks service button
⑧ Connecting cable

BL0, BB*, Characteristic of the actual value signal

![Characteristic Graph]

LMV-D3LON, VRP

Volume flow rate actual value
2 – 10 V DC

\[ V_{\text{actual}} = \frac{U_5 - 2}{8} V_{\text{nom}} \]

BC0, BL0, BP*, B1*, BB*

BL0, Connecting cable core identification

<table>
<thead>
<tr>
<th>BK</th>
<th>RD</th>
<th>WT</th>
<th>OR</th>
<th>PK</th>
<th>GR</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>1⊥</td>
<td>~</td>
<td>+</td>
<td>Y</td>
<td>MFT</td>
<td>LON</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Compact</td>
</tr>
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</table>

1,⊥, ~: Ground, neutral
2, ~, +: Supply voltage
3, Y: Connection of external sensor or switch
5, MFT: Actual value signal and communication
6, 7, LON: LonWorks

Compact: LMV-D3LON, NMV-D3LON

BL0, Volume flow control

Compact: LMV-D3LON, NMV-D3LON

Application
- Electronic volume flow controller Type LMV-D3-MOD (LMV-D3-MOD-J6) or NMV-D3-MOD (NMV-D3-MOD-J6) as Compact controller
Variable air or constant air volume flow control

The flow rate is measured using the dynamic measurement principle

Modbus RTU communication interface; communication parameters can be set

Setpoint value defaults and overrides by means of data exchange with a higher-level Modbus master

Local override control with switch contacts or relays (only with supply voltage 24 V AC)

Status values such as volume flow rate actual value and damper blade position are sent to the Modbus

Connection of an active sensor or switch contact for integration into Modbus

Use adjustment device or PC tool to configure the controller and the communication parameters

Construction

- BM0: ...-MOD: Compact controller with connecting cable and bare wire ends
- BM0-J6: ...-MOD-J6: Compact controller with RJ12 socket for the connection to zone module X-AIR-ZMO-MOD (X-AIRCONTROL control system)

- LMV-D3-MOD, LMV-D3-MOD-J6 for TVR, TZ-Silenzio, TA-Silenzio, TVZ, TVA
- NIV-D3-MOD, NIV-D3-MOD-J6 for TVJ, TVT
- 2 × LMV-D3-MOD, LMV-D3-MOD-J6 for TVM

Useful additions

- AT-VAV-B: Adjustment device
- X-AIR-ZMO-MOD: Zone module for Modbus RTU, for single room control system

Communication interface

- Modbus RTU (RS-485)
- Data points are those in the Modbus register list

Operating modes

- \( V_{\text{min}} \): minimum volume flow rate
- \( V_{\text{max}} \): maximum volume flow rate
- OPEN: Damper blade open
- CLOSED: Damper blade closed

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning

- Use adjustment device or PC tool to configure the Modbus interface (network address)
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates

BM0

Setpoint value setting

- The room or building automation system sends via Modbus a control signal
- The volume flow rate setpoint depends on the control signal and the saved parameters
- The control signal is sent as a percentage and leads to a volume flow rate setpoint between \( V_{\text{min}} \) and \( V_{\text{max}} \)
- If \( V_{\text{min}} = 0 \) and \( V_{\text{max}} = V_{\text{nom}} \), the automation system can use the entire adjustment range of the VAV terminal unit
- If \( V_{\text{nom}} = 0 \), a preset value of 0% results in the closure of the damper blade
- \( V_{\text{min}} > 0 \) and/or \( V_{\text{max}} < V_{\text{nom}} \) results in a reduced variable volume flow range with higher resolution of the control signal
- Register address 1 allows for overriding \( V_{\text{min}}, V_{\text{nom}} \), damper blade open, damper blade closed

Actual values

- The volume flow rate actual value is available in m³/h at register address 7

Compact controller LMV-D3-MOD, LMV-D3-MOD-J6
### Compact controller NMV-D3-MOD, NMV-D3-MOD-J6

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage (AC)</td>
<td>24 V AC ± 20 %, 50/60 Hz</td>
</tr>
<tr>
<td>Supply voltage (DC)</td>
<td>24 V DC −10/+20 %</td>
</tr>
<tr>
<td>Power rating (AC)</td>
<td>4 VA max.</td>
</tr>
<tr>
<td>Power rating (DC)</td>
<td>2 W max.</td>
</tr>
<tr>
<td>Torque</td>
<td>5 Nm</td>
</tr>
<tr>
<td>Running time for 90°</td>
<td>150 s</td>
</tr>
<tr>
<td>Communication</td>
<td>Modbus RTU (RS-485), not galvanically isolated</td>
</tr>
<tr>
<td>Baud rates</td>
<td>9600, 19200, 38400, 76800, 115200 Bd (factory setting 38400 Bd)</td>
</tr>
<tr>
<td>Transmission formats</td>
<td>1-8-N-2, 1-8-N-1, 1-8-E-1, 1-8-O-1 (factory setting 1-8-N-2)</td>
</tr>
<tr>
<td>Scheduling Modbus</td>
<td>120 Ω, can be switched</td>
</tr>
<tr>
<td>IEC protection class</td>
<td>III (protective extra-low voltage)</td>
</tr>
<tr>
<td>Protection level</td>
<td>IP 54</td>
</tr>
<tr>
<td>EC conformity</td>
<td>EMC to 2014/30/EU, low voltage to 2014/35/EU</td>
</tr>
<tr>
<td>Weight</td>
<td>0.5 kg</td>
</tr>
</tbody>
</table>

#### Modbus register list
<table>
<thead>
<tr>
<th>Usage</th>
<th>Number</th>
<th>Address</th>
<th>Access</th>
<th>Unit</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>1</td>
<td>0</td>
<td>R, W</td>
<td>%</td>
<td>Setpoint value</td>
</tr>
<tr>
<td>Operation</td>
<td>2</td>
<td>1</td>
<td>R, W</td>
<td></td>
<td>Override control</td>
</tr>
<tr>
<td>Operation</td>
<td>3</td>
<td>2</td>
<td>R, W</td>
<td></td>
<td>Command for service and tests</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>3</td>
<td>R</td>
<td></td>
<td>Type of actuator</td>
</tr>
<tr>
<td>Operation</td>
<td>5</td>
<td>4</td>
<td>R</td>
<td>%</td>
<td>Damper blade position [%]</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>5</td>
<td>R</td>
<td>°</td>
<td>Damper blade position [° angle]</td>
</tr>
<tr>
<td>Operation</td>
<td>7</td>
<td>6</td>
<td>R</td>
<td>%</td>
<td>Volume flow rate [%]</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>7</td>
<td>R</td>
<td>m³/h</td>
<td>Volume flow rate [m³/h]</td>
</tr>
<tr>
<td>Operation</td>
<td>9</td>
<td>8</td>
<td>R</td>
<td>mV, Ω</td>
<td>Actual value of the connected function</td>
</tr>
<tr>
<td>Service</td>
<td>101</td>
<td>100</td>
<td>R</td>
<td></td>
<td>Serial number, part 1</td>
</tr>
<tr>
<td>Service</td>
<td>102</td>
<td>101</td>
<td>R</td>
<td></td>
<td>Serial number, part 2</td>
</tr>
<tr>
<td>Service</td>
<td>103</td>
<td>102</td>
<td>R</td>
<td></td>
<td>Serial number, part 4</td>
</tr>
<tr>
<td>Service</td>
<td>104</td>
<td>103</td>
<td>R</td>
<td></td>
<td>Firmware version of the Modbus module</td>
</tr>
<tr>
<td>Service</td>
<td>105</td>
<td>104</td>
<td>R</td>
<td></td>
<td>Fault messages and service messages</td>
</tr>
<tr>
<td>Service</td>
<td>106</td>
<td>105</td>
<td>R, W</td>
<td>%</td>
<td>Minimum volume flow rate</td>
</tr>
<tr>
<td>Service</td>
<td>107</td>
<td>106</td>
<td>R, W</td>
<td>%</td>
<td>Maximum volume flow rate</td>
</tr>
<tr>
<td>Service</td>
<td>108</td>
<td>107</td>
<td>R, W</td>
<td></td>
<td>Type of sensor</td>
</tr>
<tr>
<td>Service</td>
<td>109</td>
<td>108</td>
<td>R, W</td>
<td></td>
<td>Setpoint (action) if communication fails</td>
</tr>
</tbody>
</table>

R: Read
W: Write

Registers 1 – 3 (write register, operation): volatile, hence to be updated periodically

Registers 106 – 108 (write register, service): non-volatile

Compact controller LMV-D3-MOD
Compact controller NMV-D3-MOD-J6
① VAV-Compact
② Gear release button
③ Connections for differential pressure sensor
④ Service socket
⑤ Blade shaft clamp
⑥ Rotation stop
⑦ Indicator lights
⑧ Connecting cable
⑨ Connection socket RJ12 (~J6)

BM0, Connecting cable core identification

<table>
<thead>
<tr>
<th>BK</th>
<th>RD</th>
<th>WH</th>
<th>OG</th>
<th>PK</th>
<th>GY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>⊥</td>
<td>~</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−</td>
<td>+</td>
<td>Y</td>
<td>MFT</td>
<td>D−</td>
<td>D+</td>
</tr>
</tbody>
</table>

1 ⊥, ~: Ground, neutral
2 −, +: Supply voltage
3 Y: Connection of external sensor or switch
5 MFT: Communication
6 D-: Modbus A (C1)
7 D+: Modbus B (C2)

Compact: LMV-D3-MOD, NMV-D3-MOD

BM0-J6, connection socket pin identification
1. Ground, neutral
2. +24 V: Supply voltage
3. Bus A: Modbus A (C1)
4. Bus B: Modbus B (C2)
5. Ground, neutral
6. +24 V: Supply voltage

Compact: LMV-D3-MOD-J6, NMV-D3-MOD-J6

**BM0, Volume flow control**

Compact: LMV-D3-MOD, LMV-D3-MOD-J6, NMV-D3-MOD, NMV-D3-MOD-J6

**BM0, Variable volume flow control and local override control**
Switch functions
S1 Shut-off CLOSED
S2 Maximum volume flow rate $V_{\text{max}}$
S3 Damper blade OPEN
All OPEN: bus operation
When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

Compact: LMV-D3-MOD, NMV-D3-MOD

Only with supply voltage 24 V AC

**BM0, connection of a switch contact**

The switch contact has to be suitable for 16 mA at 24 V

Compact: LMV-D3-MOD, NMV-D3-MOD

**BM0, connection of an active sensor**

Input voltage range: 0 – 32 V DC, resolution 30 mV
Compact: LMV-D3-MOD, NMV-D3-MOD

**Analogue (Gruner), Analogue (Siemens), KNX (Siemens)**

**Application**
- Electronic volume flow controller 227V-024-10 as Compact controller
- Variable air or constant air volume flow control
- The flow rate is measured using the dynamic measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC

**Construction**

XB0
- 227V-024-10 for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA
- 2 x 227V-024-10 for TVM
Useful additions
- AT-VAV-G: Adjustment device

Signal voltage range
- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.8 V DC)

Operating modes
E: Single and M: Master
- $V_{\text{min}}$: Minimum volume flow rate
- $V_{\text{max}}$: Maximum volume flow rate

S: Slave operation
- $V_{\text{min}}$: 0 %
- $V_{\text{max}}$: Volume flow rate ratio to the master controller

F: Constant value
- $V_{\text{min}}$: constant volume flow rate
- $V_{\text{max}}$: 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning
- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use

Compact controller 227V-024-10

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage (AC)</td>
<td>24 V AC ± 20 %, 50/60 Hz</td>
</tr>
<tr>
<td>Supply voltage (DC)</td>
<td>24 V DC ± 20 %</td>
</tr>
<tr>
<td>Power rating (AC)</td>
<td>5.5 VA max.</td>
</tr>
<tr>
<td>Power rating (DC)</td>
<td>3 W max.</td>
</tr>
<tr>
<td>Torque</td>
<td>10 Nm</td>
</tr>
<tr>
<td>Running time for 90°</td>
<td>100 s</td>
</tr>
<tr>
<td>Setpoint value signal input</td>
<td>0 – 10 V DC, $R_u &gt; 100 , k\Omega$</td>
</tr>
<tr>
<td>Actual value signal output</td>
<td>0 – 10 V DC, 0.5 mA max.</td>
</tr>
<tr>
<td>IEC protection class</td>
<td>III (protective extra-low voltage)</td>
</tr>
<tr>
<td>Protection level</td>
<td>IP 42</td>
</tr>
<tr>
<td>EC conformity</td>
<td>EMC according to 2014/30/EU</td>
</tr>
<tr>
<td>Weight</td>
<td>0.570 kg</td>
</tr>
</tbody>
</table>

Compact controller 227V-024-10
① VAV-Compact
② Connections for differential pressure sensor
③ Gear release button
④ Service socket
⑤ Connecting cable

XB0, Characteristic of the setpoint value signal

Volume flow rate setpoint value
**Volume flow rate setpoint value**

\[
\dot{V}_{\text{setpoint}} = \frac{6}{10} (\dot{V}_{\max} - \dot{V}_{\min}) + \dot{V}_{\min}
\]

**Volume flow rate actual value**

\[
\dot{V}_{\text{actual}} = \frac{6}{10} \dot{V}_{\text{nom}}
\]

**Characteristics of the actual value signal**

1. 0 – 10 V DC
2. 2 – 10 V DC

227V-024-10, GUAC-D3, GUAC-S3
2 – 10 V DC

\[ \dot{V}_{\text{actual}} = \frac{U - 2}{8} \cdot V_{\text{nom}} \]

XB0, XC*, XD*

XB0, Connecting cable core identification

<table>
<thead>
<tr>
<th>BL</th>
<th>BR</th>
<th>BK</th>
<th>GR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>(\perp)</td>
<td>(\sim)</td>
<td>(\sim)</td>
<td>Y/Z</td>
</tr>
</tbody>
</table>

1 \(\perp, \sim\): Ground, neutral
2 \(\sim+: Supply voltage\)
3 Y/Z: Setpoint value signal and override control
4 U/pp: Actual value signal and communication

Compact: 227V-024-10

XB0, Variable volume flow control and override control, voltage signal 0 – 10 V DC

Switch functions
All OPEN: Minimum volume flow rate \(V_{\text{min}}\)
S1 Room temperature control
S3 Maximum volume flow rate \(V_{\text{max}}\)
S4 Damper blade CLOSED (only with supply voltage 24 V AC)
S5 Damper blade OPEN (only with supply voltage 24 V AC)
When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007
XB0, Variable volume flow control and override control, voltage signal 2 – 10 V DC

When combining several override controls the switches must be interlocked to prevent short-circuits.

Diode: e.g. 1N 4007

XB0, Dual duct terminal units Type TVM
Application
- Electronic volume flow controller GLB181.1E/3 as Compact controller
- Variable air or constant air volume flow control
- The flow rate is measured using the dynamic measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC
- For room temperature controllers with output signal 0 – 10 V DC

Construction
LN0
- GLB181.1E/3 for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA
- 2 × GLB181.1E/3 for TVM

Useful additions
- AT-VAV-S: Adjustment device

Signal voltage range
- 0: 0 – 10 V DC

Operating modes
E: Single and M: Master
- \( V_{\text{min}} \): Minimum volume flow rate
- \( V_{\text{max}} \): Maximum volume flow rate

S: Slave
- \( V_{\text{min}} \): 0 %
- \( V_{\text{max}} \): Volume flow rate ratio to the master controller

F: Constant value
- \( V_{\text{min}} \): Constant volume flow rate
- \( V_{\text{max}} \): 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning
- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use

Compact controller GLB181.1E/3
<table>
<thead>
<tr>
<th>Specification</th>
<th>Specification Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage (AC)</td>
<td>24 V AC ± 20 %, 50/60 Hz</td>
</tr>
<tr>
<td>Power rating (AC)</td>
<td>3 VA max.</td>
</tr>
<tr>
<td>Torque</td>
<td>10 Nm</td>
</tr>
<tr>
<td>Running time for 90°</td>
<td>125 – 150 s</td>
</tr>
<tr>
<td>Setpoint value signal input</td>
<td>0 – 10 V DC, $R_a &gt; 100 , k\Omega$</td>
</tr>
<tr>
<td>Actual value signal output</td>
<td>0 – 10 V DC, max. 1 mA</td>
</tr>
<tr>
<td>IEC protection class</td>
<td>III (protective extra-low voltage)</td>
</tr>
<tr>
<td>Protection level</td>
<td>IP 54</td>
</tr>
<tr>
<td>EC conformity</td>
<td>EMC according to 2014/30/EU</td>
</tr>
<tr>
<td>Weight</td>
<td>0.6 kg</td>
</tr>
</tbody>
</table>

Compact controller GLB181.1E/3
LN0, Characteristic of the setpoint value signal

GLB181.1/E

Volume flow rate setpoint value
0 – 10 V DC

\[ \dot{V}_{\text{netpoint}} = \frac{Y_C}{10} (\dot{V}_{\text{max}} - \dot{V}_{\text{min}}) + \dot{V}_{\text{min}} \]

LN0

LN0, Characteristic of the actual value signal

GLB181.1/E

Volume flow rate actual value

0 – 10 V DC

\[ \dot{V}_{\text{actual}} = \frac{U}{10} \dot{V}_{\text{nom}} \]

XB0, XC*, XD*, LN0

LN0, Connecting cable core identification

<table>
<thead>
<tr>
<th>RD</th>
<th>BK</th>
<th>VI</th>
<th>OR</th>
<th>GR</th>
<th>PK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>G</td>
<td>G0</td>
<td>Y1</td>
<td>Y2</td>
<td>YC</td>
<td>U</td>
</tr>
</tbody>
</table>

Compact

1 G: Supply voltage
2 G0: Ground, neutral
6 Y1: Override control
7 Y2: Override control
8 YC: Setpoint value signal and communication
9 U: Actual value signal

Compact: GLB181.1E/3

LN0, Variable volume flow control and override control

Switch functions
S1 Damper blade OPEN
S2 Damper blade CLOSED
S1 and S2 Maximum volume flow rate $V_{\text{max}}$
All OPEN: Room temperature control or minimum volume flow rate $V_{\text{min}}$

Compact: GLB181.1E/3

LN0, control with external digital single room controllers (3P)
LN0, Dual duct terminal unit Type TVM

Application
- Electronic volume flow controller GLB181.1E/KN as Compact controller
- Variable air or constant air volume flow control
- The flow rate is measured according to the dynamic measurement principle
- KNX communication interface (S-mode and LTE-mode) and PL-link (peripheral equipment bus) with adjustable communication parameters
- Setpoint value defaults and overrides by means of data exchange with a higher-level system (Siemens Desigo, Siemens Synco 700 or S-mode compatible systems)
- Status values such as volume flow rate actual value and damper blade position are sent to the interface
- Use adjustment device or commissioning tool to configure the controller

Construction

LK0
• GLB181.1E/KN for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA
• 2 × GLB181.1E/KN for TVM

Useful additions
• AT-VAV-S: Adjustment device AST20

Communication interface
• KNX in S-mode and LTE-mode
• PL-link (peripheral equipment bus)

Operating modes
• Variable volume flow control: \( V_{\text{min}} - V_{\text{max}} \)
• Constant volume flow control: \( V \)

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning
• Use adjustment device or commissioning tool to configure the interface
• When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates

LK0

Setpoint value setting
• The room or building automation system sends via a KNX bus a control signal
• The volume flow rate setpoint depends on the control signal and the saved parameters
• The control signal is sent as a percentage and leads to a volume flow rate setpoint between \( V_{\text{min}} \) and \( V_{\text{max}} \)
• If \( V_{\text{min}} = 0 \) and \( V_{\text{max}} = V_{\text{room}} \), the automation system can use the entire adjustment range of the VAV terminal unit
• \( V_{\text{min}} > 0 \) and/or \( V_{\text{max}} < V_{\text{room}} \) results in a reduced variable volume flow range with higher resolution of the control signal
• If the control signal does not change, a constant volume flow rate is maintained

Actual values
• Volume flow rate actual value and damper blade position

Compact controller GLB181.1E/KN

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage (AC)</td>
<td>24 V AC ± 20 %, 50/60 Hz</td>
</tr>
<tr>
<td>Power rating (AC)</td>
<td>3 VA max.</td>
</tr>
<tr>
<td>Torque</td>
<td>10 Nm</td>
</tr>
<tr>
<td>Running time for 90°</td>
<td>125 – 150 s</td>
</tr>
<tr>
<td>Communication</td>
<td>KNX, TP1-256 (galvanically separated), Busload 5 mA</td>
</tr>
<tr>
<td>IEC protection class</td>
<td>III (protective extra-low voltage)</td>
</tr>
<tr>
<td>Protection level</td>
<td>IP 54</td>
</tr>
<tr>
<td>EC conformity</td>
<td>EMC to 2014/30/EU</td>
</tr>
<tr>
<td>Weight</td>
<td>0.6 kg</td>
</tr>
</tbody>
</table>

KNX data points in S-mode
<table>
<thead>
<tr>
<th>Name in ETS tool</th>
<th>A: Input</th>
<th>Flags</th>
<th>E: Input</th>
<th>Name in ETS tool</th>
<th>A: Input</th>
<th>Flags</th>
<th>E: Input</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>K</td>
<td>L</td>
<td>S</td>
<td></td>
<td>K</td>
<td>L</td>
<td>S</td>
</tr>
<tr>
<td>Fault information</td>
<td>A 0 0 1 0</td>
<td>0 219.001</td>
<td>_AlarmInfo</td>
<td>6 bytes</td>
<td>[0–255]=log no., [0–2]=alarm priority, [0–14]=application area, [0–4]=error class, [0–7]=attributes, [0–7]=fault state</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fault state</td>
<td>A 0 0 1 0</td>
<td>1.005</td>
<td>_Alarm</td>
<td>1 bit</td>
<td>0=normal, 1=fault</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fault transmission</td>
<td>E 0 1 0 1</td>
<td>1.003</td>
<td>_Enable</td>
<td>1 bit</td>
<td>0=disable, 1=enable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Default</td>
<td>E 0 1 0 1</td>
<td>5.001</td>
<td>_Scaling</td>
<td>1 byte %</td>
<td>[0–100], resolution 0.4 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual position</td>
<td>A 1 0 1 0</td>
<td>5.001</td>
<td>_Scaling</td>
<td>1 byte %</td>
<td>[0–100], resolution 0.4 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume flow rate actual value</td>
<td>A 1 0 1 0</td>
<td>8.010</td>
<td>_Percent_V</td>
<td>2 bytes %</td>
<td>–327.68–327.67 %, resolution 0.01 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A 1 0 1 0</td>
<td>14.077</td>
<td>_Value_Volume_Flux</td>
<td>4 bytes m³/s</td>
<td>Resolution 1 m³/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fault</td>
<td>A 1 0 1 0</td>
<td>1.002</td>
<td>_Bool</td>
<td>1 bit</td>
<td>0=no error, 1=error</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simulated default setting</td>
<td>A 1 0 1 0</td>
<td>1.002</td>
<td>_Bool</td>
<td>1 bit</td>
<td>0=no error, 1=error</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

K: Communication  
L: Read  
S: Write  
Ü: Transmission  
A: Update

**Compact controller GLB181.1E/KN**
① Rotation stop
② Blade shaft clamp
③ Position indicator
④ Indicator light
⑤ Push button
⑥ Service socket
⑦ Gear release button (at the side)
⑧ Connections for differential pressure sensor
⑨ Connecting cable

LK0, Characteristic of the setpoint value signal

Volume flow rate setpoint value
0 – 100%  

\[ \dot{V}_{\text{setpoint}} = \frac{X}{100} (\dot{V}_{\text{max}} - \dot{V}_{\text{min}}) + \dot{V}_{\text{min}} \]

**LK0**  
**LK0, Characteristic of the actual value signal**

![](image)

**GLB181.1E/KN**  
**Volume flow rate actual value**  

0 – 100%  

\[ \dot{V}_{\text{actual}} = \frac{X}{100} \dot{V}_{\text{nom}} \]

**LK0**  
**LK0, Connecting cable core identification**

<table>
<thead>
<tr>
<th>RD</th>
<th>BK</th>
<th>RD</th>
<th>BK</th>
</tr>
</thead>
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<td>G</td>
<td>G0</td>
<td>CE+</td>
<td>CE-</td>
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<td>Compact</td>
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</tbody>
</table>

Cable 1, supply voltage, black sheath
1 G: Supply voltage
2 G0: Ground, neutral
Cable 2, communication, green sheath
1 CE+: PL-Link (KNX)
2 CE–: PL-Link (KNX)
Compact: GLB181.1E/KN

LK0, Volume flow control