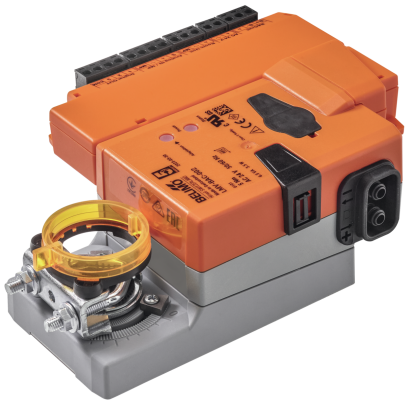
VAV unit – with pressure-independent temperature and CO_2 controller, Δp sensor and damper actuator

- **Application: VAV, room temperature control and room CO_2 control**
- **Belimo D3, dynamic flow sensor**
- **Belimo M1, static diaphragm sensor**
- **Functional range differential pressure 0...500 Pa**
- **Communication via BACnet MS/TP or Modbus RTU**
- **Analogue / digital input**



Picture may differ from product

Technical data

Electrical data	Nominal voltage	AC 24 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...28.8 V
	Power consumption in operation	16 W
	Power consumption in rest position	1.5 W, 2.5 VA
	Power consumption for wire sizing	17 VA
	Connection supply / control	Terminals 2.5 mm^2
Data bus communication	Communicative control	BACnet MS/TP Modbus RTU
	Number of nodes	BACnet / Modbus see interface description
Functional data	Torque motor	5 Nm
	V'max adjustable	20...100% of V'nom
	V'mid adjustable	>V'min...<V'max
	V'min adjustable	0...100% of V'nom (<V'max)
	Manual override	with push-button, can be locked
	Angle of rotation	95°
	Angle of rotation note	adjustable mechanical or electrical limitation
	Mechanical interface	Universal shaft clamp 6...20 mm
	Position indication	Mechanical
Measuring data	Measuring principle	Belimo D3, dynamic flow sensor Belimo M1, static diaphragm sensor
	Installation orientation	position-independent, no zeroing necessary
	Functional range differential pressure	0...500 Pa
	Maximum system pressure	1500 Pa
	Burst pressure	±5 kPa
	Height compensation	Adjustment of system height (range 0...3000 m above sea level)
	Condition measuring air	0...50°C / 5...95% RH, non-condensing
	Pressure tube connection	Nipple diameter 5.3 mm
Safety data	Protection class IEC/EN	III, Safety Extra-Low Voltage (SELV)
	Degree of protection IEC/EN	IP20
	EMC	CE according to 2014/30/EU
	Certification IEC/EN	IEC/EN 60730-1 and IEC/EN 60730-2-14

Technical data

Safety data	UL Approval	cURus according to UL60730-1A, UL60730-2-14 and CAN/CSA E60730-1
	Type of action	Type 1
	Rated impulse voltage supply / control	0.8 kV
	Pollution degree	2
	Ambient humidity	Max. 95% RH, non-condensing
	Ambient temperature	0...50°C [32...122°F]
	Storage temperature	-20...80°C [-4...176°F]
	Servicing	maintenance-free
Weight	Weight	0.52 kg

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.
- Outdoor application: only possible in case that no (sea) water, snow, ice, insolation or aggressive gases interfere directly with the device and that it is ensured that the ambient conditions remain within the thresholds according to the data sheet at any time.
- Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied with 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 device contains electrical and electronic components and must not be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Product features

Application

Room temperature and indoor air quality control (CO_2)

ZoneEase VAV actuators contain control loops for room temperature and indoor air quality (based on the CO_2 measurement), which can be activated separately or together.

See technical brochure – ZoneEase VAV Application Description.

Room units with integrated sensors can be connected to the integrated MP-Bus port.

Sensor connection

One active sensor can be connected to the analogue input.

I/O extension

Variants with I/O extension (..-BAC-002) allow for the connection of electric or hydronic reheaters and serial or parallel fans.

Selection of configurable applications

ZoneEase VAV actuators are delivered with pre-installed configurable applications for heating or cooling control with optional indoor air quality control, flow control or pressure-dependent bypass control.

Pressure measurement

The integrated differential pressure sensor is highly accurate and long-term stable and allows for an installation independently of the device orientation.

The sensor is suitable for comfort HVAC applications such as in offices, public buildings, hotels, hospitality in health care, cruise ships, residential buildings, etc.

Actuators

For the various applications and damper designs, various actuator variants with torque 5 or 10 Nm are available to the VAV unit manufacturer.

Additional devices

Depending on the selected application, additional peripheral devices such as zone valves and room operating units are available.

Belimo Cloud

ZoneEase VAV actuators and the connected peripheral devices are engineered and commissioned through a cloud based workflow (https://zoneease.cloud.belimo.com). The settings can be downloaded via NFC access to room units and ZoneEase actuators.

Demand Controlled Ventilation (DCV)

By using the actual values for flow and damper position via the BMS interface, demand controlled ventilation can be implemented by means of an AHU fan optimiser function.

Operating and service tools

Belimo ZoneEase™ VAV App, Belimo Assistant 2

Manual override

Manual override with push-button possible (the gear train is disengaged for as long as the button is pressed or remains locked).

High functional reliability

The actuator is overload protected, requires no limit switches and automatically stops when the end stop is reached.

Peripheral devices

Description	Type
Room Operating Unit Temperature, ePaper touch display	P-22RT-1T00D-1
Room Operating Unit Humidity / Temperature, ePaper touch display	P-22RTH-1T00D-1
Room Operating Unit CO_2 / Humidity / Temperature, ePaper touch display and LED	P-22RTM-1T00D-1
Room Operating Unit Temperature, Belimo Display App and LED	P-22RT-1T-1
Room Operating Unit Humidity / Temperature, Belimo Display App and LED	P-22RTH-1T-1

Peripheral devices

Description	Type
Room Operating Unit CO_2 / Humidity / Temperature, Belimo Display App and LED	P-22RTM-1T-1
Rotary actuator (ZoneTight), AC/DC 24 V, MP-Bus, 75 s	CQ24A-MPL-A8
Duct/Immersion sensor Temperature	22DT-12T
Duct/Immersion sensor Temperature	22DT-12P
Duct/Immersion sensor Temperature	22DT-12N
Duct/Immersion sensor Temperature	22DT-12L
Duct/Immersion sensor Temperature	22DT-12H
Duct/Immersion sensor Temperature	22DT-12R
Duct sensor CO_2	22DC-11

Accessories

Tools	Description	Type
	Service tool, with ZIP-USB function, for configurable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH EU
	Service tool for wired and wireless setup, on-site operation and troubleshooting.	Belimo Assistant 2
	Converter Bluetooth / NFC	ZIP-BT-NFC
	Belimo ZoneEase™ VAV App, Smartphone app for easy commissioning, configuration and maintenance (Android smartphones only)	Belimo ZoneEase™ VAV App
	Belimo Display App	Belimo Display App

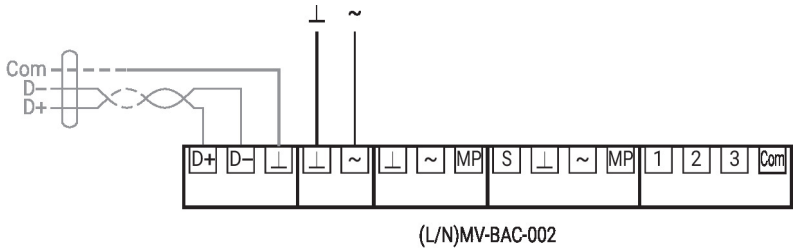
Electrical installation

Supply from isolating transformer.

The wiring of the line for BACnet MS/TP / Modbus RTU is to be carried out in accordance with applicable RS-485 regulations.

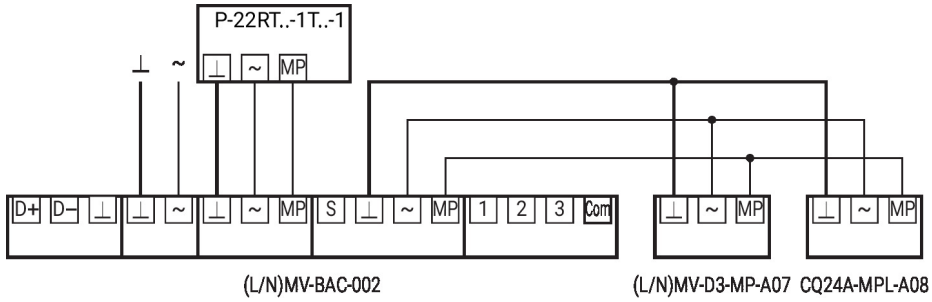
Modbus / BACnet: Supply and communication are not galvanically isolated. COM and ground of the devices must be connected to each other.

BACnet MS/TP / Modbus RTU



(L/N)MV-BAC-002

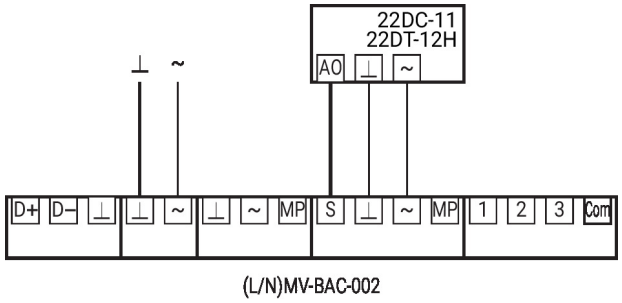
System connection via MP-Bus client-server connections



(L/N)MV-BAC-002 (L/N)MV-D3-MP-A07 CQ24A-MPL-A08

Electrical installation

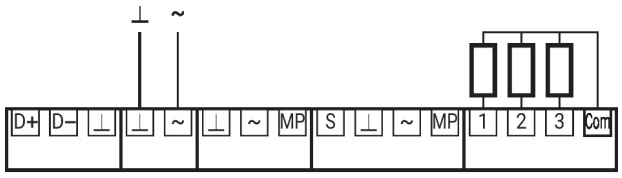
Sensor connection (temperature or CO2)



(L/N)MV-BAC-002

Converter for sensors

Digital output connection



(L/N)MV-BAC-002

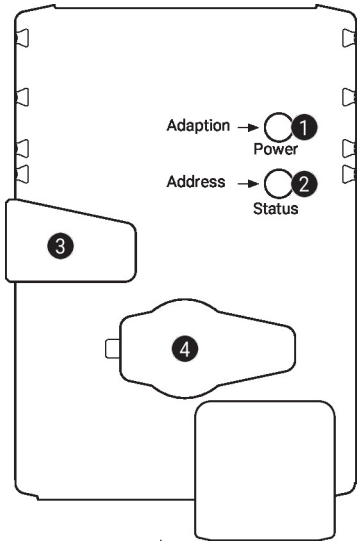
Parameter and tool overview

Settings and tool functions

Designation	Setting values, limits, explanations	Units	Tool: Assistant 2	Tool: Cloud[1]	Tool: ZoneEase App	Remarks
System-specific data						
Position	120 characters, e.g. office 4 6th floor SUP	String	–	r/w	r/w	Not stored in the actuator
Designation	120 characters, e.g. VRS1400-55	String	–	r/w	r/w	Not stored in the actuator
Bus address	BACnet: 1...127 (default: 1) Modbus: 1...247 (default: 1)		–	r/w	r/w	
V'_{max}	20...100% [V'_{nom}]	m³/h / l/s / cfm	r/w	r/w	r/w	>/= V'_{min}
V'_{min}	0...100% [V'_{nom}]	m³/h / l/s / cfm	r/w	r/w	r/w	</= V'_{max}
Altitude of installation	0...3000	m	r/w	–	r/w	
Controller settings						
Application selection	1...20		r/w	r/w	r/w	See Application Description
Enable secondary damper	0 (disabled) / 1 (enabled)		–	r/w	r/w	
Volumetric flow gain	0...2 (default: 1)	100%	–	r/w	r/w	
Unit-specific settings						
V'_{nom}	0...99´999 m³/h	m³/h / l/s / cfm	r/(w)[2]	–	r/(w)[2]	Set by OEM
$\Delta p@V'_{nom}$	38...500	Pa	r/(w)[2]	–	r/(w)[2]	Set by OEM
Calibration height	0...4000	m	r/(w)[2]	–	–	Set by OEM
Height compensation	Compensated / not compensated		r/(w)[2]	–	–	Set by OEM
Other settings						
Direction of rotation	cw/ccw		r/w	r/w	r/w	
Range of rotation	95, mechanically adjustabe	°	r	–	r	
Torque	100 / 75 / 50 / 25	%	–	–	–	% of nominal torque
Operating data						
Setpoint / Actual value Damper position	0...99´999 / 0...27´777 0...58´857 / 0...100	m³/h / l/s cfm / %	r	–	r	
Simulation	Open / Close / V'_{max} / V'_{min} / Stop / Pos. % / Flow % / Flow m³/h		w	–	w	
Serial number	Device ID		r	–	r	
Type	Type designation		r	–	r	
Version display	Firmware, Config. table ID		r	–	r	

[1] Includes offline editing with XLS template
[2] Write function accessible only with OEM release code

Operating controls and indicators



1 Push-button and LED display green

Off:	No power supply or malfunction
On:	In operation
Press button:	In standard mode: Triggers angle-of-rotation adaptation
	When starting: Resets to factory setting (communication)

2 Push-button and LED display yellow

Off:	Standard mode
On:	Adaptation or synchronisation process active
Flickering:	BACnet/Modbus communication active
	When starting (>5 s): Resets to factory setting (communication)

3 Manual override button

Press button:	Gear train disengages, motor stops, manual override possible
Release button:	Gear train engages, synchronisation starts, standard mode

4 Service plug

For connecting configuration and service tools

Check supply 24 V

1 Off and 2 On	Possible wiring error in power supply

Installation notes

Installation situation

Mounting ZoneEase VAV control equipment:

The ZoneEase VAV is assembled, set and calibrated on the VAV unit in the factory by the VAV unit manufacturer.

Installation of the VAV unit:

The VAV unit must be installed according to the specifications of the VAV unit manufacturer.

Installation specification Δp sensor:

No restrictions, but it must be avoided that any condensation can run into the sensor and remain there.

Accessibility of control equipment:

Accessibility to the control equipment must be guaranteed at all times.

Pressure tube connections:

The pressure tube connections must not come into contact with liquids or greasing agents of any kind, this includes any residue inside or on the surface of the pressure tubes.

Installation notes

Servicing

Cleaning work during installation, commissioning or maintenance

Belimo VAV devices are maintenance-free. We recommend dry removal of dust from the outside of the housing if necessary.

The duct system and the VAV units are maintained on the occasion of the cleaning intervals required by law or by the specific system. Please observe the following points.

Cleaning work on the damper, differential pressure pickup devices and pressure tubes

When cleaning the duct system or the VAV unit, remove the pressure tubes on the VAV controller so that it will not be affected.

Using compressed air, e.g. blowing out the differential pressure pickup devices or pressure tubes

Before doing this work, disconnect the differential pressure pickup devices or pressure tubes from the differential pressure sensor.

Connecting the pressure tubes

To ensure the correct installation of the pressure tubes, we recommend marking them with + or – before disassembly.

Service

Wireless connection

Belimo ZoneEase devices marked with the NFC logo can be operated with Belimo Assistant 2 and Belimo ZoneEase™ VAV App.

Requirement:

- NFC- or Bluetooth-capable smartphone
- Belimo ZoneEase™ VAV App
- Belimo Assistant 2

Align NFC-capable smartphone on the device so that both NFC antennas are superposed.

Connect Bluetooth-enabled smartphone via the Bluetooth-to-NFC converter ZIP-BT-NFC to the device. Technical data and operating instructions are shown in the ZIP-BT-NFC data sheet.

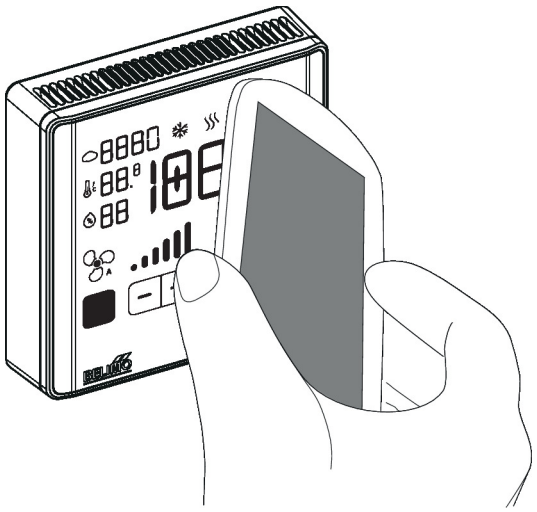
NFC read/write is possible directly at the ZoneEase actuator, but also through the connected room unit. Access through the room unit might be more convenient depending on the installation situation.

When the smartphone with the Belimo ZoneEase™ VAV App is held against the room unit, the app display guides the user through the read/write process.

Note: Only compatible room units can be used with ZoneEase VAV.

• With ePaper display: P-22RT(RTH/RTM)-1T00D-1

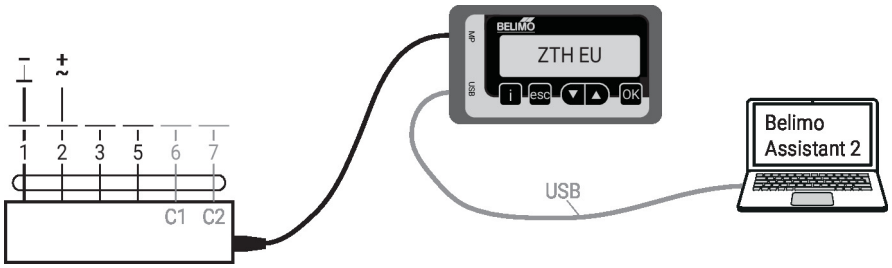
• With virtual display: P-22RT(RTH/RTM)-1T-1



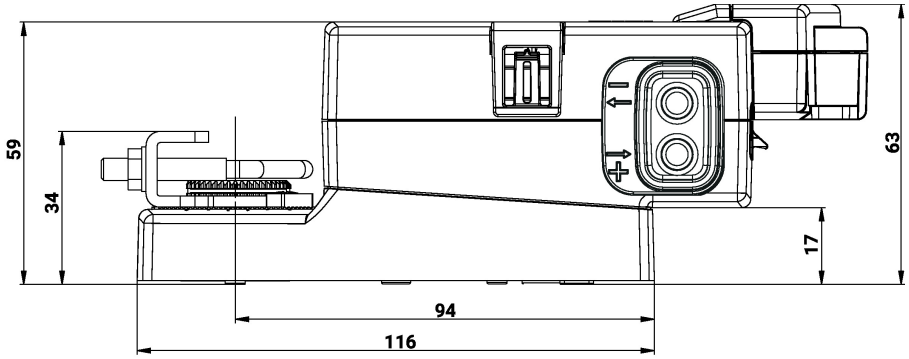
Service

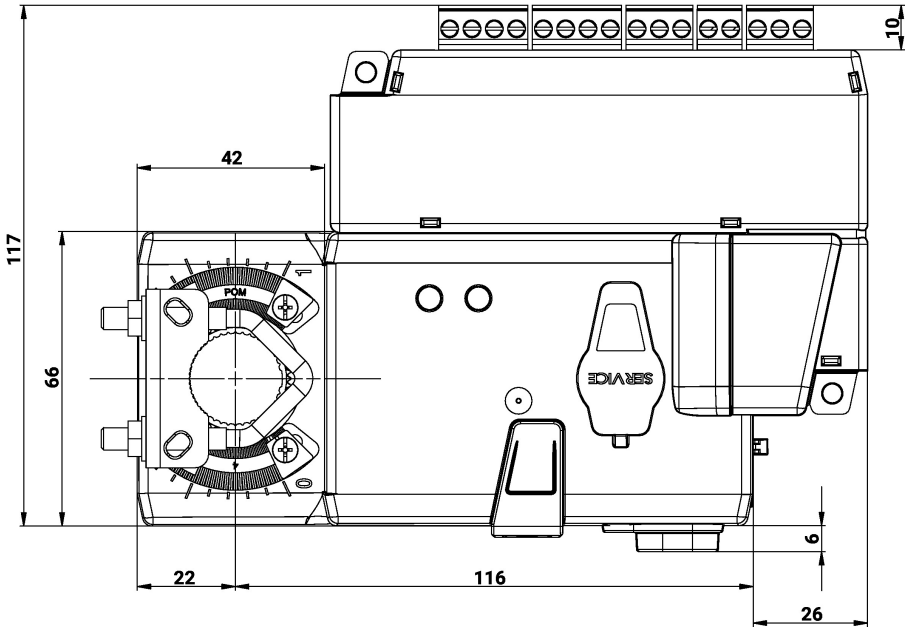
Wired connection

Setting and diagnostics of the ZoneEase actuator can be carried out quickly and easily with Belimo Assistant 2.



Dimensions





Further documentation

- BACnet Interface description
- Modbus Interface description
- ZoneEase VAV application description
- Quick Guide – Belimo Assistant 2