Service tool for parameterisable and communicative actuators / VAV controllers and HVAC performance devices from Belimo.

- **Connection via service socket on the device or MP/PP connection**
- **ZIP USB function**

Technical data

Electrical data	Nominal voltage	AC 24 V, 50/60 Hz, DC 24 V (from actuator)
	Operating range	AC 19.2...28.8 V / DC 21.6...28.8 V
	Power consumption Operation	1 W
	Connection	Socket for connecting cable ZK1-GEN (3 m) supplied with connector
	Interface USB 2.0	USB socket type B, connecting cable (1 m) with socket A to B supplied
	Optional cables	ZK2-GEN, ZK6-GEN
Interface	Communication	Point to Point (PP), no bus mode possible (MP)
Operating modes	Parameterisation	Point to Point (PP) Connection using service socket or connecting terminals on the actuator
	MP level converter (ZIP function)	Connection in control cabinet or via service socket on actuator For MP monitor operation, connection on MP-Bus
Operation	LCD display	2 x 16 characters, with background lighting
	Keys	i / esc / ▲ / ▼ / OK
Safety	Protection class	**III** Safety extra-low voltage
	EMC	CE according to 2014/30/EU
	Operating temperature	0...50 °C, non-condensing
	Non-operating temperature	–20...50 °C, non-condensing
Dimensions / weight	Dimensions	L x W x D: 95 x 55 x 25 mm
	Weight	Approx. 135 g

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.**
- **Only connection to Belimo devices with 24 V safety extra-low voltage and PP/MP interface permitted.**
- **Changes to parameters etc. may only be performed following consultation with/specification from the OEM, device or mechanical/electrical contractor. Operating and adjustment regulations must be observed.**

Definitions

ZTH AP The ZTH AP is sold worldwide. Therefore the product name for the European region is defined as ZTH AP. In the product information, the term ZTH is used to represent the ZTH AP.

Actuators For simplicity in the product information, the terms actuators, VAV controllers, fire damper actuators and HVAC performance devices are summarised using the term actuators.

Supported devices

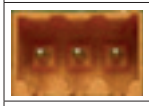
Damper product range	..-MF / ..-MP / ..-MPL / ..-MFT(2) /..-MOD / ..LON	
Valve product range	..-MF / ..-MP / ..-MPL / ..-MFT(2) /..-MOD / ..LON / ..BAC	
Electronic pressure-independent characterised control valve EPIV	P6..W..-MP / EP0..R+MP P6..W..-KMP / EP0..R+KMP	available since 2011
Fire damper actuator	BF-TopLine with BKN230-24MP	
VAV product range	VRD2 / VRD2-L	available 1992-2007
	VRD3	available since 2008
	VRP-M (VAV and STP applications)	available since 2005
	NMV-D2..	available 1992-2000
	LMV-D2M / NMV-D2M..	available 2000-2006
	LMV-D2-MP / NMV-D2-MP / SMV-D2-MP.., LHV-D2-MP..	available 2006-2011
	LMV-D2LON / NMV-D2LON	available 2006- 2011
	LMV-D3-MP / NMV-D3-MP / SMV-D3-MP.., LHV-D3-MP..	available since 2011
	LMV-D3LON / NMV-D3LON	available since 2011
	LMV-D3-MOD / NMV-D3-MOD	available since 2012
	LMV-D3-KNX / NMV-D3-KNX, LHV-D3-KNX..	available since 2015
	CMV-..-MP	available since 2013
HVAC performance devices	According to system description (e.g. Energy valve, pressure-independent zone valve 6-way)	
sharedlogic	According to system description	

Connection

Connection and supply

The ZTH AP is supplied via the actuator. The connection is set up
- either directly on the service socket of the actuator
- or via PP/MP connection (U5), e.g. connection socket, control cabinet and room controller CR24

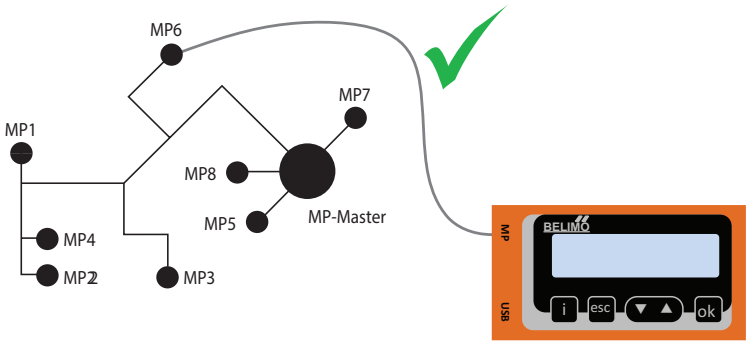
Type of connection and connection cable

	Suitable cable
	ZK1-GEN
	ZK2-GEN
	ZK4-GEN
	ZK6-GEN

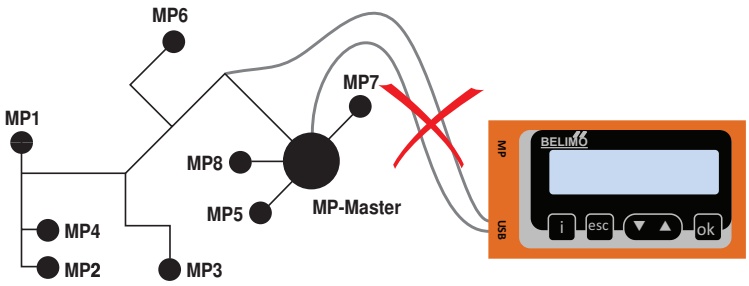
Connection for ZTH adjustment and diagnostic device

Direct connection to the MP-Bus or MP master is not possible with the ZTH AP.

Right



Wrong

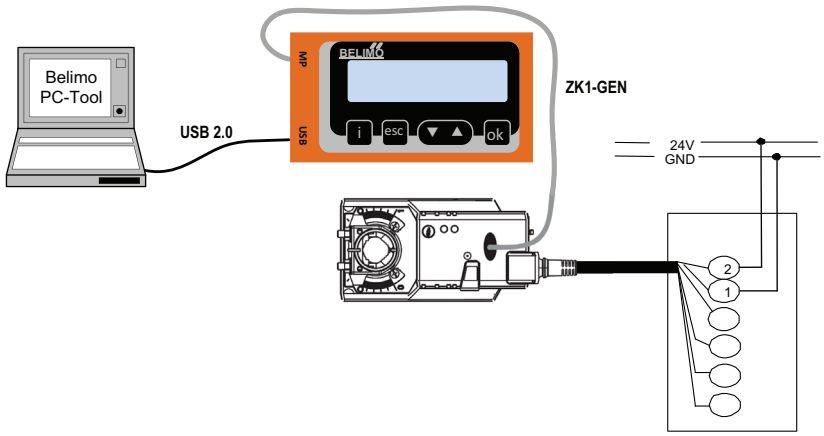


Solution: Use the service socket on the actuator or temporarily disconnect the MP connection of the MP device from the MP-Bus and connect the ZTH AP to the MP connection.

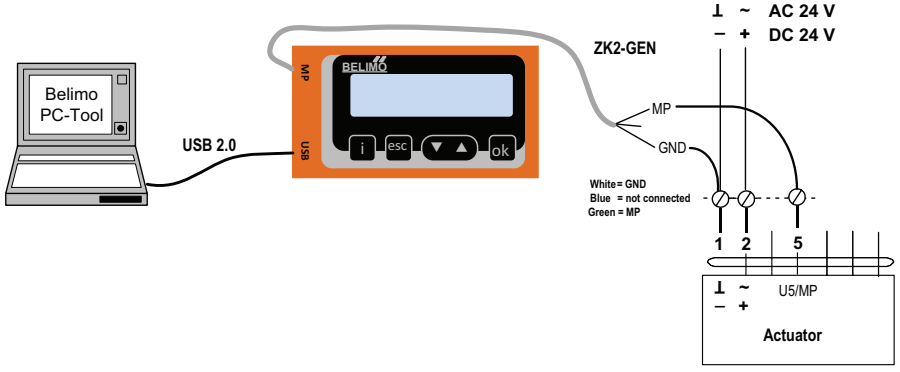
ZIP function connection

Note
The USB driver required will be automatically installed with PC-Tool version 3.9 or higher. For older versions of the PC-Tool, the driver can be downloaded from www.belimo.com and installed separately.

Connection via service socket - local connection with ZK1-GEN cable



Connection via connecting cable - local connection with ZK2-GEN cable



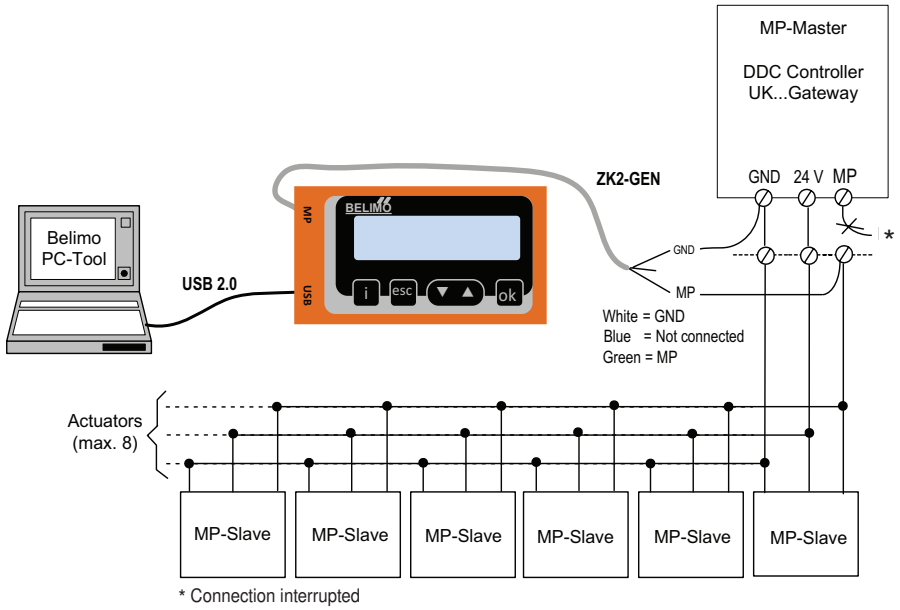
ZIP function connection

PC-Tool as MP master

- Actuator parameterisation via MP-Bus
- Specification of setpoints for simulation of actuators via MP-Bus
- Reading in of sensors that are connected to the MP actuator
- Recording of graphic trends

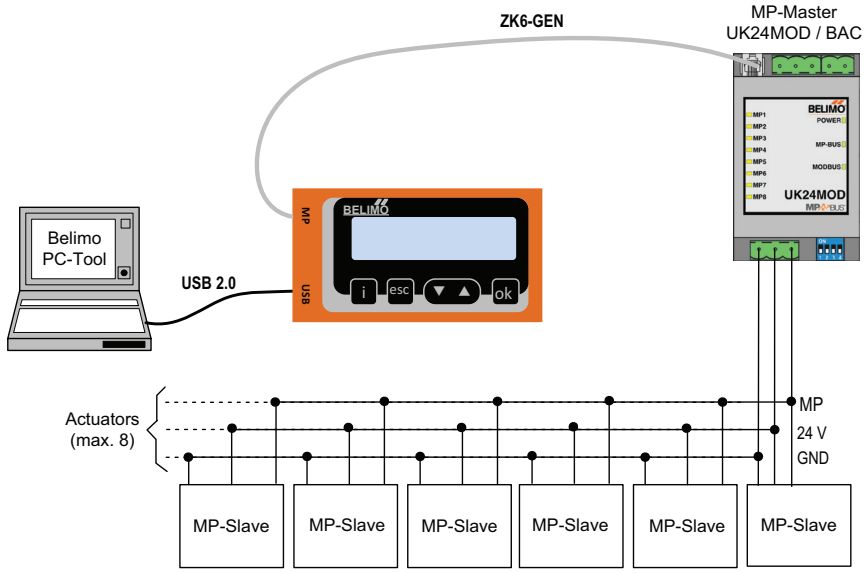
Note

* Interrupt connection between ZTH AP and MP master before using the ZIP function.



PC-Tool connection with ZK6-GEN, ZK4-GEN on Belimo gateways

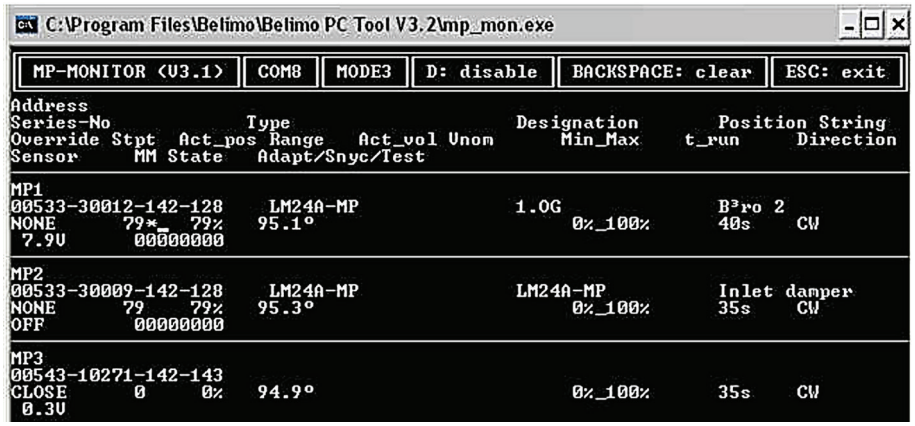
- For connection to UK24MOD and UK24BAC, use the ZK6-GEN cable.
- For connection to UK24EIB and UK24LON, use the ZK4-GEN cable.



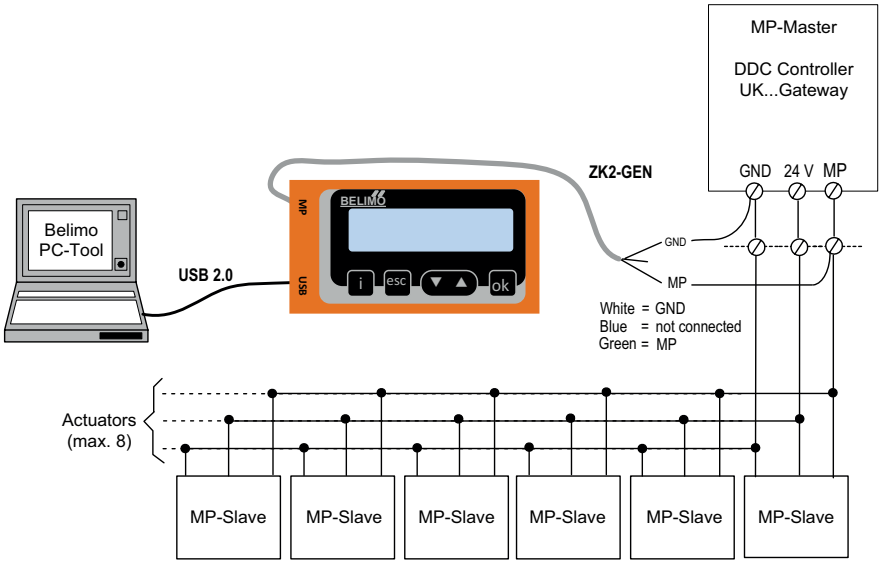
ZIP function connection

PC-Tool as monitor

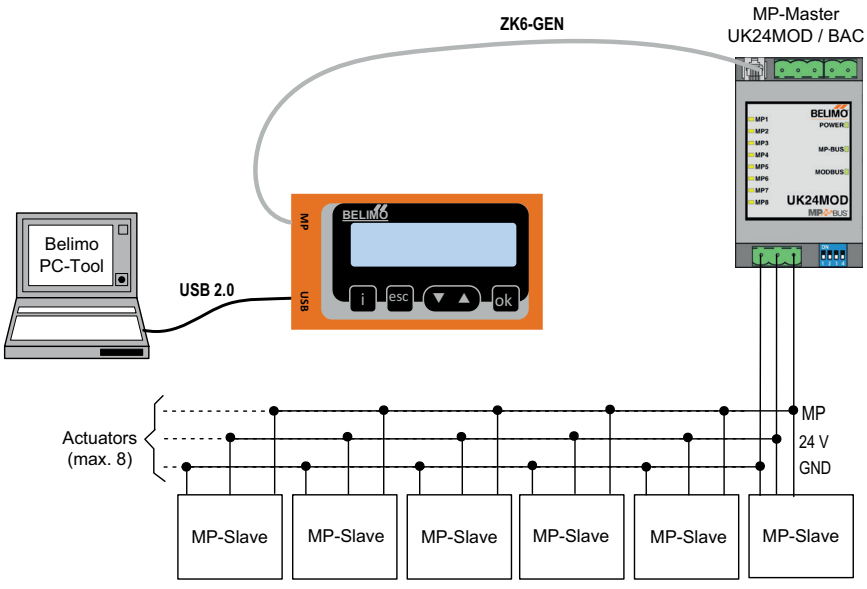
Check the MP communication with the MP monitor tool (module of PC-Tool V3.x).



PC-Tool with monitor function / connection: ZK2-GEN to MP master

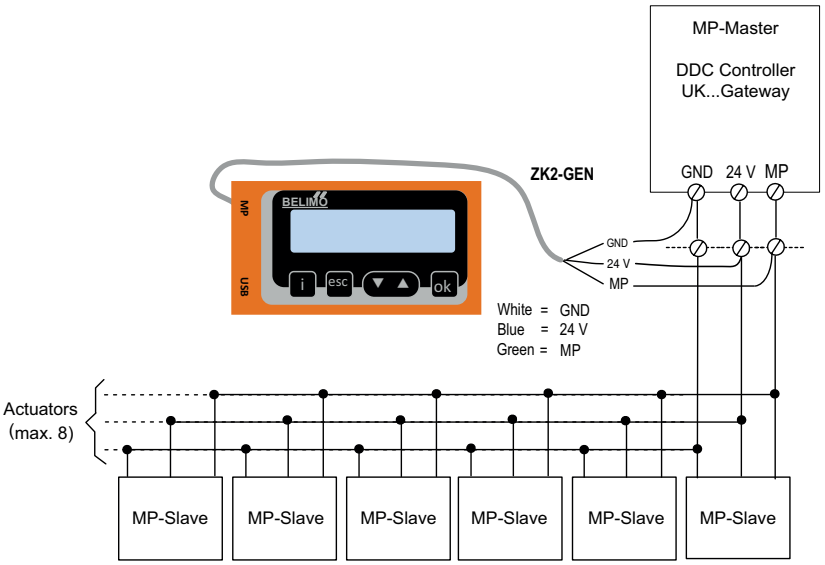


PC-Tool with monitor function / connection: tool socket with ZK6-GEN, ZK4-GEN

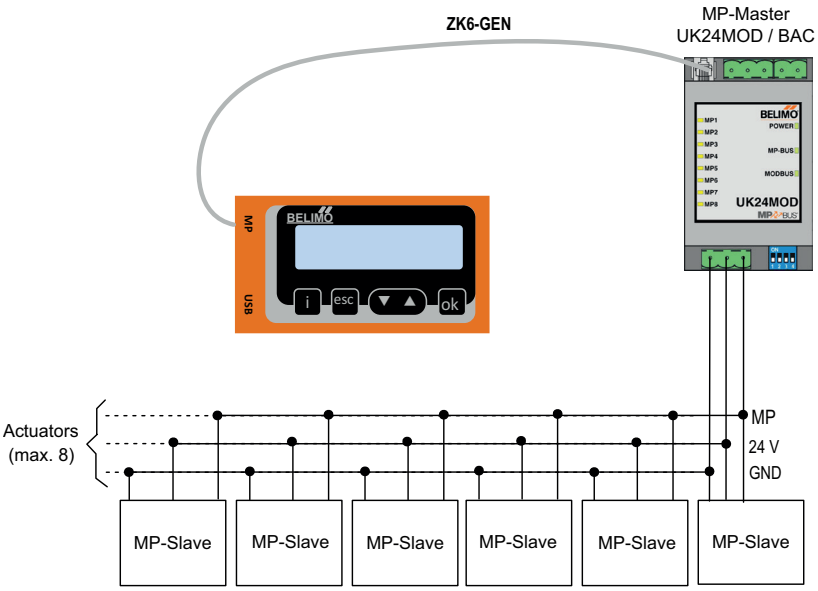


MP tester connection

MP-Bus direct ZTH connection



ZTH connection to tool socket with ZK6-GEN, ZK4-GEN



Operation

When the ZTH AP is connected to the Belimo actuator, the operating device starts and data is read from the connected device. The available adjustment and operating options are displayed in accordance with the device type. The available setting parameters are listed in the product documentation for the actuators. See www.belimo.com

Operating elements

LCD display
- Background lighting
- Display with 2 x 16 characters

Key function

▼ and ▲	Forward /backward Change value / status
OK	Confirm entry, go to submenu
esc	Abort entry, leave submenu, discard change
i	Shows additional information (if available)

- RJ12 connection socket
- USB connection socket for communication with PC

Language setting, unit depiction

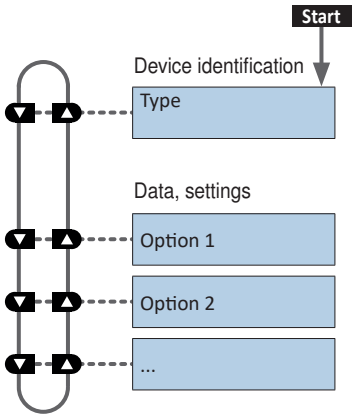
Language and units can be set in the Configuration menu.

Operation

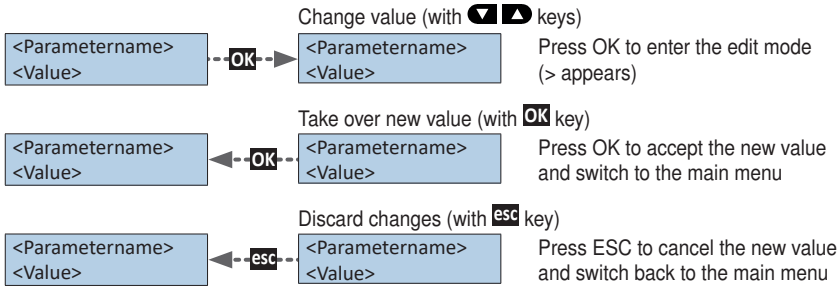
Operating is context-related, i.e. the user sees only the options available for the connected device. The corresponding Configuration table is read from the actuator for this purpose. In addition to the parameter type, this table also contains the corresponding divisions, e.g.: minimum running time which can be set, type etc. Non-relevant options are not displayed.

Menu structure, handling

The operating menu can be scrolled through from both sides using the ▼▲ keys.



Changing values



Starting / ending

The connection to the actuator is started by plugging in the RJ plug and terminated by unplugging it.

Device specifications/Technical data

For a more detailed description, including setting parameters, please refer to the respective separate product information. See www.belimo.com ¦ Documentation.

Configuration

Starting configuration

1. Press the key (OK) while simultaneously plugging in the connecting cable.
2. Configuration menu display appears.

Configuration menu

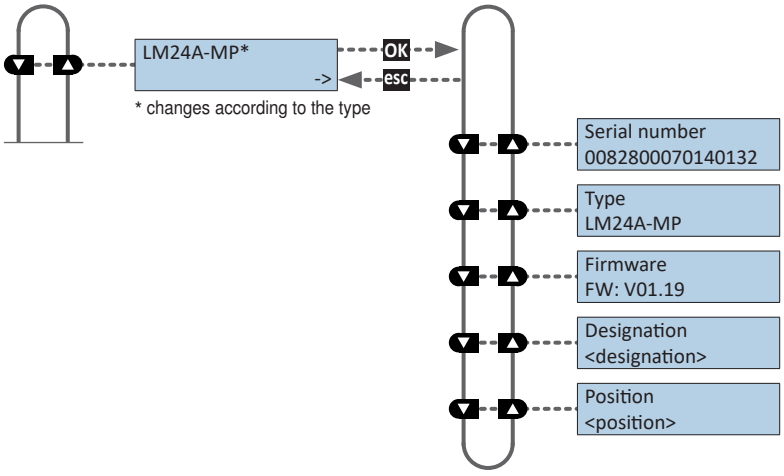
Option / Display	Setting	Product range	Explanation
Empty cache	Yes / No		Function to delete data profiles of HVAC performance devices from the local cache
Backlight	After 0.. 255 sec off / always active		Setting for duration of backlight in seconds
Show favourites	Disabled / after 1…65535 s	HVAC performance devices (Energy Valve)	Alternating display of the first 3 values after the set time
OEM number	0…65535	VAV	
Advanced Mode [1]	Yes / No	VAV Fire protection Modbus	Enabled settings: – VAV: direction of rotation – VAV: set Vmin / Vmax to original values (call up OEM setting) – CMV: Correction factor – BF-Top: adaption – Modbus: basic address
Expert Mode [1]	Yes / No	VAV Valves	Enabled settings: – VAV: switching mode – VAV: Vmid parameter – VAV: altitude compensation
PICCV function	Yes / No	Valves	Belimo US: Enable PICCV Wizard function
Start RT-Monitor	RTMonitor active		Realtime monitor function
Start MP tester	MP-Bus level / Frame counter		MP tester function
Power supply measurement	Value V (AC) VHW (%)		
Pressure unit	Pa / in WC	VAV	
Flow unit (water)	m³/h / l/min / gpm / l/s	Valves	
Flow unit (air)	m³/h / l/s / cfm	VAV	
Exit configuration	ESC		

[1] Only activate this option as needed and with the respective know-how. Adjustment of the respective parameters requires special expertise.

Basic functions

Device identification

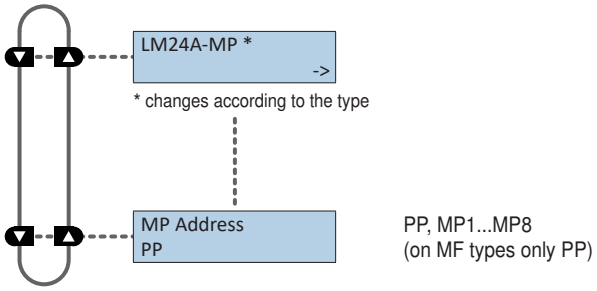
The following menu tree shows the basic functions which are identical for all devices.



Basic functions

MP address

With MP-capable actuators, the MP address (PP, MP1-MP8) can be set.

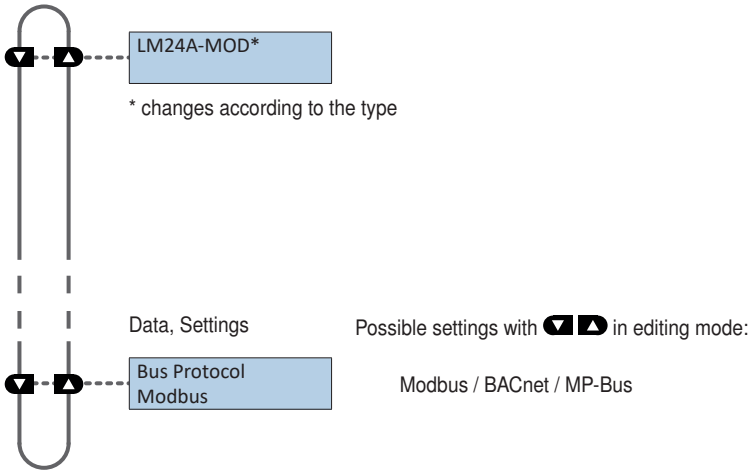


Functions for -MOD Actuators (Modbus/ BACnet /MP-Bus)

Bus Protocol

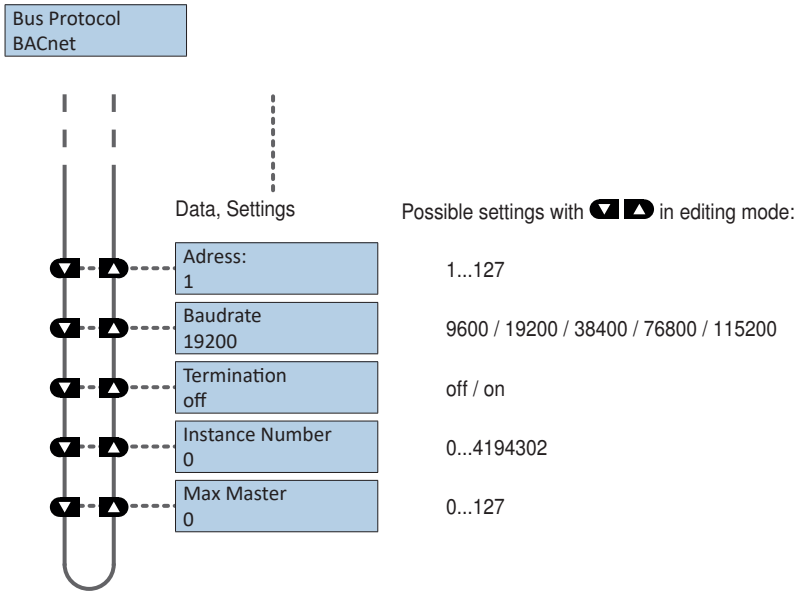
Specific communication settings of actuators with integrated BACnet MS/TP, Modbus RTU and MP-Bus interface (..-MOD).
The specific communication protocols are displayed by selecting the corresponding bus protocol.

Note:
After changing communication settings (baudrate, address, parity etc.) wait at least 5 seconds before selecting the next menu. This also applies when writing the setting before unplugging the ZTH AP or interrupting the power supply.



BACnet Settings

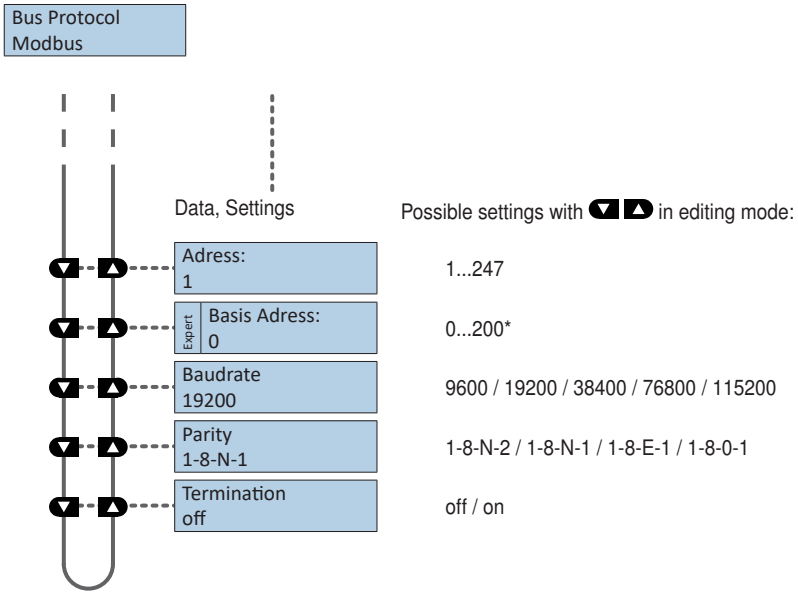
The following menu tree shows the adjustment/display options for the BACnet communications settings.



Functions for -MOD Actuators (Modbus/ BACnet /MP-Bus)

Modbus Settings

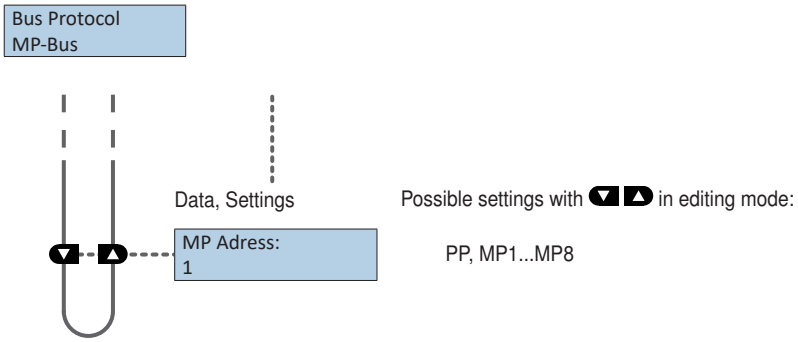
The following menu tree shows the adjustment/display options for the Modbus communications settings.



*) The setting of the base address is also taken into account for the BACnet MS / TP address.

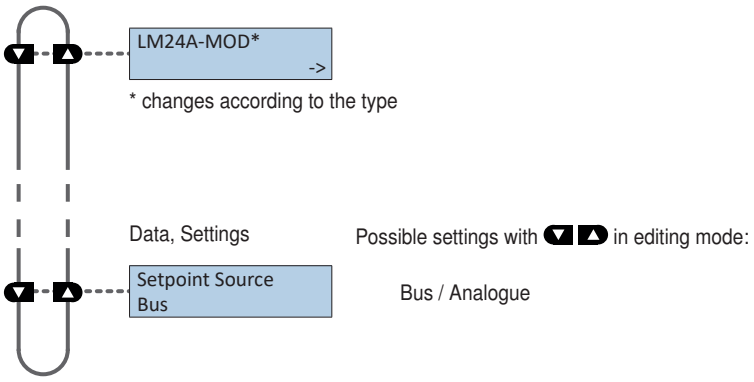
MP-Bus Settings

The following menu tree shows the adjustment/display options for the MP-Bus communications settings.



Setpoint source (hybrid mode)

The setpoint source setting allows to select the operating mode for controlling the devices.



Selection Bus: The control takes place exclusively via selected bus protocol (Modbus or BACnet)

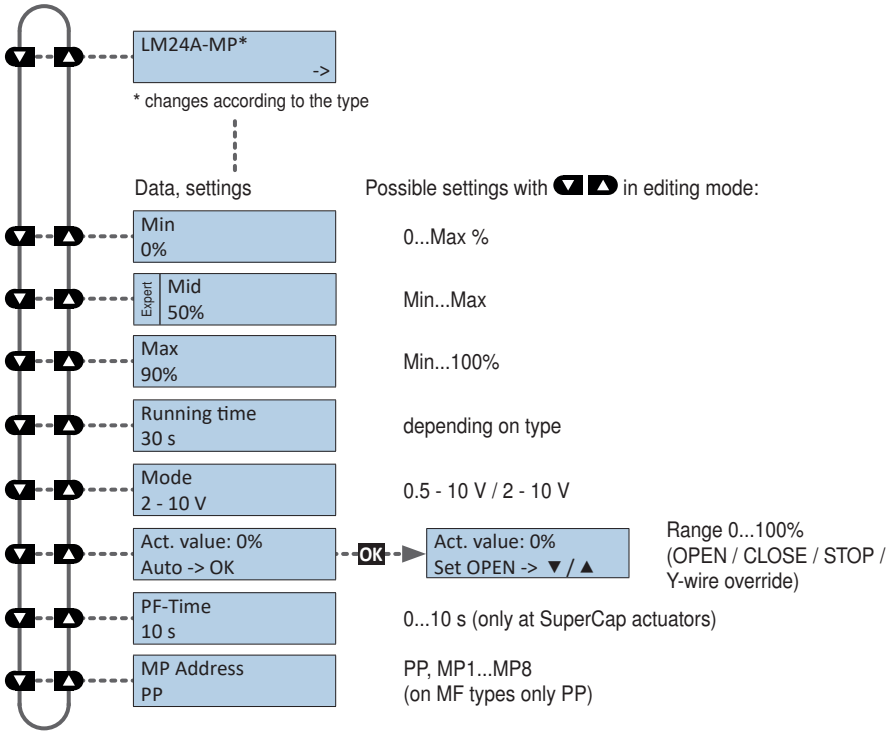
Selection Analog: The control takes place via analogue 0...10V signal. Reading out and monitoring of the device is still possible via the selected bus protocol (Modbus or BACnet).

Functions for damper / rotary valve product range

Menu tree

The ZTH AP recognises the device family of the connected device automatically. The menu and the options available are shown related to the connected device.

Adjustment/display options LM24A-MP.

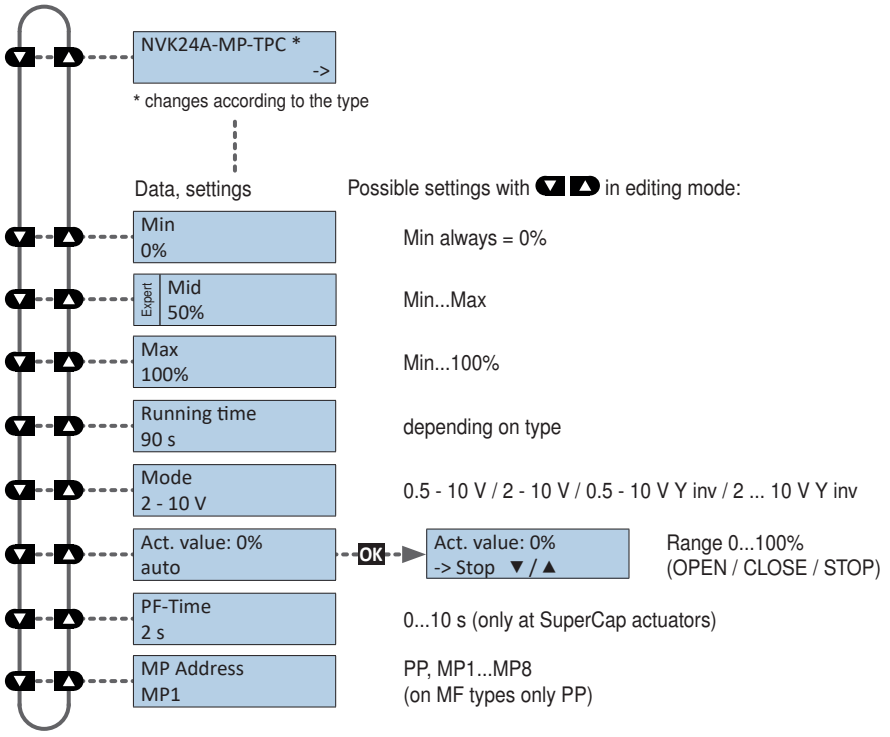


Functions for globe valve product range

Menu tree

The ZTH AP recognises the device family of the connected device automatically.
The menu and the options available are shown related to the connected device.

Adjustment/display options NVK24A-MP-TPC.

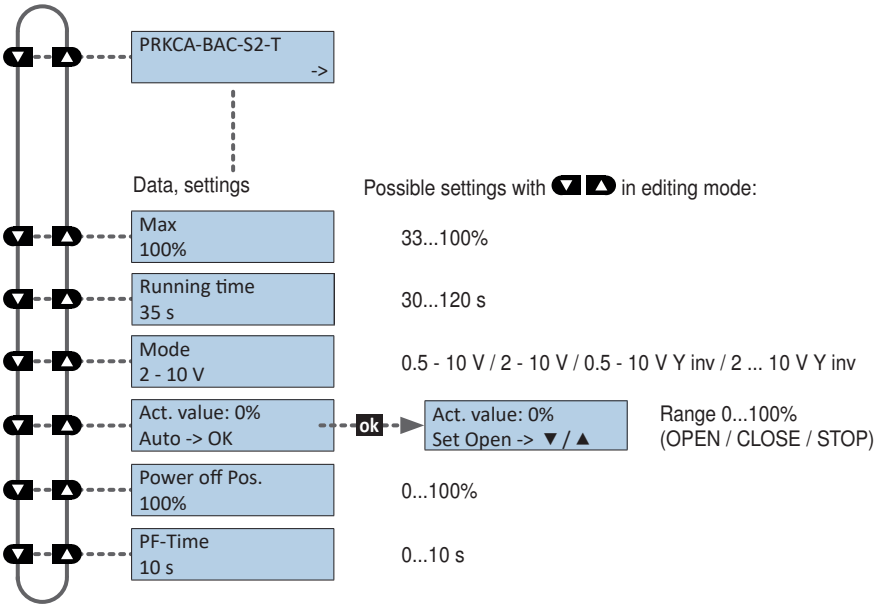


Funtions for butterfly valve actuators

Menu tree

The following menu tree shows the adjustment/display options of an PRKCA-BAC-S2-T.

Adjustment/display options PRKCA-BAC-S2-T

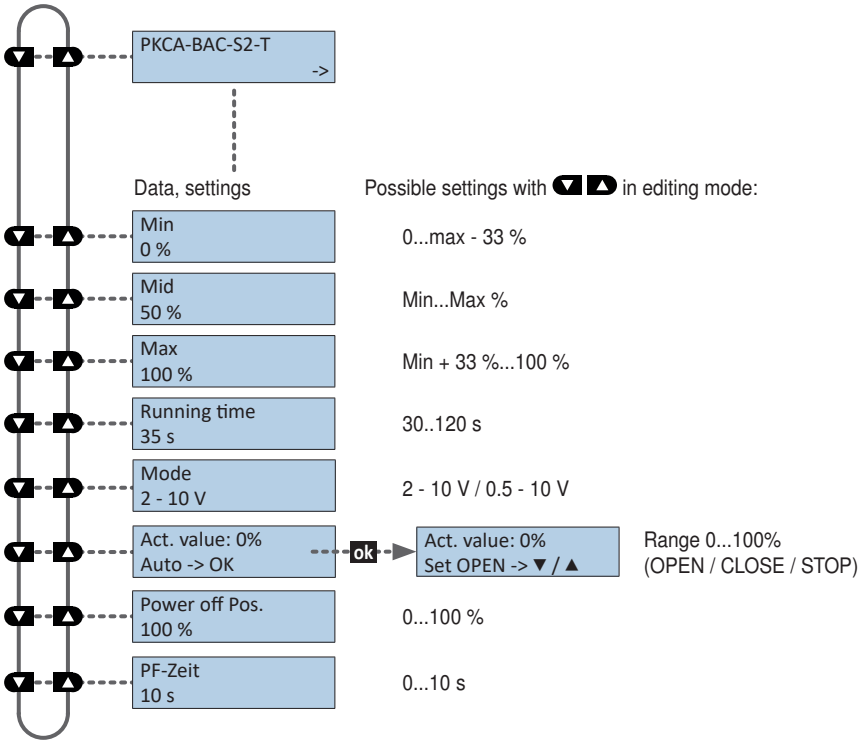


Funtions for rotary actuators with high torque

Menu tree

The ZTH AP recognises the device family of the connected device automatically.
The menu and the options available are shown related to the connected device.

The following menu tree shows the adjustment/display options of an PKCA-BAC-S2-T

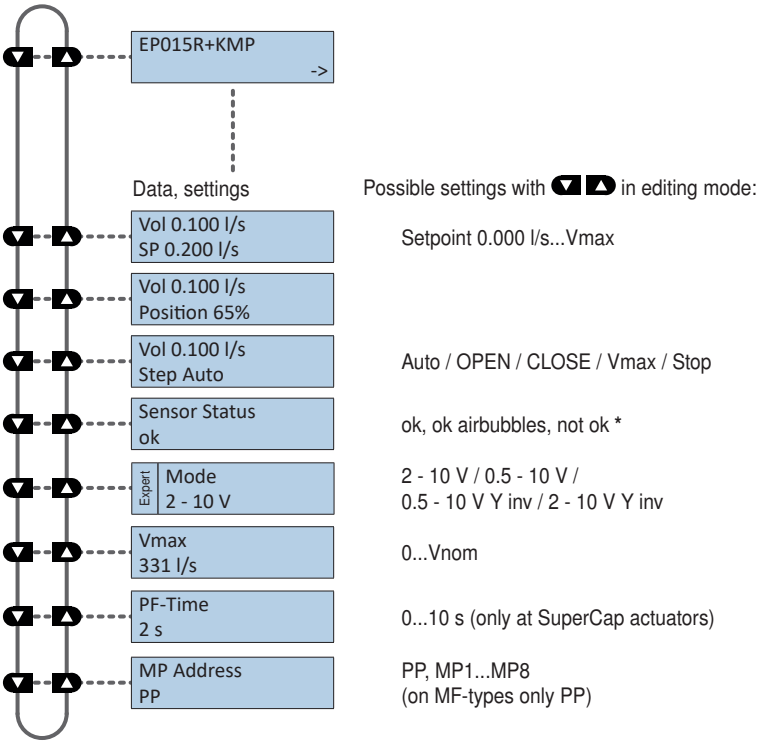


Funtions for electronic pressure-independent characterised control valve EPIV

Menu tree

The following menu tree shows the adjustment/display options of an EP015R+KMP

Adjustment/display options electronic pressure-independent characterised control valve EPIV



* ok: Flow sensor is working properly
ok airbubbles: Flow sensor is working properly, airbubbles in the system
not ok: Sensor error

Functions for VAV product range

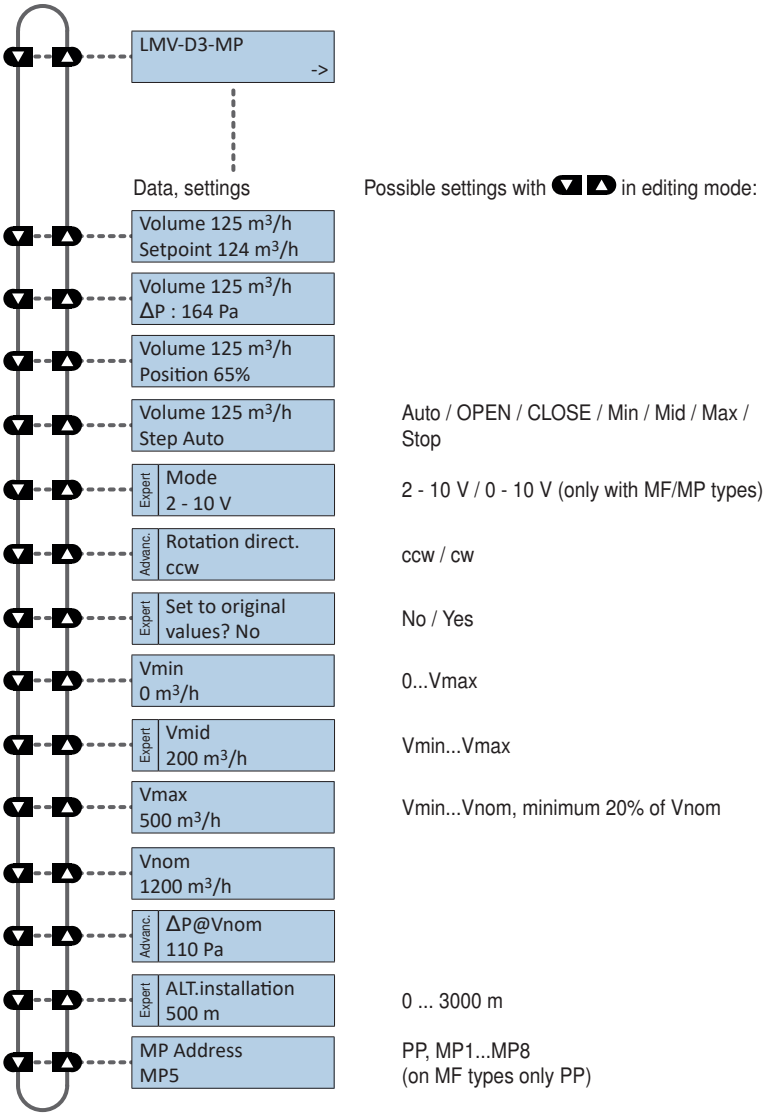
Menu tree

The following menu tree corresponds to the new VAV-Compact D3 generation: L/N/SMV-D3-MP, LHV-D3-MP, L/NMV-D3LON, L/NMV-D3-MOD, LHV-D3-MOD [1], L/NMV-D3-KNX, LHV-D3-KNX.

1) For Modbus settings, see previous description of „Basic functions for Modbus actuators“
2) With defined Vnom the volume is displayed in m³/h. With non-defined Vnom the volume is displayed in %.

Adjustment/display options LMV-D3-MP.

Note: VAV-Universal actuators
The V-actuators L/N/SM24A-V, L/NMQ24A-SRV-ST, which fit the VAV universal controllers VR.., have a tool connection but are nevertheless not tool-capable.



Deviations

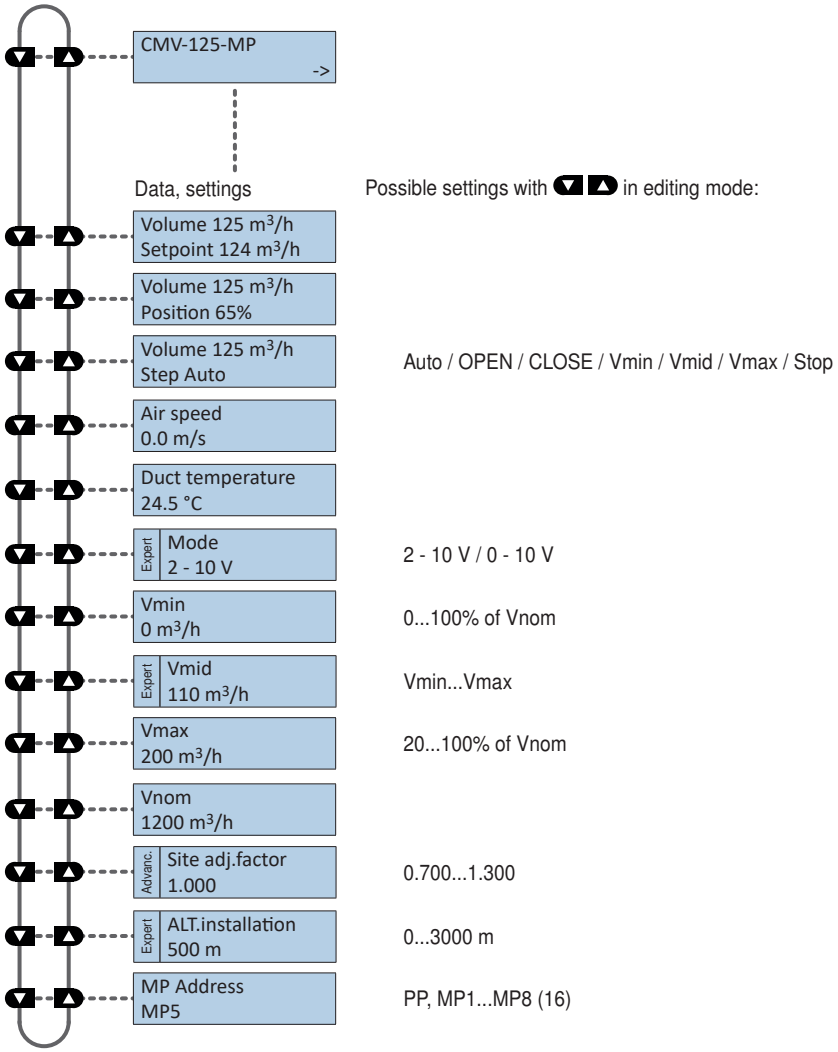
VRD2 (1992-2007)	Display showing actual value/setpoint in [% Vnom] Vmin in [% Vmax], Vmax in [% Vnom]		Read only	PP
VRD3 (as of 2008)	Display showing actual value/setpoint in [% Vnom] Vmin in [% Vnom], Vmax in [% Vnom]		HW potentiometer setting Tool → Read/write, otherwise → Read only	PP
VRP-M VAV	Up to V2.16 As of V3.0	Vmin in [% Vmax], Vmax in [% Vnom] Vmin in [% Vnom], Vmax in [% Vnom]		PP / MP1…8
NMV-D2 (1992 – 2000) **NMV-D2M** (2000 –2006)	Display showing actual value/setpoint in [% Vnom], Vmin in [% Vmax], Vmax in [% Vnom]			PP PP / MP1…8
Altitude compensation	This function requires VAV-Compact D3 with firmware V2.06 (03/2013) or higher			

Functions for CMV actuators

Menu tree

The following menu tree corresponds to that of the CMV-..-MP VAV control system)

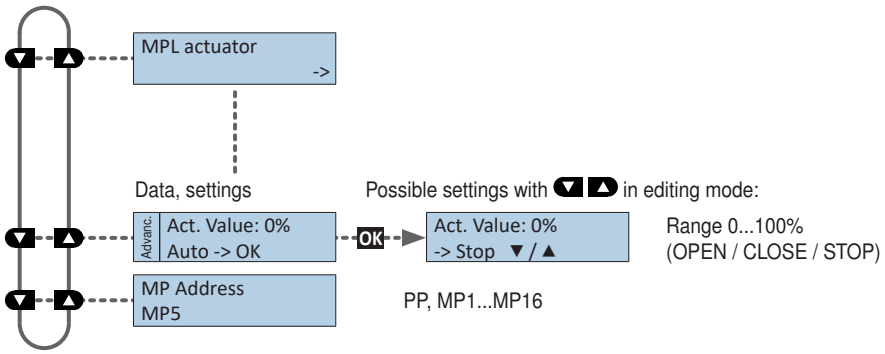
Adjustment/display options CMV-..-MP



Functions for MPL actuators

Menu tree

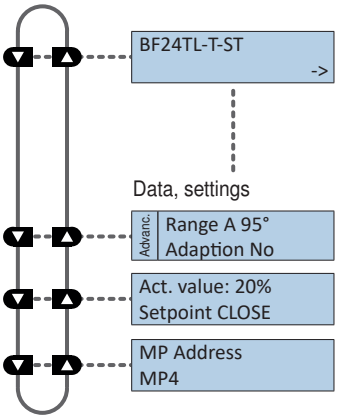
Adjustment/display options MPL actuator.



Functions for BF-TopLine fire damper actuators

Menu tree

Adjustment/display options BF-TopLine actuator.



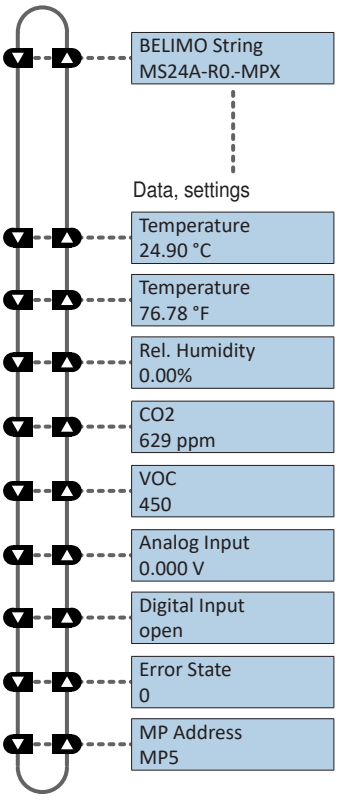
Possible settings with ▼ ▲ in editing mode:

- YES / No
- OPEN / CLOSE
- PP, MP1...MP8

Functions for room sensors MS24A-R0x-MPX

Menu tree

Adjustment/display options Room sensor MS24A-R08-MPX (T, rH, CO2, VOC).



Possible settings with ▼ ▲ in editing mode:

- Measurement 0.00...50.00 °C
- Measurement 32.00...122.00 °F
- Measurement 10.00...90.00%
- Measurement 0...2000 ppm
- Measurement 0...2000 (pseudo ppm)
- Measurement 0.000...10.000 V
- open / closed
- 1,2,4,8 see Data pool value
- PP, MP1...MP8 (16)

ZIP functions

Note
If the ZTH AP is connected to the PC, the display flashes a few times until the driver is installed on the PC.

In this configuration, the ZTH AP works as a level converter between the USB port of a PC and the Belimo MP device. The correct driver will be automatically installed on the PC when the ZTH AP is plugged in. As soon as the USB interface is connected, the ZTH AP switches to ZIP mode.

ZIP disabled

ZIP disabled

ZIP Master

ZIP Master Tx: ■ Rx: ■

Connection as MP master (e.g. PC-Tool).
If there is bus communication, this is indicated by Tx and Rx flashing.

ZIP Monitor

ZIP Monitor Tx: Rx: ■

Connection for monitor function with PC-Tool.
If there is bus communication, this is indicated by Rx flashing.

Diagnose function power supply

Checking the power supply

The ZTH AP allows the "AC 24 V" power supply (III safety extra-low voltage) of the Belimo devices to be checked. Voltages >30V are not permitted!
Application: e.g. commissioning, troubleshooting in the event of a malfunction.

Measuring process

Note
Connect RJ12 plug to ZTH AP only when starting!

Equipment: ZTH AP, ZK2-GEN
Connect in the following order:
– Connect free wires of the ZK2-GEN to AC 24 V
  • White to GND (connection 1 MP node)
  • Blue to ~ (connection 2 MP node)
  • Turquoise do not connect

Start:

Press the ZTH AP key (OK) while at the same time connecting the RJ12 plug
Select "AC measurement" function with arrow key (▼)

End:

Disconnect RJ12 plug or end "Configuration" function (ESC)

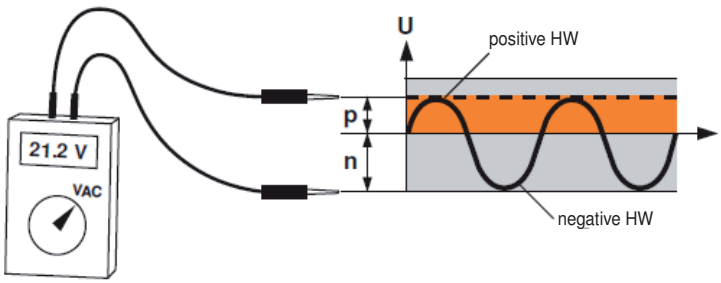
Display

Supply okay AC 25V, VHW: 85%

Quality: Supply OK: VHW >80% and AC supply in the range 19.2 ... 28.8 V
Supply low: VHW <80% and AC feed <19.2 or >28.8 V
AC value: measured AC voltage (accuracy ±1.0 V provided that VHW >95%)

Explanation of VHW

The VHW unit describes the relationship between the positive and negative half-wave.
The deviation between the positive and negative half-wave value must not be too great. The following formula applies: positive HW / negative HW x 100 should be >80%:



Possible problems

The following factors influence the half-wave load:
• Transformer dimensions too small
• Maximum signal cable length between transformer and MP node exceeded

MP tester diagnostics function

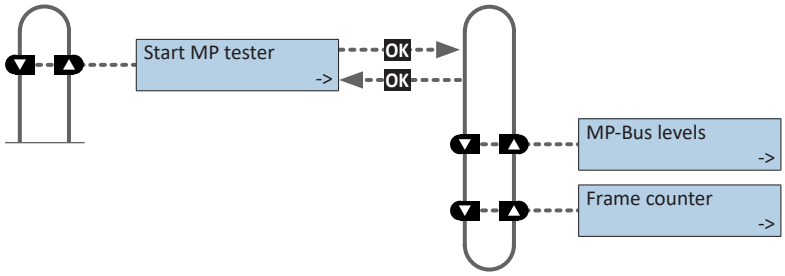
MP tester

With the MP tester function, the ZTH AP offers the possibility of
– Determining the MP-Bus level on the MP master as well as on the MP slave nodes
– Checking the MP-Bus communication based on the counting of telegrams

Selection

The MP tester function can be selected in the Configuration menu of the ZTH AP.

Configuration menu



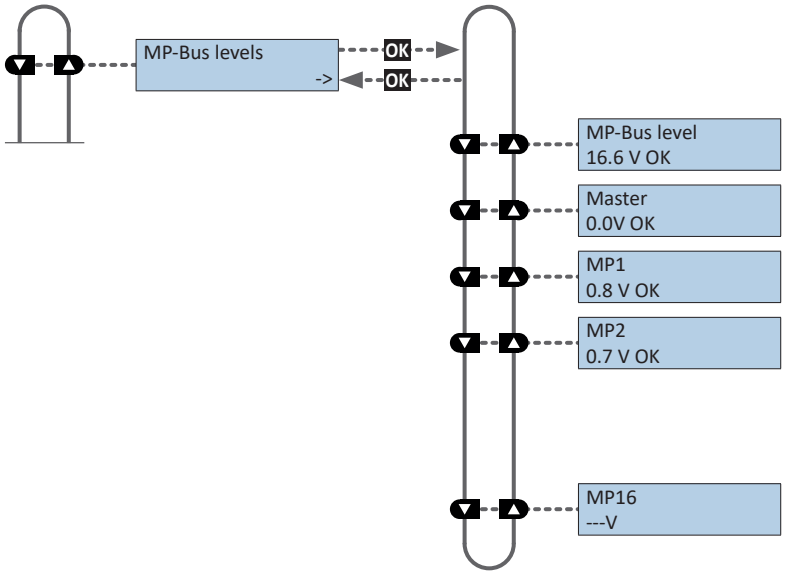
MP tester / MP-Bus level diagnostics function

MP-Bus levels

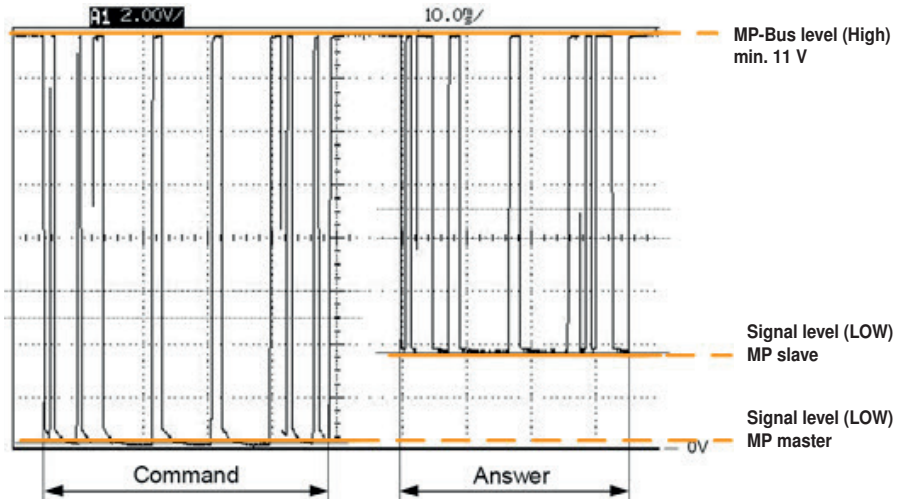
The MP signal levels from the MP master and the MP slave nodes are measured against GND and compared with the limit values of the protocol specification.
The following values are checked:
– Signal level HIGH (identical with command and answer telegram)
– Signal level LOW with command telegram from the master
– Signal level LOW with answer telegram of the slaves (MP1 … MP16, PP)
The signal levels can be measured at any given place. It is recommended to carry out measurements at a variety of positions (e.g. control cabinet and bus end).

Menu tree MP-Bus levels

The following menu tree shows the display possibilities of the various MP levels:



Interpretation of the measurements



MP-Bus levels	OK:	Signal level >11 V
	not OK:	Signal level <11 V
MP master levels	OK:	Signal level <2.5 V
	not OK:	Signal level >2.5 V
MP slave levels	OK:	Signal level <4.5 V
	not OK:	Signal level >4.5 V
	---V:	No MP slave nodes detected and/or connected

Possible causes

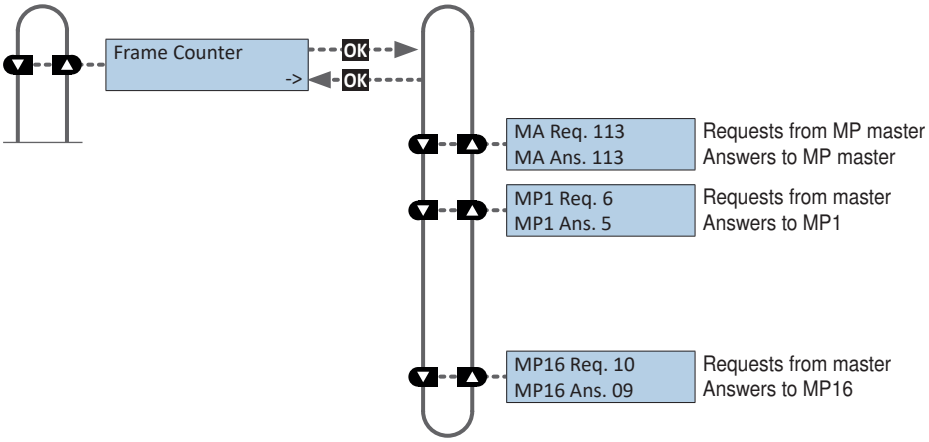
- Incorrect cable dimension
- Signal cable lengths too long
- Node does not reply (---V)

MP tester / Frame counter diagnostics function

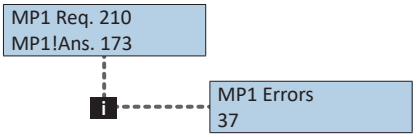
Frame counter

The number of telegrams and also the correctness of telegrams (checksum) are checked. The number of telegrams per node varies and is largely dependent on the function profile of the node. VAV controllers, for example, provide a larger range of information than damper/valve actuators do, which is why usually more communication is carried out with this type of node.

The following menu tree shows the display possibilities of the frame counter function



If it is determined that telegrams are being erroneously transmitted, then this will be indicated visually with a "!" as a mark of mistrust.
Erroneous telegrams are not counted as answers.



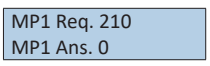
The number of erroneous telegrams of both the MP master and the MP slaves can be displayed using the "i" Information button.

Function

The registered erroneous telegrams are identified separately for the nodes (MP1...MP16, PP and MA). The absolute number of errors must always be judged in relation to the total number of telegrams or the number of telegrams per node, respectively. Erroneous telegrams are ignored by the nodes (master/slaves) and the MP commands from the master are repeated if necessary, which is why low error rates (<5%) require no further clarification. It is only with high error rates or identified communications difficulties that a detail analysis should be carried out with the MP monitor.

Possible causes

- A high error rate could indicate insufficient signal levels (see "MP-Bus level" function).
- The MP command set used is not compatible with the node.
- An actuator expected by the MP master is not connected or not addressed.



If no answer is received from an MP slave node
- …then no MP slave node is connected to the listed address
- …or the MP slave node cannot be reached at the listed address

MP-Bus total failure

In the event of a total MP-Bus failure, no activity can be detected with the MP-Bus tester. Neither queries from the master nor answers from the slaves will be registered.
The following points are to be checked in the event of a total failure of MP-Bus communications:
- Disconnect MP master from the bus and secure the master activity separately with the MP-Bus tester
- The wiring at all nodes is to be checked:
  – Connection wire 1 (⊥ / –) is wired correctly to the bus
  – Connection wires 1 (⊥ / –) and 2 (~ / +) have not been interchanged

MP tester / RT-Monitor diagnostics function

RT-Monitor function Internal Belimo function for enabling real-time analysis of MP networks.

Additional checks

MP Monitor The MP monitor is installed with the BELMO PC-Tool and can be started either directly or via the PC-Tool. Depending on the type of check, the MP monitor can be operated in either Application mode or Command mode. The utilisation of the monitor has no influence on the system function (passive participant).

Belimo PC-Tool The installed MP master is temporarily replaced by a "standardised" MP master when the PC-Tool is in Scan mode.

MP master The programming (Application program) is to be checked at the freely programmable MP masters. Particular attention is to be paid to the correct mapping of the MP adresses on the functional blocs and to the version of the components utilised (e.g. module library).

Installation The installation is to be checked for wiring errors (e.g. 24 V and GND connections were interchanged) and loose terminal connections (loose contact).
At the same time, attention is to be paid to possible EMC disturbance sources (antennas, frequency converters, ...) in the area of the MP network.

MP-Bus design The possibility exists of checking the correct design of the MP network using the MP cable length calculator on the Belimo homepage.

Firmware upgrade

The ZTH AP can be updated to the latest firmware version using the ZTH AP updater. The required software and the instructions for the upgrade can be downloaded from the download area of the Belimo website www.belimo.com.

Compatibilities

Function and handling The ZTH AP includes the complete functionality of all previous versions of the ZTH-GEN and ZTH-VAV.

Note
Latest information about firmware upgrades, version overviews, documentation:
See www.belimo.com

The hardware of the ZTH AP is not however compatible with the hardware of the ZTH-GEN. The updates for the ZTH-GEN cannot be loaded to the ZTH AP.

In addition, the new ZTH AP supports the ZIP USB function. This can be used for the ZTH AP updates and also as a level converter USB/MP with the PC-Tool.

ZEV The ZEV adjustment tool (1992 to 2007) is replaced by the ZTH AP.

ZTH-VAV Is replaced by the ZTH AP.

ZTH-GEN V2.xx / V3.xx / V4.xx Is replaced by the ZTH AP.

Version overview

V 2.09
- Supplement: BACnet Settings for -MOD actuators
- Supplement: Setpoint source function for -MOD actuators
- New devices: Support for PM../PK.. actuators
- Error correction: Detection of PM.. actuators
- Error correction Behaviour of Vmin and Vmax when connecting NMV-D2

V 2.08
- New devices: Support for PRKC.. actuators
- Error correction: Display for PR.. actuators
- Supplement: Control Mode Function for PR.. actuators

V 2.06
- Supplement: VAV: Function "Vmin / Vmax Set to original values" also in Expert Mode available
- Supplement: "Power Off Position" for PR.. actuators with SuperCap
- New devices: Support for EP..R-R6+BAC actuators
- New devices: Support for PR.. actuators

V 2.05
- Display of small flows optimised (EPIV)
- Supplement: Unit l/s for valve actuators
- New function: MP Tester with MP level measurement and frame counter
- Error correction: Failure of LCD display with low ambient temperature
- Error correction: Override is not set with BF-Top actuator

Version overview

V 2.03	• Device identification for VRD2 / NMV-D2 corrected
V 2.02	• New menu "Sensor monitoring of air bubbles" for the EPIV • Error correction: impairment of the sensor measurement at Y3 • Error correction: impairment of the analogue setpoint at Y3
V 2.01	• Release of the ZTH and ZIP function