



Room Control Module

Operation Manual

Ver. 2.2





MP↑↑BUS®

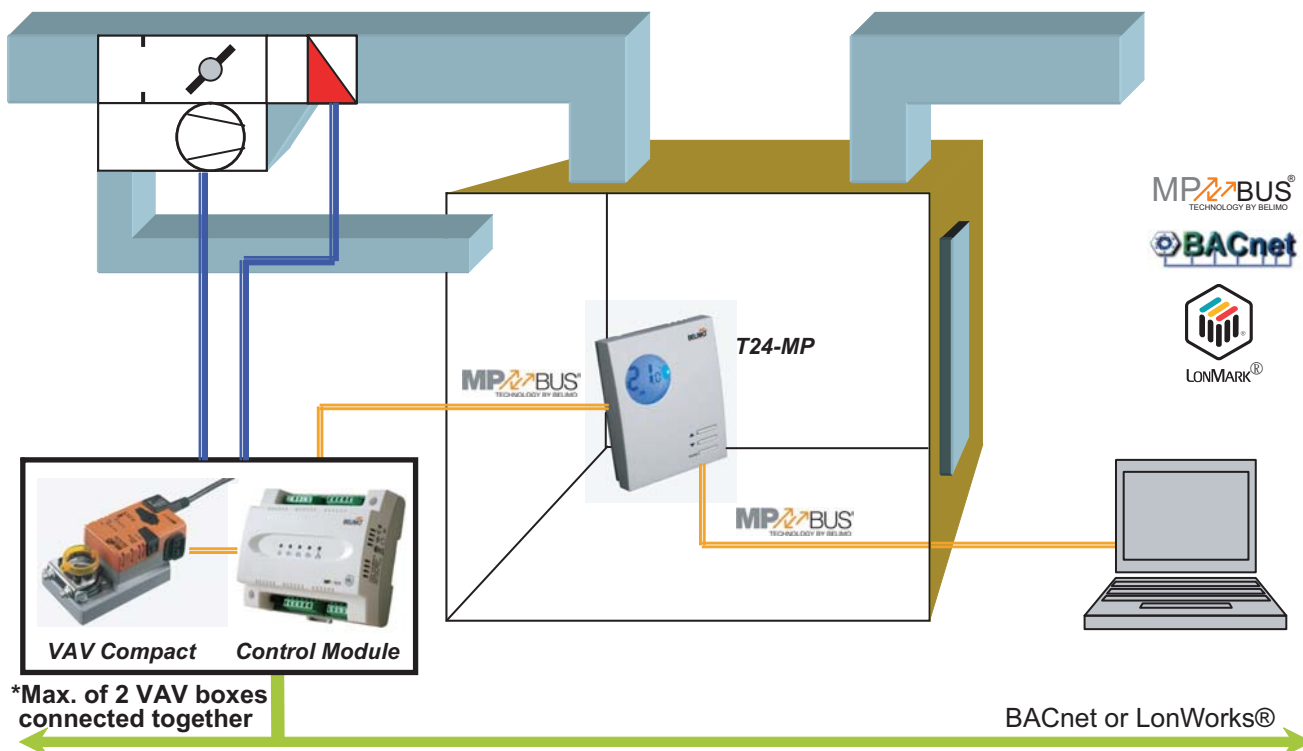
VAV/CAV system solution
with Room Control Module and Room Unit



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Overview of the system



Product overview

Description



LMV-D3-MFT-RM
(LMV-D3-MP)
NMV-D3-MP

VAV Compact included with sensor, VAV controller and actuator functions



VAV boxes
(B-RSV...)

VAV Boxes included with 4 x hangers, velocity sensor and clear labels,
More product ranges available for selection



T24-V42(-V02)...

Room Control Module with communication protocol BACnet or LonWorks



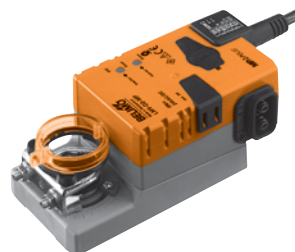
T24-MP
(TG-R10000)

Room Unit with LCD display and diagnostic socket for servicing device
or Room Sensor used in open area

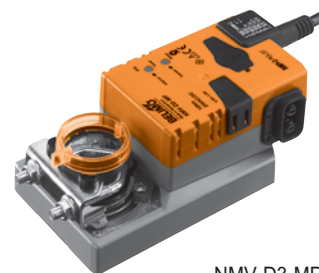
Note:
Detailed documentation for the VAV Compact,
T24-V42(-V02)..., T24-MP, TG-R10000,
B-RSV..., tools and interfaces can be found
on the Internet at www.belimo.com

A pressure sensor, digital VAV controller and damper actuator all in one, providing a VAV Compact solution with a communications capability for pressure-independent VAV and CAV systems in the comfort zone

- Control function: VAV-CAV / Open-Loop
- Control: DC 2...10V / 0...10V / MP-bus
- With additional connection facility for sensors or switches (not available for LMV-D3-MFT-RM)
- Specially integration into VAV Room Control Module T24-V42(-V02)... + T24-MP
- Service button and LEDs for servicing and commissioning
- Diagnostic socket for Service and PC-Tool



LMV-D3-MFT-RM
(LMV-D3-MP)



NMV-D3-MP

Brief description

Application	The digital VAV Compact has PI control characteristics and is used for pressure-independent control of VAV units in the comfort zone.
Pressure measurement	The integrated maintenance-free Belimo D3 differential pressure sensor is also suitable for very small volumetric flows. It is for this reason that it covers versatile applications in the comfort zone, e.g. in residential construction, offices, hospitals, hotels, cruise ships, etc.
Control function	VAV-CAV or Open-Loop operation for integration in an external VAV control loop.
Feedback	Damper position for fan optimiser systems, current volumetric flow or pressure value.
VAV - variable volumetric flow	For variable volumetric flow applications with a modulating reference variable, e.g. room temperature controller, direct digital control or bus system, it enables demand-related, energy-saving ventilation of individual rooms or zones. The operating range V_{min} ... V_{max} can be connected via selectable mode. The following are available: DC 2 ... 10V / 0 ... 10V / adjustable range / bus operation
CAV - constant volumetric flow	For constant volumetric flow applications, e.g. in step mode, controlled by means of a switch. The following operating modes can be selected from: CLOSED / V_{min} / (V_{mid}) / V_{max} / OPEN
Bus function	Up to eight Belimo MP devices (VAV / damper actuator / valve actuator) can be connected together over the MP-Bus and integrated into the following systems: <ul style="list-style-type: none"> – LonWorks® applications with Belimo UK24LON interface – MODBUS RTU applications with Belimo UK24MOD interface – BACnet applications with Belimo UK24BAC interface – Communication functions with Belimo T24-V42(-V02)... + T24-MP (Only available for MP2 & MP3) – DDC controller with integrated MP-Bus protocol – Fan optimiser applications with optimiser COU24-A-MP * A sensor (0...10V or passive), e.g. a temperature sensor or a switch, can optionally be integrated into the higher-level DDC or bus system via the MP-Bus.
Operating and service devices	Belimo PC-Tool or service tool ZTH-GEN AP, can be plugged into the VAV Compact (PP connection) or via MP-Bus.
Assembly and connection	The VAV Compact, which is assembled on the unit by the OEM, is connected using the prefabricated connecting cable.
Test function / test display	The VAV Compact features two LEDs with a functional readiness display for commissioning and functional checking. Extended information with ZTH-GEN AP.
OEM factory settings	The VAV Compact is mounted on the VAV unit by the unit manufacturer, who adjusts and tests it according to the application. The VAV Compact is sold exclusively via the OEM channel for this reason.

* Type LMV-D3-MFT-RM, same as the LMV-D3-MP in function but without a position indicator and additional connection facility for sensor or switch.

Type overview

Type	Torque	Power consumption	Dimensioning	Weight
LMV-D3-MFT-RM (LMV-D3-MP)	5 Nm	2 W	4 VA (max. 8 A @ 5 ms)	Approx. 500g
NMV-D3-MP	10 Nm	3 W	5 VA (max. 8 A @ 5 ms)	Approx. 700g

Technical data

Supply	
Nominal voltage	AC 24V, 50/60 Hz DC 24 V
Operating range	AC 19.2 ... 28.8V DC 21.6 ... 28.8V
Differential pressure sensor	
Type, principle of operation	Belimo D3 sensor, dynamic response
Operating range	0 ... 600 Pa
Overload capability	±3000 Pa
Installation position	Any, no reset necessary
Materials in contact with medium	Glass, epoxy resin, PA, TPE
Control function	
	– VAV-CAV – Open-loop operation
Adjustment values	
V'_{nom}	OEM-specific nominal volumetric flow setting, suitable for the VAV unit
$\Delta p @ V'_{nom}$	50 ... 450 Pa
V'_{max}	20 ... 100% of V'_{nom}
V'_{min}	0 ... 100% of V'_{nom}
V'_{mid}	50% of V'_{min} to V'_{max}
Classic control	
VAV mode for reference value input Y (Connection 3)	<div> <div> – DC 2 ... 10V / (4 ... 20 mA with 500 Ω resistance) – DC 0 ... 10V / (0 ... 20 mA with 500 Ω resistance) – Adjustable DC 0 ... 10V </div> <div> } Input impedance min. 100 kΩ </div> </div>
Mode for actual value signal U ₅ (Connection 5)	<div> <div> – DC 2 ... 10V – DC 0 ... 10V – adjustable: volumetric flow, damper position or differential pressure </div> <div> } max. 0.5 mA </div> </div>
CAV operating modes (constant volumetric flow)	CLOSED / V'_{min} / (V'_{mid} *) / V'_{max} / OPEN * (* only with AC 24V supply)
MP-Bus function	
Address in bus operation	MP1 ... 8 (classic operation: PP)
LONWORKS® / MODBUS RTU / BACnet	with BELIMO Interface UK24LON / UK24MOD / UK24BAC 1 ... 8 BELIMO MP devices (VAV / damper actuator / valve actuator)
DDC controller	DDC controllers/programmable controller with an integrated MP interface from various manufacturers
Fan optimiser (fan control)	with BELIMO Fan Optimiser COU24-A-MP
Sensor integration (not available for LMV-D3-MFT-RM)	Passive (Pt1000, Ni1000, etc.) and active sensors (0...10V), e.g. temperature, humidity 2-point signal (switching capacity 16 mA @ 24V), e.g. switches, occupancy switches
Communication solution (LONWORKS® or BACnet)	With BELIMO T24-V42(-V02)... + T24-MP only MP2 and MP3 addressing available
Operating and service	
Communication	Pluggable / PC-Tool (V3.6 or higher) / service tool ZTH-GEN AP
Push-button	PP/MP-Bus, max. DC 15V, 1200 baud
LED display	Adaption / addressing – 24V supply – Status / bus function
Actuator	
	Brushless, non-blocking actuator with power-save mode
Direction of rotation	ccw / cw
Adaption	Capture of setting range and resolution to control range
Gear disengagement	Push-button self-resetting without functional impairment
Sound power level	max. 35 dB
Actuator - rotating	
Angle of rotation	95° <↵, adjustable mechanical or electronic limiting
Position indication	Mechanical with pointer (not available for LMV-D3-MFT-RM)
Spindle holder	– Spindle clamp, spindle round 10 ... 20 mm / spindle square 8 ... 16 mm – Form fit in various versions, e.g. 8 x 8 mm
Connection	Cable, 4 x 0.75 mm ²
Safety	
Protection class	III Safety extra-low voltage
Degree of protection	IP54
Electromagnetic compatibility	CE according to 89/336/EEC

Technical data

(continued)

Safety

Principle of operation	Type 1 (in acc. with EN 60730-1)
Rated current voltage	0.5 kV (in accordance with EN 60730-1)
Control pollution degree	2 (in accordance with EN 60730-1)
Ambient temperature	0 ... +50°C
Non-operating temperature	-20 ... +80°C
Ambient humidity	5 ... 95% r.h., non-condensing (in accordance with EN 60730-1)
Maintenance	Maintenance-free

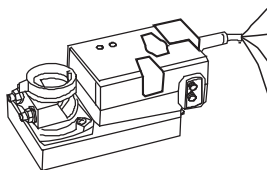
Connection

Cable connection

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

Information

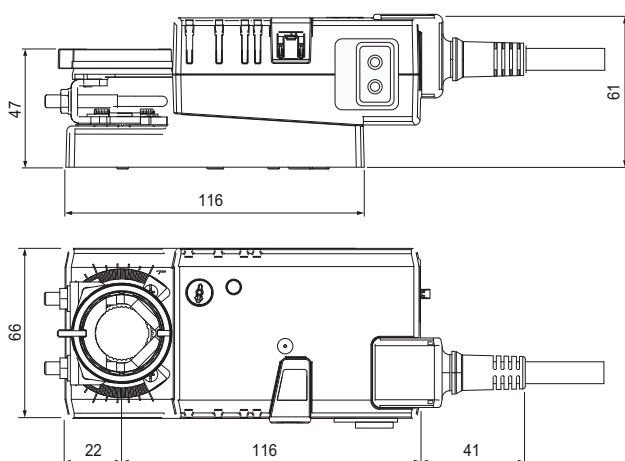
- Supply via safety isolating transformer!
- Connections 1 and 2 (AC/DC 24V) and 5 (MP signal) must be routed to accessible terminals (room temperature controller, floor distributor, control cabinet, etc.) in order to enable access with the tool for diagnostic and service work.



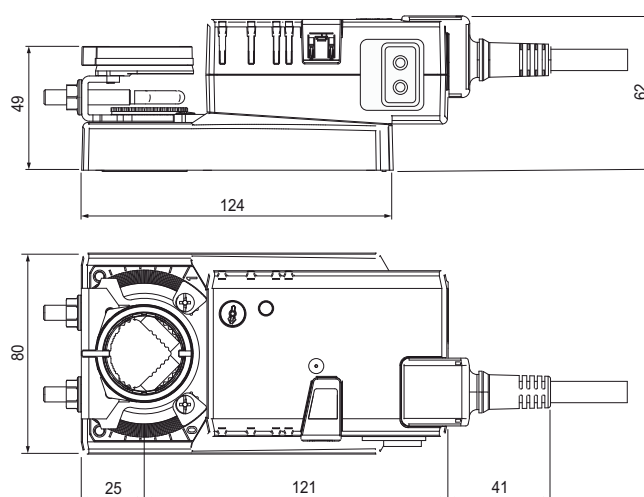
No.	Designation	Wire colour	Function
1	— — ⊥	black	⊥ —
2	— — + ~	red	~ +
3	← — Y	white	Reference signal VAV/CAV
5	→ — U	orange	— Actual value signal — MP-Bus connection

Dimensions (mm)

LMV-D3-MFT-RM (LMV-D3-MP)



NMV-D3-MP



Safety notes



- The device is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- It may be installed only 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.

Product overview

The T24-V42(-V02)BAC Room Control Module is specifically designed for VAV applications with direct link to BACnet® network.

Features

On-board LED indication without cover removal
Built-in room control applications
PI control algorithm
Operating modes: Normal, Economy and Standby
Minimum setpoint limitation
Memory storage



Brief description


The T24-V42(-V02)BAC Room Control Module offers the advantages of network control via BACnet® Master-Slave/Token-Passing (MS/TP) protocol. This controller features memory storage, analogue input, digital input, analogue output, 3 x AC 24V digital outputs, MP-Bus interface for connection to the Belimo VAV Compact and optional T24-MP Room Unit or TG-R10000 Room Sensor. Suitable for new or existing VAV system installations.

The T24-V42(-V02)BAC Room Control Module conforms to the BACnet® MS/TP protocol for open communication and interoperability with third party BACnet® devices, providing greater freedom in system design.

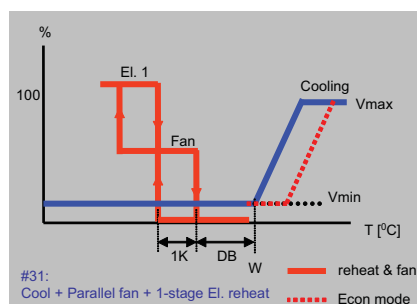
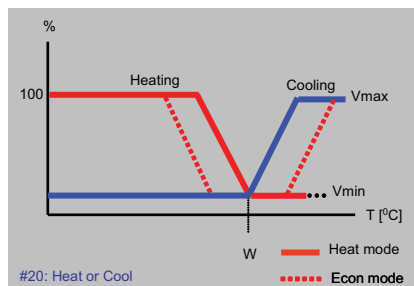
Technical data

Nominal voltage		AC 24V 50/60Hz
Power supply range		AC 19.2...28.8V
Wiring terminals		Screw terminals, 0.5...2.5mm ²
Power consumption:	T24-V42BAC	6.0VA @ AC 24V, 50/60 Hz
	T24-V02BAC	3.5VA @ AC 24V, 50/60 Hz
Communication - BACnet®		Master-Slave/Token-Passing (MS/TP) protocol
Functional profile		BACnet Application Specific Controller (B-ASC)
Firmware		Native BACnet® firmware
Band rate (Auto detection)		9,600, 19,200, 38,400 (default) or 76,800bps
Network address		Max. can support up to 0x7F (default = 0x7F)
Device address		Max. can support up to 0x3F FF FF (default = 0x00 00 00)
Conductors, cables		22AWG standard, 3-wire twisted, Shielded cable Cable length in accordance with BACnet® bus standard
Communication - MP-Bus		Standard Belimo MP connection
Input / output control		Analog input x 1 (Type NTC, 10kOhm@25°C, sensing range 0...40°C)
(AO, DO only available for T24-V42BAC)		Analog output x 1 (2...10V, max. 5mA) Digital input x 1 (Dry contact, max. 10mA) Digital output x 3 (AC 24V, SELV, max. 1A)
Application selection		Application number selectable via T24-MP Room Sensor; can be overridden by BMS
LED indications		- Power - Digital output 1 ~ 3 (Only for T24-V42BAC) - BACnet® communication status
Protection class		III Safety extra-low voltage
Degree of protection		IP20
Low-voltage directive		CE according to 2006/95/EC
EMC directive		CE according to 2004/108/EC
Ambient conditions		0...+50°C
Non-operating temperature		-10...+60°C
Ambient humidity range		5...95% RH, non-condensing
Weight:	T24-V42BAC	250g
	T24-V02BAC	230g
Dimensions (L x W x H)		130 x 106 x 49.2mm
Mounting		2 x Screws provided or DIN rail 35mm



To be opened by accredited servicing agents only
Electronic control - Type 2.B action (micro-disconnection operation)
Separate collection for electrical and electronic equipment 

Application number selection



No. 10	Cool Only	No. 51	Cool + parallel fan 3-point reheat with deadband 1K reheat switching differential
No. 20	Heat (or Cool) **	No. 61	Cool + parallel fan Modulating reheat with deadband 1K reheat switching differential
No. 30	Cool Electric reheat 1 stage with deadband 1K reheat switching differential	No. 12*	Cool Only + series fan
No. 40	Cool Electric reheat 2 stages with deadband 1K reheat switch differential	No. 22*	Heat (or Cool) + series fan **
No. 50	Cool 3-point reheat with deadband	No. 32*	Cool + series fan Electric reheat 1 stage with deadband 1K reheat switching differential
No. 60	Cool Modulating reheat with deadband	No. 42*	Cool + series fan Electric reheat 2 stages with deadband 1K reheat switching differential
No. 21	Cool + parallel fan with deadband	No. 52*	Cool + series fan 3-point reheat with deadband
No. 31	Cool + parallel fan Electric reheat 1 stage with deadband 1K reheat switching differential	No. 62*	Cool + series fan Modulating reheat with deadband
No. 41	Cool + parallel fan Electric reheat 2 stages with deadband 1K reheat switching differential	* Series fan will always ON ** Factory setting = Heat	

xxx T24-V02BAC functions under in Application 10 & 20

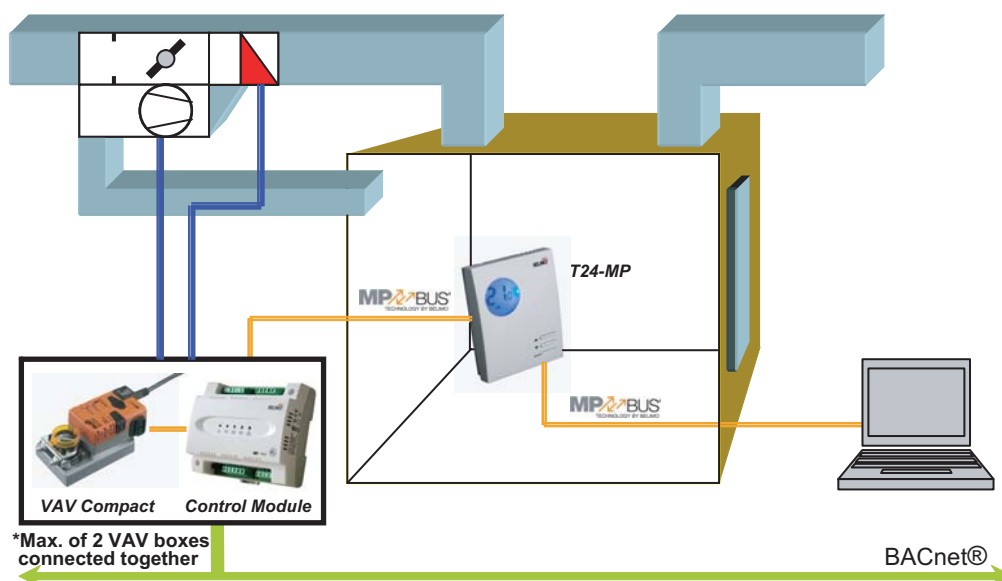
The above room control applications are pre-stored in the T24-V42(-V02)BAC Room Control Module. Application number can be selected via the T24-MP Room Unit through MP-Bus commands or by communication network BACnet. (Factory setting = 10)

Detailed information can be found in operation manual.

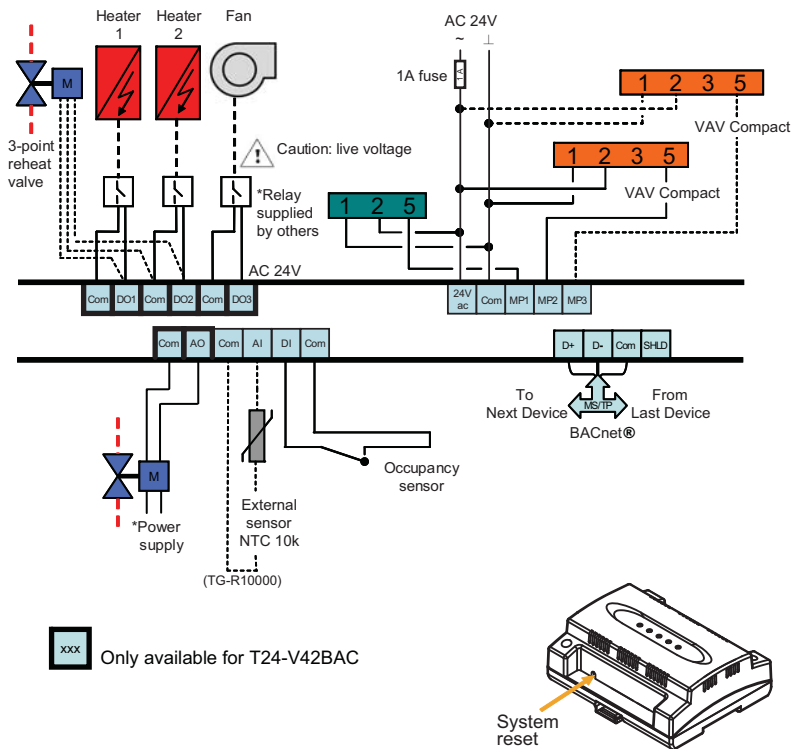
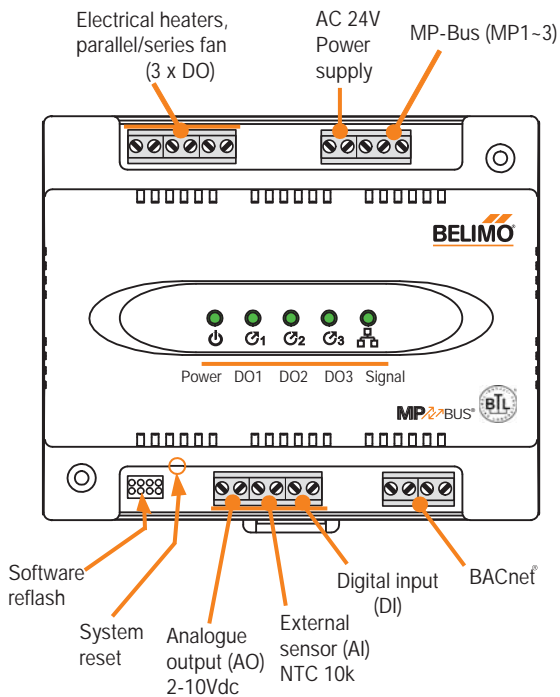
Status output by room cooling module

When the T24-V42(-V02)BAC Room Control Module communication with the building management system (BMS) via BACnet® protocol, then the following information or reset values will included:

Heating / cooling mode status
Heating / cooling setpoint
Operating mode
- Normal
- Standby
- Override
- Economy
Room temperature value
Fan / heater status
Temperature setpoint
V'min, V'max value setting
Relative flow control in %
Air flow value in CFM
Damper position in %



Wiring diagram



Input & output assignment

Inputs

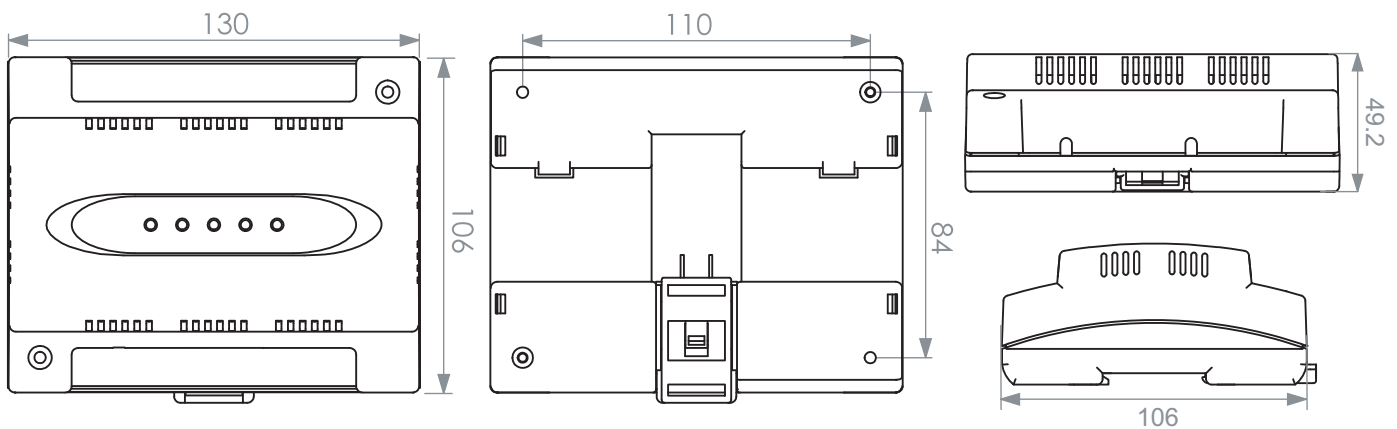
- AI External temp. sensor TG-R10000 *
- DI Remote setpoint shift, e.g. Occupancy sensor *
Open - Normal mode, Close - Economy mode

* Optional

Outputs

- AO Modulating reheat control DC 2...10V
- DO1 Heating output I AC 24V ON/OFF
- DO2 Heating output II AC 24V ON/OFF
- DO3 Parallel or series fan output AC 24V ON/OFF

Dimensions [mm]



To be opened by accredited servicing agents only
Electronic control - Type 2.B action (micro-disconnection operation)
Separate collection for electrical and electronic equipment

Functional profile according to BACnet® -- Software version 2.2

The T24-V42(-V02)BAC Room Control Module is certified by BACnet Testing Laboratories (BTL). The module functions are supplied with the BACnet® network as standardised network variables according to BACnet Application Specific Controller (B-ASC).

Network variable	Type	Instance Number	Read / Write	Availability on V02 or V42	Setting range / selection	Description
Rm_Temp	AI	0	R	V02 & V42	5.0~40.0°C, step 0.1°C	Current room temperature
Eco_Mode	BI	0	R	V02 & V42	0: Normal 1: Economy	Economy / Normal mode status
Rm_Setpt	AV	0	R/W	V02 & V42	10.0~30.0°C, step 0.5°C	Room temperature setpoint
Min_Setpt	AV	1	R/W	V02 & V42	10.0~30.0°C, step 0.5°C	Minimum setpoint limitation in Normal mode
Eco_Cool_Setpt	AV	2	R/W	V02 & V42	20.0~30.0°C, step 0.5°C	Setpoint of cooling in Economy mode
Eco_Heat_Setpt	AV	3	R/W	V02 & V42	10.0~20.0°C, step 0.5°C	Setpoint of heating in Economy mode
Cool_P_Band	AV	4	R/W	V02 & V42	1~3K, step 1K	P-band in cooling mode
Heat_P_Band	AV	5	R/W	V02 & V42	1~3K, step 1K	P-band in heating mode
Deadband	AV	6	R/W	V02 & V42	0.5, 1.0, 2.0K	Deadband
Int_Time	AV	7	R/W	V02 & V42	60~300sec, step 30sec	Integral action time
3Pt_Float_Time	AV	8	R/W	V42	60~150sec, step 10sec	3-point float control time for reheat valve
App_No	AV	9	R/W	V02 & V42	10~62	Application number
Manu_Override	AV	10	R/W	V02 & V42	101: Auto 102: Fully Open, 103: Fully Close 0~100: Relative flow of Vnom	Damper manual override functions by BMS
Mod_Reheat	AV	11	R	V42	0~100%	Modulating reheat (2-10V) output in %
Act1_Damper_Pos	AV	12	R	V02 & V42	0~100%	Damper position of 1 st VAV Compact
Act2_Damper_Pos	AV	13	R	V02 & V42	0~100%	Damper position of 2 nd VAV Compact
Act1_Vmax	AV	14	R/W	V02 & V42	0~9999CFM	V'max preset value of 1 st VAV Compact
Act1_Vmin	AV	15	R/W	V02 & V42	0~9999CFM	V'min preset value of 1 st VAV Compact
Act1_flow	AV	16	R	V02 & V42	0~9999CFM	Actual flow rate of 1 st VAV Compact
Act2_Vmax	AV	17	R/W	V02 & V42	0~9999CFM	V'max preset value of 2 nd VAV Compact
Act2_Vmin	AV	18	R/W	V02 & V42	0~9999CFM	V'min preset value of 2 nd VAV Compact
Act2_flow	AV	19	R	V02 & V42	0~9999CFM	Actual flow rate of 2 nd VAV Compact
Act1_Output_St	AV	20	R	V02 & V42	0 (Normal VAV Compact) 1 (VAV Compact don't exist) 2 (Invalid VAV Compact) 8 (Room Unit in Service mode)	Warning signal of 1 st VAV Compact
Act2_Output_St	AV	21	R	V02 & V42	0 (Normal VAV Compact) 1 (VAV Compact don't exist) 2 (Invalid VAV Compact) 8 (Room Unit in Service mode)	Warning signal of 2 nd VAV Compact
Manu_ModReH	AV	22	R/W	V42	101: Auto 0~100: Particular value of 2-10Vdc	Override modulating reheat
Act1_Vnom	AV	23	R	V02 & V42	0~9999CFM	V'nom preset value of 1 st VAV Compact
Act2_Vnom	AV	24	R	V02 & V42	0~9999CFM	V'nom preset value of 2 nd VAV Compact
Display_Set	BV	0	R/W	V02 & V42	0: Room temp. & setpoint display 1: Setpoint display only	Display setting in Room Unit
Rm_Unit_Overid	BV	1	R/W	V02 & V42	0: Disable/ 1: Enable	Room Unit to override the Standby mode ordered by BMS
Heat_Cool_ChOv	BV	2	R/W	V02 & V42	0: Cool/ 1: Heat	Heating / cooling mode changeover (only apply for application 20 & 22)
Module_Mode	BV	3	R/W	V02 & V42	0: Standby/ 1: Normal	BMS request Standby / Normal
Heater1_State	BV	4	R	V42	0: Off 1: On	Heater1 status
Heater2_State	BV	5	R	V42	0: Off 1: On	Heater2 status
Fan_State	BV	6	R	V42	0: Off 1: On	Fan status
Rm_Unit_State	BV	7	R	V02 & V42	0: Standby 1: Normal	Room Unit status
Override_State	BV	8	R	V02 & V42	0: Room Unit in Standby mode 1: Room Unit in Override enable	Room Unit to override the Standby mode ordered by BMS (1 to 12 hrs override mode to normal setpoint operation)

Note: * The LCD will display "Err" message when using invalid actuator series
V02 = T24-V02BAC, V42 = T24-V42BAC

Product overview

The T24-V42(-V02)LON Room Control Module is specifically designed for VAV applications with direct link to LonWorks® network.

Features

On-board LED indication without cover removal
Built-in room control applications
PI control algorithm
Operating modes: Normal, Economy and Standby
Minimum setpoint limitation
Memory storage



LONMARK®



MP-BUS
TECHNOLOGY BY BELIMO


Brief description


The T24-V42(-V02)LON Room Control Module offers the advantages of network control via the high performance LON transceiver. This controller features memory storage, analogue input, digital input, analogue output, 3 x AC 24V digital outputs, MP-Bus interface for connection to the Belimo VAV Compact and optional T24-MP Room Unit or TG-R10000 Room Sensor. Suitable for new or existing VAV system installations.

The T24-V42(-V02)LON Room Control Module conforms to the LonMark® communication protocol for open communication and interoperability with third party LonMark® devices, providing greater freedom in system design.

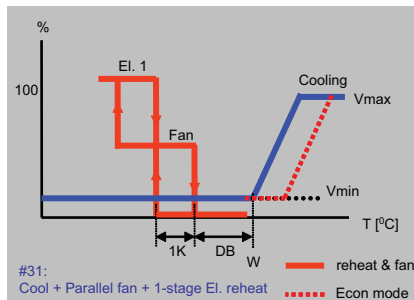
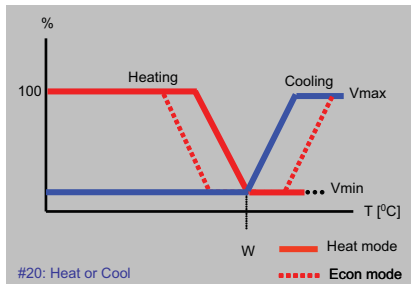
Technical data

Nominal voltage		AC 24V 50/60Hz
Power supply range		AC 19.2...28.8V
Wiring terminals		Screw terminals, 0.5...2.5mm ²
Power consumption:	T24-V42LON	6.0VA @ AC 24V, 50/60Hz
	T24-V02LON	3.5VA @ AC 24V, 50/60Hz
Communication - LON		LonTalk® protocol
Functional profile		According to LonMark® / SFPTvariableAirVolume object #8010
Processor / Memory		Neuron 3150® ; 10 MHz ; 64kb flash memory input/output control
Transceiver		Echelon® , Free topology transceiver (FT-X1)
Media channel		TP/FT-10; 78kbps
Service button and status LED		According to LonMark® guidelines
Conductors, cables		Conductor lengths, cable specifications and topology of the LonWorks® network according to Echelon® directives
Communication - MP-Bus		Standard Belimo MP connection
Input / output control		Analog input x 1 (Type NTC, 10kOhm@25°C, sensing range 0...40°C)
(AO, DO only available for T24-V42LON)		Analog output x 1 (2...10V, max. 5mA) Digital input x 1 (Dry contact, max. 10mA) Digital output x 3 (AC 24V, SELV, max. 1A)
Application selection		Application number selectable via T24-MP Room Sensor; can be overridden by BMS
LED indications		- Power - Digital output 1 ~ 3 (Only for T24-V42LON) - LonWorks® communication status
Protection class		III Safety extra-low voltage
Degree of protection		IP20
Low-voltage directive		CE according to 2006/95/EC
EMC directive		CE according to 2004/108/EC
Ambient conditions		0...+50°C
Non-operating temperature		-10...+60°C
Ambient humidity range		5...95% RH, non-condensing
Weight:	T24-V42LON	250g
	T24-V02LON	230g
Dimensions (L x W x H)		130 x 106 x 49.2mm
Mounting		2 x Screws provided or DIN rail 35mm



To be opened by accredited servicing agents only
Electronic control - Type 2.B action (micro-disconnection operation)
Separate collection for electrical and electronic equipment 

Application number selection



No. 10	Cool Only	No. 51	Cool + parallel fan 3-point reheat with deadband 1K reheat switching differential
No. 20	Heat (or Cool) **	No. 61	Cool + parallel fan Modulating reheat with deadband 1K reheat switching differential
No. 30	Cool Electric reheat 1 stage with deadband 1K reheat switching differential	No. 12*	Cool Only + series fan
No. 40	Cool Electric reheat 2 stages with deadband 1K reheat switch differential	No. 22*	Heat (or Cool) + series fan **
No. 50	Cool 3-point reheat with deadband	No. 32*	Cool + series fan Electric reheat 1 stage with deadband 1K reheat switching differential
No. 60	Cool Modulating reheat with deadband	No. 42*	Cool + series fan Electric reheat 2 stages with deadband 1K reheat switching differential
No. 21	Cool + parallel fan with deadband	No. 52*	Cool + series fan 3-point reheat with deadband
No. 31	Cool + parallel fan Electric reheat 1 stage with deadband 1K reheat switching differential	No. 62*	Cool + series fan Modulating reheat with deadband
No. 41	Cool + parallel fan Electric reheat 2 stages with deadband 1K reheat switching differential	* Series fan will always ON ** Factory setting = Heat	

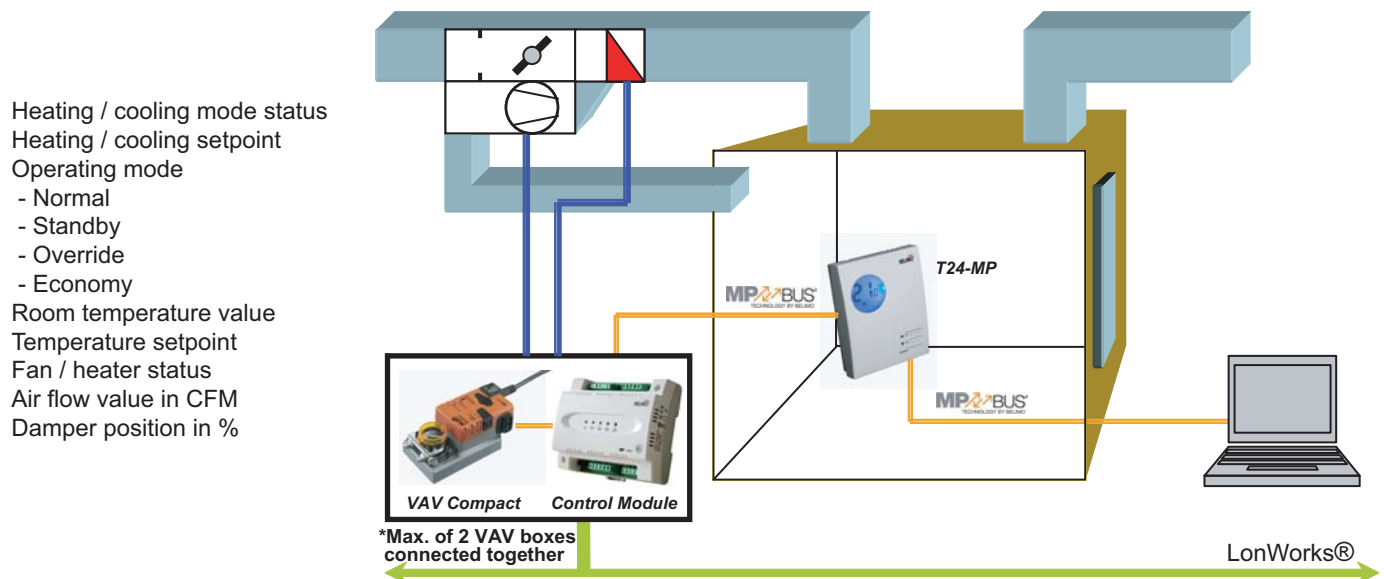
xxx T24-V02LON functions under in Application 10 & 20


The above room control applications are pre-stored in the T24-V42(-V02)LON Room Control Module. Application number can be selected via the T24-MP Room Unit through MP-Bus commands or by communication network LonWorks. (Factory setting = 10)

Detailed information can be found in operation manual.

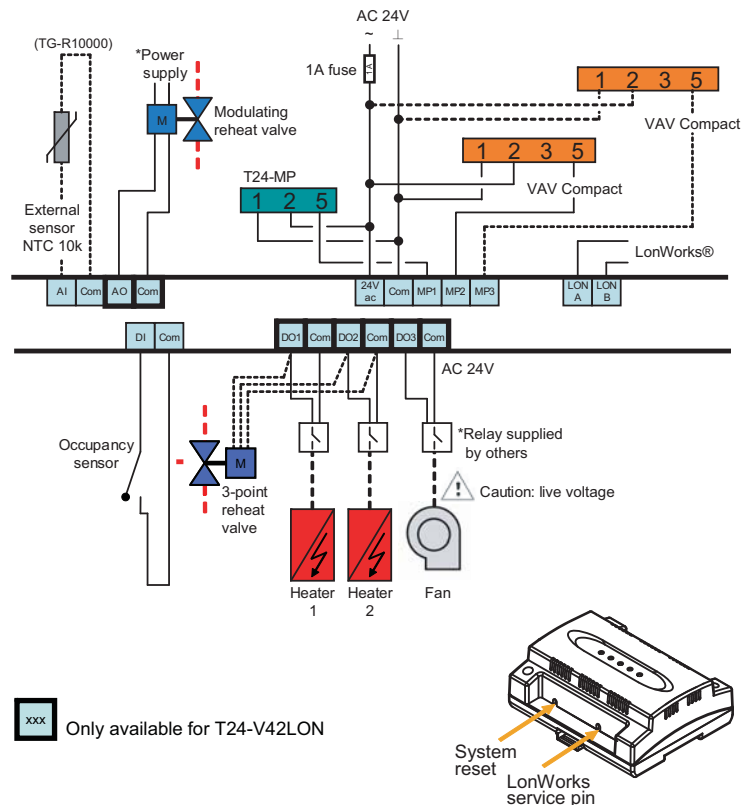
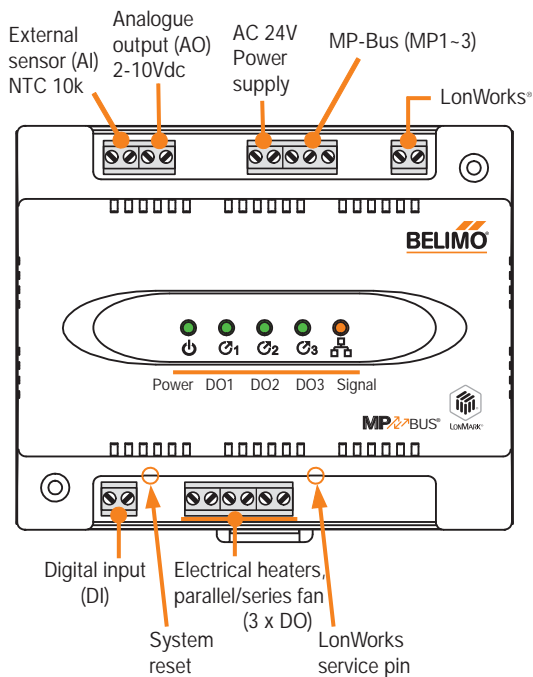
Status output by room control module

When the T24-V42(-V02)LON Room Control Module communication with the building management system (BMS) via LonTalk® protocol, then the following information or reset values will included:



To be opened by accredited servicing agents only
Electronic control - Type 2.B action (micro-disconnection operation)
Separate collection for electrical and electronic equipment 

Wiring diagram



Input & output assignment

Inputs

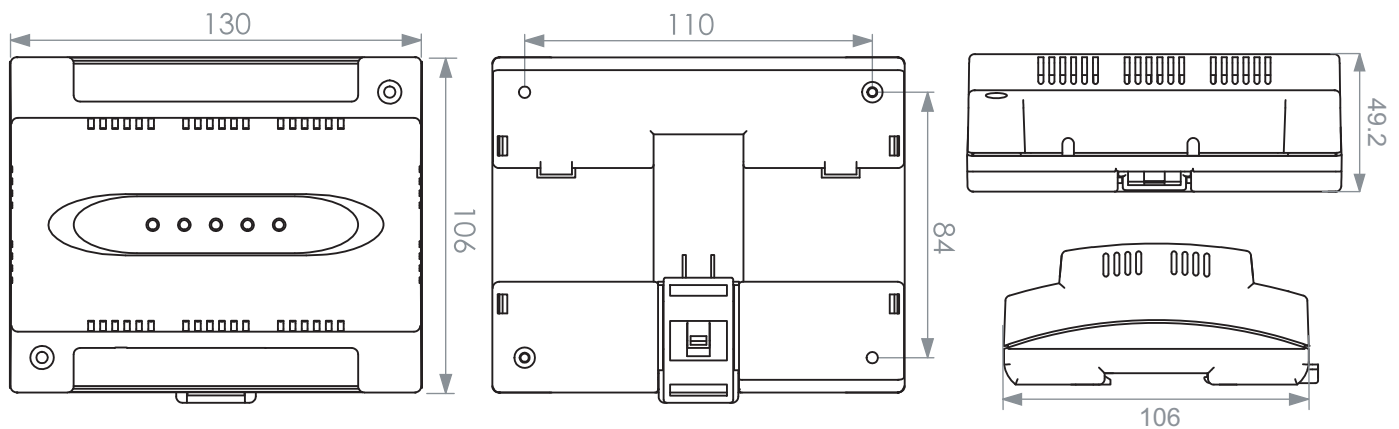
- AI External temp. sensor TG-R10000 *
 - DI Remote setpoint shift, e.g. Occupancy sensor *
- Open - Normal mode, Close - Economy mode

* Optional

Outputs

- AO Modulating reheat control DC 2...10V
- DO1 Heating output I AC 24V ON/OFF
- DO2 Heating output II AC 24V ON/OFF
- DO3 Parallel or series fan output AC 24V ON/OFF

Dimensions [mm]



To be opened by accredited servicing agents only
Electronic control - Type 2.B action (micro-disconnection operation)
Separate collection for electrical and electronic equipment

Functional profile according to LonMark® -- Software version 1.3

The T24-V42(-V02)LON Room Control Module is certified by LonMark®. The module functions are supplied with the LonWorks® network as standardised network variables according to LonMark®. (Functional profile: SFPTvariableAirVolume object #8010)

Input variables

Input network variable	Network variable type	Setting range / selection	Description	Factory setting
<i>nvi3PtFloatTime</i>	<i>SNVT_time_sec</i>	<i>60...150 (sec.), step 10</i>	<i>3 point floating control for reheat valve</i>	<i>90 sec.</i>
nviActOpenClose	SNVT_hvac_overid	HVO_OPEN,100.000,0 HVO_CLOSE,-100.000,0 HVO_NUL,0.000,0	HVO_OPEN: Set actuator to fully open HVO_CLOSE: Set actuator to fully close HVO_NUL: Release command to auto	HVO_NUL,0.000,0
nviApplication	SNVT_count	10,20, <i>30,40,50,60,21,31,41,51,61,12,22,32,42,52,62</i>	Selection of application number	10
nviApplicMode	SNVT_hvac_mode	HVAC_HEAT, HVAC_COOL	Heating / cooling changeover	HVAC_COOL
nviCoolPband	SNVT_temp_p	1...3 (K), step 1	P-band in cooling mode	1 K
nviDeadband	SNVT_temp_p	0.5,1.0,2.0 (K)	Deadband range	1 K
nviDisplaySetPt	SNVT_switch	Room temp. & setpoint display: 0.0 0 Only setpoint display: 100.0 1	Selection of LCD display by room unit	0.0 0
nviEconCoolSetPt	SNVT_temp_p	20.0...30.0 (°C), step 0.5	Setpoint of cooling in Economy mode	28 °C
nviEconHeatSetPt	SNVT_temp_p	10.0...20.0 (°C), step 0.5	Setpoint of heating in Economy mode	18 °C
nviHeatPband	SNVT_temp_p	1...3 (K), step 1	P-band in heating mode	2 K
nviIntegralTime	SNVT_time_sec	60...300 (sec.), step 30	Integral action time	120 sec.
nviMinSetpoint	SNVT_temp_p	10.0...30.0 (°C), step 0.5	Minimum setpoint limitation in Normal mode	10 °C
nviOveridEnable	SNVT_switch	Room unit override enable: 100.0 1 Room unit override disable: 0.0 0	Enable / disable the room unit to override the Standby mode ordered by BMS (user can extend the operation in Normal mode)	100.0 1
nviSetPoint	SNVT_temp_p	10.0...30.0 (°C), step 0.5	Effective room temp. setpoint	24 °C
nviSpaceTemp	SNVT_temp_p	5...40 (°C) = current temperature value	Value of current room temp. reading (no setting, display only)	-
nviStandby	SNVT_switch	Standby mode: 100.0 1 Normal mode: 0.0 0	Standby / Normal mode selection	0.0 0

"Bold italic fonts" no actions for T24-V02LON

Explanation of special network variables:

nviOveridEnable, **nviStandby**, **nvoDisplySetPt**, **nvoEnergyHoldOff**, **nvoOveridEnable**, **nvoRmUnitOverid**, **nvoStandby** belong to SNVT_switch network variable type. This type of network variable is composed of a percentage and a boolean state:

Percentage 0.0 0 State Percentage 100.0 1 State

- In our application here, only the Boolean state is effective. The percentage can be ignored.

nvoUnitStatus & **nvoUnitStatus2** belongs to SNVT_hvac_status network variable type. It is expressed in the form of "mode, heat_output_primary, heat_output_secondary, cool_output, econ_output, fan_output, in_alarm".

Example: HVAC_AUTO, **0.000**, **0.000**, **100.000**, 0.000, **100.000**, **0**

Heat 1 = 0% Heat 2 = 0% Cool = 100% Fan = 100% Alarm = 1

Functional profile according to LonMark® -- Software version 1.3

The T24-V42(-V02)LON Room Control Module is certified by LonMark®. The module functions are supplied with the LonWorks® network as standardised network variables according to LonMark®. (Functional profile: SFPTvariableAirVolume object #8010)

Output variables

Output network variable	Network variable type	Status	Description
<i>nvo3PtFloatTime</i>	<i>SNVT_time_sec</i>	<i>60...150 (sec.), step 10</i>	<i>3 point floating control for reheat valve</i>
nvoAct1Vflow	SNVT_flow	0...9999 (CFM)	Actual flow rate of 1st VAV Compact
nvoAct1Vmax	SNVT_flow	0...9999 (CFM)	V'max setting valve of 1st VAV Compact
nvoAct1Vmin	SNVT_flow	0...9999 (CFM)	V'min setting value of 1st VAV Compact
nvoAct2Vflow	SNVT_flow	0...9999 (CFM)	Actual flow rate of 2nd VAV Compact
nvoAct2Vmax	SNVT_flow	0...9999 (CFM)	V'max setting value of 2nd VAV Compact
nvoAct2Vmin	SNVT_flow	0...9999 (CFM)	V'min setting value of 2nd VAV Compact
nvoApplication	SNVT_count	10,20, 30,40,50,60,21,31,41,51,61,12,22,32,42,52,62	Application number
nvoCoolPband	SNVT_temp_p	1...3 (K), step 1	P-band in cooling mode
<i>nvoDeadband</i>	<i>SNVT_temp_p</i>	<i>0.5,1.0,2.0 (K)</i>	<i>Deadband value</i>
nvoEconCoolSetPt	SNVT_temp_p	20.0...30.0 (°C), step 0.5	Setpoint of cooling in Economy mode
nvoEconHeatSetPt	SNVT_temp_p	10.0...20.0 (°C), step 0.5	Setpoint of heating in Economy mode
nvoEffectSetPt	SNVT_temp_p	10.0...30.0 (°C), step 0.5	Effective room temp. setpoint
nvoEnergyHoldOff	SNVT_switch	Economy mode: 100.0 1 Normal mode: 0.0 0	Economy / Normal mode status
nvoHeatPband	SNVT_temp_p	1...3 (K), step 1	P-band in heating mode
nvoIntegralTime	SNVT_time_sec	60...300 (sec.), step 30	Integral action time
nvoMinSetpoint	SNVT_temp_p	10.0...30.0 (°C), step 0.5	Minimum setpoint limitation in Normal mode
nvoParameter	SNVT_state	(B1,B2,B3,B4,B5,B6,B7,B8,B9,B10,B11,B12,B13,B14, B15,B16) B1: 0 = Rm. override disable, 1 = Rm. override enable B2: 0 = Rm. temp. & SP display, 1 = SP display B3... B16: No meaning	B1: Status of room unit to enable / disable override the Standby mode ordered by BMS B2: Status of LCD display in Room Unit
nvoRmUnitOverrid	SNVT_switch	Room unit overridden by user: 100.0 1 Room unit standby: 0.0 0	Status of Room Unit working in override the Standby mode ordered by BMS (i.e. user from room unit can choose to extend the operation in Normal mode up to 12 hrs)
nvoSpaceTemp	SNVT_temp_p	5.0...40.0 (°C), step 0.5	Value of current room temp. reading
nvoStandby	SNVT_switch	Standby mode: 100.0 1 Normal mode: 0.0 0	System Standby / Normal mode status
nvoUnitStatus	SNVT_hvac_status	(HVAC_AUTO, 0.000, 0.000, 100.000, 0.000, 100.000, 0) mode: HVAC_HEAT, HVAC_COOL, HVAC_AUTO heat_primary_output: 0.0-100.0 (%) heat_secondary_output: 0.0-100.0 (%) cool_damper position_output: 0.0-100.0 (%) econ_output: (irrelevant) fan_output: 0.0 / 100.0 (%) in_alarm: 0,1,2,8 *	1st VAV Compact output status
nvoUnitStatus2	SNVT_hvac_status	(HVAC_AUTO, 0.000, 0.000, 100.000, 0.000, 100.000, 0) mode: HVAC_HEAT, HVAC_COOL, HVAC_AUTO heat_primary_output: 0.0-100.0 (%) heat_secondary_output: 0.0-100.0 (%) cool_damper position_output: 0.0-100.0 (%) econ_output: (irrelevant) fan_output: 0.0 / 100.0 (%) in_alarm: 0,1,2,8 *	2nd VAV Compact output status

"Bold italic fonts" no actions for T24-V02LON

Note: * in_alarm = 0 (Normal VAV Compact), 1 (VAV Compact don't exist), 2 (Invalid VAV Compact), 8 (Room Unit in Service mode)
The LCD will display " Err " message when using invalid actuator series

Product overview

The newly developed T24-MP Room Unit provides the foundation for modern single room control concepts.

Features

- Blue backlight LCD display
- Built-in NTC type sensing element
- Room/Setpoint temperature display
- Minimum setpoint limitation
- Diagnostic socket for servicing devices
- Working in group with T24-V... Room Control Module



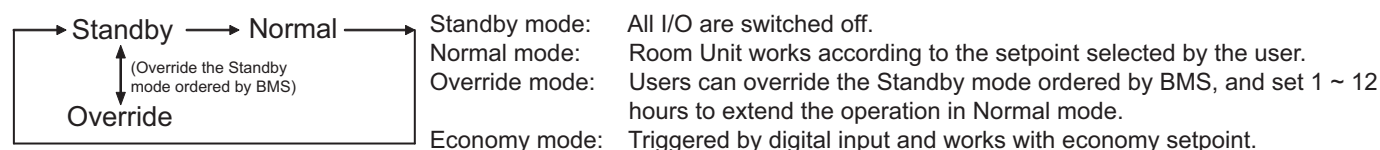
MP  **BUS**
TECHNOLOGY BY BELIMO

Technical data

Nominal voltage	AC 24V 50/60Hz
Power supply range	AC 19.2...28.8V
Wiring terminals	Screw terminals, 0.5...1.5 mm ²
Power consumption	1.5VA @ AC 24V, 50/60 Hz
Backlight	Blue backlight (automatically switches on 10s after any key pressed)
Sensing range	5...40°C, Type NTC, 10kOhm@25°C
Operation mode	Normal / Standby / Economy / Commissioning selection
Display resolution	0.5K (0.1K internal calculation)
Normal setpoint range	10...30°C, at 0.5K step (Factory setting = 24°C)
Commissioning mode	By press "▲" + "MODE" for 5s
Economy setpoint range heating	10...20°C, at 0.5K step (Factory setting = 18°C)
Economy setpoint range cooling	20...30°C, at 0.5K step (Factory setting = 28°C)
Cooling or Heating P band	0.5, 1 or 2K
Integral time	60-300s, at 30s step
Application number input	By pressing "▲" "▼" buttons
Communication bus	Standard Belimo MP connection
Accuracy	+/- 0.5K
Protection class	III Safety extra-low voltage
Degree of protection	IP30
Low-voltage directive	CE according to 2006/95/EC
EMC directive	CE according to 2004/108/EC
Ambient conditions	0...+50°C
Non-operating temperature	-10...+60°C
Ambient humidity range	5...95% RH, non-condensing
Weight	108g
Dimensions (L x W x H)	110 x 84 x 25mm
Mounting	Surface mounted


Operation modes

Short pressing the "MODE" key for 2s continuously will allow you to change the operation mode as follows:

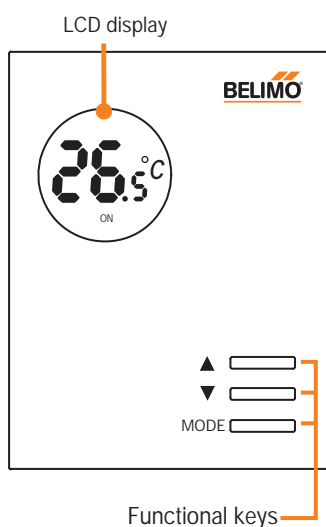


Long pressing the "▲" + "MODE" key for 5s continuously will allow you to enter Commissioning mode for parameter setting. Blue backlight will always be ON during the Commissioning mode. The system will NOT return to Normal mode until keys are pressed correctly through Standby mode. Keep storage in memory (every 2mins. cycling).

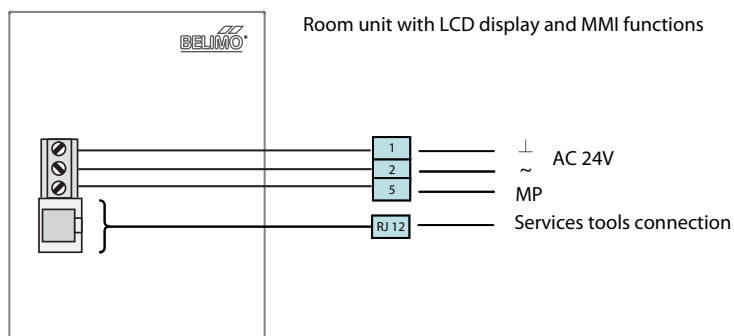


To be opened by accredited servicing agents only
 Electronic control - Type 2.B action (micro-disconnection operation)
 Separate collection for electrical and electronic equipment 

Please note: A standard RJ12 6/4 (1:1) cable can be plugged onto the RJ12 and connected to a Belimo MP-Bus level converter (e.g. ZTH-USB-MP) for the Belimo PC-Tool.



Wiring diagram



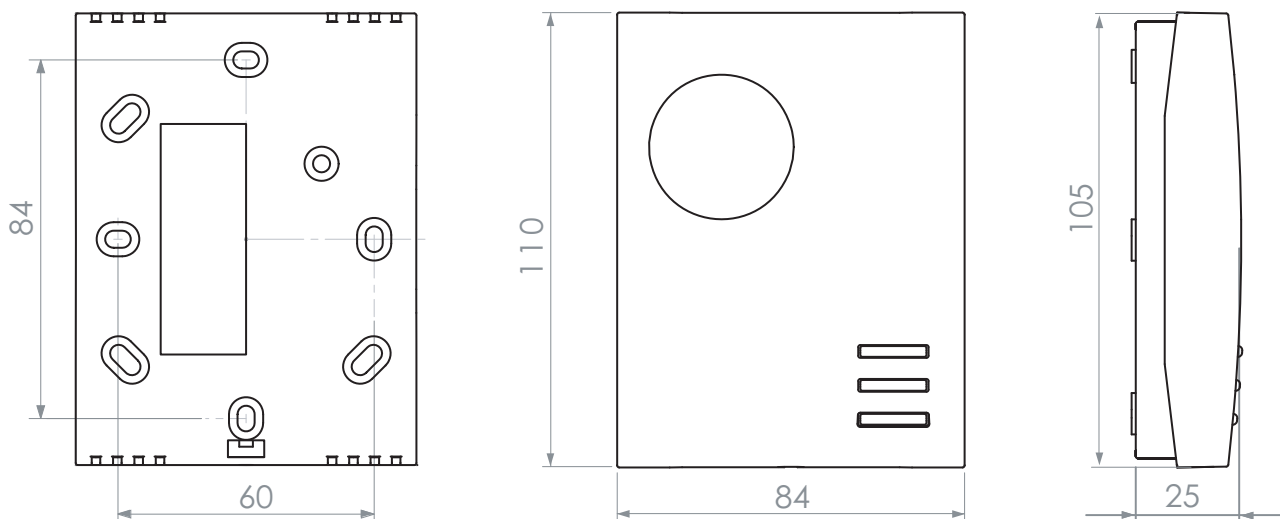
Principle of the functional keys



There are three functional keys on the cover of T24-MP. The function of the buttons are listed below.

Functional Keys	Function
▲	Normal mode: Increment the temperature setpoint value Commissioning mode: Adjust options of parameters
▼	Normal mode: Decrement the temperature setpoint value Commissioning mode: Adjust options of parameters
MODE	Standby mode or Normal mode selection Commissioning mode: Change parameters
▲ + MODE	Switch from "Normal mode" to "Commissioning mode" by pressing "▲" + "MODE" for 5 seconds

Dimensions [mm]



Product overview

The room temperature sensors are primarily used to transmit the measured air temperature on wall.

For surface mounting



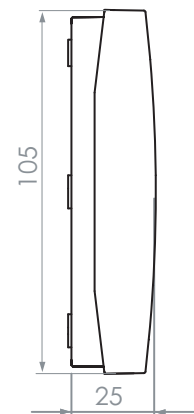
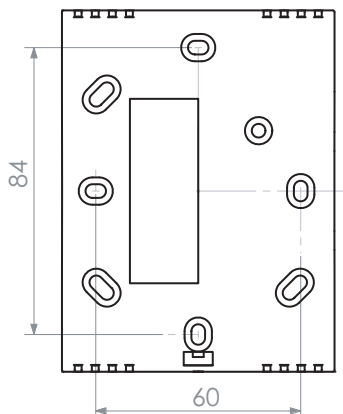
Specifications

Model number	TG-R10000
Wiring terminals	Screw terminals, 0.5...1.5 mm ²
Sensing element	NTC Thermistor, 10kOhm@25°C, See Table 1 for characteristics
Range	0...40°C
Accuracy	+/- 0.5K
Degree of protection	IP30
Ambient humidity range	5...95% RH, non-condensing
Weight	100g
Dimensions (L x W x H)	110 x 84 x 25mm

Resistance versus Temperature

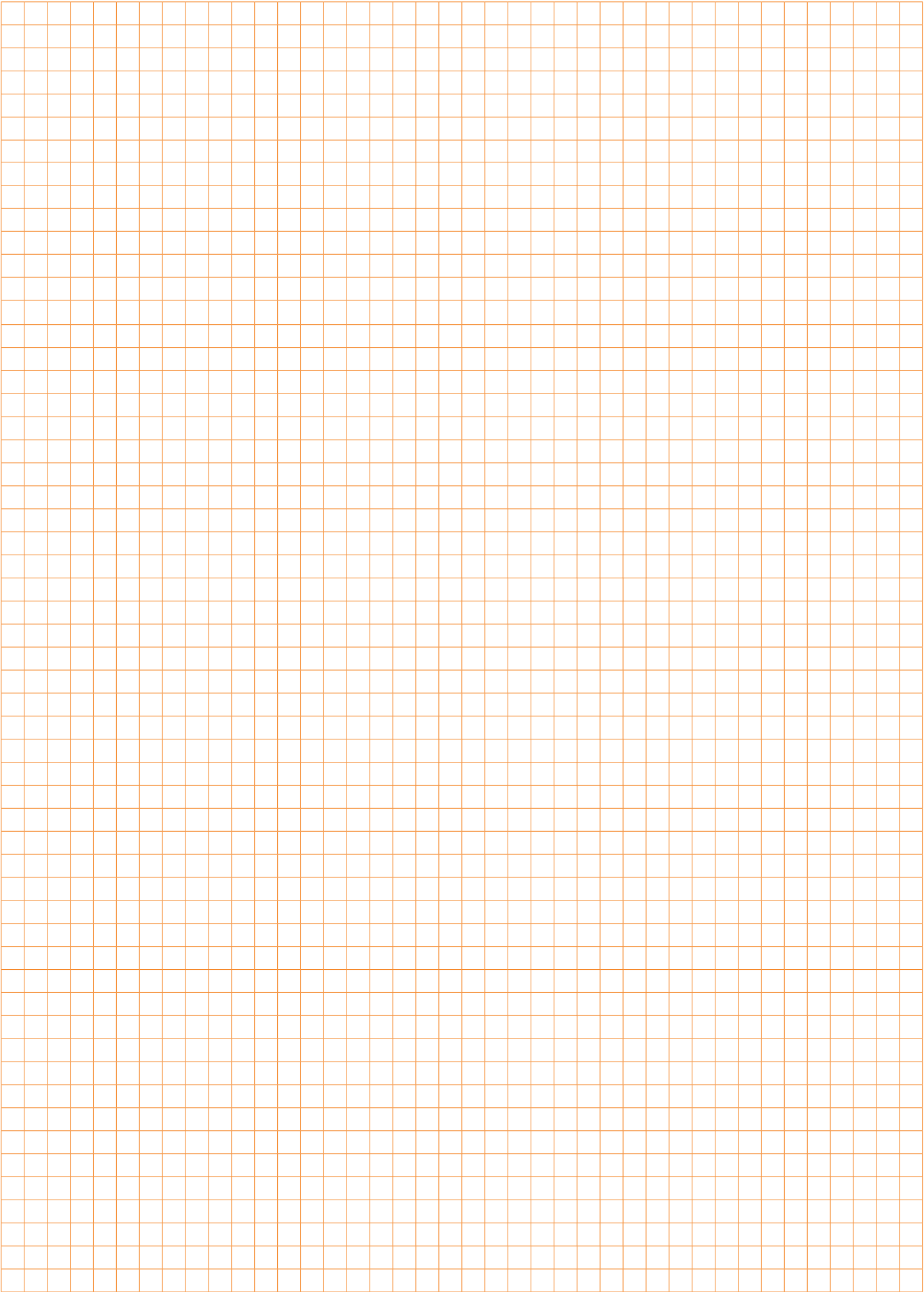
Temperature °C	Resistance Ω	Temperature °C	Resistance Ω	Temperature °C	Resistance Ω	Temperature °C	Resistance Ω
0	27780	11	17550	21	11850	31	8160
1	26610	12	16860	22	11400	32	7869
2	25490	13	16190	23	10980	33	7590
3	24430	14	15560	24	10570	34	7323
4	23420	15	14950	25	10180	35	7066
5	22450	16	14370	26	9808	36	6821
6	21540	17	13820	27	9450	37	6585
7	20660	18	13300	28	9107	38	6359
8	19830	19	12790	29	8779	39	5142
9	19040	20	12310	30	8464	40	5933
10	18290						

Dimensions [mm]



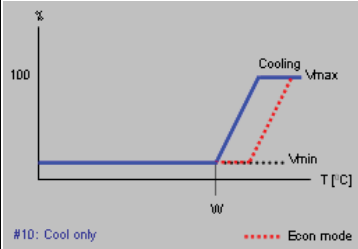
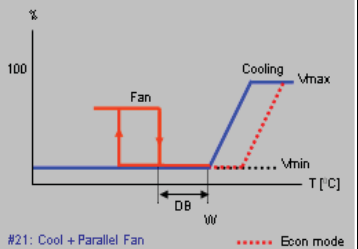
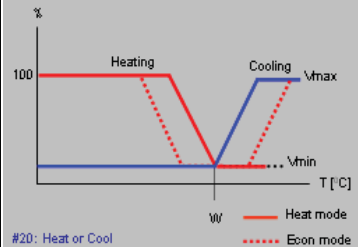
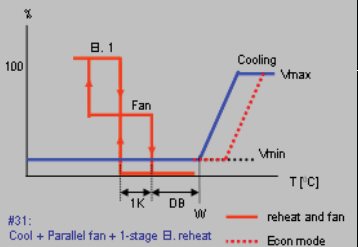
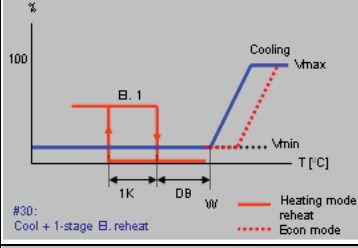
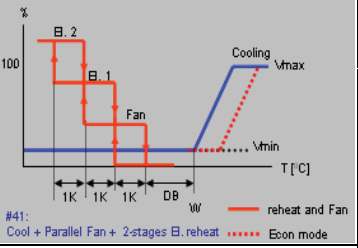
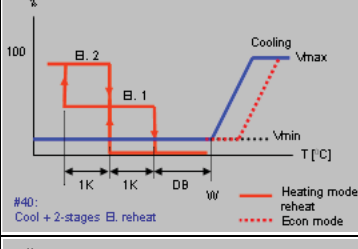
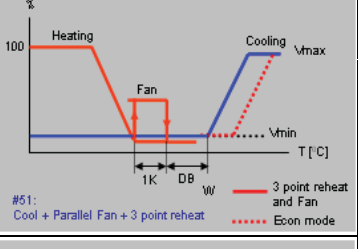
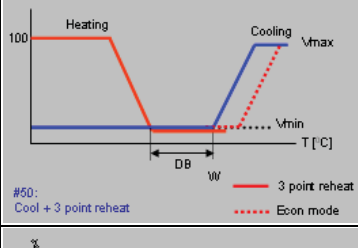
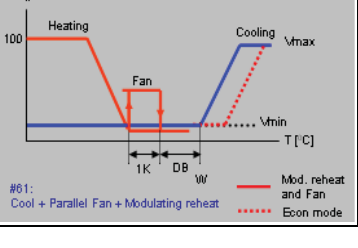
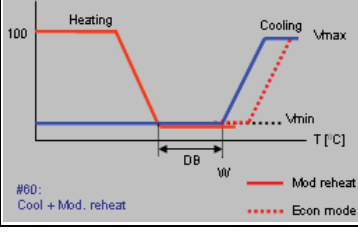
Do not open

Do not open the sensor cover.
No serviceable parts inside.
To be opened by accredited servicing agents only



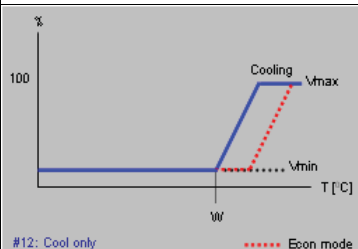
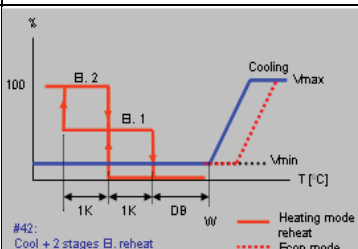
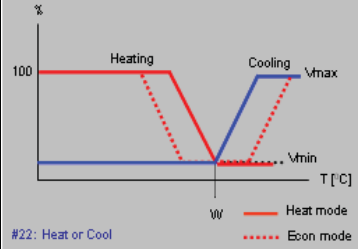
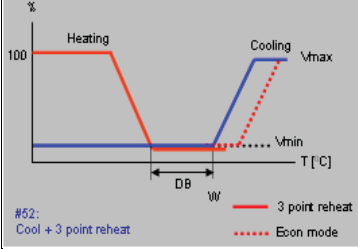
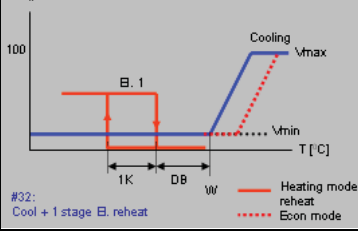
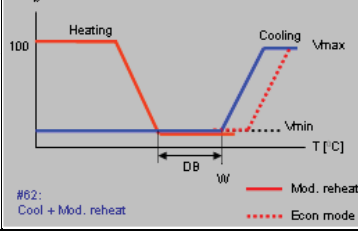
Application Description

The following room control applications are pre-stored in the module. Applications number can be selected by Room Unit through MP-bus commands or BMS through LonWorks or BACnet network.

Appl. no.	Sequence	Description	Appl. no.	Sequence	Description
10	 <p>#10: Cool only Eeon mode</p>	Cool only	21	 <p>#21: Cool + Parallel Fan Eeon mode</p>	Cool + parallel fan w/ deadband
20	 <p>#20: Heat or Cool Eeon mode</p>	Heat (or Cool)** Factory setting = Heat	31	 <p>#31: Cool + Parallel fan + 1-stage E. reheat Eeon mode</p>	Cool + parallel fan w/ deadband Electric reheat 1 1K reheat switching differential
30	 <p>#30: Cool + 1-stage E. reheat Eeon mode</p>	Cool w/ deadband Electric reheat 1 1K reheat switching differential	41	 <p>#41: Cool + Parallel Fan + 2-stages E. reheat Eeon mode</p>	Cool + parallel fan w/ deadband Electric reheat 1 & 2 1K reheat switching differential
40	 <p>#40: Cool + 2-stages E. reheat Eeon mode</p>	Cool w/ deadband Electric reheat 1 & 2 1K reheat switching differential	51	 <p>#51: Cool + Parallel Fan + 3 point reheat Eeon mode</p>	Cool + parallel fan w/ deadband 3-point reheat 1K reheat switching differential
50	 <p>#50: Cool + 3 point reheat Eeon mode</p>	Cool w/ deadband 3-point reheat	61	 <p>#61: Cool + Parallel Fan + Modulating reheat Eeon mode</p>	Cool + parallel fan w/ deadband Modulating reheat 1K reheat switching differential
60	 <p>#60: Cool + Mod. reheat Eeon mode</p>	Cool w/ deadband Modulating reheat			

Application Description

The following room control applications are pre-stored in the module. Applications number can be selected by Room Unit through MP-Bus commands or BMS through LonWorks or BACnet network.

Appl. no.	Sequence	Description	Appl. no.	Sequence	Description
12		Cool only + series fan*	42		Cool + series fan* w/ deadband Electric reheat 1 & 2 1K reheat switching differential
22		Heat (or Cool)** + series fan* Factory setting = Heat	52		Cool + series fan* w/ deadband 3-point reheat
32		Cool + series fan* w/ deadband Electric reheat 1 1K reheat switching differential	62		Cool + series fan* w/ deadband Modulating reheat

- * Series fan (DO3) will always be ON in Normal / Economy / Override modes. It will automatically switch OFF in Standby mode.
 ** Heat / Cool changeover function in Application 20 & 22 shall manually be selected by BMS via LonWorks or BACnet network.
 *** T24-V02LON and T24-V02BAC functions under in Application 10 & 20.

Insufficient air-flow protection of electrical heaters **

The Room Control Module is default as auto power "ON". Once the power failure and after resume, the HVAC system will not resume immediately and thus there is no airflow through the VAV box. If setpoint of the Room Unit is lower than room temperature, the Control Module may kick the heater to "ON" status.

For such case, it is very danger to allow the heater to "ON" without airflow in the system. So, for that application with heater function (Application: 30, 31, 32, 40, 41, 42). The Control Module should not drive a digital output (DO1 & 2) to kick the heater "ON" when the airflow status is lower than the 50% of V'min. The heater never be "ON" unless there is enough flow.

i.e.

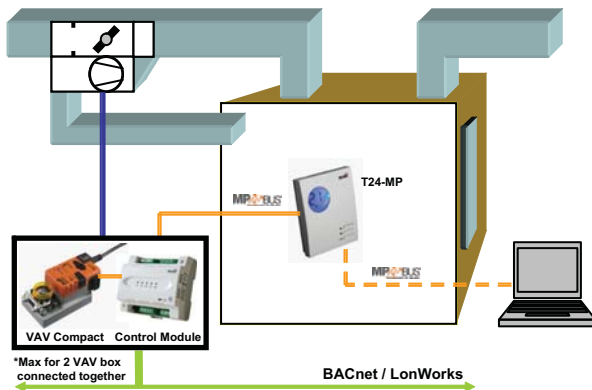
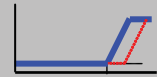
Heater "ON" --> Each VAV Compact 1 or 2, airflow is higher than 50% of V'min

Heater "OFF" --> Software will check the airflow of two cycle times (each cycle ≈ 7s) to make sure the Control Module was detected the airflow lower than 50% of V'min

Examples of heater "OFF":

- VAV Compact 1 detects air-flow is lower than 50% of V'min, VAV Compact 2 does not connect.
- VAV Compact 2 detects air-flow is lower than 50% of V'min, VAV Compact 1 does not connect.
- Both VAV Compact 1 and VAV Compact 2 detects air-flow are lower than 50% of V'min.
- Both VAV Compact 1 and VAV Compact 2 do not connected.
- One invalid actuator (e.g. Damper Actuator) is detected.

Application No. 10 - Cool only - VAV single duct application

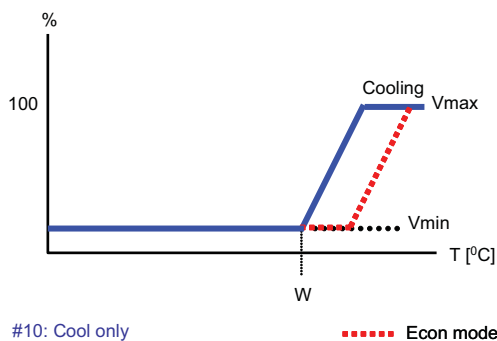


The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

- $V'min$ - to the hygienic change or minimum fresh air

- $V'max$ - to the maximum cooling demand

Functional diagram



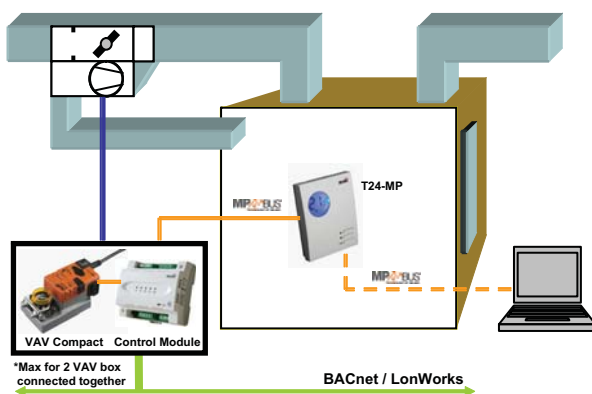
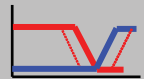
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 20 - Heat (or Cool) * - VAV single duct application



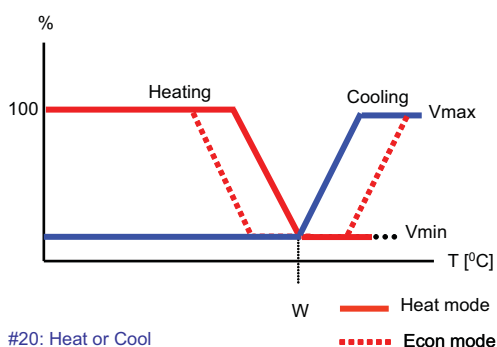
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

- $V'min$ - to the hygienic change or minimum fresh air

- $V'max$ - to the maximum cooling / heating demand

* Factory setting = Heat
Heat or cool changeover shall manually be selected by BMS via BACnet / LonWorks

Functional diagram



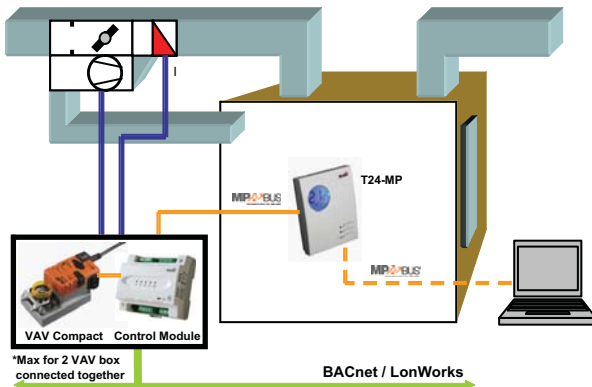
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 30 - Cool with 1-stage electric reheat - VAV single duct application



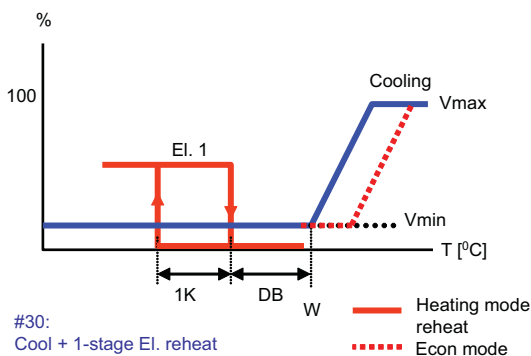
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

-V'min - to the hygienic change or minimum fresh air

-V'max - to the maximum cooling demand

At heating conditions the electric reheat gets controlled via the digital output - DO1

Functional diagram



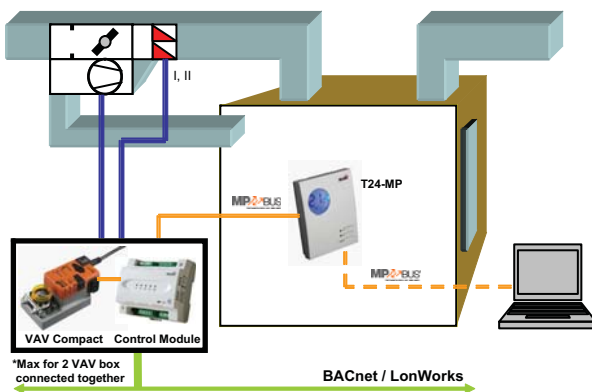
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 40 - Cool with 2-stages electric reheat - VAV single duct application



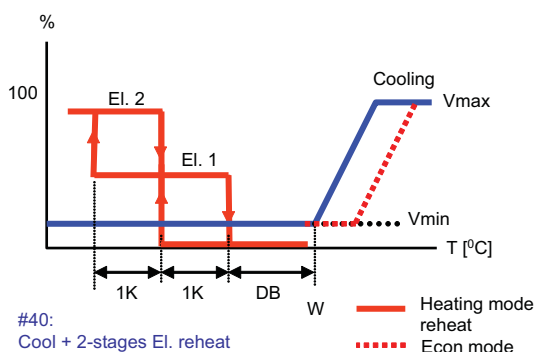
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

-V'min - to the hygienic change or minimum fresh air

-V'max - to the maximum cooling demand

At heating conditions the 2-steps electric reheat gets controlled via two digital outputs - DO1 & DO2

Functional diagram



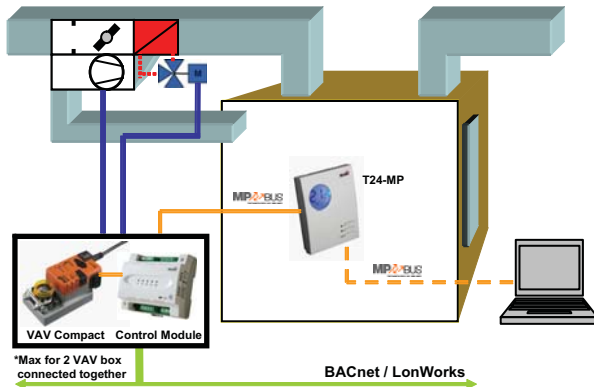
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 50 - Cool with 3-point reheat - VAV single duct application



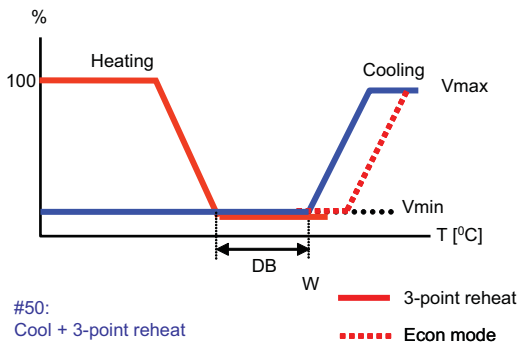
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

- $V'min$ - to the hygienic change or minimum fresh air

- $V'max$ - to the maximum cooling demand

At heating conditions the 3 point reheat valve gets controlled via two digital outputs - DO1 & DO2

Functional diagram



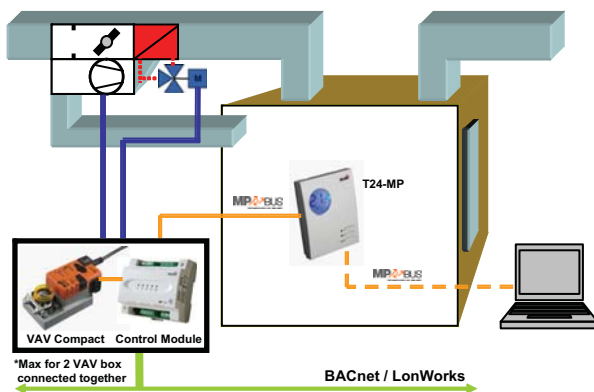
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 60 - Cool with modulating reheat - VAV single duct application



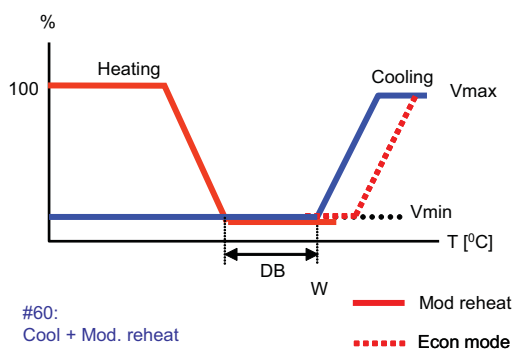
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

- $V'min$ - to the hygienic change or minimum fresh air

- $V'max$ - to the maximum cooling demand

At heating conditions the modulating reheat valve gets controlled via the analogue output - AO

Functional diagram



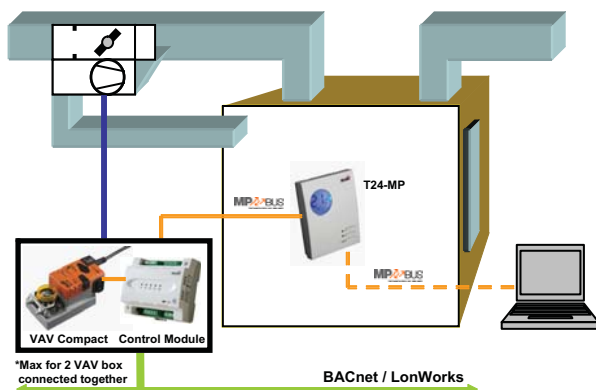
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 21 - Cool with parallel fan - VAV single duct application



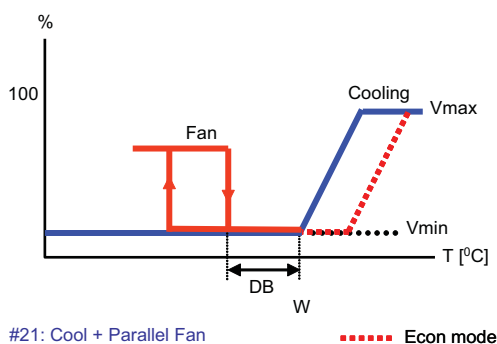
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

-V'min - to the hygienic change or minimum fresh air

-V'max - to the maximum cooling demand

At heating conditions the parallel fan gets controlled via the digital output - DO3

Functional diagram



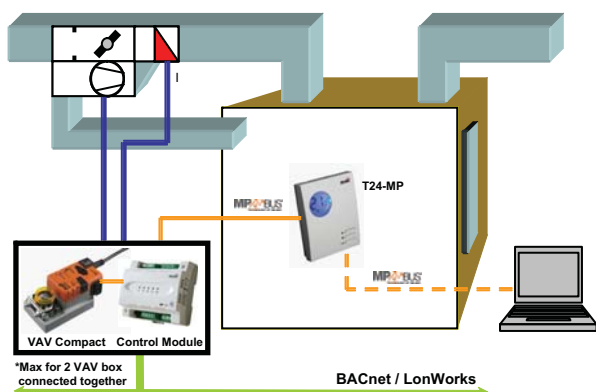
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 31 - Cool with 1-stage electric reheat & parallel fan - VAV single duct application



The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

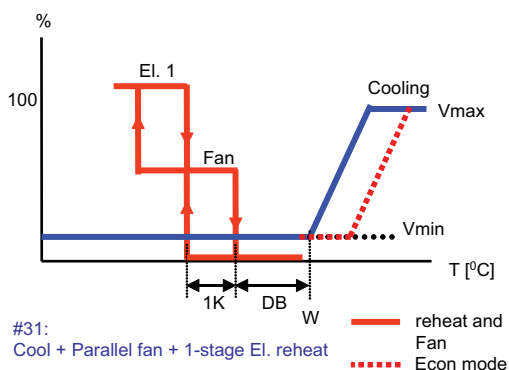
-V'min - to the hygienic change or minimum fresh air

-V'max - to the maximum cooling demand

At heating conditions the electric reheat & parallel fan gets controlled via two digital outputs - DO1 & DO3

If the room setpoint suddenly increases, the electric reheat function will automatically switch off. The control module will delay 1 mins. to switch off parallel fan as precaution in case of high temp. inside the air duct.

Functional diagram



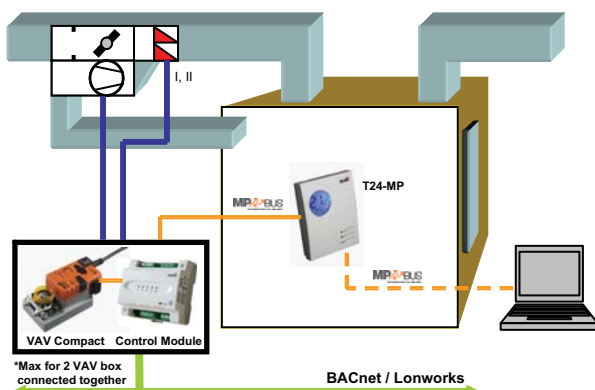
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 41 - Cool with 2-stages electric reheat & parallel fan - VAV single duct application



The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

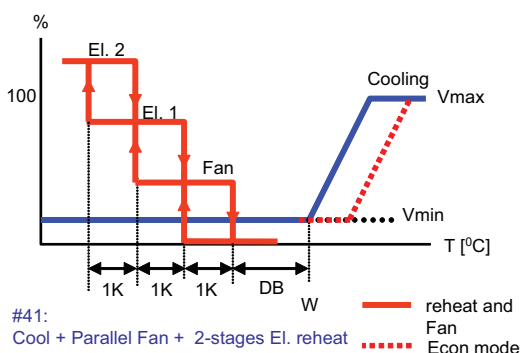
- $V'min$ - to the hygienic change or minimum fresh air

- $V'max$ - to the maximum cooling demand

At heating conditions the 2-steps electric reheat & parallel fan gets controlled via three digital outputs
- DO1, DO2 & DO3

If the room setpoint suddenly increases, the electric reheat function will automatically switch off. The control module will delay 1 mins. to switch off parallel fan as precaution in case of high temp. inside the air duct.

Functional diagram



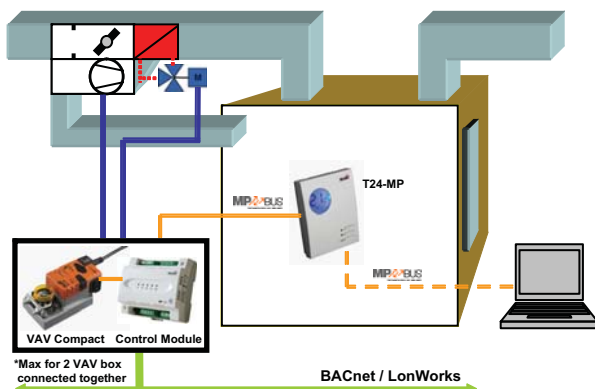
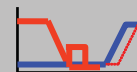
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 51 - Cool with 3-point reheat & parallel fan - VAV single duct application



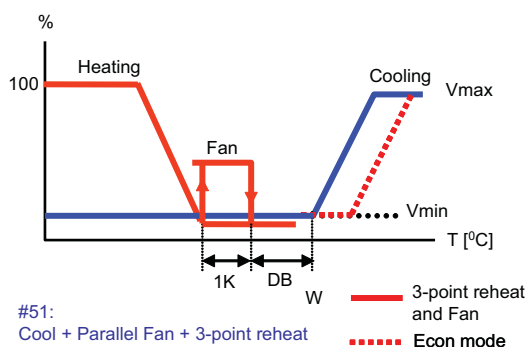
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

- $V'min$ - to the hygienic change or minimum fresh air

- $V'max$ - to the maximum cooling demand

Under heating conditions the 3-point reheat valve & parallel fan gets controlled via three digital outputs
- DO1, DO2 & DO3

Functional diagram



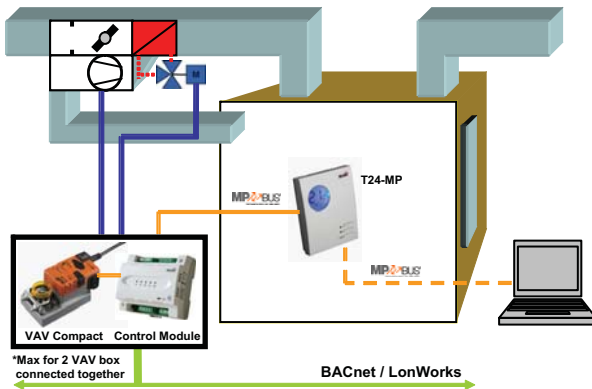
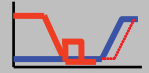
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 61 - Cool with modulating reheat & parallel fan - VAV single duct application



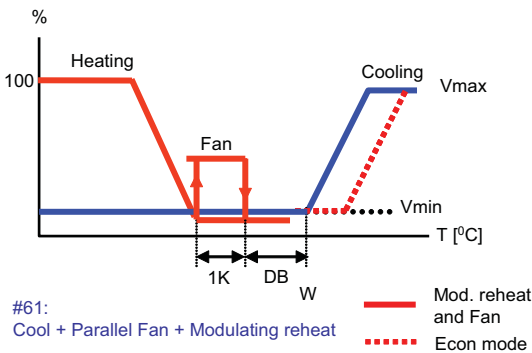
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V_{min}...V_{max}$:

- V_{min} - to the hygienic change or minimum fresh air

- V_{max} - to the maximum cooling demand

Under heating conditions the modulating reheat valve & parallel fan gets controlled via analogue and digital output - AO & DO3

Functional diagram



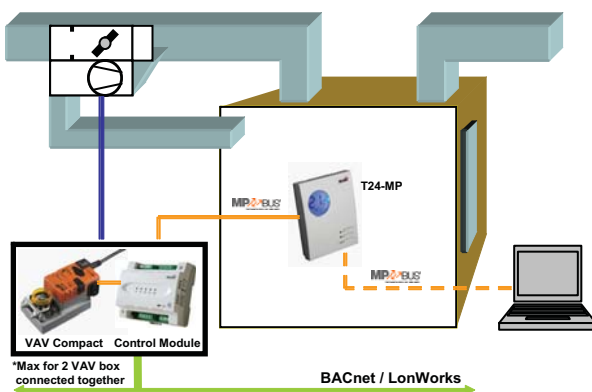
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 12 - Cool with series fan - VAV single duct application



The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V_{min}...V_{max}$:

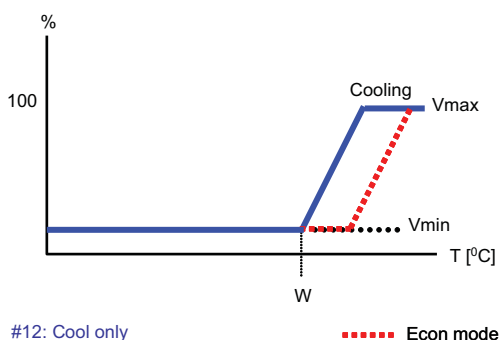
- V_{min} - to the hygienic change or minimum fresh air

- V_{max} - to the maximum cooling demand

Under normal conditions the series fan gets controlled via digital output - DO3

* During the normal operation, the series fan will always on.

Functional diagram



Options

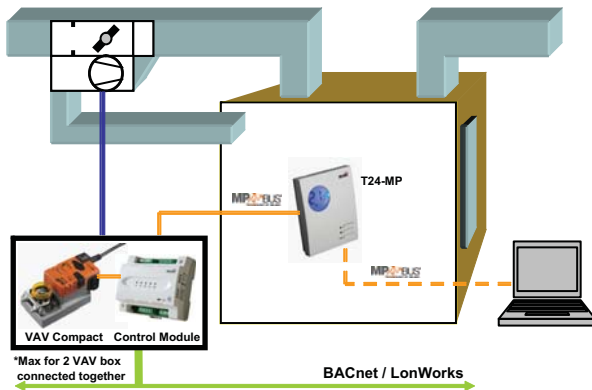
- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 22 - Heat (or Cool) with series fan *

- VAV single duct application



The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

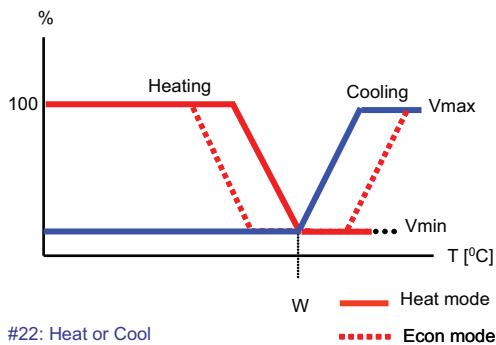
- V'min - to the hygienic change or minimum fresh air
- V'max - to the maximum cooling / heating demand

Under normal conditions the series fan gets controlled via the digital output - DO3

* During the normal operation, the series fan will always on.

* Factory setting = Heat
Heat or cool changeover shall manually be selected by BMS via BACnet / LonWorks

Functional diagram



Options

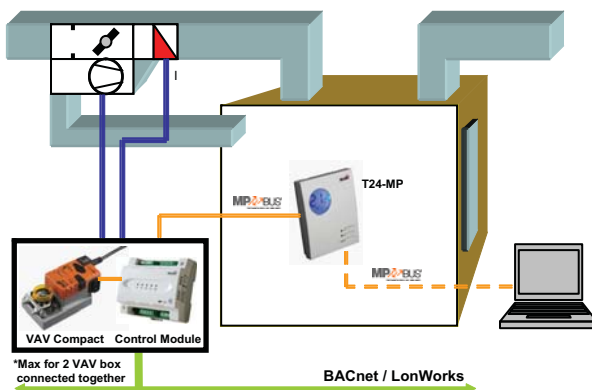
- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 32 - Cool with 1-stage electric reheat & series fan

- VAV single duct application



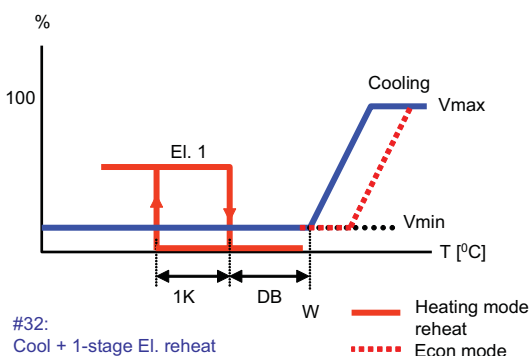
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

- V'min - to the hygienic change or minimum fresh air
- V'max - to the maximum cooling demand

Under heating conditions the electric reheat & series fan gets controlled via two digital outputs - DO1 & DO3

During the Commissioning mode, the electric reheat function will automatically switch off. The control module will delay 1 mins. to switch off series fan as precaution in case of high temp. inside the air duct.

Functional diagram



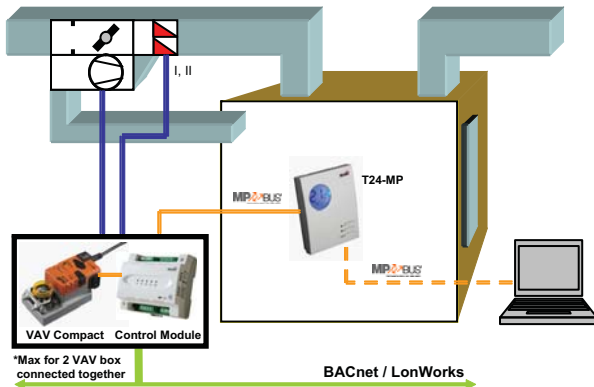
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 42 - Cool with 2-stages electric reheat & series fan - VAV single duct application



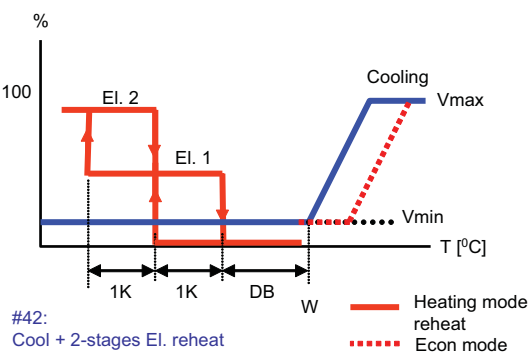
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V_{min}...V_{max}$:

- V_{min} - to the hygienic change or minimum fresh air
- V_{max} - to the maximum cooling demand

Under heating conditions the 2-steps electric reheat & series fan gets controlled via three digital outputs - DO1, DO2 & DO3

During the Commissioning mode, the electric re-heat function will automatically switch off. The control module will delay 1 mins. to switch off series fan as precaution in case of high temp. inside the air duct.

Functional diagram



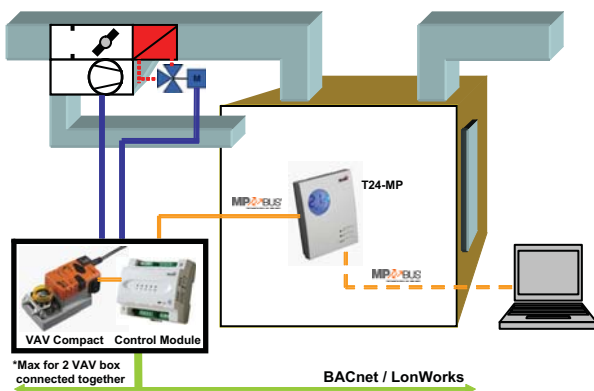
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 52 - Cool with 3-point reheat & series fan - VAV single duct application



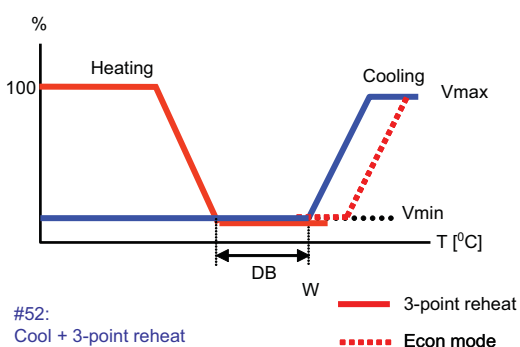
The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V_{min}...V_{max}$:

- V_{min} - to the hygienic change or minimum fresh air
- V_{max} - to the maximum cooling demand

Under heating conditions the 3 point reheat valve & series fan gets controlled via three digital outputs - DO1, DO2 & DO3

* During the normal operation, the series fan will always on.

Functional diagram



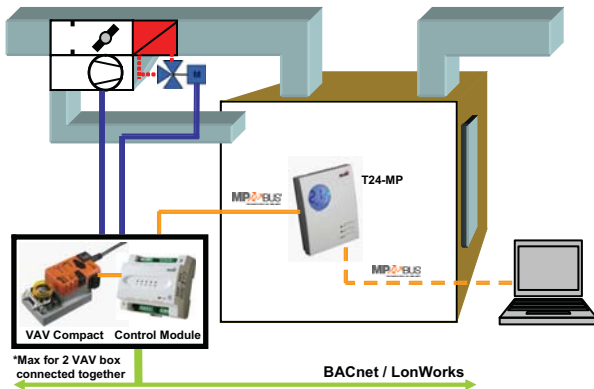
Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display

Application No. 62 - Cool with modulating reheat & series fan - VAV single duct application



The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range $V'min...V'max$:

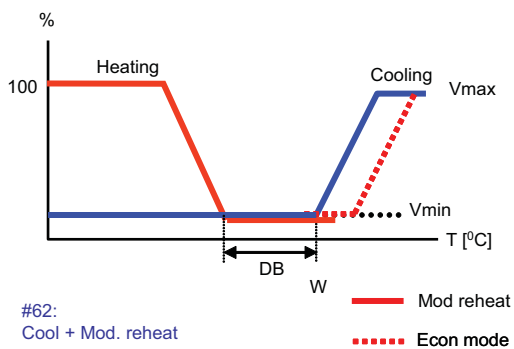
- $V'min$ - to the hygienic change or minimum fresh air

- $V'max$ - to the maximum cooling demand

Under heating conditions the modulating reheat valve & series fan gets controlled via analogue and digital output - AO & DO3

* During the normal operation, the series fan will always on.

Functional diagram

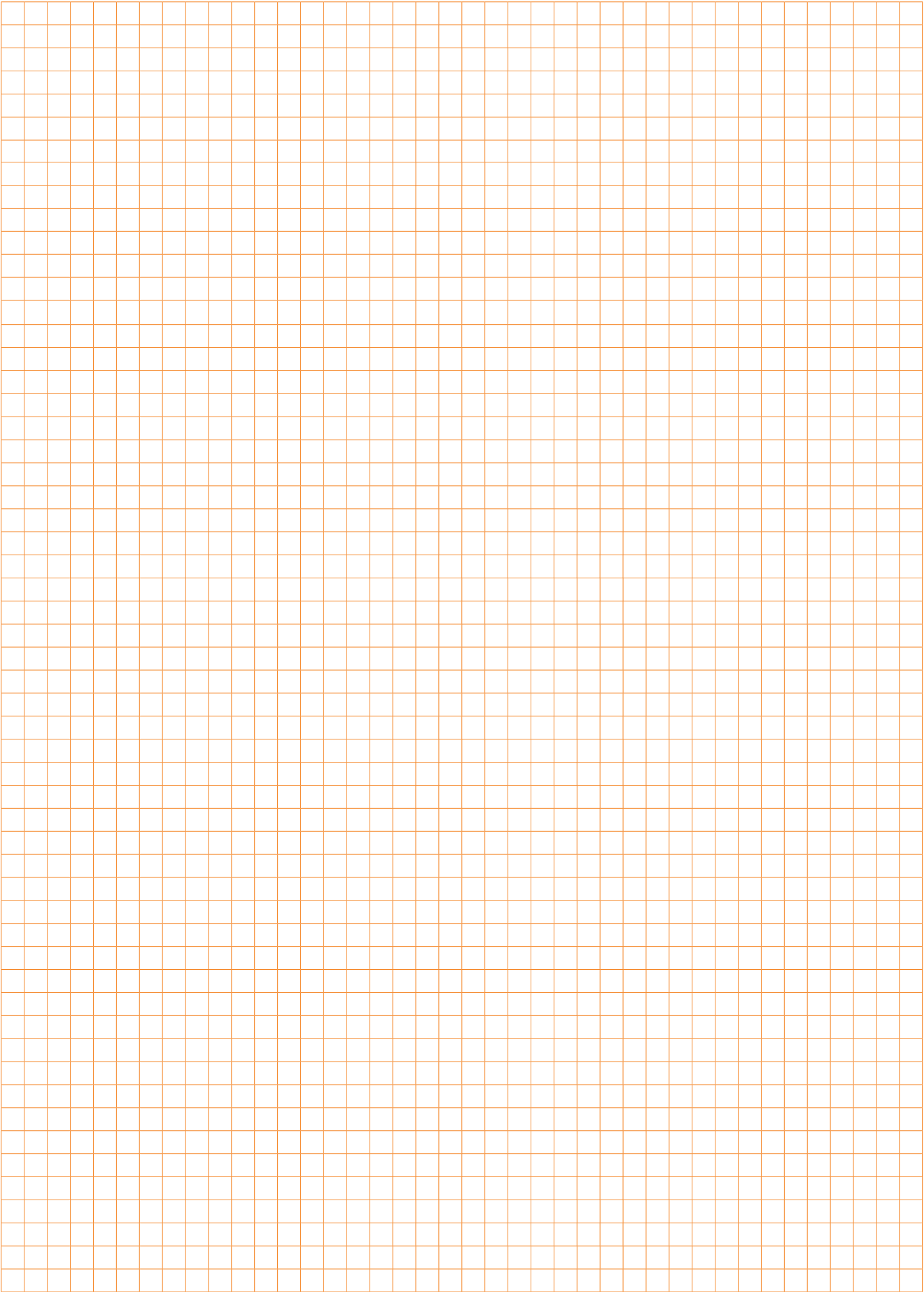


Options

- AI External temp. sensor, NTC 10kOhm@25°C sensor
- DI Remote setpoint shift, e.g. Occupancy sensor (NO)
Open - Normal mode, Close - Economy mode

Operations - MMI

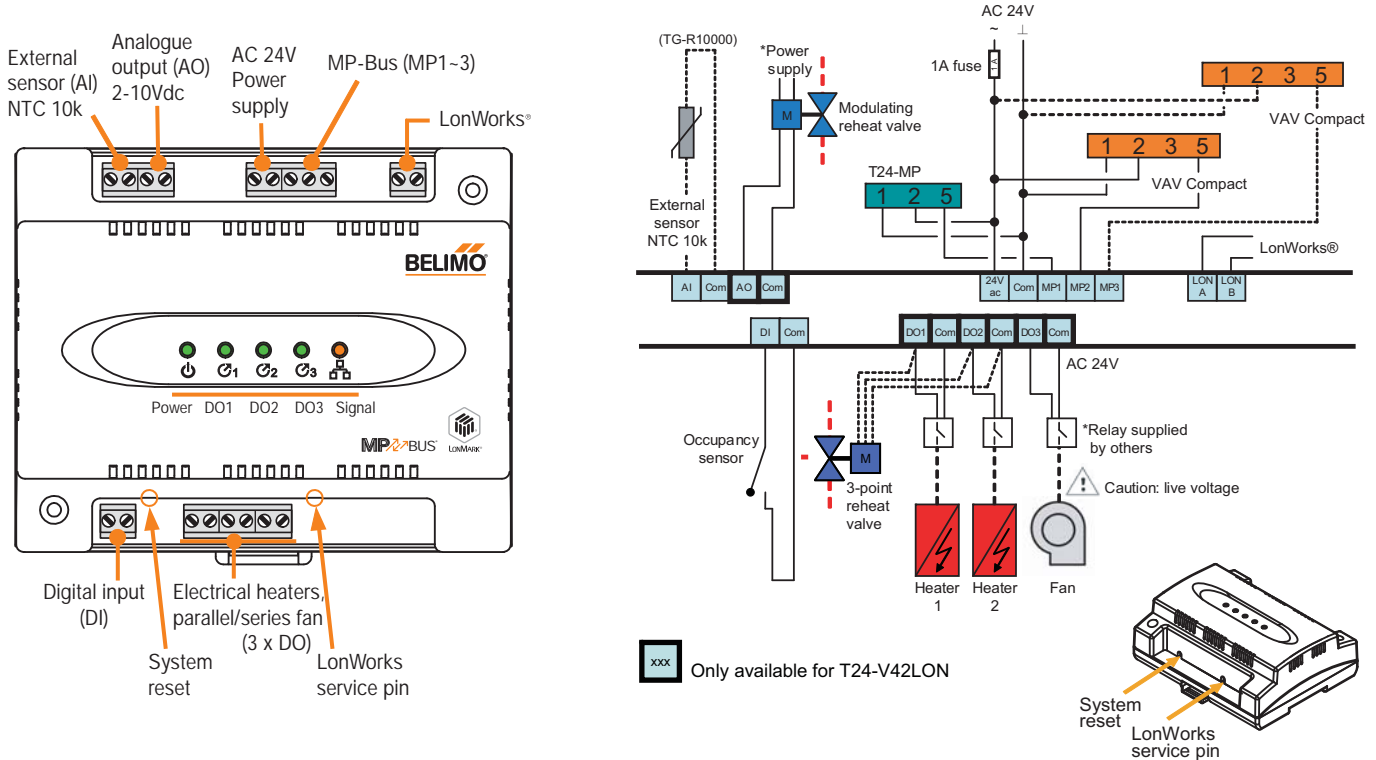
- T24-MP with user interface, LCD display
- TG-R10000 without user interface, No display



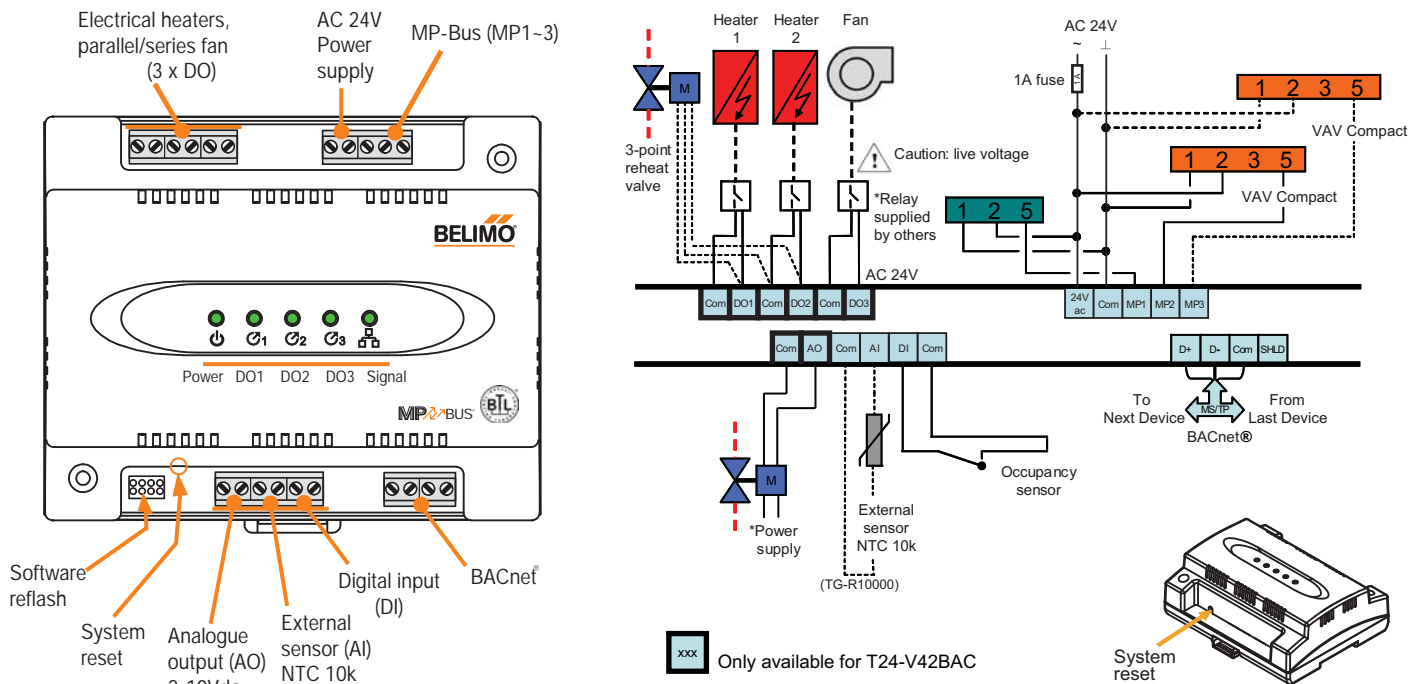
Controller operation

The T24-V42(-V02)... Room Control Module offers the advantages of network control via the high performance network protocol. This controller features clear LED's indication, analogue input, digital input, analogue output, 3 x AC 24V digital outputs. MP-Bus interface for connection to the Belimo VAV Compact and optional T24-MP Room Unit or TG-R10000 Room Sensor. Suitable for new or existing VAV system installations.

Functions of T24-V42(-V02)LON and wiring diagram



Functions of T24-V42(-V02)BAC and wiring diagram



Input & output assignment

Inputs

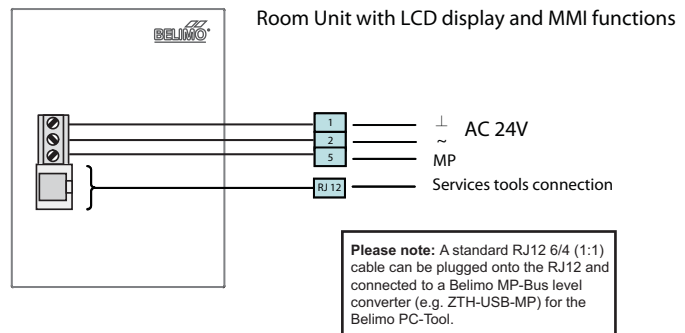
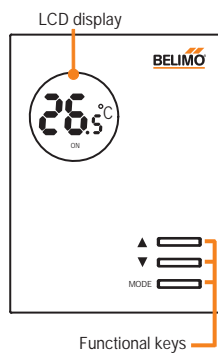
- AI External temp. sensor TG-R10000 *
 - DI Remote setpoint shift, e.g. Occupancy sensor *
- Open - Normal mode, Close - Economy mode

* Optional

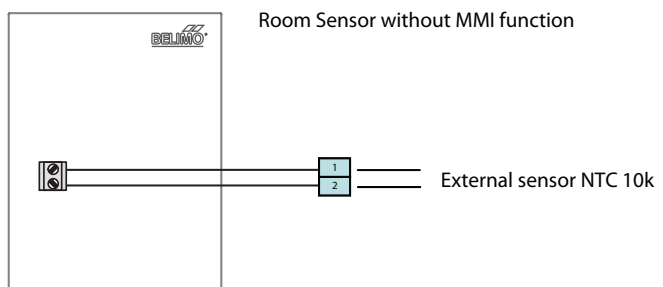
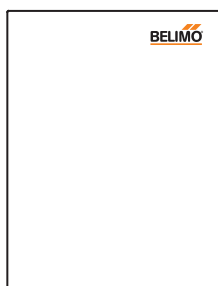
Outputs

- AO Modulating reheat control DC 2...10V
- DO1 Heating output I AC 24V ON/OFF
- DO2 Heating output II AC 24V ON/OFF
- DO3 Parallel or series fan output AC 24V ON/OFF

Functions of T24-MP and wiring diagram



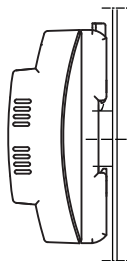
Functions of TG-R10000 and wiring diagram



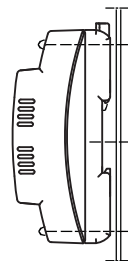
Mounting notes

The T24-V42(-V02)... Room Control Module can be mounted as follows:

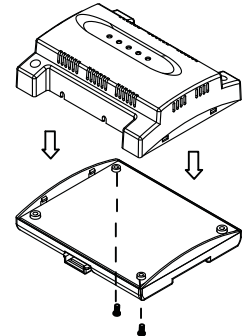
Observe all local installation and mounting regulations.



DIN rail (EN 50 022-35 x 7.5) at least 120 mm long

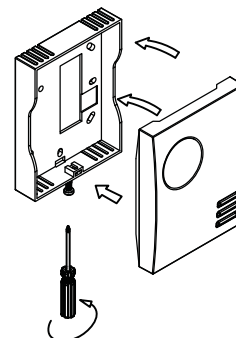
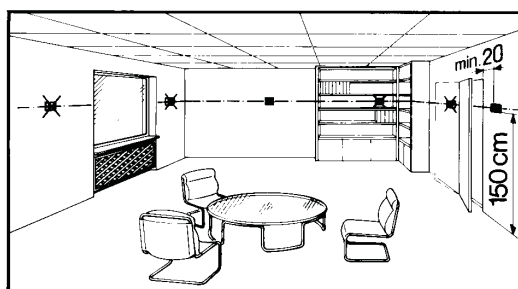


Wall mounted with 2 screws



The T24-MP Room Unit or TG-R10000 Room Sensor can be mounted as follows:

Wall mounted. Not in niches or bookshelves, not behind curtains, above or near heat sources and exposed to direct solar radiation. Mounting height is about 1.5 m above the floor. The connecting wires can be run to the controller from a recessed conduit box.

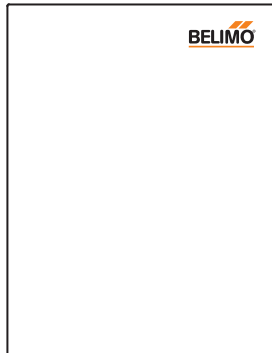


Electrical requirement

The Room Control Module is designed for AC 24V operating voltage. Standard cables can be used for the devices. However, when mounting in an environment greatly exposed to EMI, use only shielded cables.

- The low voltage must comply with the requirements for safety extra-low voltage (SELV) as per EN 60730.
- Use safety insulating transformers with double insulation as per EN 60742; they must be designed for 100% on-time.
- Supplying voltages above AC 24V to low voltage connections may damage or destroy the control module or any other connected devices. Additionally, connections to voltages exceeding AC 42V endanger personal safety.
- Wiring terminal: Fixed screw terminals, 0.5...1.5mm².

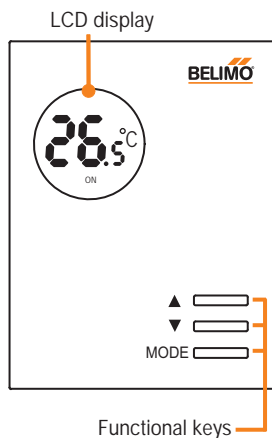
Principle operation of TG-R10000



Surface mounting TG-R10000 Room Sensor directly connected to T24-V42 (-V02)... room module of analogue input (AI) point. This device is without MMI and LCD display. The room temperature can be read through Building Management System (BMS) by LonWorks / BACnet.

⚠ The device would not function if T24-MP is connected together.

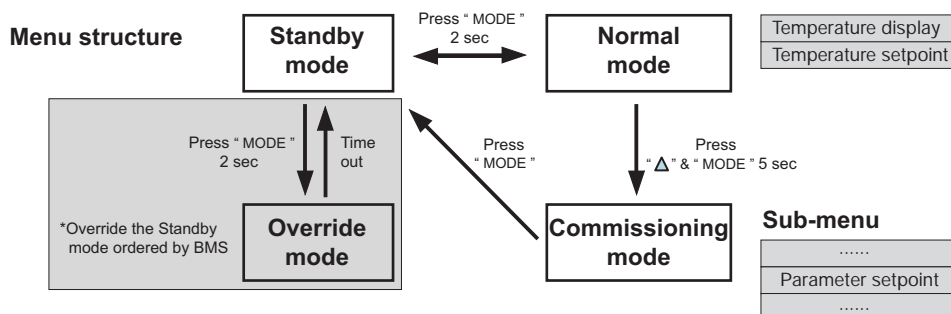
Principle functional keys of T24-MP



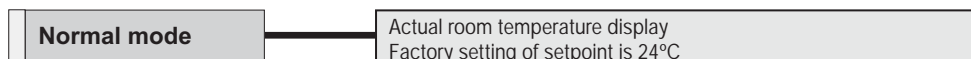
There are three functional keys on the cover of T24-MP. The function of the buttons are listed below.

Functional Keys	Function
▲	Normal mode: Increment the temperature setpoint value Commissioning mode: Adjust options of parameters
▼	Normal mode: Decrement the temperature setpoint value Commissioning mode: Adjust options of parameters
MODE	Standby mode or Normal mode selection Commissioning mode: Change parameters
▲ + MODE	Switch from "Normal mode" to "Commissioning mode" by pressing "▲" + "MODE" for 5 seconds

Operation menu of T24-MP











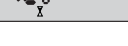

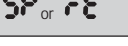






Start-up Device start after power ON



Parameter setting of T24-MP

It is possible to set different parameter values in Commissioning mode by pressing “ Δ ” and “MODE” for 5s continuously. Parameter values can be changed with the “ Δ ” or “ ∇ ” buttons and changes can be confirmed with the “MODE” button. After completing the parameter setup, the system will return to Standby mode and keep storage in memory (every 2mins. cycling).

Parameters display selectable by “MODE”	Setting range / options selectable by Δ and ∇	Description	Factory setting
1 		Start to Commissioning mode (All input/output signals will switch off)	
2 	10.0...30.0 (°C), step 0.5	Minimum setpoint limitation in Normal mode	10
3 	1...3 (K), step 1	P-band in heating mode	2
4 	1...3 (K), step 1	P-band in cooling mode	1
5 	0.5, 1.0, 2.0 (K)	Deadband range	1
6 	10.0...20.0 (°C), step 0.5	Setpoint of heating in Economy mode	18
7 	20.0...30.0 (°C), step 0.5	Setpoint of cooling in Economy mode	28
8 	10, 20, 30, 40, 50, 60, 21, 31, 41, 51, 61, 12, 22, 32, 42, 52, 62	Application number selection	10
9 	60...300 (sec), step 30	Integral action time	12.0
10 	60...150 (sec), step 10	3 point floating control for reheat valve	90
11 		Enable / disable the room unit to override the Standby mode ordered by BMS	or y
12 		LCD display: “Setpoint only” or “Room temp. with setpoint”	rt
13 		Parameter or flow rates re-set from room unit - RJ12 plug	PC n
# 14 	0x00n-0x7Fn	Network address in hex format (BACnet version only) *	7F n
15 	0x00n-0x3Fn	Device address 1 in hex format (BACnet version only e.g. 0x[3F] FF FF) *	00 d
16 	0x00n-0xFFn	Device address 2 in hex format (BACnet version only e.g. 0x3F [FF] FF) *	00 d
17 	0x00n-0xFFn	Device address 3 in hex format (BACnet version only e.g. 0x3F FF [FF]) *	00 d

The network and device address only to display for connection with BACnet version control module together

* Max. network address for BACnet control module is 0x7F, and the default network address is 0x7F

Max. device address for BACnet control module is 0x3F FF FF, and the default device address is 0x00 00 00

MP-Bus - VAV Compact addresses

T24-V42(-V02)..., MP-Bus requirement

The MP-Bus is the Belimo master/slave bus. Up to 8 slaves can be connected to a MP-master devices. Each MP slave must be assigned a unique MP address between MP1 to MP8 before it can be operated on the MP-Bus. Belimo VAV Compacts are set to PP (point-to-point) addressing on delivery. PP is the required conventional control setting for CAV/VAV functions with 0...10 / 2...10 V signals.

For T24-V42(-V02)... control module, it can manage up to 3 MP devices (MP1 to MP3). MP1 is for T24-MP, MP2 and 3 are for VAV Compacts connection. MP4 to 8 are not used in this situation.

Pre-addressing with Belimo PC-Tool V3.x

VAV Compacts can be pre-addressed with the PC-Tool (address / de-address device). Pre-addressed VAV Compacts are automatically detected and read as soon as they are connected to the T24-V42(-V02)....



Address setting

Room Unit - T24-MP;
It is defaulted as MP1, no need to address with PC-Tool

When 1 VAV Compact is connected with T24-V42(-V02)...;
Pre-address it to MP2 or MP3 with Belimo PC-Tool

When 2 VAV Compacts are connected with T24-V42(-V02)...;
Pre-address the first actuator to MP2 and the second actuator to MP3 with Belimo PC-Tool.

PC-Tool connection

- a) On the Room Unit - T24-MP
After the Room Unit is enable from  to  in commissioning mode, the LCD will display "PS" and allow the user to start to operate PC-Tool by connecting with external hardware device (e.g. ZIP-USB-MP).

BACnet Room Control Module:

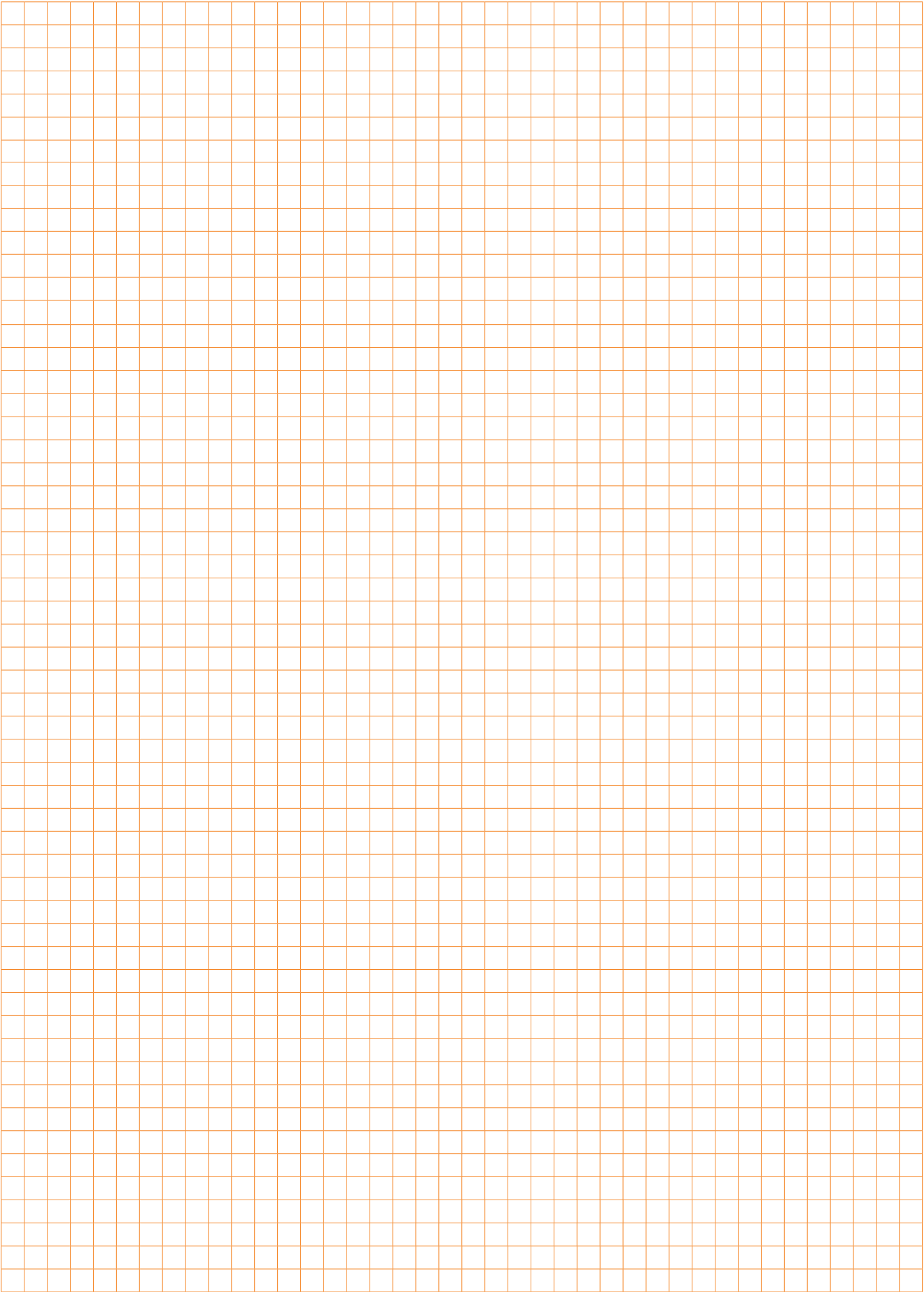
The Room Unit will resume to *normal operation* if the control module has not received any commands from PC-Tool after 3 mins. and "PS" display will cancel out. Both MP2 and MP3 can be read in this situation.

LonWorks Room Control Module:

The Room Unit will resume to *normal operation* after 30 mins. to entry into parameter setting by using PC-Tool and "PS" display will cancel out. Both MP2 and MP3 can be read in this situation.

Please note: Bus jam will occur if two or more devices respond to the same address. Or Room Unit (T24-MP) and external hardware device (ZIP-USB-MP) connected together in normal operation.

- b) On the VAV Compact
If the PC-Tool is connected locally to the service socket of the VAV Compact, it is free to set all the parameters in this MP device. No other MP devices can be accessed.



Innovation, Quality and Consultancy: A partnership for motorising HVAC actuators



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