In-room temperature controller with two continuous output DC 0…10 V and adjustable limits for $V_{\text{MIN}}$ and $V_{\text{MAX}}$

**Application**
The TRS-M room temperature controller is intended for the individual control of room air temperature in heating, ventilating and air-conditioning systems (HVAC). The temperature sensor is incorporated into the controller itself, although an external sensor can be connected if required.

The controller provides appropriate operating control (heating or cooling) for the modulating actuators of control and mixing dampers, valves and air-volume controllers.

A selector switch allows the user to choose from four alternative operating modes whichever suits him best for the room. A slide-type potentiometer is provided to allow local correction of the temperature setpoint ($\pm 3 \, ^\circ C$) according to individual needs.

The controller also has an input for central operating control.

**Mode of operation**
The TRS-M controller employs a proportional characteristic with fixed, preset proportional bands. It compares the actual value with the setpoint and, if there is a discrepancy between the two, generates a continuous proportional control signal to correct it. There is an adjustable dead band $X_e$ between the two control outputs for heating and cooling. The setting potentiometers for setpoint and dead band and limit values $V_{\text{MIN}}$, $V_{\text{MAX}}$ cooling and $V_{\text{MAX}}$ heating are housed inside the controller itself.

By means of an override signal, it is possible to shift the cooling and heating setpoints by 10 K and 6 K respectively or to set the cooling signal to zero. This is consistent with ensuring minimum power consumption and monitoring of limit values and damper closed.

**Mode selector**
Removing the housing cover gives access to the selector switch which allows the operating mode to be altered as necessary. The selector can also be disengaged completely if required.

**Technical data**

<table>
<thead>
<tr>
<th>TRS-M</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>AC 24 V 50/60 Hz</td>
</tr>
<tr>
<td>Nominal voltage range</td>
<td>AC 19.2…28.8 V</td>
</tr>
<tr>
<td>Power consumption</td>
<td>0.5 W</td>
</tr>
<tr>
<td>For wire sizing</td>
<td>1.0 VA</td>
</tr>
<tr>
<td>Connection</td>
<td>Screw terminals (2 x 1.5 mm²)</td>
</tr>
<tr>
<td>Temperature sensor</td>
<td>NTC (0…+40 °C) on p.c.b., or external sensor TFK</td>
</tr>
<tr>
<td>Output signal</td>
<td>$Y_k$: DC 0…10 V (reverse-acting) $Y_h$: DC 0…10 V (direct-acting)</td>
</tr>
<tr>
<td>Operating range</td>
<td>heating: DC 0…10 V; cooling: DC 0…10 V</td>
</tr>
<tr>
<td>Output current</td>
<td>max. 0.5 mA</td>
</tr>
</tbody>
</table>

**Setting ranges**
- setpoint, internal $X_k$: $21 \, ^\circ C \pm 5 \, ^\circ C$
- setpoint, external $\Delta X_k$: $\pm 3 \, ^\circ C$ (slide potentiometer)
- dead band $X_e$: $-1…+5 \, ^\circ C$ (factory preset: 2 K)
- max. flow $V_{\text{MAX}}$ 30…100%
- min. flow $V_{\text{MIN}}$ 0…80% of $V_{\text{MAX}}$
- max. flow, heating $V_{\text{MIN}}$ $V_{\text{MAX}}$ (0…$V_{\text{MAX}}$)

**Mode selector**
- Automatic
- Continuous
- Night (unassigned)
- Ventilation ($\text{MAX Yk}$)
Room temperature controller TRS-M

Function diagram, instructions for use

Function diagram

Legend
XK Setpoint
Xe Dead band
Yh Output, heating
Yk Output, cooling
Y_{\text{MAX C}} Maximum limiting Yk (cooling)
Y_{\text{MIN}} Minimum limiting Yk
Y_{\text{MAX H}} Maximum limiting Yk (heating)
k Setpoint shift to limit value
U Voltage
\text{t}_{\text{room}} Room temperature

Settings

- **Setpoint, external**
  For individual adjustment of the room temperature setpoint ($\pm 3$ K).

- **Setpoint, internal XK**
  For altering the factory-preset setpoint ($X_k = 21^\circ C$) by means of the potentiometer inside the controller.

- **Dead band Xe**
  For making the dead band larger or smaller by means of the potentiometer inside the controller ($X_e = 2$ K).

- **Minimum limiting output signal Yk** \(Y_{\text{MIN}}\)
  For increasing the minimum value of cooling output signal (Yk) to within 0...80% of the preset maximum value. This corresponds, for example, to limit value setting of minimum volumetric flow for the BELIMO VAV-Compact.

Notes for electricians
Consult the appropriate regulations concerning the sizing of the necessary transformers, cabling and wiring. Also adhere strictly to any relevant regulations issued by local authorities.

Terminal 5 of the controller is spare. It is advisable to connect it to terminal 5 of the air-volume controller (BELIMO VAV-Compact: actual-value signal \(U_5\)) since it makes servicing of the control loop much easier.

Specification
Proportional-action room temperature controller with two continuous outputs of DC 0...10 V for heating and cooling, with an adjustable dead band and adjustable limiting of the output signals. Compact housing suitable for in-room mounting with internal (or external) temperature sensor, setpoint adjuster and mode selector for Automatic, Night, Continuous and Ventilation.

Input for central operating control.
In-room mounting.

Mode selection
The temperature setpoints can be raised and lowered by central control in order to ensure that energy-saving standby operation is always possible.

1 **Standby**
The dead band is enlarged; the setpoints for heating and cooling are shifted by -6 and +10 K. This is consistent with ensuring minimum power consumption and monitoring of limit values.

2 **Ventilating**
The cooling output Yk is set to maximum (\(Y_{\text{MAX C}}\)). The heating control loop functions normally.

3 **“Damper closed”**
The cooling output Yk is set to zero. The preset value for \(Y_{\text{MIN}}\) is inoperative. The BELIMO VAV-Compact controller closes the damper.

Using the mechanical mode selector

1  Setpoint, external
   For individual adjustment of the room temperature setpoint ($\pm 3$ K).

2  Setpoint, internal XK
   For altering the factory-preset setpoint ($X_k = 21^\circ C$) by means of the potentiometer inside the controller.

3  Dead band Xe
   For making the dead band larger or smaller by means of the potentiometer inside the controller ($X_e = 2$ K).

4  Minimum limiting output signal Yk \(Y_{\text{MIN}}\)
   For increasing the minimum value of cooling output signal (Yk) to within 0...80% of the preset maximum value. This corresponds, for example, to limit value setting of minimum volumetric flow for the BELIMO VAV-Compact.

5  Maximum limiting output signal Yk \(Y_{\text{MAX C}}\)
   For limiting the maximum value of cooling output signal (Yk) to within 30...100%.
   This corresponds, for example, to limit value setting of maximum volumetric flow for the BELIMO VAV-Compact.

6  Increasing the cooling output in the heating mode \(Y_{\text{MAX H}}\)
   For producing a simultaneous increase in cooling output signal in the heating mode.
   The maximum value can be set between the preset limits for the cooling signal (0...MAX corresponds to \(Y_{\text{MIN}}...Y_{\text{MAX C}}\)).

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