

US100

Communicative heating controller with sunblind control



Summary

US100 is a communicative room heating controller with one PWM output for control of a radiator or electrical heater, and two digital outputs for sunblind motor control. It can work autonomously, or in connection to a primary controller (MiniPLC or SoftPLC), or to a building management system (RcWare Vision or any SCADA).

Application

- **Systems with radiators, or electric heaters – control and measuring of room temperature, sunblind manual control and central override**
- **monitoring and communication of room temperatures**

Function

The controller reads actual room temperature, setpoint set by the pushbuttons, and set operation status which is set by short push of the central button. The room temperature is measured in the range of -20 to +50 °C. Measured and set values are processed in a PI algorithm, at the output of which there is a PWM controlled triac. All values are displayed on a large LCD display.

The output works either as PWM controlled by a PI controller, or on/off (thermostat). The functionality and control parameters, i.e. P and I constants, and hysteresis, can be set with **ModComTool**, the configuration software, which is free to download at <http://domat-int.com/en/downloads/software>.

The digital input may be configured as a window contact (switches to Off) or presence contact (switches to Standby/Night). It may be set as normally open or normally closed.

The sunblinds are controlled by the „up“ and „down“ buttons. It is possible to control the sunblind operation as central building function, such as „fully closed“ at night time, „fully open“ at strong wind, etc. Those commands must be programmed in the BMS and communicated over the RS485 bus to the controller.

The controller contains real time clock with a weekly scheduler (6 events per day). It changes between three operation modes: Day, Night, and Off. A short push in the Night mode switches to Party mode – Comfort extension by 2 hours.

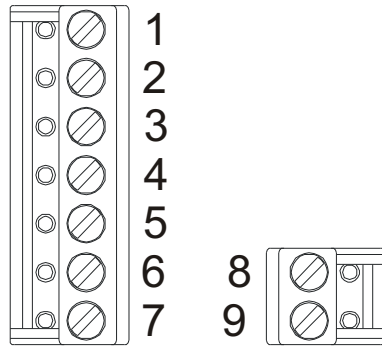
The Change-over function (communicated over the bus) switches to the cooling mode while cooling setpoints come into effect. This mode is used when heat pumps with change-over mode are installed. The change-over signal is read from the heat pump interface or a thermostat at the supply water piping, and is transmitted to the controllers over MiniPLC, UCWEB, or any Modbus master. See *Room units and controllers, Communication protocol description* handbook for register addressing and communication examples.

The communication bus is Modbus RTU over RS485, therefore the controllers are easily to integrate into any SCADA or BMS system.

Technical data

Power	24 V AC +/- 10%
Consumption	1,5 W + peripherals (ca. 5VA)
Measuring range	-20 ÷ 50 °C
Protection	IP20
Sensor accuracy	according to DIN IEC 751, Class B
Output - heating	1x solid state relay, zero switching, for AC load, 24 V AC against G0, max. switching current 0,4A; recommended thermic actuators are Siemens STA71, Danfoss TWA (24V types) etc.
Outputs - sunblinds	2x solid state relay, zero switching, for AC load, 24 V AC against G0, max. switching current 0,4A
Input	24 V AC, 7.5 mA
Setpoint correction	according to configuration, +/- 10 to +/- 1 K
Communication	2 wire RS485 - Modbus RTU, slave, optically separated, 1200...115200 bps, bus end switches
Display	LCD 60 x 60 mm
Terminals	screw terminals for 0.14 – 1.5 mm ² wires
Cover	ABS, similar to RAL9010
Weight	0.13 kg
Dimensions	see below

Terminals



Terminals as seen from above in the bottom part:

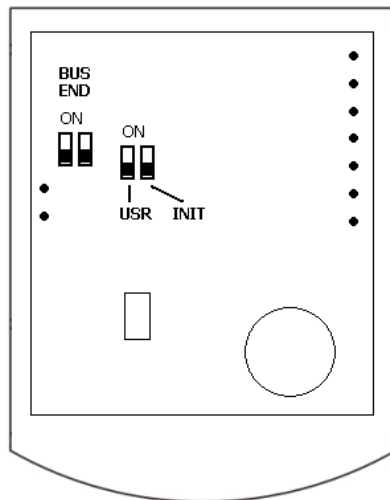
- 1: DI1 presence / window contact input
- 2: DO1 heating valve output
- 3: DO2 blinds up output
- 4: DO3 blinds down output
- 5: G0 power, input, outputs – reference point
- 6: G0 power, input, outputs – reference point
- 7: G power

- 8: K- communication RS485 -
- 9: K+ communication RS485 +

Motor connection

Note that the triac outputs must not be connected directly to the sunblind control motor. They are low-power, low-voltage outputs. Consult the sunblind power control unit manual if you want to connect US100 to the sunblind control unit. Use **ME200**, the relay power module, to control the sunblind motors directly.

DIP switches



Back of the PCB

BUS END: if ON, the bus is terminated (if last device on the line)

USR: not used, reserved for future applications

INIT: sets the controller into default state and sets bus address to 1, baud rate to 9600. To init, proceed as follows:

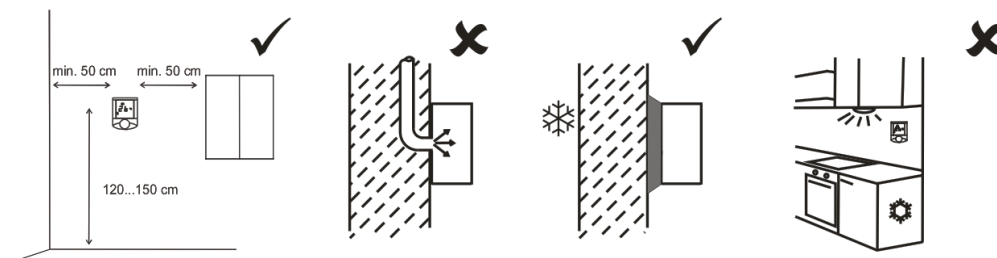
- connect the device over RS485 to a PC with ModComTool config tool
- set INIT to ON
- apply power (use only the connector without bottom)
- find the controller in the tool (Scan)
- set INIT to OFF
- in the **ModComTool** tool, open the controller window
- click the Init button in the tool
- remove and apply power.

Installation

Units are intended for operating in a normal and chemically non-aggressive environment. They do not need any servicing or maintenance. Install them in a vertical position at places where they can be operated easily and measure correct values of temperature, i.e. in the height of about 150 cm, with no direct sunlight or other heat / cool source (AHU outlets, refrigerator, electrical appliances). The device consists of two parts: bottom with screw terminal block and cover containing PCB, display, and the knob. The bottom part is fixed by 2 or 4 screws to any flat surface or a flush-mounting box \varnothing 50 mm. At the back of the bottom there is an aperture for cabling. The bottom

should be installed and cabling connected first, and the upper part inserted after the construction work have been finished to prevent damage to the unit.

Seal the conduits to avoid influencing the sensor by draught. Use insulating pad when installing the sensor on cold walls. Avoid sensor exposition to sunlight or other heat sources.

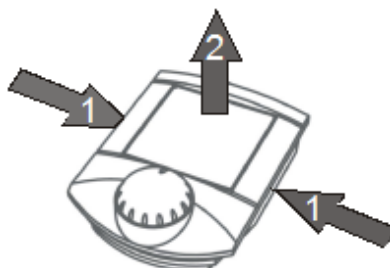


Opening the cover

When removing the display part, proceed as follows:

- press gently the side parts of the unit and pull the right of the display part by several millimeters
- pull the left of the display part
- pull the display part and remove it from the bottom.

Do not bend the display part too much, the connector pins could be damaged. The locks are only at the sides of the display part, not at the top nor bottom.



Settings

Temperature correction:

Push the right button to increase setpoint, push the left button to decrease setpoint. The maximum correction range can be modified over the bus e.g. with the ModComTool configuration tool.

Sunblind controls:

Push the up / down button shortly to change the slat angle. Hold the up / down button (>1.5 s) to travel the sunblind up / down. Push the down / up button to stop travelling. The triacs are deenergized after the sunblind reaches its terminal positions; the travelling time is configurable with 70 secs default.

It is possible to set and read the sunblind position (0...100 % of travelling time) over the bus. See Modbus register description.

Operation mode change:

Push the central button shortly (<1 s). Each push changes the operation mode to Party – Day – Night – Off – Auto.

In the Auto mode, the Day / Night / Off modes change according to time schedule.

The Party mode overrides to Comfort for 120 minutes, then follows the actual time schedule.

The weekly time schedule switches between Day, Night, and Off modes according to the event list. There may be up to 6 events per day.

Time schedule settings:

Switch to the time schedule settings mode with a long central button push (>1 s). The controller switches to settings mode (clock icon).

Push the left / right buttons to select the weekday (1 to 7). Then short push central button to confirm the selection. Push the left / right buttons to select the event (large number 1 to 6). Each event displays the mode activated by this event.

Short push the central button to confirm the event selection. Push the left / right buttons to select the operation mode (Day, Night, Off, Event inactive) invoked by this event. If the event is not active, the operation mode is not changed at the set time.

Short push the central button to confirm the operation mode setting. The event time displays. Push the left / right buttons to set the time of the event and confirm by a short central button push. Then push the left / right buttons to select another event or long push the central button and push the left / right buttons to select another weekday.

After all desired events have been edited, long push the central button to leave the time schedule settings. The controller goes to the basic display mode also after 30 secs of user inactivity.

Change of setpoints and controller time:

Switch to the settings mode with a superlong central button push (>2.5 s). The controller switches to settings mode (flashing thermometer icon).

Pushing the left / right buttons selects between following settings:

Controller time and day of week (Clock icon, Day of week)

Setpoint temp. Heating Day mode (Temperature, Heating, Day are flashing)

Setpoint temp. Heating Night mode (Temperature, Heating, Night are flashing)

Setpoint temp. Heating Off mode (Temperature, Heating, Empty house are flashing)

Setpoint temp. Cooling Day mode (Temperature, Cooling, Day are flashing)

Setpoint temp. Cooling Night mode (Temperature, Cooling, Night are flashing)

Setpoint temp. Cooling Off mode (Temperature, Cooling, Empty house are flashing)

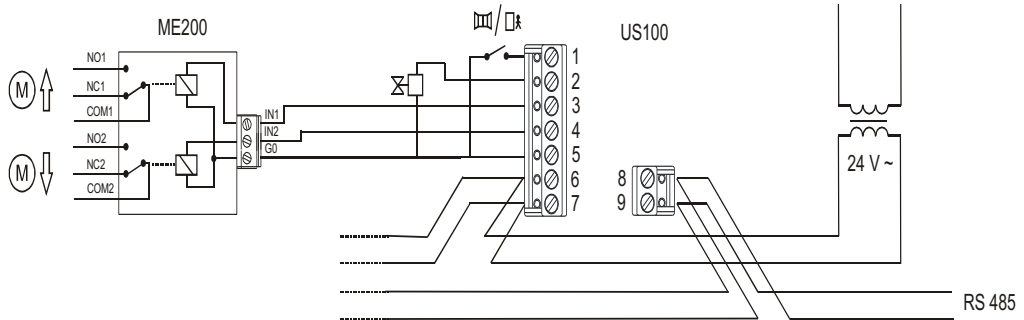
Select the requested value by a short central button push. Push the left / right buttons to change value. Confirm by a short central button push again.

If there is no user activity for 30 s, the controller goes to the basic display mode.

Default values:

The default values as well as all other settings (PI parameters, address, baudrate...) can be set by the configuration program, *ModComTool*.

Connection



Connection of power, communication, motors, and valve. Suitable cable types for low-voltage installations are LAM DATAPAR 2x0.8 (cross-section in mm²), JYTY 2x1 (diameter in mm) etc. If communication and power are in the same cable, use 4-core LAM DATAPAR 2x2x0.8, JYTY 4x1. Up to 100-120 meters, parallel lines of 24 V and data bus are no problem. Regarding to EMC it is better if the pairs are twisted, such as with the LAM DATAPAR or Belden 8205 cable.

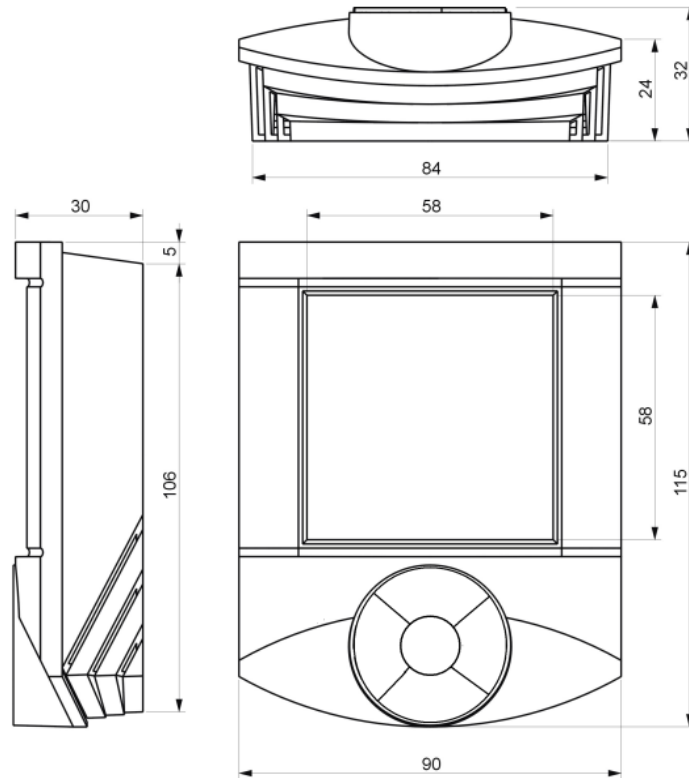
A terminal is designed for maximum 3 wires of 0.8 mm². With cable types as above, maximum (starting) power of the controller and valve of ca. 7 VA and acceptable voltage drop of max. 15 %, the maximum cable length for 10 controllers is about 50 m.

If the controllers and valves are at higher distance than 50 m from the transformer or more valves are connected to the transformer (max. 2 valves per controller), it is more suitable to supply the controllers locally. The RS485 bus is galvanically separated and connects all controllers, regardless of the way they are powered.

Temperature compensation

After switching the unit on, allow about 90 mins to dissipate the heat inside of the housing. Then the sensor is measuring correctly. Do not change the sensor correction variable immediately after powering the device on!

Dimensions



All dimensions in *mm*.

WEEE notice

The device contains a non-rechargeable battery which backups the real-time clock and part of the memory. After the device is not operable, please return it to the manufacturer or dispose of it in compliance with local regulations.

Safety note

The device is designed for monitoring and control of heating, ventilation, and air conditioning systems. It must not be used for protection of persons against health risks or death, as a safety element, or in applications where its failure could lead to physical or property damage or environmental damage. All risks related to device operation must be considered together with design, installation, and operation of the entire control system which the device is part of.

**Changes in
version**

- 09/2016 — Changed the format and reference to the configuration software.
- 03/2017 — Added picture and description of the installation and link on the datasheet with other colours.
- 05/2018 – Change technical data.
- 10/2023 – Added *Safety note*, change of the logo, stylistic changes.