

UI309 Communicative room unit with CO₂ sensor



Summary

UI309 is communicative room unit with analogue input for PT1000 sensor, with temperature sensor, humidity and CO₂ sensor and control knob for setpoint control and other settings. The binary output is controlled either on a remote basis, or as thermostat, hygostat or CO₂ controller. The units communicate over Modbus RTU / RS485 and they can be used as open system components with majority of building control system and controllers.

Different versions of unit may contain display, backlight and knob:

UI309 – basic version with display and knob

UI309BL – version with knob and display with backlight

UI309DK – version without knob and display

Application

- Air handling units and air condition in rooms with variable load – schools, cinemas, lecture halls etc.
- Systems with water or electrical floor heating – control and measuring of room temperature
- monitoring and recording of temperature, and CO₂ concentration indoors

Function

The units acquire temperature, CO₂ concentration, and relative humidity in the room, temperature correction (controlled by the knob) and required operation status which is set by short push of the knob or in the menu. In the configurable menu following values can be set and displayed:

- temperature, actual temperature correction
- humidity (actual value only at room units containing the humidity sensor)
- time (only display at room units with RTC)
- basic setpoint - day
- basic setpoint - night
- outside temperature for heating enable
- DHW temperature
- heating curve type (1...4)

- operation mode (Residential with Day, Night, Time schedule, Off, or Hotel / Office with Comfort, Standby, Party, Off)
- fan stage (Auto, Off, St.1, St. 2, St. 3)
- A/C mode (Auto, Heating, Cooling, Off, Fan only)
- weekly scheduler: 7 days, up to 6 events per day
- another 5 variables (air quality, fan speed etc.) – each has a profile where max. and min. values, step, number of decimals, and symbol set are defined.

It is also possible to set / reset any of the LCD symbols on the display over Modbus. The turn / push knob has three basic functions:

- instant edit (turning the knob) – settings of one predefined analogue value, usually room temperature correction
- quick edit (short push) – change of predefined state, e.g. Presence (Comfort / Standby / Off), Air condition (Auto / Heating / Cooling / Fan only / Off) etc.
- long push – jump to menu where values are listed by turning the knob, short push selects the value to be edited, and the value is changed by turning the knob followed by short push for confirmation.

After definable inactivity time, the display goes back to its basic state with rolling display of selected values (e.g. actual temperature and humidity).

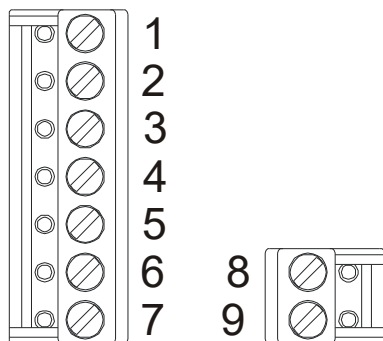
The unit Modbus address and functionality is defined over the RS485 interface with service software **ModComTool** which is free for download at <http://domat-int.com/en/downloads/software> To interface the room unit to the computer use the USB/485 converter **M080/R080**, RS232/RS485 converter R012, or any suitable RS485 converter.

Technical data

| | |
|--|--|
| Power supply | 24 V AC $\pm 20\%$, 1.5 W |
| Temperature measuring range | -20 ... 55 °C (accuracy ± 1 °C) |
| Humidity measuring range | 10 ... 90 % rH (accuracy ± 3 %) |
| CO ₂ measuring range | 0 ... 5000 ppm (secondary output 0-100%) |
| CO ₂ measuring method | NDIR (Non-dispersive Infra Red) |
| CO ₂ measuring accuracy | ± 50 ppm, $\pm 3\%$ of measured value (defined conditions for at least 3 calibration ACDL completed over the past 3 weeks) |
| Reaction time of CO ₂ sensor (90 %) | 90 seconds heating time (warm-up), 2 minutes, ECDL calibration (automatic calibration in dimming light mode), correction of measuring CO ₂ |
| Protection degree | IP20 |
| Inputs | 1x digital input for presence /window contact 1x analogue input for external temperature sensor Pt1000 |
| Outputs | 1x solid state relay, zero switching, for AC load 24 V AC, max. 0.4 A, AC1, general usage, non-inductive load according to EN 60947-4-1, galvanic isolation 1 kV |
| Setpoint | according to configuration, ± 10 to ± 1 K |

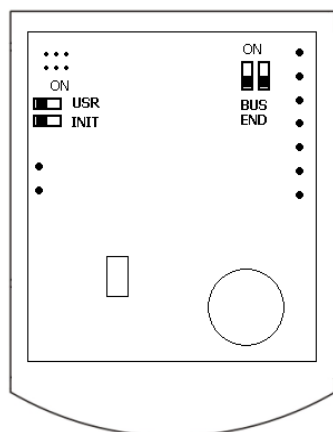
| | |
|----------------------|--|
| Communication | RS485 - Modbus RTU, slave selectable speed 1200 ... 115200 bps, parity and bits are set in service SW default 9600/N/8/1 The interface is optically separated 1 kV. |
| Display | LCD 60 x 60 mm |
| Terminals | recommended wire cross-section 0,14 – 1,5 mm ² |
| Cover | ABS, RAL9010 |
| Weight | 0,17 kg |
| Dimensions | 90 x 115 x 30 mm, see below |
| Ambient conditions | According to class 3K3 (+5 to +45 ° C, 5% to 95% non-condensing relative humidity). |
| Storage conditions | According to DIN EN 60721-3-1 Climatic class 1K3 (-5 to +45 ° C, 5% to 95% non-condensing relative humidity). |
| Standards conformity | EMC EN 61000-6-2 ed.3:2005 + opr.2005-09, EN 61000-6-4 ed.2:2007 + A1:2011 (industrial environment) Electrical safety EN 60950-1 ed.2:2006 + A11:2009 + A12:2011 + A1:2010 + A2:2013 + corr.1:2011-10 Restriction of hazardous substances EN 50581: 2012 |

Terminals



- 1: AIN external temperature sensor Pt1000
- 2: AGND external temperature sensor Pt1000
- 3: DI1 input (presence/window) activated by connection to G0
- 4: DO1 output for heating valve
- 5: G0 power, outputs – common point
- 6: G0 power, outputs – common point
- 7: G power
- 8: K- communication RS485 -
- 9: K+ communication RS485 +

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 the 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, open the controller window
- click the Init button in the tool
- remove and apply power.

Type table

| Type | LCD | Backlight | Knob | DI | DO | AI | t | rH | CO ₂ |
|---------|-----|-----------|------|----|----|----|---|----|-----------------|
| UI309 | ✓ | | ✓ | 1 | 1 | 1 | ✓ | ✓ | ✓ |
| UI309BL | ✓ | ✓ | ✓ | 1 | 1 | 1 | ✓ | ✓ | ✓ |
| UI309DK | | | | 1 | 1 | 1 | ✓ | ✓ | ✓ |

Measuring range

Measuring range of temperature sensor is from -20 to +55 °C.
 Measuring range of humidity sensor is from 10 to 90 % rH.

CO₂ measuring range is 0...5000 ppm. Measured value from this range is recalculated as value on scale 0...100%, which is displayed in the screen. There is absolute value in modbus registers in ppm as well. Parameters are set in **ModComTool** or by direct writing in Modbus registers. Default values are 0% = 350 ppm (clean air), 100% = 2500 ppm (pollution).

Autocalibration

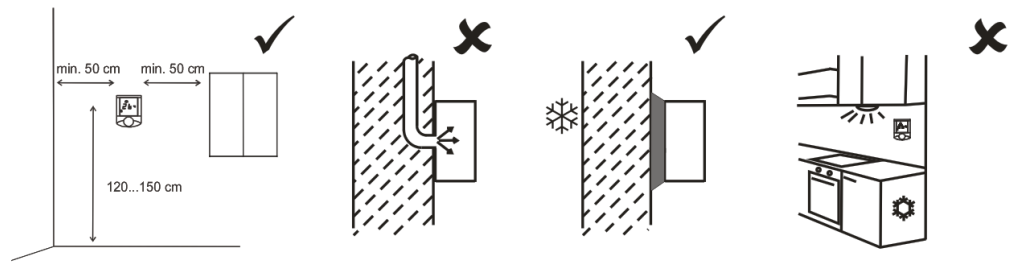
Due to aging and shocks during transport, the sensor accuracy may be reduced. The sensor continuously monitors the minimum measured values during operation and assumes that the CO₂ level will drop to outside air concentration (400 ppm) at least once every 8 days. The lowest measured value is then assigned a concentration of 400 ppm. The self-calibration algorithm does not work if the room is occupied continuously, or there is no decrease in concentration (e.g. greenhouses). In this case, the function can be disabled via the configuration program or directly by writing to the Modbus registers. By default the autocalibration is turned on.

During first couple of days i.e. until first autocalibration, the sensor may show values that differs by hundreds of ppm from real values, e.g. 200 ppm at night. This state is automatically corrected with first autocalibration.

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 Ø 60 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 works 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.

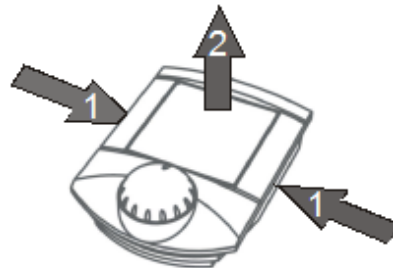


Opening the cover

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.

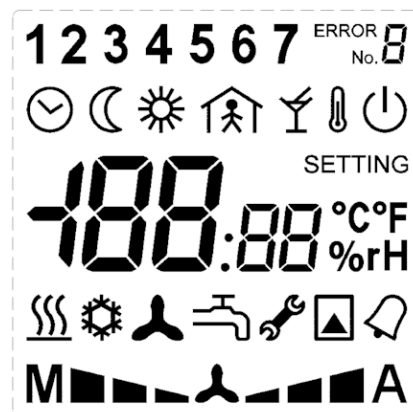
Do not bend the display part too much, the connector pins could be damaged. The locks are only at the sides of the display part, not at the top nor bottom.



Communication

The units communicate with a controller (master) over RS485 using Modbus RTU and thus they can be used in a number of control and SCADA systems. The register description is available in a separate document *Room units UI... – Communication description*. User manual for domat.exe and detailed description of the room unit functions find in the document *Room units configuration – User manual*.

Display

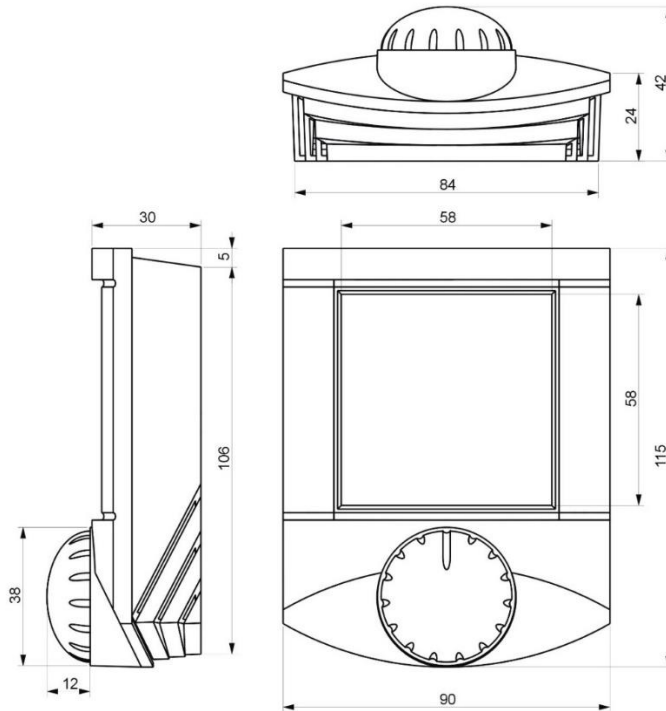


A large (60 x 60 mm) display clearly shows actual room temperature and controller status with 7-segment digits and standard Day, Night, Off, and Time scheduler symbols. Active output is indicated by a heating symbol. In the upper part, there are week days used for time scheduler setup. Other symbols are not used.

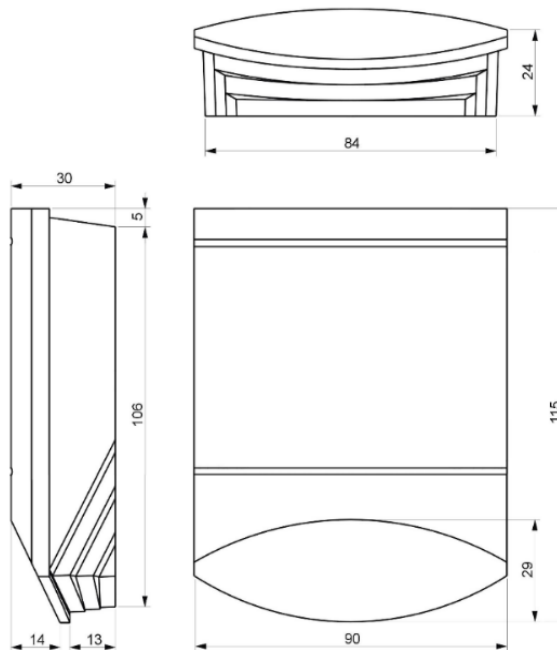
LCD symbol set

Dimensions

UI309, UI309BL



UI309DK



All dimensions in *mm*.

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
versions**

08/2020 — First datasheet version.