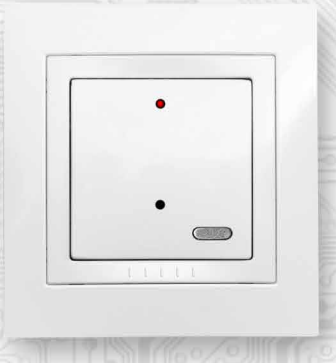
Indoor sensors on 1- wire bus in designs - types 1WNC24V and 1WTC24V



The sensors are designed for measuring physical quantities in interiors with high aesthetic demands.
he information about measured values is transmitted using the DS2438 circuit on a 1-wire communication bus.
Each sensor has its own unique address, which must be found via the bus using a Master device - e.g. a 1 wire extension from Loxone.
If more accurate temperature measurement is required, a DS18B20/DS18S20 temperature sensor can be added to all types, in which case the device will communicate at two addresses.
The sensor electronics, including terminal blocks, are glued into the blanks of the required designs.
The sensors must be protected from dirt, excessive dust or direct exposure to water!

Basic technical parameters

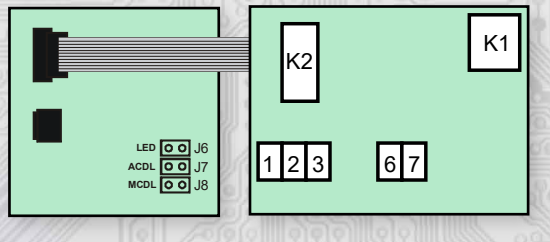
Supply voltage	5 VDC
Current consumption	max. 2 mA
Type of used temperature sensor (1WTC24V)	SHT31-ARP
Temperature resolution	0,17°C
Accuracy of temperature measurement [1]	± 0,5°C (20 ÷ 40°C), ± 1°C (0 ÷ 60°C)
Range of CO_2 measurement	0 ÷ 2000ppm
Resolution of CO_2 measurement	5ppm
Accuracy of CO_2 measurement	±(30ppm ±3% of the range)
Sampling interval of CO_2 measurement	3s
Auxiliary voltage for CO2 measurement (term. 7)	24 VDC ± 20%
Auxiliary voltage current consumption (term. 7)	10mA + pulsed **100 mA**/500ms every 3s
Communication	1-wire
HW Communication interface	DS2438
Galvanic separation input - output - 1wire	no
Range of working temperature and humidity	-10 ÷ 40°C / 0 ÷ 100 %RH without condensation
Range of recommended storage temp. / RH	10 ÷ 50 °C / 20 ÷ 60 %RH
Protection level	IP40 (EN 60529)
Type of terminal board	CPP (conductors max. 1 mm^2)

List of types:

1WTC24V = T (temperature) + concentration CO_2 with ext. power source 24V (10V÷30VDC)
1WNC24V = concentration CO_2 with ext. power source 24V (10V÷30VDC)

1 For type 1WTC (temperature + CO2) the measured temperature is influenced by the CO2 sensor, which has several times higher temperature losses than the rest of the electronics. After connecting and warming up the device for at least 2 hours, the effect of self-heating stabilizes at a certain value. Using a reference thermometer placed near the device, the difference between the temperature measured by the device and the temperature of the reference thermometer is calculated and this value Tcor[°C] can be subtracted from the measured value T[°C] in the system to obtain the actual temperature value.

Wirring diagram (fig. 1)



J6... LED (Optical signalling of increased CO_2 concentration)
J7... ACDL (Automatic Calibration in Dimming Light mode)
J8... MCDL (Manual Calibration in Dimming Light)

Terminal 1..... Ucc +5V (only for 1 - wire bus, not used to power the CO_2 sensor
Terminal 2..... common terminal (GND)
Terminal 3..... 1 - wire

Terminal 6..... common terminal (GND)
Terminal 7..... external power source +24V of sensor CO_2

K1... temperature sensor connection
K2... CO_2 sensor connection

Description of CO2 concentration measurement:

CO2 measurement is performed by a connected module that converts the CO2 concentration into a voltage signal, which is further processed by one of the A/D converters of the DS2438 circuit.

The CO2 module is powered by an external 24VDC voltage source. The positive terminal of this source is connected to terminal 7, the negative terminal is connected to common terminal 6 (GND).

ACDL automatic calibration and MCDL manual recalibration functions:

The CO2 sensor contains optical elements, which "age" during operations and the sensor losses its accuracy. In normal living rooms, where occasional complete air exchange of the room is assumed, ageing is compensated by setting the ACDL mode, which is the automatic calibration function. This function is activated by a permanent short-circuit of the J7connector, when the first automatic calibration takes place after 3 days and then after every week.In areas, where it is not possible to use the automatic calibration function, it is advisable to occasionally use the manual recalibration function. This is done by placing sensors with a connected voltage supply into the ventilated area, preferably into an outdoor environment (CO2 content = approx. 400ppm) for at least 30 minutes. Then, the J8 connector is short-circuited for 10 minutes. After 10 minutes, the connector is disconnected and the sensor works with modified values.The senor must be placed in a ventilated area for the duration of the recalibration.
The instrument is supplied calibrated from the manufacturer without any set mode. It is up to the user to choose how the calibration will take place. The majority of the users use the optimal automatic calibration function (ACDL), thereby connected to J9.

Optical signalling of increased CO2 concentration:

By shorting jumper J6 (LED), the function of signaling increased CO2 concentration is activated. If this function is active, then when the CO2 concentration exceeds 1000ppm, the red LED in the upper part of the cover lights up and goes out when it drops below 800ppm.

Formulas for calculating the value of measured quantities:

Calculation from bit values of registers:
rVDD = register value VDD (supply voltage to DS2438) [b]
rVAD = register value VAD [b]
rVsens = register value Vsens [b]]

T(SHT31) [°C] = -66,875+218,75*((0,00390625*rVsens)/(rVDD*0,01))
CO2[ppm] =((rVAD*0,01-0,5)/4)*2000

Calculation from voltage values:
VDD = voltage value (supply voltage to DS2438) [V]
VAD = voltage value [V]
Vsens = voltage value [V]

T(SHT31) [°C] = -66,875+218,75*(16*Vsens/VDD)
CO2 [ppm] = ((VAD-0,5)/4)*2000

Assembly and connection

The devices are designed for installation in installation boxes.
The electrical connection of the wires is made on the terminal board with a wire with a cross-section of max. 1 mm2 according to Fig. 1.
After connecting the terminal block, the box with the main part of the device is inserted into the installation box. Then the device frame is screwed into the installation box and both parts of the electronics are connected. The front cover is placed in the device frame. This completes the mechanical installation.
When disassembling, proceed in the reverse order.