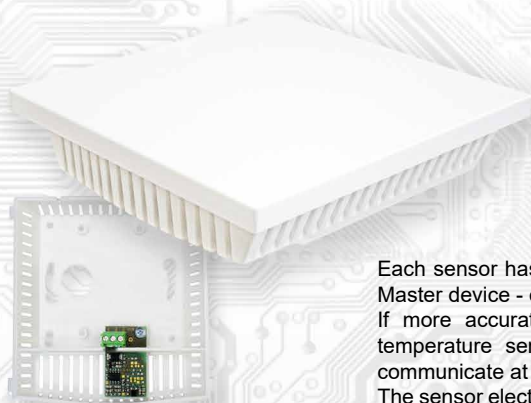




The sensors are designed for measuring physical quantities in interiors with high aesthetic demands. They are adapted for direct mounting on an interior wall or on a standard installation box with a spacing of 60mm.

Depending on the type, it is possible to measure temperature, relative air humidity, CO₂ concentration, analog signal 0÷10V or use a digital input.

The 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.

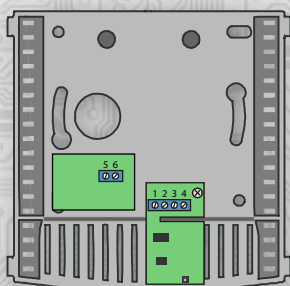
If more accurate temperature measurement is required, a DS18B20/DS18S20 temperature sensor can be added to all types, in which case the device will communicate at two addresses.

The sensor electronics with terminal blocks are located in the base part of the box and are accessible after removing the lid. The sensors must be protected from dirt, excessive dust or direct exposure to water!

Basic technical parameters

Supply voltage (terminal 3) ¹	5 VDC
Current consumption	max. 2 mA (except types with CO ₂ measurement)
Ext. Supply volt. RK-xTC1W-5V (term. 4)	5 VDC
RK-xTC1W-5V (term. 4)	10mA + pulsed 80 mA /400ms every 2s
Ext. Supply voltage RK-xTC1W-24V	24 VDC ± 20%
Current consumption RK-xTC1W-24V	10mA + pulsed 50 mA /400ms every 2s
Type of temperature sensor	DS2438 / SHT31-ARP / DS18B20 / DS18S20
Accuracy of temperature measurement ¹	DS2438 ± 2°C / SHT31-ARP ± 0,5°C / DS18x20 ± 0,5°C
Type of used humidity sensor	SHT31-ARP
Measurement range of humidity	0 ÷ 100%
Humidity resolution	0,25%
Accuracy of RH (+25°C) ¹	± 3% (20 ÷ 80 %RH)
Range of CO ₂ measurement	0 ÷ 5000ppm
Resolution of CO ₂ measurement	5ppm
Accuracy of CO ₂ measurement	± (30 ppm + 3%MV)
Sampling interval of CO ₂ measurement	cca 2s
Measurement range of AI	0 ÷ 10 VDC
Resolution of AI measurement	0,009765625V
Accuracy of AI measurement	0,05V
DI (digital input)	Active - activated by connecting the terminals 2,4: terminals connected : rVsens = ≤5 [b] / Vsens = ≤0,00122 [V] not connected : rVsens = ≥1000 [b] / Vsens = ≥0,2441 [V] Passive - activated by voltage at the terminals 2,4: ≤1V : rVsens = ≤5 [b] / Vsens = ≤0,00122 [V] ≥2.5V (max.30V) : rVsens = ≥1000 [b] / Vsens = ≥0,2441 [V]
Communication	1-wire
HW Communication interface	DS2438 (+DS18x20)
Galvanic separation input - output - 1wire	no
Range of working temp. and humidity ²	-10 ÷ 40°C / 0 ÷ 100 %RH without condensation
Range of recommen. storage temp. / RH	10 ÷ 50 °C / 20 ÷ 60 %RH
Protection level	IP40 (EN 60529)
Type of terminal board	CPP (conductors max. 1 mm ²)

Wiring diagram (fig. 1)



- Terminal 1..... 1- wire
- Terminal 2..... common terminal (GND)
- Terminal 3..... + 5V (Ucc)
- Terminal 4 Analog (AI) / Digital input (DI)
/ external power source +5V of sensor CO₂ (type **RK-xTC1W-5V**)
- Terminal 5..... common terminal (GND)
- Terminal 6..... external power source +24V of sensor CO₂ (type **RK-xTC1W-24V**)

External temperature sensor **DS18B20/DS18S20** is connected to terminals 1 + 3

1 The accuracy of temperature and RH measurement depends on the stability of the supply voltage U_{cc} (+5V = terminal 3), since the SHT31-ARP sensor is directly powered from it, see: Formulas for calculating the value of measured quantities.

2 In types with CO₂ measurement, 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 $T_{cor}[^{\circ}C]$ can be subtracted from the measured value $T[^{\circ}C]$ in the system to obtain the actual temperature value.

3 The devices are intended for use in residential interiors.

The sensor operates stably within the recommended measuring range, which is $5 \pm 60^{\circ}C$ and $20 \pm 80\%RH$. Long-term exposure to high humidity, especially $>80\%RH$, results in a gradually increasing deviation of the RH reading (+3%RH after 60 hours $>80\%RH$). After returning to the normal range, the RH measurement slowly returns to the calibrated values. Long-term exposure to extreme conditions can accelerate the aging of the sensor. More detailed information on the conditions of long-term use of the sensor in conditions outside the normal range, especially at rel. humidity $>80\%RH$, is provided directly on the manufacturer's website <http://www.sensirion.com>.

List of types: (in parentheses is the input signal source)

RK-HT1W	= T (DS2438 + SHT31) + RH (SHT31)
RK-HTA1W	= T (DS2438) + RH (SHT31) + AI (analog input 0÷10V)
RK-HTD1W	= T (DS2438) + RH (SHT31) + DI (digital input)
RK-NTA1W	= T (DS2438) + AI (analog input 0÷10V)
RK-NTD1W	= T (DS2438) + DI (digital input)
RK-NTC1W-5V	= T (DS2438) + CO ₂ (0÷5000ppm) with ext. power source 5V
RK-NTC1W-24V	= T (DS2438) + CO ₂ (0÷5000ppm) with ext. power source 24V
RK-HTC1W-5V	= T (DS2438) + RH (SHT31) + CO ₂ (0÷5000ppm) with ext. power source 5V
RK-HTC1W-24V	= T (DS2438) + RH (SHT31) + CO ₂ (0÷5000ppm) with ext. power source 24V

Types with temperature sensor DS18B20 (or DS18S20) = **RK-xx1W+DB** (**RK-xx1W+DS**):

RK-HT1W+DB	= T (DS2438 + SHT31 + DS18B20) + RH (SHT31-ARP)
RK-HTA1W+DB	= T (DS2438 + DS18B20) + RH (SHT31) + AI (analog input 0÷10V)
RK-HTD1W+DB	= T (DS2438 + DS18B20) + RH (SHT31) + DI (digital input)
RK-NTA1W+DB	= T (DS2438 + DS18B20) + AI (analog input 0÷10V)
RK-NTD1W+DB	= T (DS2438 + DS18B20) + DI (digital input)
RK-NTC1W-5V+DB	= T (DS2438 + DS18B20) + CO ₂ (0÷5000ppm) with ext. power source 5V
RK-NTC1W-24V+DB	= T (DS2438 + DS18B20) + CO ₂ (0÷5000ppm) with ext. power source 24V
RK-HTC1W-5V+DB	= T (DS2438 + DS18B20) + RH (SHT31) + CO ₂ (0÷5000ppm) with ext. power source 5V
RK-HTC1W-24V+DB	= T (DS2438 + DS18B20) + RH (SHT31) + CO ₂ (0÷5000ppm) with ext. power source 24V

T = temperature; RH = relative humidity; AI = analog input 0÷10V; DI = digital input; CO₂ = concentration CO₂

Description of measured quantities:

T (temperature):

All types have a temperature sensor, which is part of the DS2438 circuit.

In the RH-HT1W and RK-NTC1W types, an SHT31 temperature sensor is additionally available for more accurate temperature measurement.

If more accurate temperature measurement is required, a DS18B20/DS18S20 temperature sensor can be added to all types (types RK-xx1W+DB/ RK-xx1W+DS). In this case, the device will communicate at two addresses.

RH (relative humidity):

To measure RH, an SHT31 sensor is used, mounted in a metal housing on the front side of the blanking plate, the output of which is processed by one of the A/D converters of the DS2438 circuit.

CO₂ (concentration CO₂):

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 5VDC voltage source. The positive terminal of this source is connected to terminal 4, the negative terminal is connected to common terminal 2 (GND).

24VDC power supply for types RK-NTC1W-24V and RK-HTC1W-24V.

The CO₂ sensor contains optical elements that "age" during operation and the sensor loses its accuracy. Therefore, the sensor is supplied from the factory in automatic calibration mode (automatic self-calibration - ASC). For the correct functioning of the ASC, it is necessary to ensure regular complete ventilation of the room. If this condition cannot be met, it must be stated in the order and the manufacturer will supply the sensors without automatic calibration mode. In this case, it is advisable to send the device to the manufacturer for calibration check after approximately every 2 years of operation.

AI (analog input 0÷10V):

To measure AI, one of the A/D converters of the DS2438 circuit is used. The positive pole of the signal is connected to terminal 4, the negative pole to terminal 2 (GND).

DI (digital input):

The digital input can be connected as active, when the circuit responds to the resistance between terminals 4 and 2.

A normally open or normally closed contact is therefore connected to terminals 4, 2.

Or it can be connected as passive, when the circuit responds to the voltage between terminals 4 and 2. A DC voltage can therefore be applied to terminal 4 (+) versus 2 (GND), e.g. a normally open or normally closed contact connected to the power supply.

Formulas for calculating the value of measured quantities:

1. 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]

$T(SHT31) [^{\circ}C] = -66,875 + 218,75 * ((0,00390625 * rVsens) / (rVDD * 0,01))$
 $RH [\%] = -12,5 + 125 * ((rVAD * 0,01) / (rVDD * 0,01))$
 $AI [V] = 0,009765625 * rVsens$
 $CO2 [ppm] = 4,8828125 * Vsens$

2. Calculation from voltage values:

VDD = voltage value (supply voltage to DS2438) [V]
 VAD = voltage value [V]
 Vsens = voltage value [V]

$T(SHT31) [^{\circ}C] = -66,875 + 218,75 * (16 * Vsens / VDD)$
 $RH [\%] = -12,5 + 125 * (VAD / VDD)$
 $AI [V] = 40 * Vsens$
 $CO2 [ppm] = 2000 * Vsens$

Assembly and connection

The sensors are intended for direct mounting on the interior wall or on a standard installation box with a pitch of 60 mm. First, the cover is removed, thereby exposing the terminal block and mounting holes. The base is screwed to the interior wall or to a standard installation box with a spacing of 60 mm using two screws. The electrical connection of the wires is made on the terminal board, which is on the main board in the base with a wire with a cross-section of max. 1 mm² according to Fig. 1. After connecting the terminal block, the box lid is put on and the installation is completed. When disassembling, proceed in the reverse order.

Connecting an external source for CO₂ sensors:

