

# User Manual

## **aSENSE RL**

### CO<sub>2</sub> / temperature transmitter with relay

#### General

The IAQ-sensor product *aSENSE RL* is used to measure indoor air carbon dioxide concentration and temperature in rooms. It is flexible controller with programmable output for relay control of e.g. mixed air dampers, humidifier and fans. The measured values are shown on the display. The sensor is designed for wall mounting or mounting in ventilation ducts.

The unit is designed for connecting to Direct Digital Control (DDC). The linear output functions are pre-programmed as CO<sub>2</sub> and temperature transmitters with jumper selected outputs 0-10 V / 2-10 V / 0-20 mA / 4-20 mA. The measuring ranges can be modified from a PC (Windows) and use of the software UIP (version 5 or higher) together with the RS232 communication cable.



Figure 1 *aSENSE RL* for wall mounting



*aSENSE Duct RL* for duct mounting with two types of cable gland

## FUNCTIONAL DESCRIPTION

*This part describes the function of the standard configuration of aSENSE RL. It may be re-programmed before or after the installation by a PC and the standard UIP software (version 5 or higher).*

- Out(1) = measuring signal of carbon dioxide concentration lowest value - highest value
- Out(2) = measuring signal of temperature lowest value - highest value
- Out(3) = ON/OFF signal of demand of air quality

The opening of the relay is controlled by the hysteresis of the relay. See figure 4.

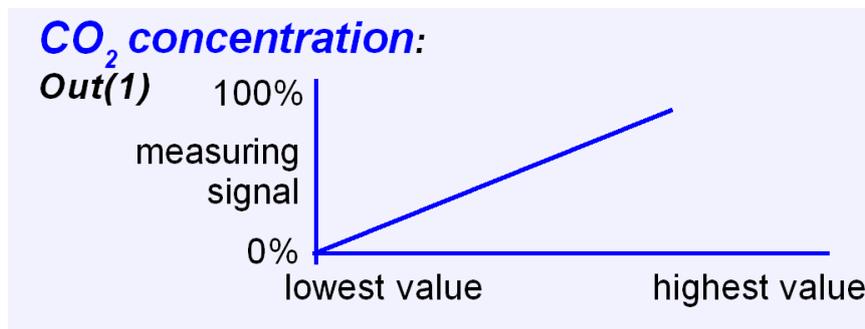


Figure 2 The measuring signal of carbon dioxide.

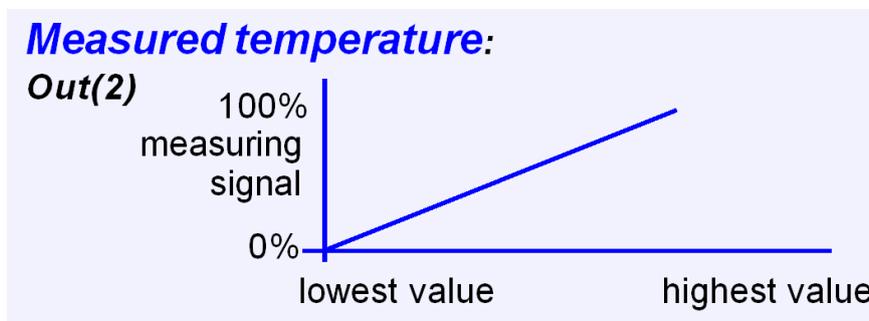


Figure 3 The measuring signal of temperature

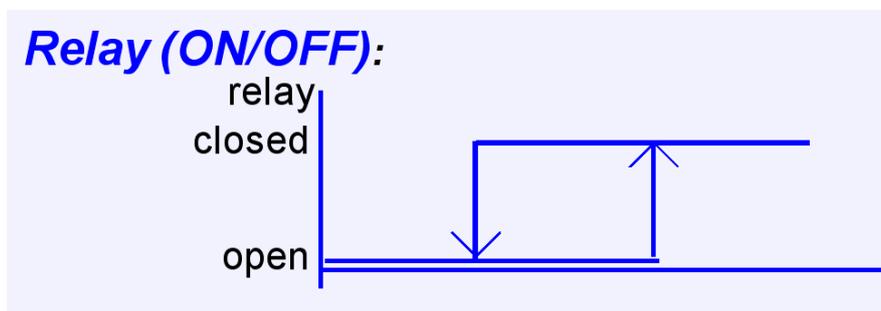


Figure 4 The relay output

## Sensor outputs

Terminal	Default Output	Default Output Range	Outputs of this sensor	Output Range of this sensor
Out(1)	0-10VDC	0-2000 ppm CO <sub>2</sub>	See label	See label
Out(2)	0-10VDC	0-50 °C 32-122 °F	See label	See label
Relay	Closed Open	> 1000 ppm CO <sub>2</sub> < 900 ppm CO <sub>2</sub>	See label	See label

Table I. Default output configurations for aSENSE RL

The red LED is lit when the relay output is closed.

## Formulas for calculation of output values

Configuration	Output Range	Formula for calculation
0-10 VDC	0-2000 ppm CO <sub>2</sub> 0-50 °C 32-122 °F	CO <sub>2</sub> value = Volt/10*2000 Temperature value in °C = Volt/10*50 = Volt*5 Temperature value in °F = Volt*9+32
2-10 VDC	0-2000 ppm CO <sub>2</sub> 0-50 °C 32-122 °F	CO <sub>2</sub> value = (Volt -2)/8*2000 Temperature value in °C = (Volt -2)/8*50 Temperature value in °F = (Volt -2)/8*(122-32)+32
4-20 mA	0-2000 ppm CO <sub>2</sub> 0-50 °C 32-122 °F	CO <sub>2</sub> value = (mA-4)*2000/16 Temperature value in °C = (mA-4)*50/16 Temperature value in °F = (mA-4)/16*(122-32)+32
a-b	c-d	Value = (reading-a)/(b-a)*(d-c)+c a = lowest value of the configuration b = highest value of the configuration c = lowest value of the range d = highest value of the range

Table II. Calculation of CO<sub>2</sub> value and temperature value for aSENSE RL

## Output Configurations

The sensors/controllers are supplied from the factory (unless otherwise ordered) with 0...10VDC linear outputs for Out(1) and Out(2) (see Table I). If other options are needed for the application, the output jumpers have to be configured before the unit is powered up. Each jumper selection is independent from the others, except for the “Start point selection” jumper, which affects both, Out(1) & Out(2), linear outputs. Alternative measuring ranges of the outputs can be selected with the software UIP (version 5 or later).

Jumper	Position	Function
Start point selection jumper	0%	Jumper top position provides 0Vdc or 0mA start point for Out(1), Out(2) (0-20mA or 0-10V).
	20%	Jumper bottom position provides 2Vdc or 4mA start point for Out(1), Out(2) (4-20mA or 2-10V).
Out(1)	Current	Connection in position “Current” provides 0/4-20mA output range for Out(1).
	Voltage	Connection in position “Voltage” provides 0/2-10VDC output range for Out(1).
Out(2)	Current	Connection in position “Current” provides 0/4-20mA output range for Out(2).
	Voltage	Connection in position “Voltage” provides 0/2-10VDC output range for Out(2).

Table III. Configuration jumpers for aSENSE RL

## FUNCTIONAL TEST aSENSE RL

### Self-diagnostics

The system contains complete self-diagnostic procedures. A full system test is executed automatically every time the power is turned on. In addition, constantly during operation, the sensor probes are checked against failure by checking the valid dynamic measurement ranges. All EEPROM updates, initiated by the sensor itself, as well as by external connections, are checked by subsequent memory read back and data comparisons. These different system checks return error bytes to the system RAM. The error codes are available by connecting a PC with a special RS232 cable connected to the UART port slide connector. The error codes are shown in the software UIP (version 5 or later). *Warm up* and *Out of Range* are the only bits that are reset automatically after return to normal state. All other error bits have to be reset manually after return to normal by power off/on.

The yellow LED flashes if an error has been detected. If a fatal error has been detected the yellow LED is lit.

## Error code and action plan

Bit #	Error code	Error description	Suggested action
0	N/A	<b>Fatal Error</b>	Try to restart sensor by power OFF/ON. Contact local distributor
1	2	Reserved	
2	4	<b>Algorithm Error.</b> Indicate wrong EEPROM configuration.	Try to restart sensor by power OFF/ON. Check detailed settings and configuration with UIP software version 5 and higher. Contact local distributor.
3	8	<b>Output Error</b> Detected errors during output signals calculation and generation.	Check detailed status of outputs with UIP software version 5 and higher.
4	16	<b>Self-Diagnostic Error.</b> Algorithm timeout.	Check detailed self-diagnostic status with UIP software version 5 and higher. Contact local distributor
5	32	<b>Out of Range Error</b> Accompanies most of other errors.  Resets automatically after source of error disappearance.	Try sensor in fresh air. Check connections of temperature probe. Check detailed status of measurements with UIP software version 5 and higher.  <i>See Note 1!</i>
6	64	<b>Memory Error</b> Non-fatal error during memory operations.	Check detailed settings and configuration with UIP software version 5 and higher.
7	128	<b>Warm Up state</b> Is always set after power up or power failure. Resets after restart sequence.	If it doesn't disappear in half a minute, check power stability.

Table IV. Error codes

**Note 1.** Any probe is out of range. Occurs, for instance, during over exposure of CO<sub>2</sub> sensor, in which case the error code will automatically reset when the measurement values return to normal. Could also indicate the need of zero point calibration. If the CO<sub>2</sub> readings are normal, and still the error code remains, the temperature sensor can be defect or the connections to these are broken.

**Remark:** If several errors are detected at the same time the different error code numbers will be added together into one single error code!

**PLEASE NOTE!** The sensor accuracy is defined at continuous operation (at least 3 weeks after installation)

## Maintenance

The *aSENSE RL* is basically maintenance free. An internal self-adjusting calibration function takes care of normal long term drift associated to the CO<sub>2</sub> sensor. To secure the highest accuracy, a time interval of five years is recommended between CO<sub>2</sub> calibrations, unless some special situations have occurred.

A zero calibration can be performed by use of pure nitrogen or air that has passed through a chemical absorber and a PC together with the *UIP software version 5* (or higher) or by shortening of holes marked in figure 2 for at least 10 seconds. The sensor needs stable gas flow for at least 3 minutes before zero calibration. The Zero Calibration bag can be used to produce carbon dioxide free air. The software can be free downloaded from [www.senseair.com](http://www.senseair.com). The RS232-cable and the zero calibration bag can be ordered from SenseAir. The cable is to be connected to the UART port slide connector (see Fig. 7). For change of control parameters and re-calibration of temperature this PC tool has to be used. Zero calibration can be done with PC and *UIP software version 5* or by shorting marked holes in figure 5. The check can be done on site without interfering with the ventilation system.

A Back-ground calibration is an easy way to correct a sensor's zero point. The sensor needs fresh air (380-420 ppm CO<sub>2</sub>). Shorten holes marked in figure 5 for at least 10 seconds.

### **This is for sensors with measuring ranges between 0-3000 ppm and 0-4%:**

When a zero calibration shall be executed a plastic tube with 2,2 mm outer diameter and 0,8 mm inner diameter shall be inserted in marked holes of the sensor. A plastic tubing is connected to the tube. The gas flow should be between 0,3 and 0,8 l/min. The sensor needs stable gas flow for at least 3 minutes before zero calibration. Shorten marked holes for at least 10 seconds. A successful calibration is acknowledged by 5 flashes of the yellow LED. If unsuccessful, please release input and waits at least 10 seconds before repeating the procedure again. Make sure that the sensor environment is steady and calm!

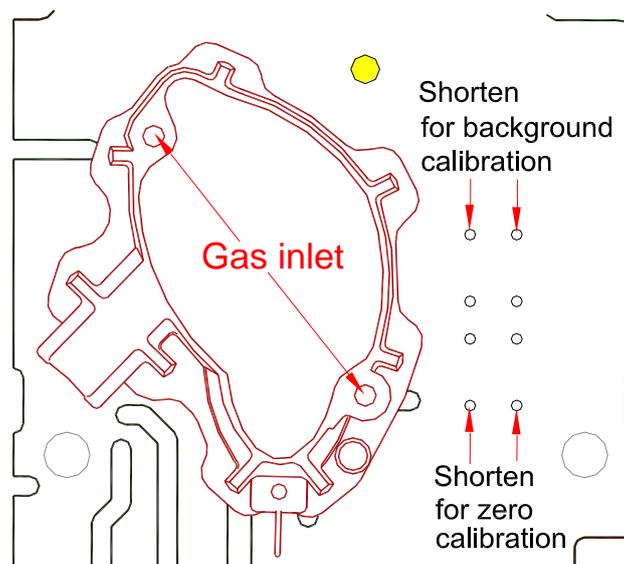


Figure 5 Part of the PCB with holes for gas inlets marked.

## Duct mounting

If for some reason the printed circuit board (PCB) needs to be removed, special precaution must be taken in order not to damage the temperature probe in the sampling tube. When putting the PCB back in the protective housing, the probe must be gently positioned in the sampling tube.

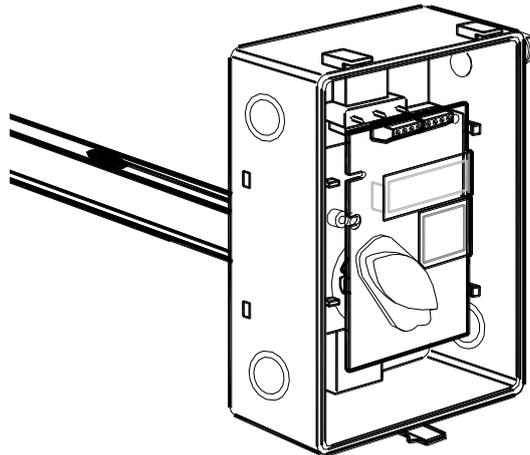


Figure 6 The aSENSE RL for duct mounting. The temperature probe is the black body in the sampling tube.

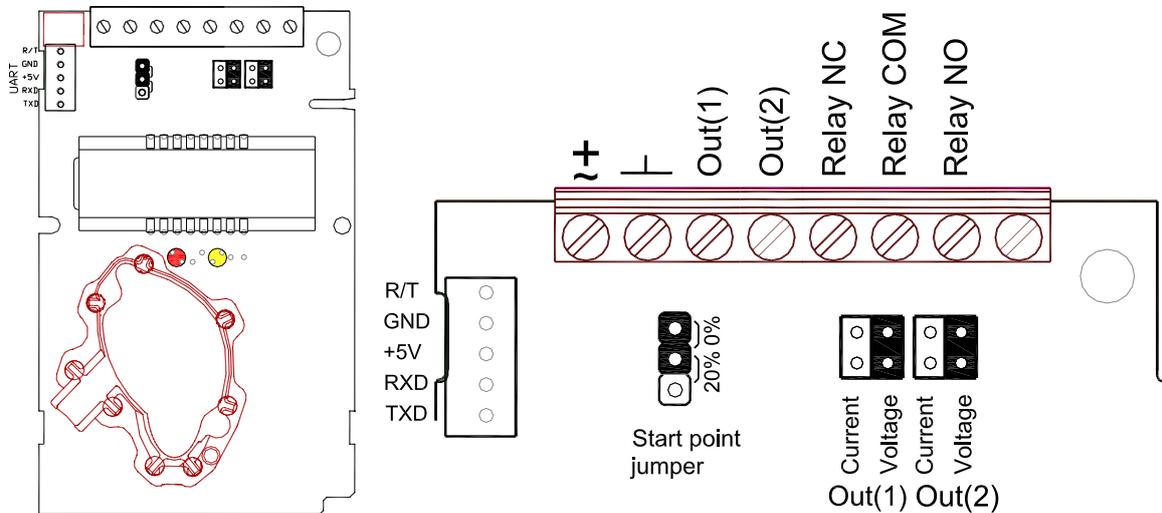


Figure 7 The aSENSE RL printed circuit board with CO<sub>2</sub> sensors for measuring ranges 0-3000ppm and 0-4%.

## WARRANTY AND LIMITATION OF LIABILITY

1. SenseAir warrants that for a period of twenty-four (24) months following receipt by Buyer the Product supplied by SenseAir to Buyer will be, under normal use and care, free from defects in workmanship or material and to be in material conformity with SenseAir's specifications. Units returned to SenseAir for warranty repairs shall be shipped to SenseAir, at Buyer's expense, according to SenseAir's instruction. Within ninety (90) days of the receipt of product, SenseAir shall replace or repair such units and shall ship them to Buyer's designated return destination freight pre-paid.

2. Warranty Limitations. This warranty does not extend to any unit that has been subject to misuse, neglect or accident; that has been damaged by causes external to the unit; that has been used in violation of SenseAir's instructions; that has been affixed to any non-standard Accessory attachment; or that has been modified, disassembled, or reassembled by anyone other than SenseAir.

3. The retailer is not responsible for any consequential loss or damages, which may occur by reason of purchase and use of this product. The warranty is, in any event, strictly limited to the replacement/repair of the product

This product is in accordance with the EMC 2004/108/EC, 92/31/EEG including amendments by the CE-marking Directive 93/68/EEC

The product fulfils the following demand:

EN 61326-1:2006, Class B equipment, Table 1 - *Basic immunity test requirements*

