User Manual

GT3101

CO2 / temperature sensor with relay

for use in greenhouses

General

The IAQ-sensor product GT3101 is used to measure indoor air carbon dioxide concentration and temperature in greenhouses. It is flexible controller with programmable output for relay control of e.g. carbonizers.

The unit is designed for connecting to Direct Digital Control (DDC). The linear output functions are pre-programmed as CO2 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 4.3 or higher) together with the communication cable RS232 CABLE.

Function Description

This part describes the function of the standard configuration of GT3101. It may be re- programmed before or after the installation by a PC and the standard UIP software (version 4.3 or higher).

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

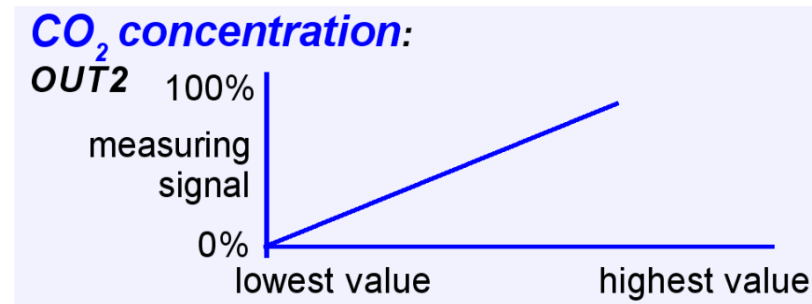The opening of the relay is controlled by the hysteresis of the relay. See figure 4.

CO$_2$ concentration:

Figure 2. The measuring signal of carbon dioxide. .

Measured temperature:
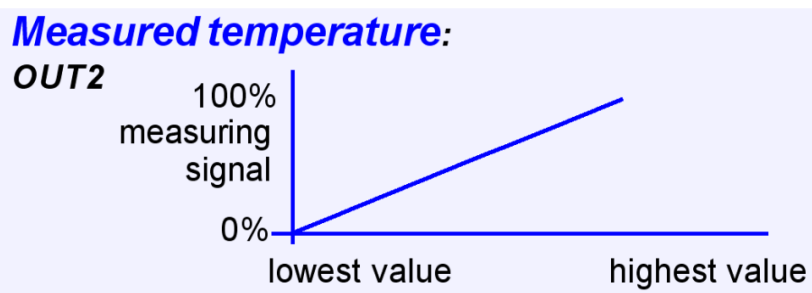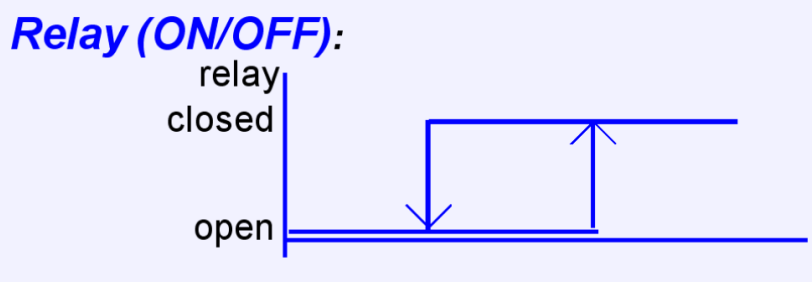
Figure 3. The measuring signal of temperature

Relay (ON/OFF):

Figure 4. The relay output

Terminal	Default Output	Default Output Range	Outputs of this sensor	Output Range of this sensor
Out(1)	0-10VDC	0-2000 ppm CO2		
Out(2)	0-10VDC	0-50 °C		
Relay	Closed Open	> 1000 ppm CO2 < 900 ppm CO2		

Table I. Default output configurations for GT3101

Formulas for calculation of output values

Configuration	Output Range	Formula for calculation
0-10 VDC	0-2000 ppm CO2 0-50 °C	CO_2 value = Volt/10*2000 Temperature value in °C = Volt/10*50
2-10 VDC	0-2000 ppm CO2 0-50 °C	CO_2 value = (Volt —2)/8*2000 Temperature value in °C = (Volt —2)/8*50
4-20 mA	0-2000 ppm CO2 0-50 °C	CO_2 value = (mA-4)*2000/16 Temperature value in °C = (mA-4)*50/16
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_2 value and temperature value for GT3101

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

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) and Out(2), linear outputs.

Jumper	Position	Function
Start point selection jumper	0^0/0	Jumper top position provides 0Vdc or 0mA start point for OUT1, OUT2 (0-20mA or 0-10V).
	20%	Jumper bottom position provides 2Vdc or 4mA start point for OUT1, OUT2 (4-20mA or 2-10V).
Communi-cation selection jumper	MB	Jumper top position provides Modbus communication protocol
	SA	Jumper bottom position provides SenseAir communication protocol
Out(1)	Current	Connection in position "Current" provides 0/4-20mA output range for OUT1.
	Voltage	Connection in position "Voltage" provides 0/2-10VDC output range for OUT1.
Out(2)	Current	Connection in position "Current" provides 0/4-20mA output range for OUT2.
	Voltage	Connection in position "Voltage" provides 0/2-10VDC output range for OUT2.

Table II. Configuration jumpers for GT3101

FUNCTIONAL TEST of GT3101

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 4.3 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.

Error code and action plan

Bit #	Error code	Error description	Suggested action
0	N/A	Fatal Error	Try to restart sensor by power OFF/ON. Contact local distributor
1	2	Reserved	
2	4	**Algorithm** Error. Indicate wrong EEPROM configuration.	Try to restart sensor by power OFF/ON. Check detailed settings and configuration with UIP software version 4.3 and higher. Contact local distributor.
3	8	Output Error Detected errors during output signals calculation and generation.	Check connections and loads of outputs. Check detailed status of outputs with UIP software version 4.3 and higher.
4	16	Self-Diagnostic Error. May indicate the need of zero calibration or sensor replacement.	Check detailed self-diagnostic status with UIP software version 4.3 and higher. Contact local distributor
5	32	Out Of Range Error Accompanies most of other errors. Can also indicate overload or failures of sensors and inputs. Resets automatically after source of error disappearance.	Try sensor in fresh air. Check connections of temperature and relative humidity probe. Check detailed status of measurements with UIP software version 4.3 and higher. *See Note 1!*
6	64	Memory Error Non fatal error during memory operations.	Check detailed settings and configuration with UIP software version 4.3 and higher.
7	128	Warm Up state 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.

Note 1. If any probe is out of range. It occurs, for instance, during over exposure of CO_2 sensor, in which case the error code will automatically reset when the measurement values return to normal. It could also indicate the need of zero point calibration. If the CO_2 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!

Maintenance

The GT3101 is basically maintenance free. An internal self-adjusting calibration function takes care of normal long term drift associated to the CO_2 sensor. To secure the highest accuracy, a time interval of five years is recommended between CO_2 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 4.3* (or higher). The Service bag can be used to produce carbon dioxide free air. The software can be free downloaded from www.senseair.com. The RS232-cable and the service bag can be ordered from Senseair. The cable is to be connected to the UART port slide connector (see Fig. 5). For change of control parameters and re-calibration (CO_2 and temperature) this PC tool has to be used. The check can be done on site without interfering with the ventilation system.

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 1.0 l/min.
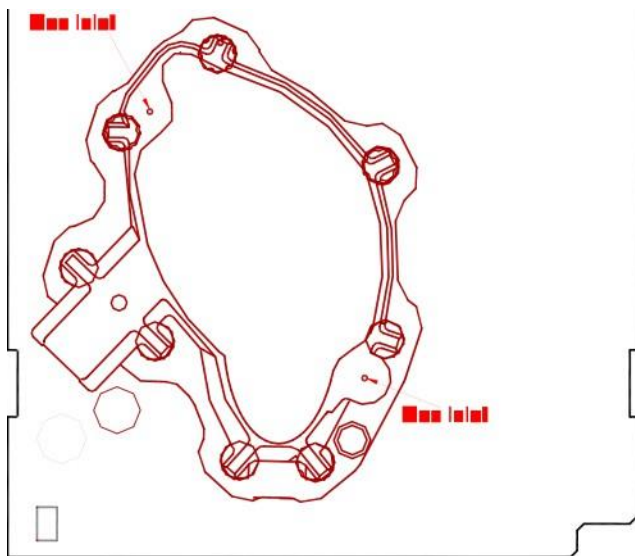

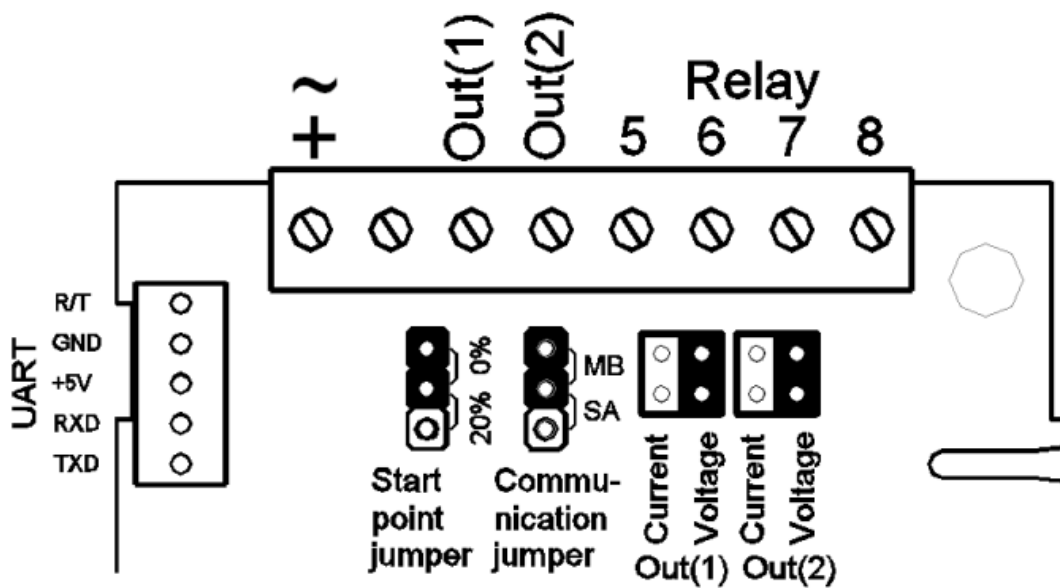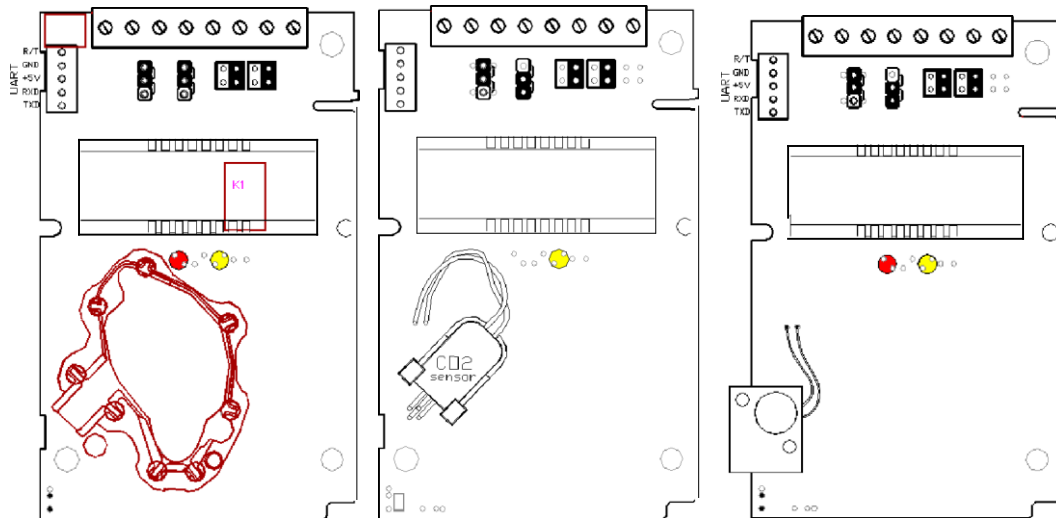Figure S. Part of the PCB with holes for gas inlets marked.

Figure 6. The GT3101 printed circuit board with CO2 sensors for measuring ranges 0-3000ppm, 0-10% och 0-25%. The terminal area enlarged at right.
The darker positions are default settings.

Cleaning (exterior only):
Use mild detergent (no harsh chemicals) and wipe dry with a dry cloth.