

User manual

CF8-W-Disp-AL

CO₂ transmitter with two relays prepared for Modbus communication protocol

General

The IAQ-sensor product *CF8-W-Disp-AL* is used to measure indoor air carbon dioxide concentration 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.

The unit is designed for connecting to Direct Digital Control (DDC). The linear output functions are pre-programmed as CO₂ transmitters with jumper selected outputs. The measuring ranges can be modified from a PC (Windows) and use of the software UIP (version 4.3 or higher) together with the RS232 communication cable.



Figure 1 CF8-W-Disp-AL for wall mounting

Functional description

This part describes the function of the standard configuration of CF8-W-Disp-AL. 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 0-4 %vol CO₂

Out(2) = measuring signal of carbon dioxide concentration 0-4 %vol CO₂

OUT3 = ON/OFF signal of demand of air quality

OUT4 = ON/OFF signal of demand of air quality

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

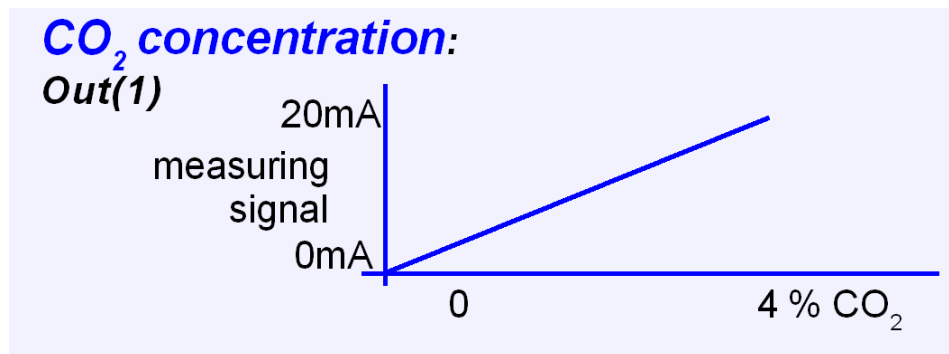


Figure 2 The measuring signal of carbon dioxide.

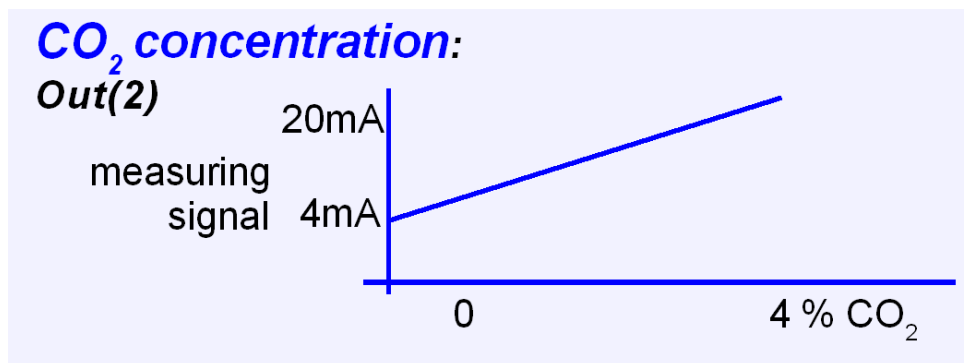


Figure 3 The measuring signal of temperature

| Terminal | Default Output | Default Output Range | Outputs of this sensor | Output Range of this sensor |
|----------|----------------|--|------------------------|-----------------------------|
| OUT1 | 0-20 mA | 0-4 % CO ₂ | | |
| OUT2 | 4-20 mA | 0-4 % CO ₂ | | |
| Relay 1 | Closed Open | > 1,5 % CO ₂ < 1,4 % CO ₂ | | |
| Relay 2 | Closed Open | > 3,0 % CO ₂ < 2,9 % CO ₂ | | |

Table I. Default output configurations for CF8-W-Disp-AL

Formulas for calculation of output values

| Configuration | Output Range | Formula for calculation |
|---------------|-----------------------------|--|
| 0-10 VDC | 0-40000 ppm CO ₂ | CO ₂ value = Volt/10*40000 |
| 2-10 VDC | 0-40000 ppm CO ₂ | CO ₂ value = (Volt -2)/8*40000 |
| 4-20 mA | 0-40000 ppm CO ₂ | CO ₂ value = (mA-4)*40000/16 |
| 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 CO₂ value for CF8-W-Disp-AL

Output Configurations

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 4.3 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). |
| Communi-cation selection jumper | MB | Jumper at top position provides Modbus communication protocol |
| | SA | Jumper at bottom position SenseAir communication protocol |
| 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 II. Configuration jumpers for CF8-W-Disp-AL

FUNCTIONAL TEST of CO₂ Sensor

CF8-W-Disp-AL

The unit has three LED's – one yellow and two red – to indicate the status of the controller.

Yellow LED - "Call for maintenance" is lit, if an error flag is set or the measurement is out of range. This information is also shown on the display by the wrench icon.

Left red LED - "the relay1 is actuated" is lit, when Out(3) (relay1) is actuated (closed).

Right red LED - "the relay2 is actuated" is lit, when Out(4) (relay2) is actuated (closed).

A simple and visual functional test can easily be performed. Take a breath and blow the air from a distance of a few centimetres on the sensor. The sensor will detect a rapid increase in the carbon dioxide concentration. The red LEDs are lit when the CO₂ concentration passes the pre-set values.

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.

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 | 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. <i>See Note 1!</i> |
| 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. Any probe is out of range. Occurs, for instance, during over exposure of CO₂ 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 CO₂ 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 CF8-W-Disp-AL is basically maintenance free. An internal self adjusting calibration function takes care of normal long term drift associated to the CO₂ sensor. To secure the highest accuracy, a time interval of five years is recommended between CO₂ 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 Zero Calibration Bag can be used to produce carbon dioxide free air. The software can be free downloaded from www.rotronic.com. The RS232-cable and the zero calibration bag can be ordered from Rotronic. The cable is to be connected to the UART port slide connector. For change of control parameters and re-calibration (CO₂ and temperature) this PC tool has to be used. The check can be done on site without interfering with the ventilation system.

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. Plastic tubing is connected to the tube. The gas flow should be between 0.3 and 1.0 l/min.

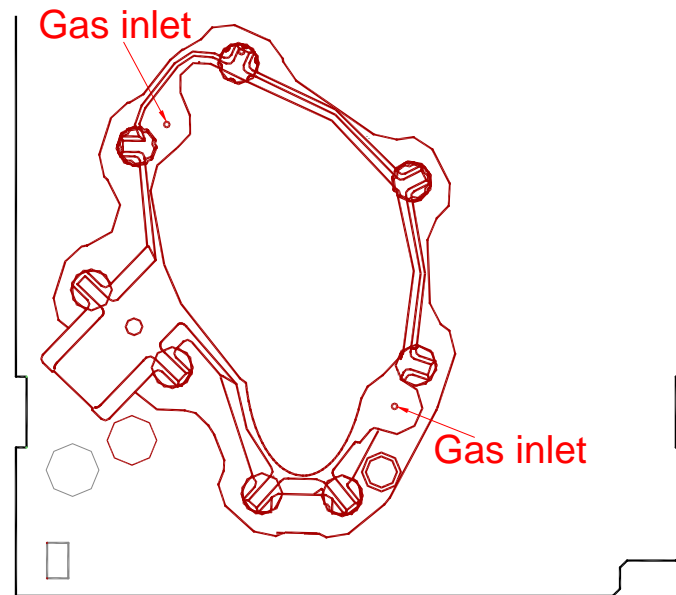


Figure 4 Part of the PCB with holes for gas inlets marked.

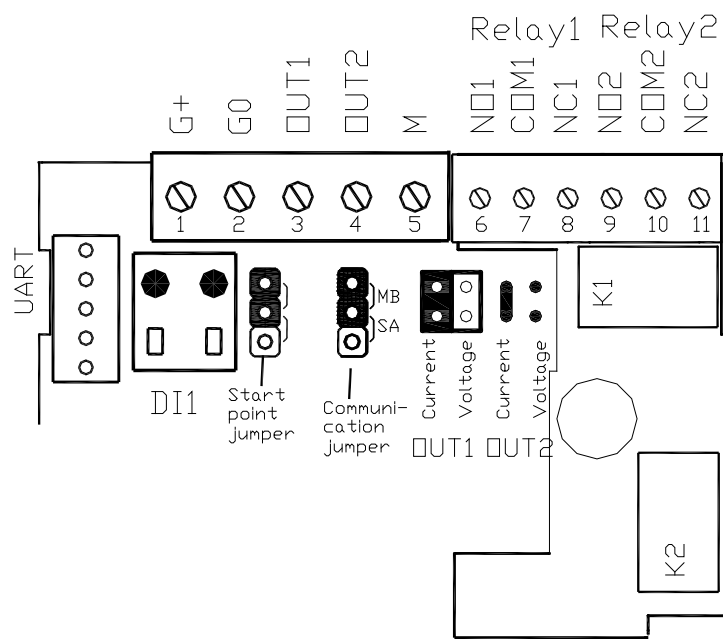


Figure 5 The CF8-W-Disp-AL printed circuit board with the terminal area enlarged at right.
The darker positions are default settings. Communication protocol is set with communication jumper
Upper position Modbus communication protocol Lower position SenseAir communication protocol

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 demands:

EN 61000-4-2 level 2, EN 61000-4-3 level 2,

EN 61000-4-4 level 4, EN 61000-4-6, EN 61000-4-8 level 4, EN 55022 class B

