MINIATURE AIR QUALITY MONITORING SYSTEMS

Ref : P087A.ABD.ConverterCard-0_5V-4_20mA.031014.EN

CAIRSENS

CONVERSION MODULE FROM DIGITAL SIGNAL UART TO ANALOG SIGNAL 0/5V OR 4-20 mA

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1. How to use the conversion module

- The conversion module digital / analog is solely for the Cairsens in the UART version.
- The module is powered following the constraints outlined in chapter 2.
- The Cairsens UART is powered by this module.
- The module takes the sensor measurements (via the UART protocol of the Cairsens) then converts them in analog data, following the range of the Cairsens (ppb converted in 0-5 V or 4-20 mA).

Warning : ***- The system with 4-20 mA output needs the creation and the power supply of the loop (power supply + load resistance or measurement controller) before any utilization.***

- Never connect directly a Cairsens UART version to the USB port of a laptop.

2. Power supply and analog output (Use of the USB cable provided):

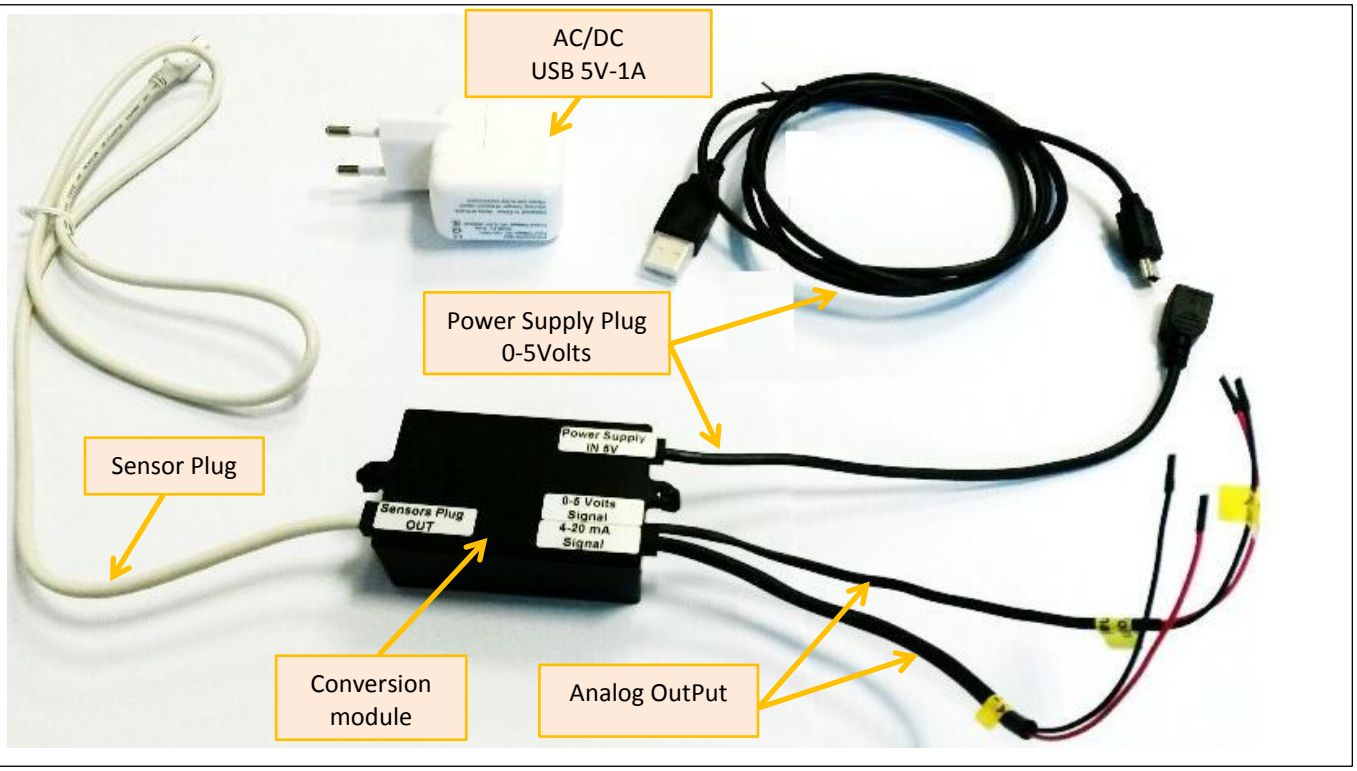

Figure 1: Conversion module and connections.

- **Analog output (*+Vout – GND*) : +Vout** (Red wire), **GND-Mass** (Black wire)

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- **Power supply +VCC 5V/200mA (to connect on the female « Mini-USB Plug »)**
  - Either 5V / 200 mA regulated
  - Either mains adaptater 220V/USB provided with the product

3. Specifications : Concentration (ppb) / (Voltage in mV)

The analog signal delivered by the conversion module output 0-5V (0/5000 mV) and the Cairsens measurement (in ppb) are liaised by a linear relationship.

A step change depends of the measurement range of the Cairsens (see Table 1) :

- **0V corresponds to the lowest value of the measurement range of the Cairsens, hence 0 ppb.**
- **5000 mV corresponds to the highest value of the measurement range of the Cairsens (Measurement range Max(ppb))**
- **The conversion step (output Vout(mV) = f(measure(ppb))) can be obtained via the following formula :**
  - **Vout(mV) = 5 000 (mV) / (Measurement range Max(ppb))**

The table 1 below gives the voltage variation of the output analog signal Vout(mV) corresponding to a concentration difference of 10 ppb for 3 Cairsens of the Cairpol range :

	Analog 0-5V Output		
	Concentration ppb	**0-5 V Output (mV)**	**Measurement range Max(ppb)**
0/1 ppm H2S Cairsens	10	50,00	1000
0/20 ppm H2S Cairsens	10	2,50	20000
0/25 ppm NH3 Cairsens	10	2,00	25000

Table 1: *Correspondence examples Vout(mV) /concentration (ppb)*

4. Specifications : Concentration (ppb) / (signal 4-20 mA)

The analog signal **Iout(mA)** at the 4-20 mA output of the conversion module and the measurer of the Cairsens (in ppb) are liaised by a linear relationship.

A step change depends of the measurement range of the Cairsens :

- **4 mA corresponds to the lowest value of the measurement range of the Cairsens, hence 0 ppb**
- **20 mA corresponds to the highest value of the measurement range of the Cairsens (Measurement range Max(ppb))**

WARNING: The 4-20 mA output of the conversion module is composed by two wires, it is essential to create the loop in full as described in the example in chapter 5.

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5. Example of the 4-20 mA loop

The 4-20 mA loop is a way to transfer an analog signal on a long distance, without any loss or changes (significant) of this signal.

To create this 4-20 mA loop, 4 elements are required:

- The emitter : Conversion module digital/analog
- The power supply for the loop : 24V DC
- The wires of the loop
- The receptor: Acquisition system of the loop current Iout (mA), measurement of the sensor.

These 4 elements are connected together to form a loop as displayed on figure 2 below:

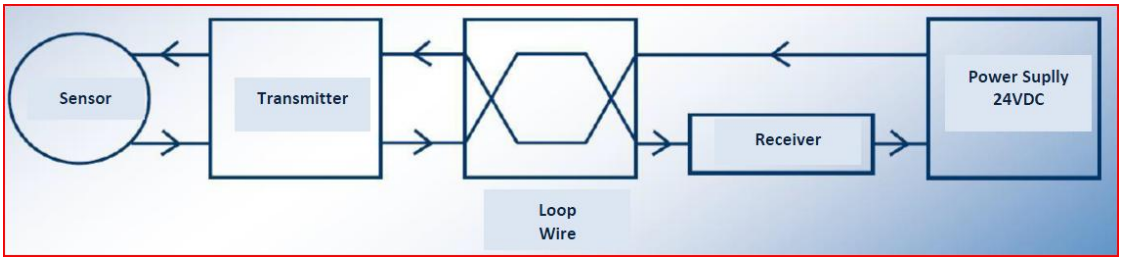

Figure 2: Basic Current Loop Schematic

The figure 3 shows the example of a loop using a 250 ohms resistance where the voltage is measured at its terminals, this voltage being the measurement of the sensor.

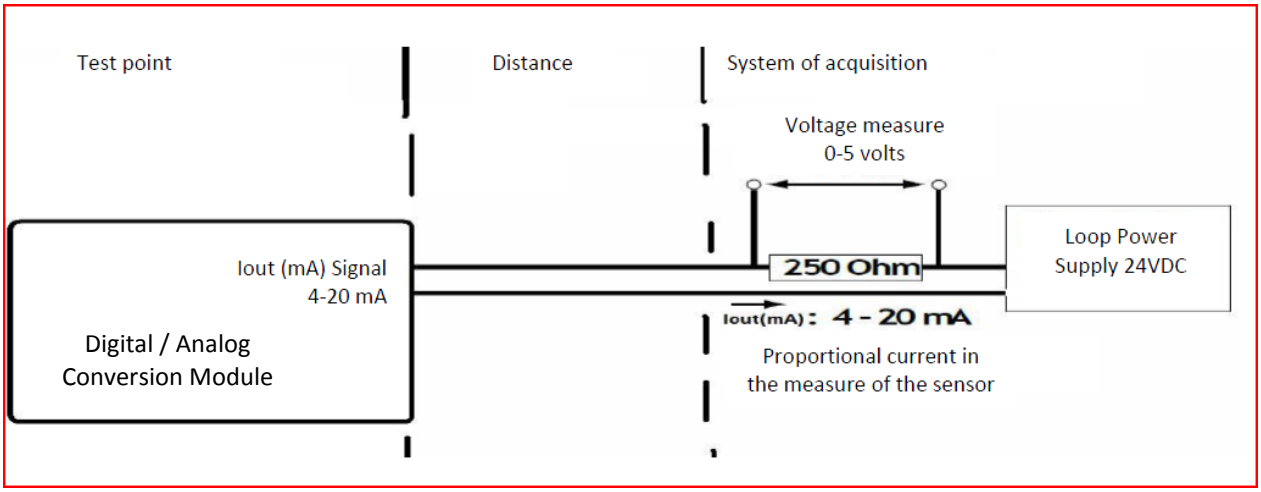

Figure 3: Example of a 4-20mA loop with the conversion module

The voltage measured at the system's terminals (250 ohms resistance) varies from 1 to 5 volts for respectively a loop current varying from 4 to 20 mA.

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