



Analog option for E4000 indoor air quality probe

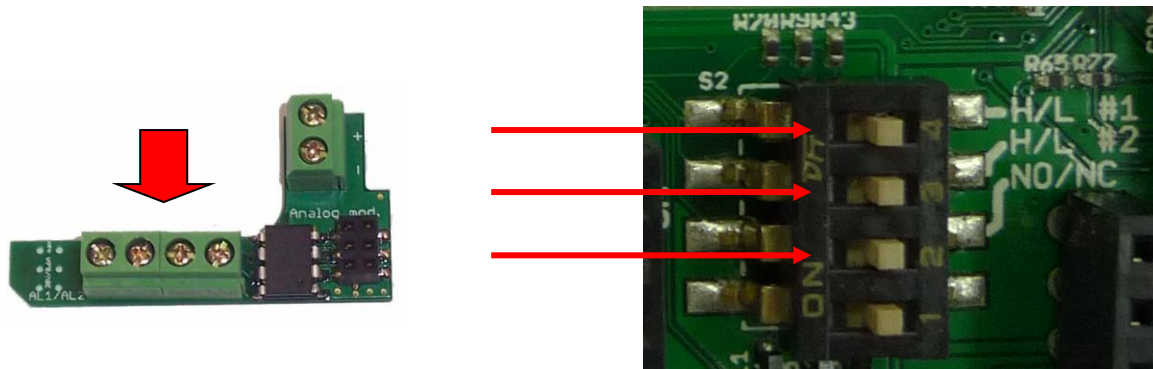
Ver	Date	Modification
V1		Initial Version
V2	Dec 2013	New CO2 curve + pictures
V3	Sept 2017	Timing changed for triggering Contact 1 & 2

The optional analog board of the E4000 probe has two dry contacts and a 0 - 10V output.

The dry contacts are typically used to control a two speed air extractor having two different coils.

The 0-10V output is used to control continuous ventilation having a 0 - 10V input speed control.

Dry contacts



The two dry contacts are activated according to CO₂, VOC or relative Humidity thresholds depending of the 3 deep switch configuration (see installation manual for details):

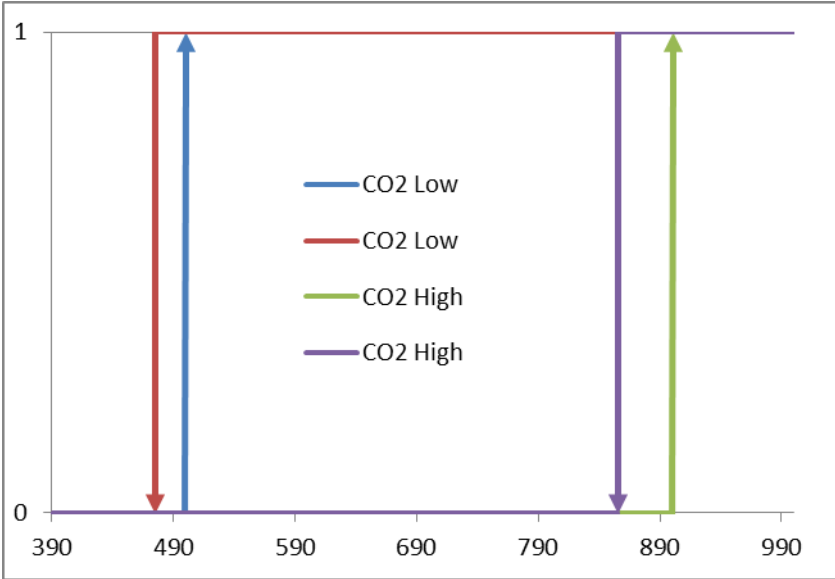
- **Contact 1: #1:** CO₂= 500 or 900 ppm (selectable) / VOC= 0,5ppm formaldehyde equivalent more than 10 minutes / 75% RH more than 20 seconds.
- **Contact 2: #2:** CO₂= 1250 or 1800ppm (selectable) / VOC= 3ppm formaldehyde equivalent more than 2 minutes / 85% RH more than 20 seconds.
- **Contacts status:** Normally open (NO) or Closed (NC) logic selectable for the two dry contacts.
- **Hysteresis:** CO₂ and RH: 5% of thresholds, VOC: 10% of threshold.
- Type of dry contacts: Isolation 3750 Vrms / 1 min, 30VDC / 0,6A max.

In order not to stress the fan motor, the following timings are applied:

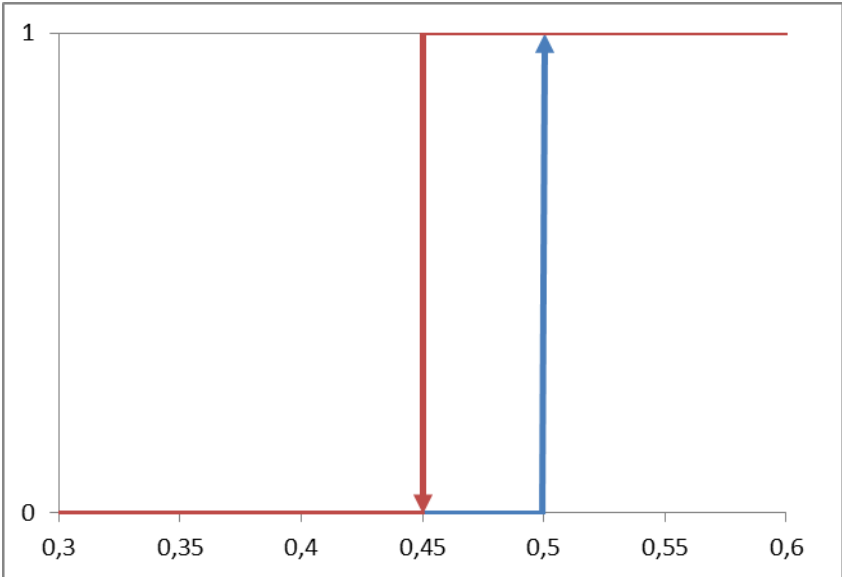
- From Low speed to High speed: 1s Off
- From High speed to Low speed: 10 seconds Off (to let the speed decrease naturally)
- From stop to High speed: Low speed activated during 10 seconds at start-up

The following graphs show the switching of the dry contacts for each criteria knowing that a switching On for one criteria prioritise on others. The switching off curves shows the influence of the hysteresis.

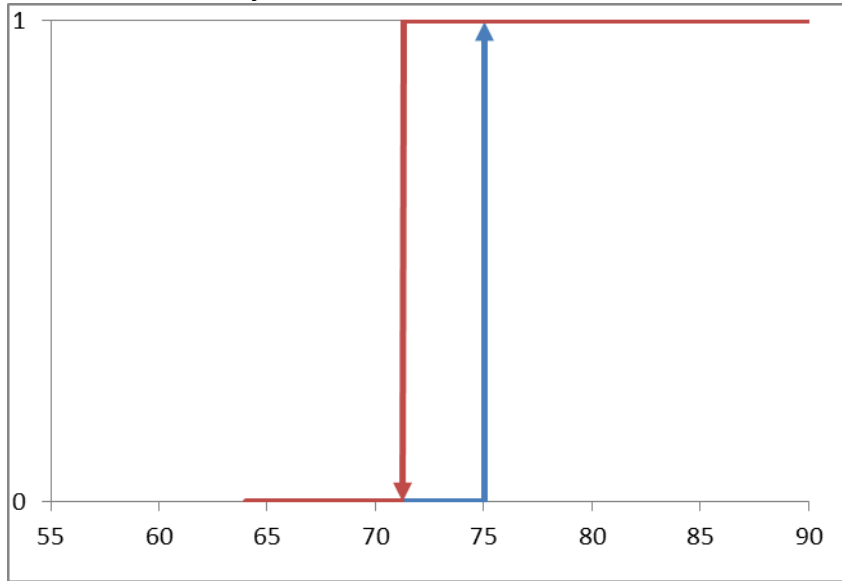
Contact 1 CO2



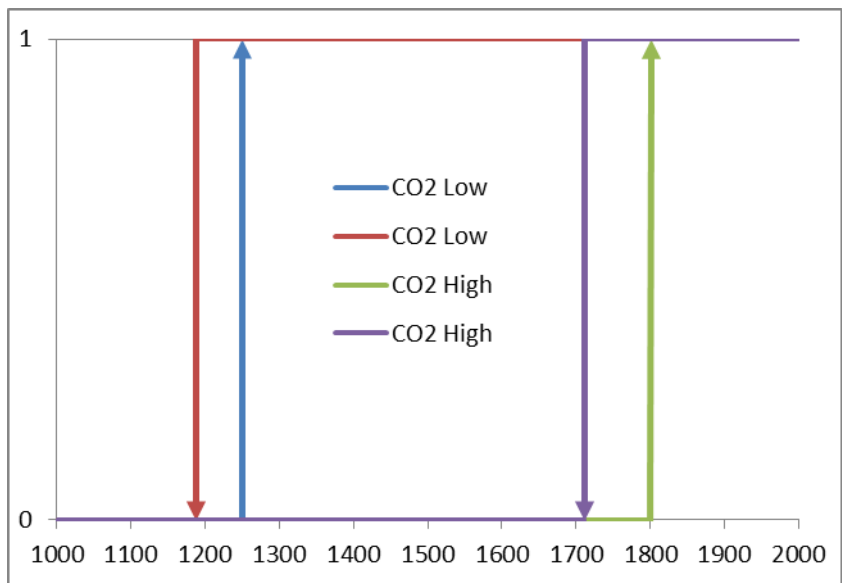
Contact 1 VOC



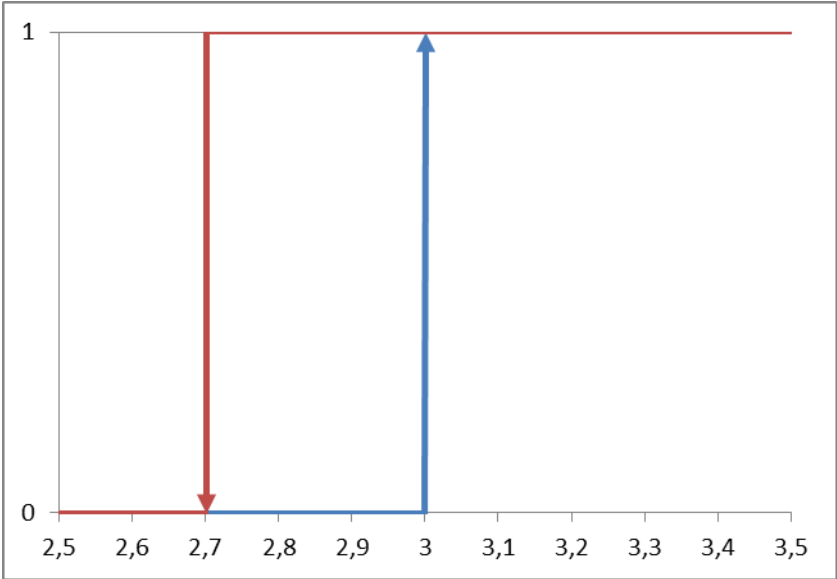
Contact 1 Humidity



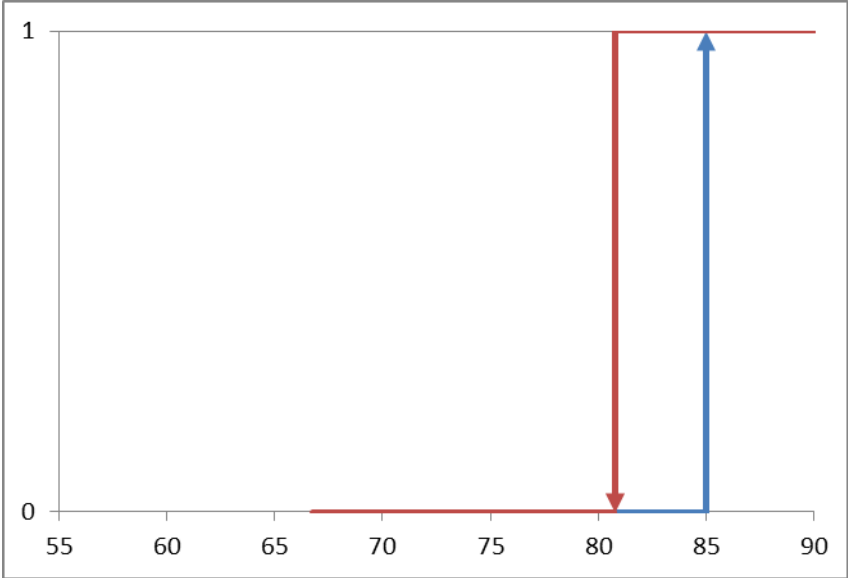
Contact 2 CO2



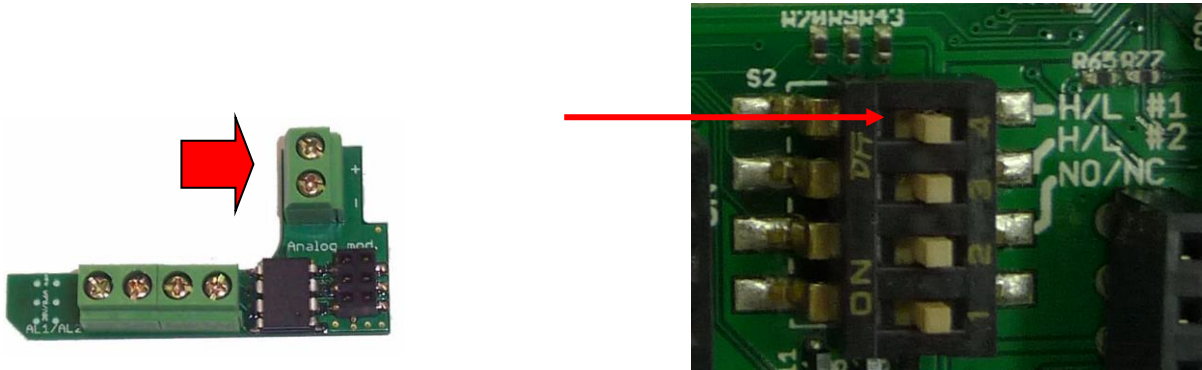
Contact 2 VOC



Contact 2 Humidity



Details on the 0-10V output algorithm



Only the #1 deep switch used for the dry contacts allows a setting on High or Low threshold for CO2.

The 0-10V output is dedicated to continuous ventilation command.

This is representative of the CO2, VOC and humidity combined concentrations.

According to the concentration, a value between 0 and 10V is computed for each criteria and the highest value of the 3 is applied. In addition, a minimum value of 1V is applied to ensure a minimum ventilation at 10% of the nominal to take care of the building health and comply with current regulation that forbid shutting down ventilation entirely.

The formula for CO2 is the following:

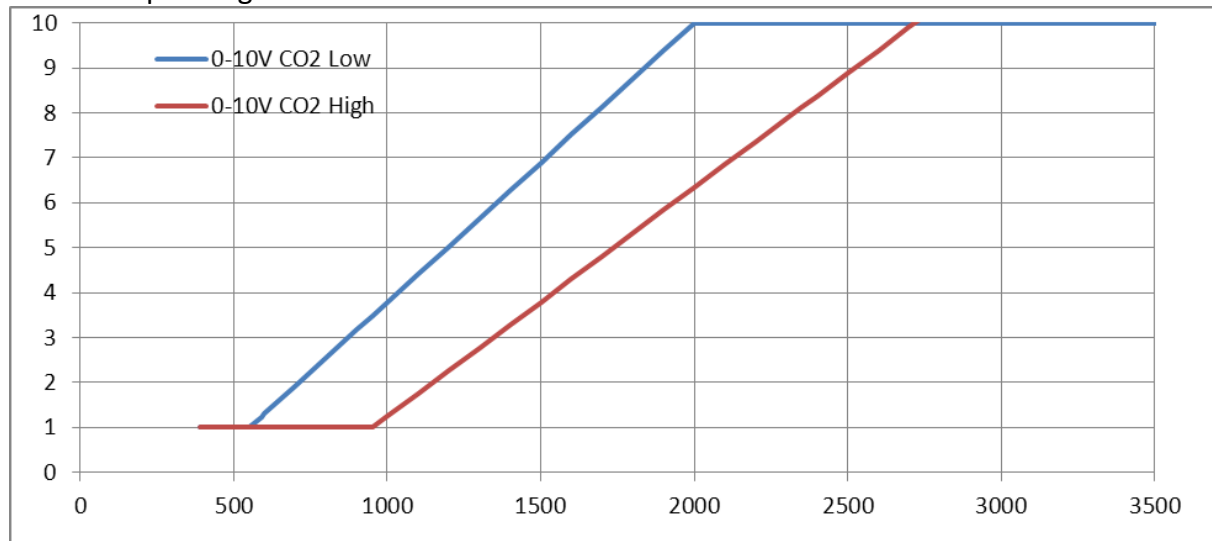
Low threshold: $(V_{CO2} - 390) / 161$

High threshold: $(V_{CO2} - 755) \times 0.82 / 161$

With

Value CO2 = V_{CO2}

The corresponding curve is as follow:



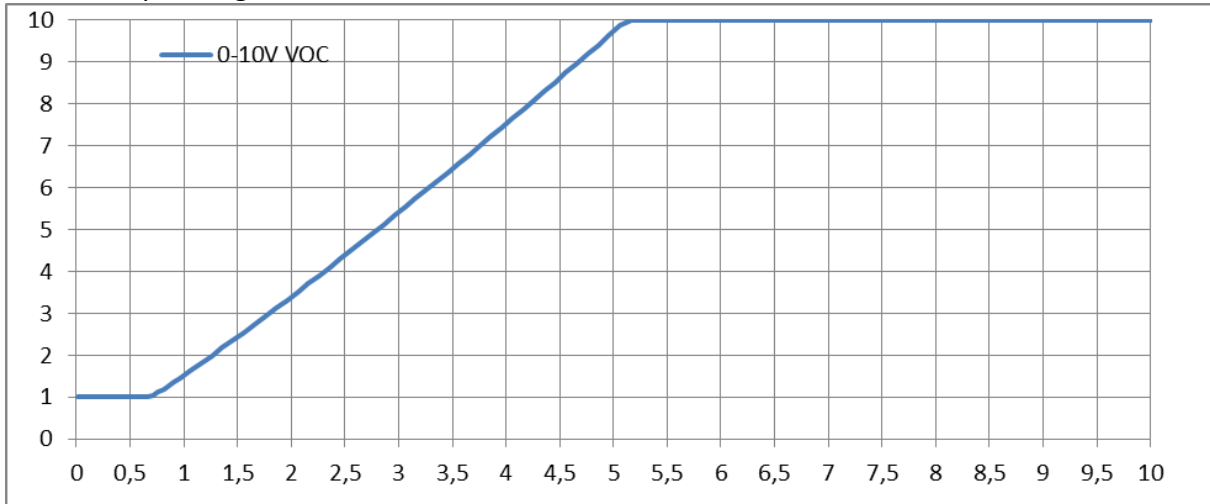
The formula for VOC is the following:

$$(VVOC \times 120)^{1.15} / 161$$

With

$$\text{Value VOC} = \text{VVOC}$$

The corresponding curve is as follow:



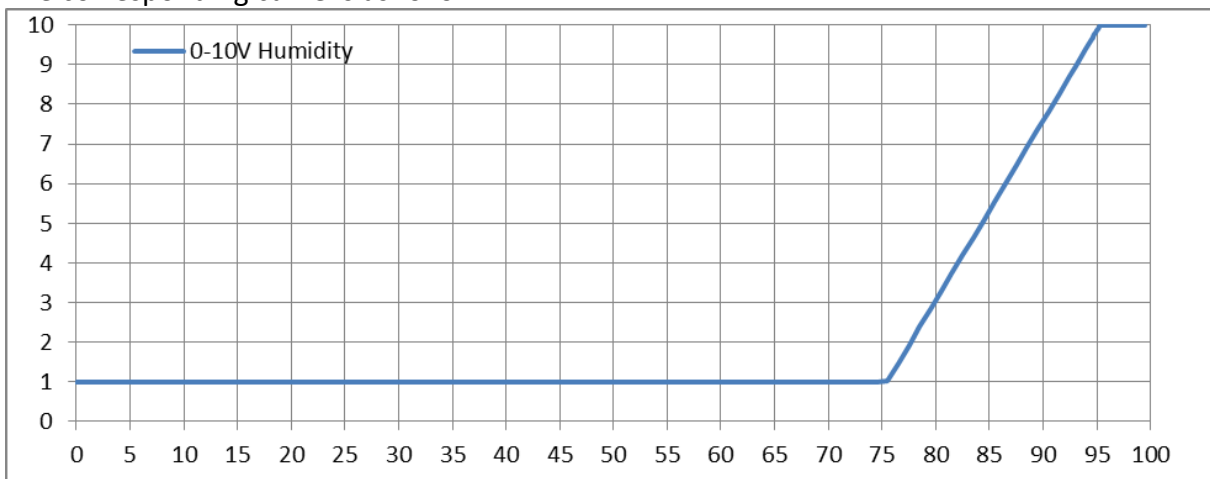
The formula for humidity is the following:

$$(VRH - 73.25) \times 73 / 161$$

With

$$\text{Value Relative Humidity} = \text{VRH}$$

The corresponding curve is as follow:



Tricolours LEDs

Coloured LEDs are activated based on the 0-10V output.
Thresholds are as follow:

Green: < 3.33V

Orange: between 3.33V and 6.66V

Red: between 6.66 and 10V



Le here under spread sheet recaps the thresholds:

CO2 L	CO2 H	VOC	Humidity
< 920ppm	< 1040ppm	< 1,96ppm	< 81%
920 < < 1450ppm	1040 < < 1750ppm	1,96 < < 3,56ppm	81 < < 88%
> 1450ppm	> 1750ppm	> 3,56ppm	> 88%