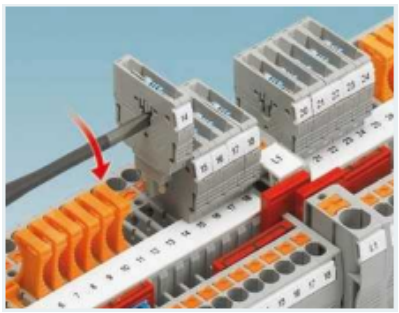
Connect a 4-20mA sensor to the FLX 3401 extension card

1. Purpose

This document explains how to use a 4-20mA sensor with a FLX3401 IO extension card.
The FLX3401 IO extension card has been designed to connect 0-10V sensors. However, through additional wiring and a resistor, you can also connect your 4-20mA sensors on this extension card.

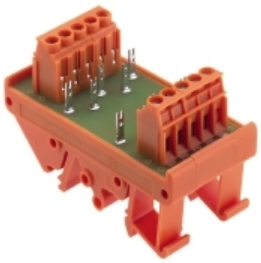
2. Needed materials

- 4 Resistors of 330R, 0.5W with a good precision, like for example a tolerance of 0.1%
- To ease the assembly we recommend to use a terminal block like, as for example:
  - Phoenix Contact : component terminal blocks



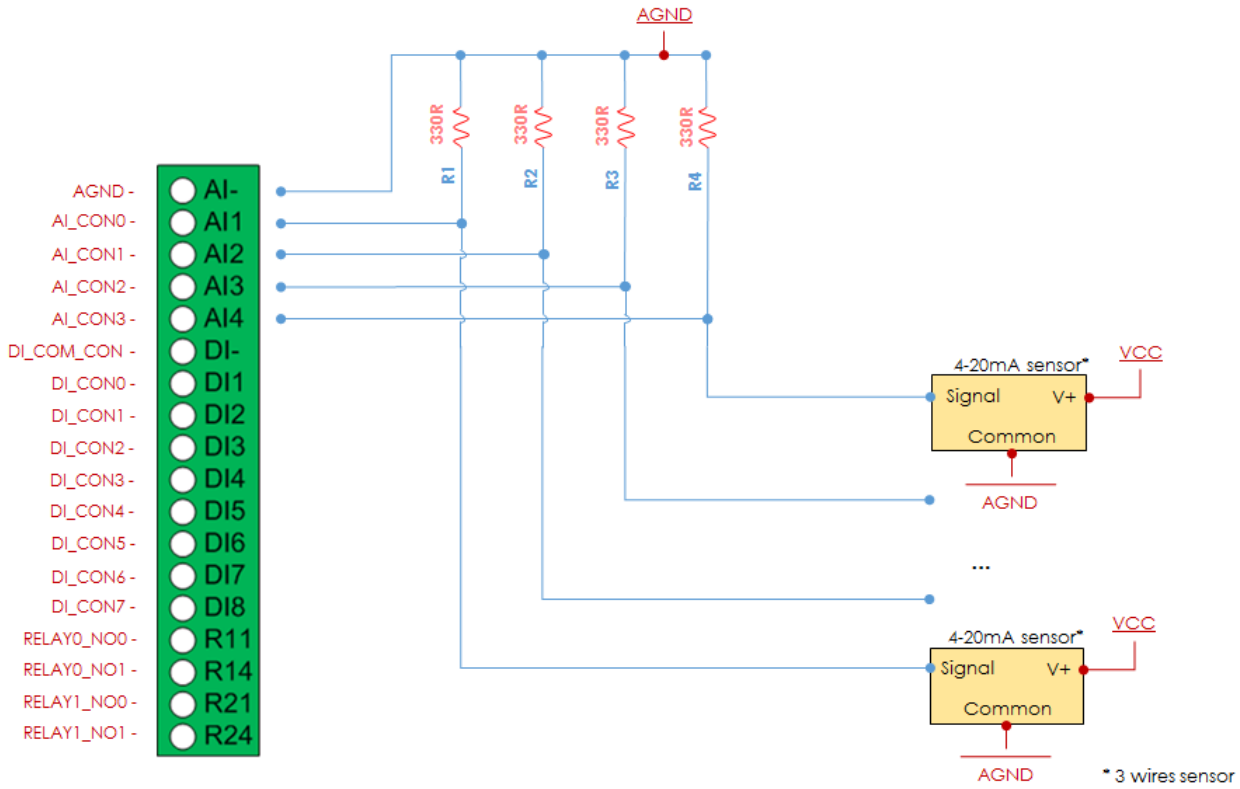
(https://www.phoenixcontact.com/online/portal/us?1dmy&urile=wcm:path:/usen/web/main/products/subcategory_pages/component_terminal_blocks_p-15-03-01/b7227917-90da-4c40-bcb0-5626dc82d0ba)

- Weidmüller Rectifier modul: RSX Loetst. LP (Reference 329761001)



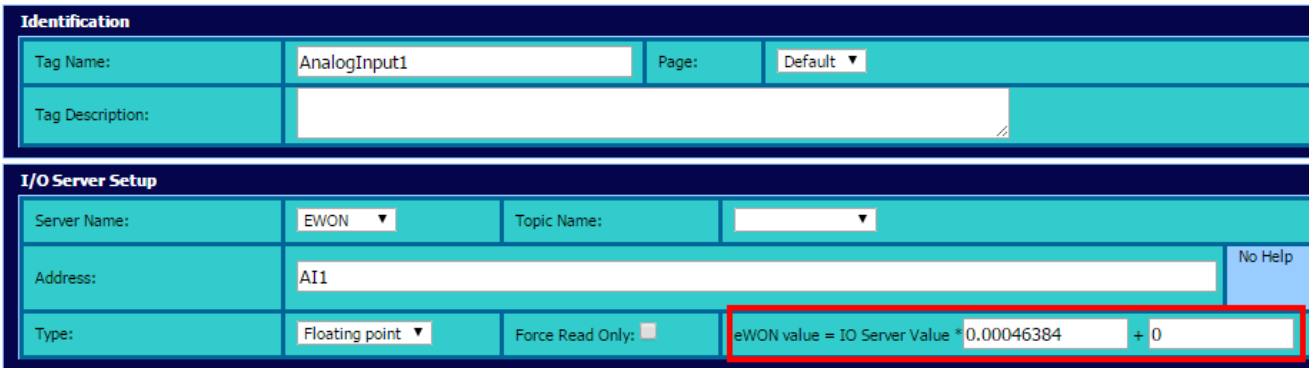
(http://catalog.weidmueller.com/procat/Product.jsp;jsessionid=76C583DE614DFEC205DDC153C63D500C?productId=(%5b0329761001%5d)&page=Product)

3. Wiring diagram



4. Converting 4-20mA signal into 0-10V

To connect your 4-20mA sensor to the FLX3401 extension card, perform the wiring as explained here above.
Using a resistor of 330 Ohm, you'll then need to specify inside the eWON Tag Setup page, a conversion factor of 20/43118.



The eWON Tag (AnalogInput1) will then reflect the 4-20mA input value.

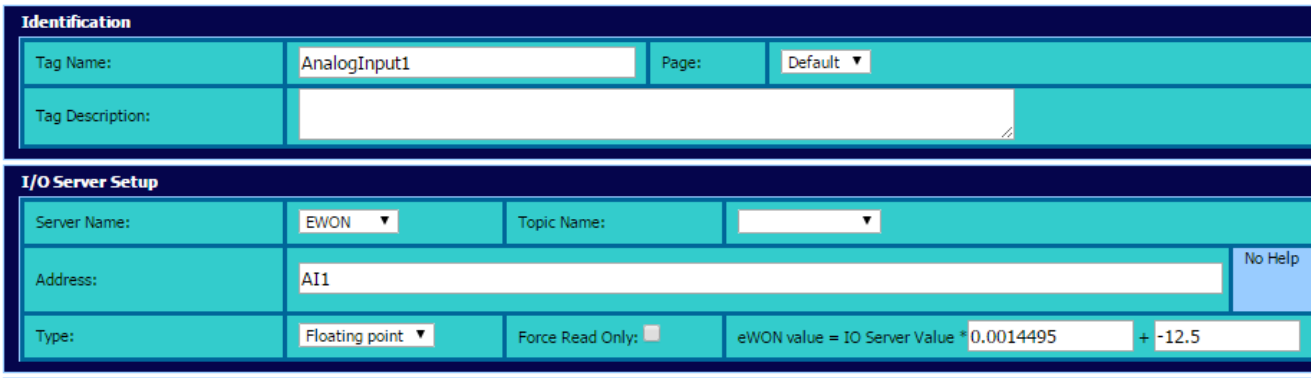
If you need to apply supplementary conversion, simply add the conversion on top of the already existing one.

For example, let assume you have an 0-50 °C sensor. (4mA = 0°C, 20mA = 50°C).

You'll then need to apply following factor and offset inside the eWON Tag configuration:

Offset = -12.4

Factor = 3.125 * (20/43118) = 0.0014495



5. Explication of conversion and resistor values used

The following chapter explains why we suggest to use a resistor value of 330 Ohm.

5.1. AI (Analog Input) specifications of the FLX3401 extension card

The generic specifications of the FLX3401 extension card are:

- Precision = 16 bit
- Input range = 0 to 10V (absolute max. -0,6 to +12 VDC)
- Firmware coding: 0 to 2^16-1 (65536 points)
- Over-voltage protected
- sampling rate 4sps
- Maximum gain error = 0,4% (= 262 points)
- Input impedance = 106k

5.2. 4-20mA usual specifications

The typical impedance of an 4-20mA Analog Input is 200 to 600R

So the typical output voltage of 4-20mA sensors are:

	200R	300R	500R	600R
4 mA	0,8V	1,2V	2V	2,4V
20 mA	3V	6V	10V	12V

5.3. Converting in current input

As the table here above indicates, with a resistor of 500R, all the voltage range of the Analog Voltage input is used (from 2V to 10V = 80%).

So the best suited resistor would be: 500R 0,5W.

At 20mA, 0,2W will then be dissipated in the resistor. (RI^2).

Small, low voltage and/or low power sensors are not always capable to have a 10V output at 20mA.

So it would be better to use a for example a 330R resistor to make the conversion. This will only use about 50 % of the whole voltage range. But this still represent more than 30,000 points due to the 16 bit ADC. Which is more than enough to control a sensor.

To avoid too much precision lost in the resistor, be careful to choose high precision resistors, for example with a tolerance of 0,1%.

Example: 330R 0.5W 0.1%

5.4. Resistor correction

The resistor, which we will use inside the wiring for the 4-20mA conversion, will be added in parallel to the already existing 106K input impedance of the 0-10V Analog Input.

So during the factor and offset calculation for the eWON Tag value configuration fields, we need to take following global impedance into account:

Conversion resistor [Ω] (R)	Global Input impedance [Ω] = 1/ (1/106000 + 1/R)
300	299,15
330	328,98
500	497,65
600	596,62

Revision

Revision History

Revision Level	Date	Description
1.0	10/07/2015	Original Document
1.1	02/11/2015	General improvement

Document build number: 23