Connect a 4-20mA Sensor

To the Flexy FLX 3401 Extension Card

SOLUTION SHEET

KB-0240-00 1.2 en-US ENGLISH

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1 Preface

1.1 About This Document

This present document explains how to use a 4-20mA sensor with a Flexy FLX 3401 IO extension card.

For additional related documentation and file downloads, please visit www.ewon.biz/support.

1.2 Document History

Version	Date	Description
1.0	2015-07-10	First release
1.1	2015-11-02	General improvement
1.2	2019-06-12	Changed: Template

1.3 Related Documents

Document	Author	Document ID

1.4 Trademark Information

2 Introduction

The FLX 3401 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 to this extension card.

3 Required Material

You need the following equipment to modify the extension card:

- 4 resistors of 330R, 0.5W with a good precision, like for example a tolerance of 0.1%
- We recommend the use of terminal block like to ease the assembly such as:
  - Phoenix Contact®

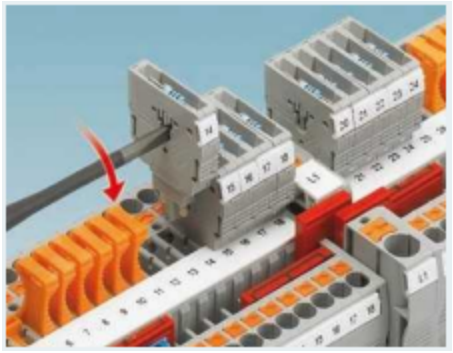

Fig. 1 Phoenix Contact® terminal block

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

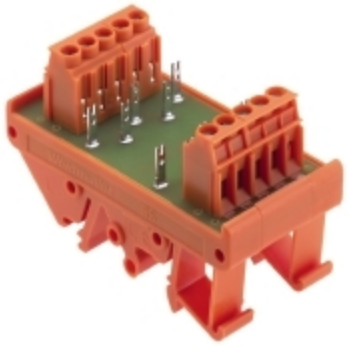

Fig. 2 Weidmüller® Rectifier module

4 Transformation

4.1 Wire Diagram

To connect your 4-20mA sensor to the Flexy FLX 3401 extension card, you must perform the following wiring:

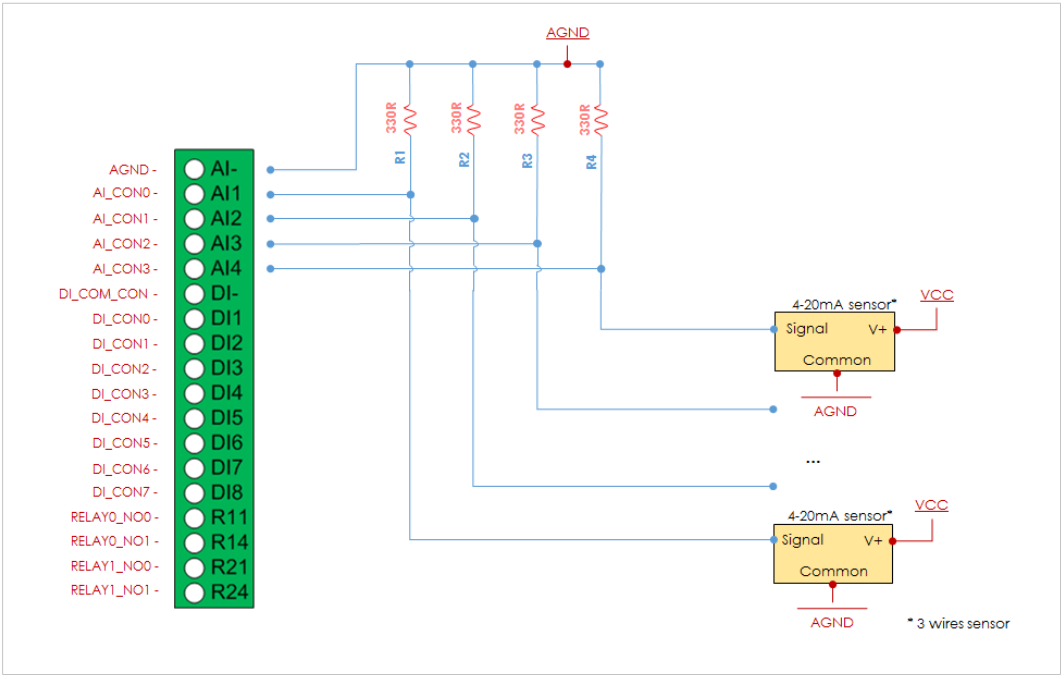

Fig. 3 4–20mA wire diagram

4.2 Convert 4-20mA Signal into 0-10V

We suggest using a resistor of 330 Ohm that would need you to apply a conversion factor of *20/43118* when you configure your tag in the “Tag Setup” web page of your Ewon.

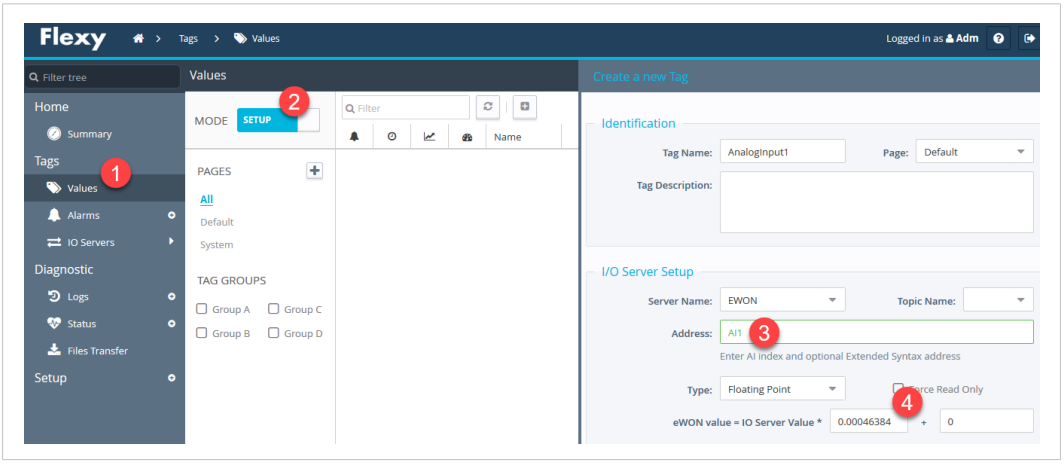

Fig. 4 Conversion factor on tag setup

The Ewon tag “AnalogInput1” reflects the 4–20mA input value.

If you need to apply an additional conversion, you can add this extra conversion on top of the existing one.

For example: if you have a 0-50°C sensor where 4mA = 0°C and 20mA = 50°C, you would need to apply the following factor and offset inside the Ewon tag configuration:

- Offset = -12.4
- Factor = 3.125 * (20/43118) = 0.0014495

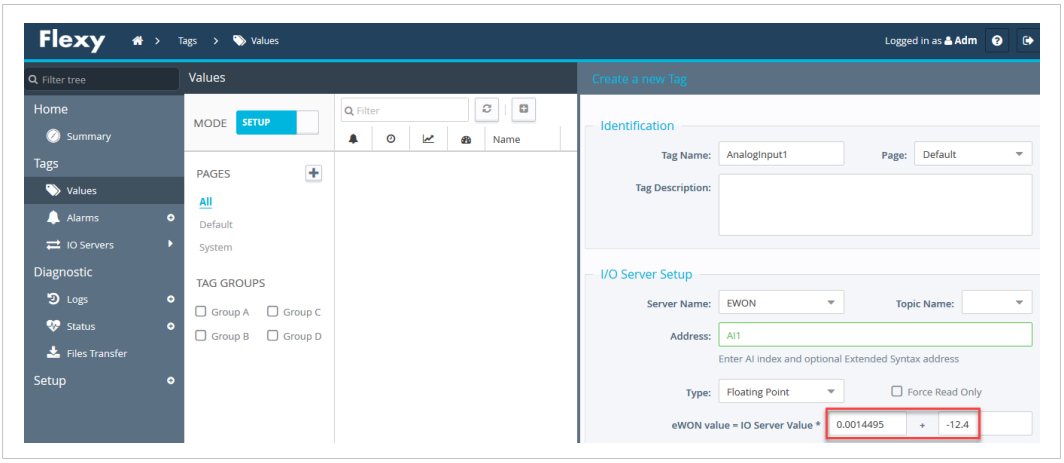

Fig. 5 Multiple conversions

5 Explanation of Conversion and Resistor Values

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

5.1 AI (Analog Input) Specifications of the FLX 3401

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 Specifications

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

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 Current Input Convertion

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%).

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

At 20mA, 0,2W is 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.

It is better to use, for example, a 330R resistor to make the conversion. This uses only ~50 % of the whole voltage range.

However, this still represents 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 (e. g.: with a tolerance of 0,1%).

Example: 330R 0.5W 0.1%

5.4 Resistor Correction

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

During the factor and offset calculation needed for the Ewon tag setup, we need to take following global impedance into consideration:

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

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