

DUOS TRANSMITTERS CALIBRATION TOOL



CALIBRATION MANUAL

DS_DUOS_PROBE_CALIB_E01B

INTRODUCTION

The sensors and probes used in the DUOS system are calibrated in the manufacturing process but over the time, users will need to make minor adjustments to the values acquired to take advantage of the best performance from DUOS transmitters. Understanding this need for the user, the [Tekon Configurator](#) software has advanced properties for linear calibration related to the transmitters. In order to make the most of this functionality, an auxiliary tool has been developed to help this calibration process.

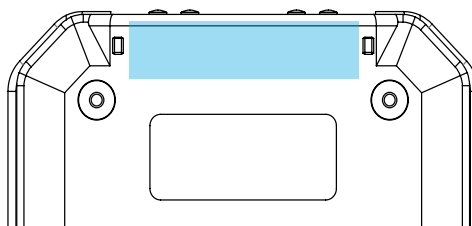
The opportunity to further calibrate the probes shows added value to the solution as a whole, as it has advantages that enhance the entire monitoring process:

- ⚠ Sensor aging compensation;
- ⚠ Sensor lifetime extension;
- ⚠ Sensor accuracy improvement;
- ⚠ Sensor gain and offset correction via software;

Steps:

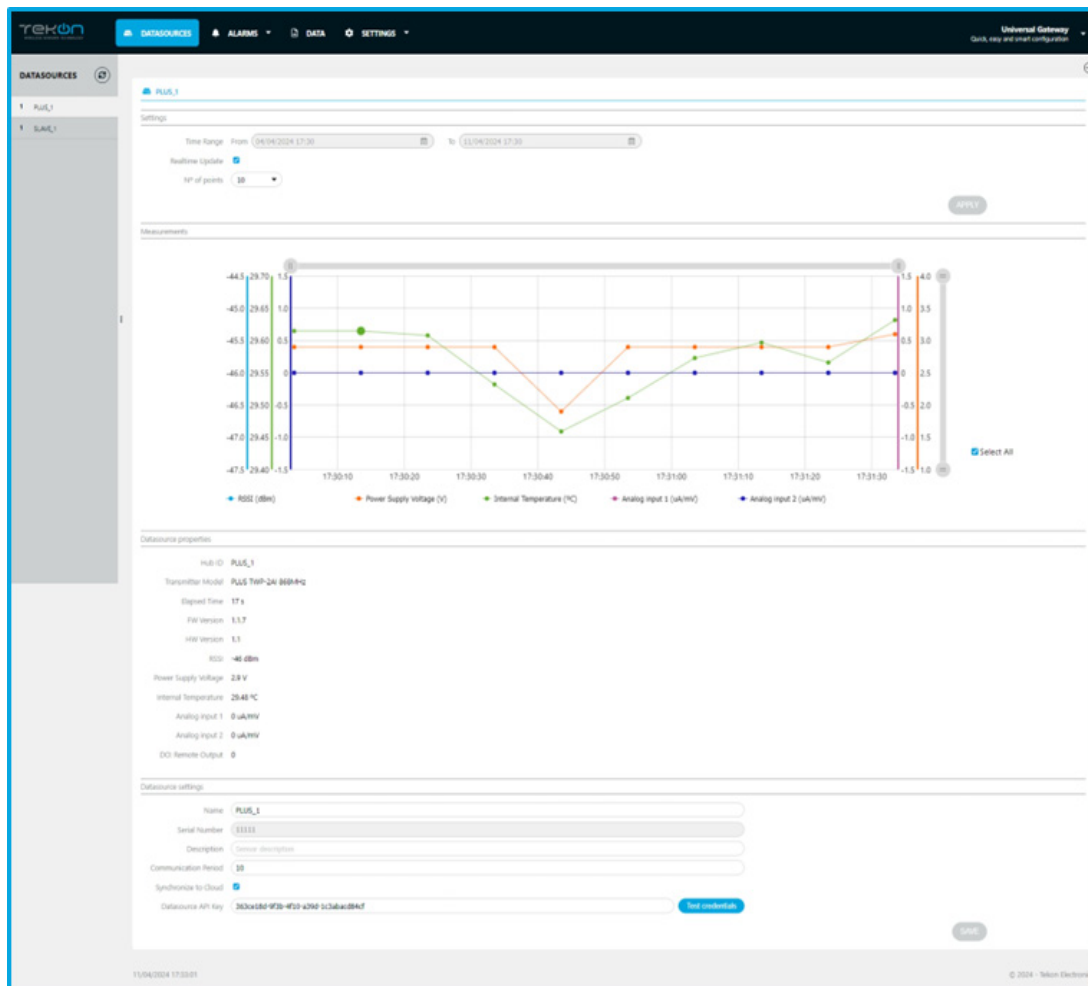
1. Connect the Universal IoT Gateway and the transmitters as described in the user manuals.

Note: If the transmitters do not appear in the Universal IoT Gateway interface, check if the devices are within 1 meter distance, as the transmitters can only communicate when they are more than 1 meter away from the Universal IoT Gateway. If communication still does not occur, reset the DUOS transmitters by passing a magnet near the LEDs.



The blue area represents the magnetic switch on the DUOS transmitters, which allows the devices to be reset. Operating mode: Pass a magnet over the area marked in the image. All the LEDs will turn on, and the transmitter will be reset.

2. Once the transmitters are communicating, you can view the data from each device by clicking on the respective datasource. A page similar to the one shown in the following image [selected datasource page] will appear.



3. After all devices are connected and communicating, you can place the transmitters in the climate chamber to expose them to the desired environmental parameters (temperature, humidity, CO², etc.).

4. For each parameter values you want to calibrate, the devices require 4 hours of stabilization. After waiting for the stabilization time, you can take the measured value displayed on the Universal IoT Gateway interface.

5. If the values measured by the transmitter have errors higher than expected, you can perform a calibration using the Tekon Configurator and the calibration tool available on Tekon Electronics' website.

step
01

HOW TO USE THE CALIBRATION TOOL TO CALCULATE THE CALIBRATION VALUES

TOOL DESCRIPTION

Our calibration method is a process based on a linear equation. In this context, it is understood the use of a mathematical methodology to assist in the calculation of gain (m) and offset (b). The mathematical formula $Y=mX+b$ is the applicable basis for this solution.

The calculation procedure is based on the reference values [1] and values recorded [2] by the sensor of the DUOS transmitters. You will need at least two reference values and two measured values to calculate the gain and offset values.

1 Reference Value	2 Measured Value	Absolute Measured Error	% Measured Error	Compensated Value	Absolute Compensated Error	% Compensated Error

Table 1 - Data analysis template

The other fields in the table are automatically filled. In the next example, we will simulate the calibration of a DUOS CO² probe, which normally equips this type of transmitter. The reference values refer to the capacity of 20%, 40%, 60% and 80% of the measuring range of our probe with a 2000ppm limit.

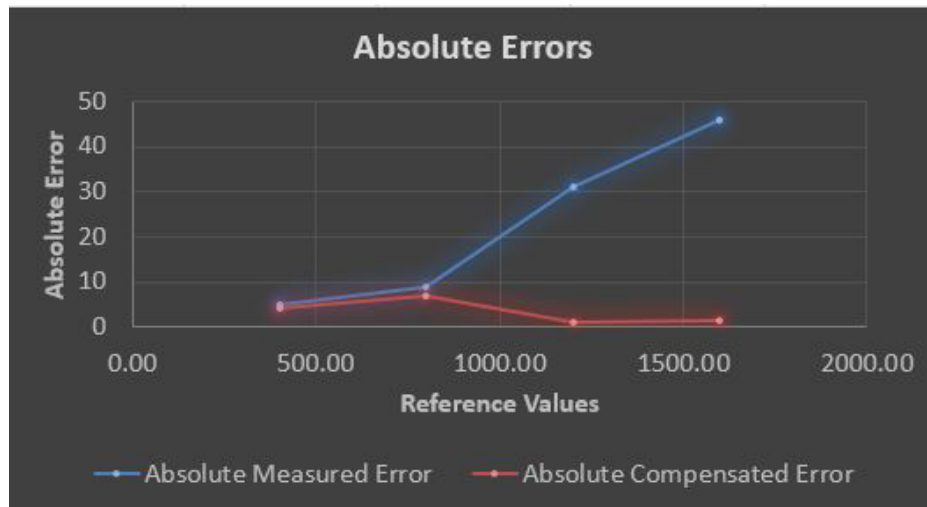
Reference Value	Measured Value	Absolute Measured Error	% Measured Error	Compensated Value	Absolute Compensated Error	% Compensated Error
400.00	395.00	5.00	1.25%	395.90	4.10	1.03%
800.00	791.00	9.00	1.13%	806.76	6.76	0.85%
1200.00	1169.00	31.00	2.58%	1198.95	1.05	0.09%
1600.00	1554.00	46.00	2.88%	1598.39	1.61	0.10%

Table 2 - Data analysis template with calculated values

For a better graphical perception of the values, the calibration tool automatically creates two types of graphs. In the graphic chart A, we can observe the measured absolute error and the compensated absolute error.

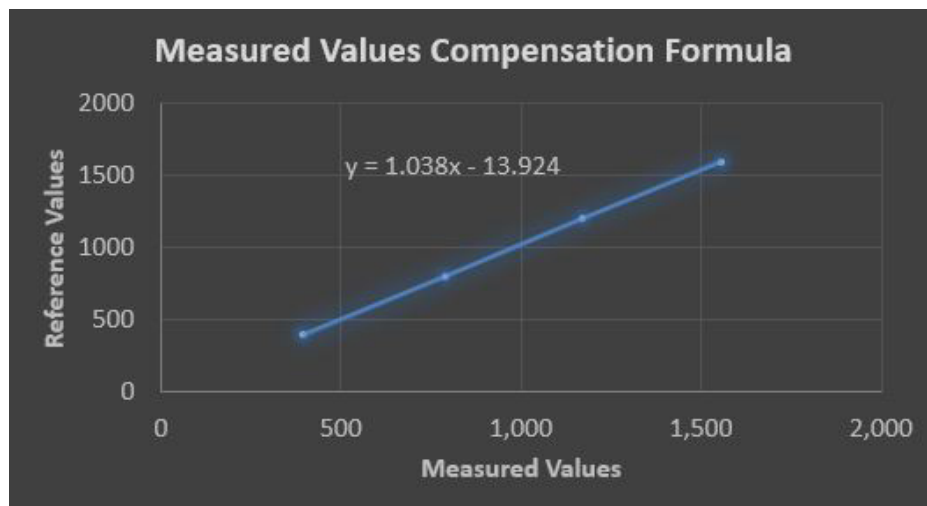
step
01

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Graphic chart A - Absolute errors

In the next graphic chart, we see the application of the formula for the calculation of gain and offset, previously mentioned.



Graphic chart B - Measured values compensation formula

At the end, a table is automatically filled in to display the final values to be used for calibration.

Linear Calibration	Value
m	1.03753
b	-13.92386
R ²	0.99992

Table 3 - Example of DUOS CO2 calibration results.

step
02

INSERT CALIBRATION VALUES IN TEKON CONFIGURATOR SOFTWARE


CALIBRATION VALUES APPLICATION

01

Turn on the [Tekon Configurator](#) software and select the DUOS device you want to calibrate by following the steps in the device's user manual.

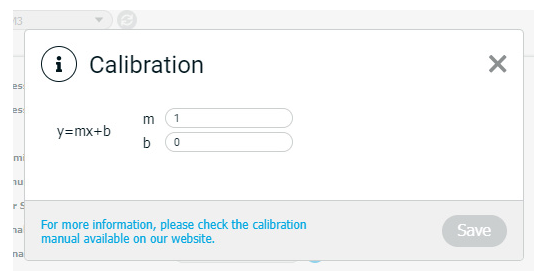
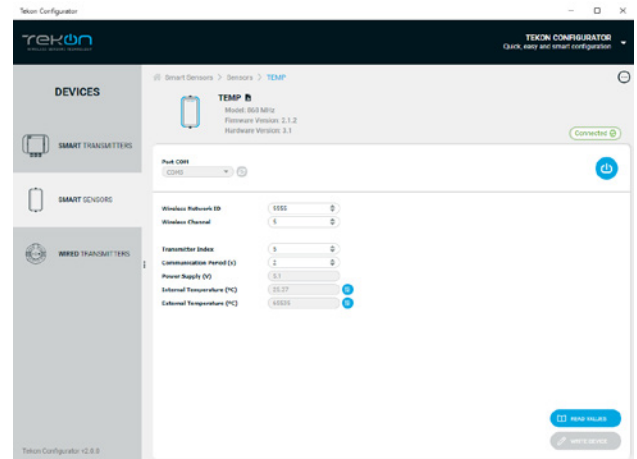


02

On the DUOS transmitter configuration page, click the calibration button corresponding to the variable you want to calibrate ().

A new window will appear, where you can enter the m and b parameter values provided by the calibration tool. Enter the calibration values, save them by clicking **SAVE**, and close the calibration window.

If you want to verify if the calibration was successful, read the values by clicking on the **READ VALUES** button.



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