

Dostmann Calibrator Users Guide

Table of Contents

Introduction.....	3
Overview.....	3
Append Replace Option.....	4
Calculation Of Codes.....	4
Code 1.....	4
Code 2.....	5
Data Range.....	5
Single Temperature Offset Calibration.....	5
Revision History.....	8

Dostmann Calibrator Users Guide

Introduction

The Dostmann Calibrator is a small utility that can be used to generate sensor calibration codes for certain models of Dostmann thermometers such as the PT-750. This utility allows the use of more than two samples of input data or a single input sample for offset calibrations.

Overview

The Dostmann Calibrator utility is a small program that allows the user to input nominal and actual temperature samples and produce a set of calibration codes as the output. The number of temperature entries that are used for the calculation of the correction codes can be increased or decreased using the '+' / '-' buttons at the bottom of the table. The display precision can be set as preferred without introducing a rounding error.

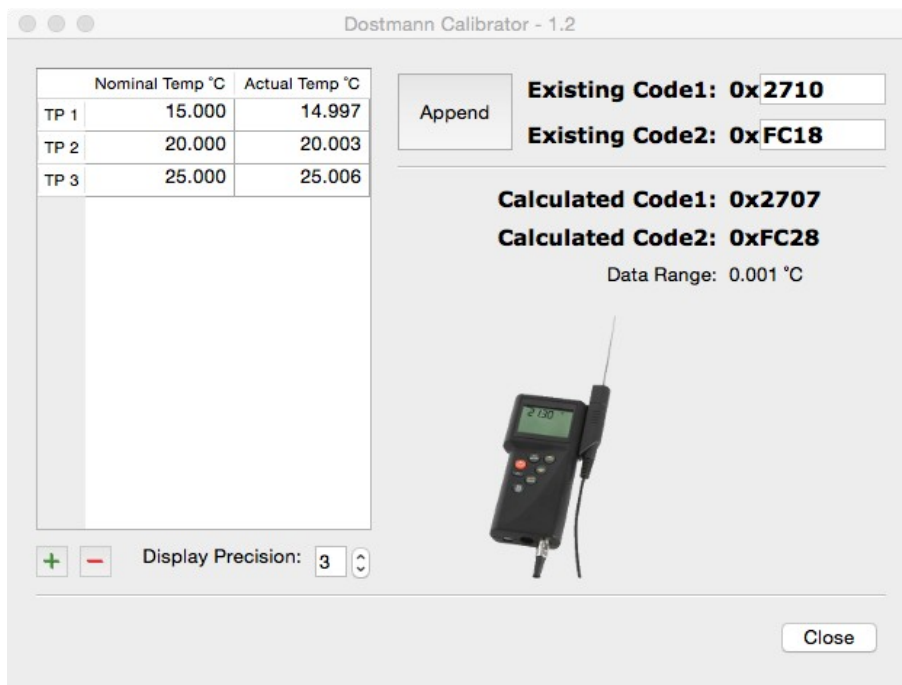


Figure 1: Main window of the Dostmann Calibrator

All input temperatures are assumed to be in Celsius.

The input data is kept internally at the resolution entered and is not rounded by the display precision setting.

Adding or removing temperature samples is always from the last row of the input table. The order the data is entered is not important and does not need to follow an ascending or descending pattern. Sections of entries for each column can be copied and pasted if it is preferred to have a logical order to the input data. Existing temperature entries that are removed are stored internally and will become the default values if a new row is added.

Dostmann Calibrator Users Guide

All input settings and options are stored when the program is closed.

Append Replace Option

For cases where existing correction codes exist the option to append was added to allow cumulative updates. The option is enabled or disabled by toggling the *Append/Replace* button to the left of the *Existing Code* entries. With *Append* enabled the *Existing Code* fields are active allowing the user to enter the current correction codes that was active during the measurements with the thermometer.

Without the option to append to existing correction codes it is necessary to clear all existing correction values within the meter prior to temperature measurements otherwise the new correction codes will be offset by the existing correction.

The values in the Existing Code fields are ignored unless Append mode is active. A null correction entry for Existing Code1 and Existing Code2 is 0x2710 and 0x0000.

Calculation Of Codes

Two hexadecimal codes are created based on the input temperature samples. The two codes describe the compensation slope and offset of the temperature sensor to established nominal reference temperatures.

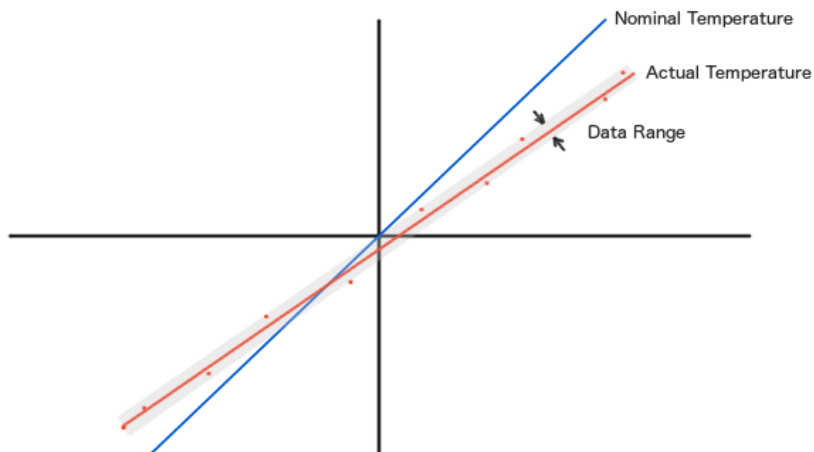


Illustration 1: Example input data showing slope, offset, and data range.

Code 1

Code 1 represents the slope of the actual input temperature relative to the slope of the nominal input temperature. When the slope of the actual measurement temperature is identical to the slope of the nominal temperature the slope has a decimal value of one (1.00000).

$$Code\ 1 = \frac{nominal_{slope}}{actual_{slope}}$$

Dostmann Calibrator Users Guide

The hexadecimal version of the slope is created by multiplying the slope ratio by 10,000 and converting the integer component into a 16 bit hexadecimal value.

Example:

```
Input slope ratio = 1.0000
Multiply input slope ratio by 10,000: = 10,000.00000
Integer component of slope ratio: 10,000 or 0x2710
```

Code 2

Code 2 represents the offset constant between the nominal and actual input temperatures at temperature 0 °C. The hexadecimal version is created by multiplying the temperature offset by 1000 and converting the integer component into a 16 bit hexadecimal value.

$$Code\ 2 = nominal_{zero} - actual_{zero}$$

Example:

```
Input offset = 0.5
Multiply offset by 1,000: = 500.0000
Integer component of offset: 500 or 0x01F4
```

Data Range

The data range field describes the band of the input temperatures around the best fit line of the actual data. This output is provided in order to help spot input entry errors and can also be useful in uncertainty calculations.

Single Temperature Offset Calibration

The calculation of the calibration codes can be done using a single sample of temperature. The slope in this case is set to either the nominal slope or the existing slope if the append option is enabled. This option allows the ability to fine tune of the temperature offset following a combined update of the offset and slope.

This option should not be necessary if the following is true:

- The calibration sample points fall on both sides of 0 °C.
- One or more of the sample points is at or close to 0 °C
- The range of sample points is relatively large.

The range of sample points used is important to the reliability of the data slope. If sample points of 10 °C, 30 °C and 50 °C are used this has a range of 40 °C to an absolute range of 50 °C which is a ratio of 80%. If sample points of 15 °C, 20 °C, and 25 °C are used the range is only 10 °C as compared to an absolute range of 30 °C which is a ratio of only 33%.

Dostmann Calibrator Users Guide

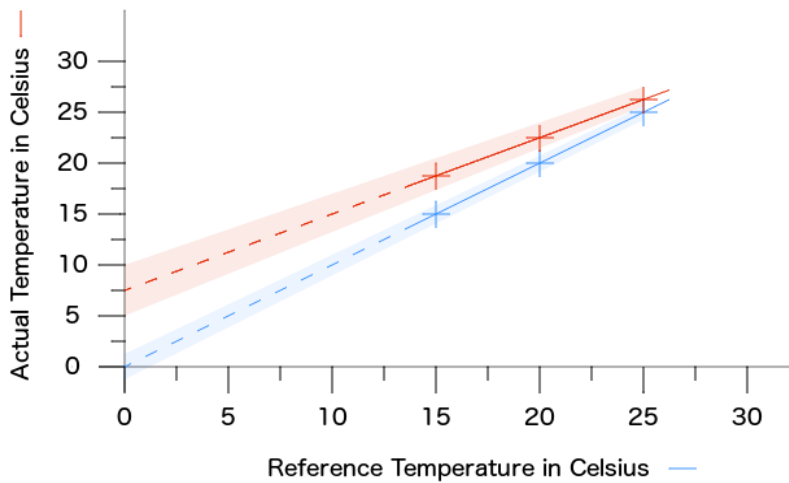


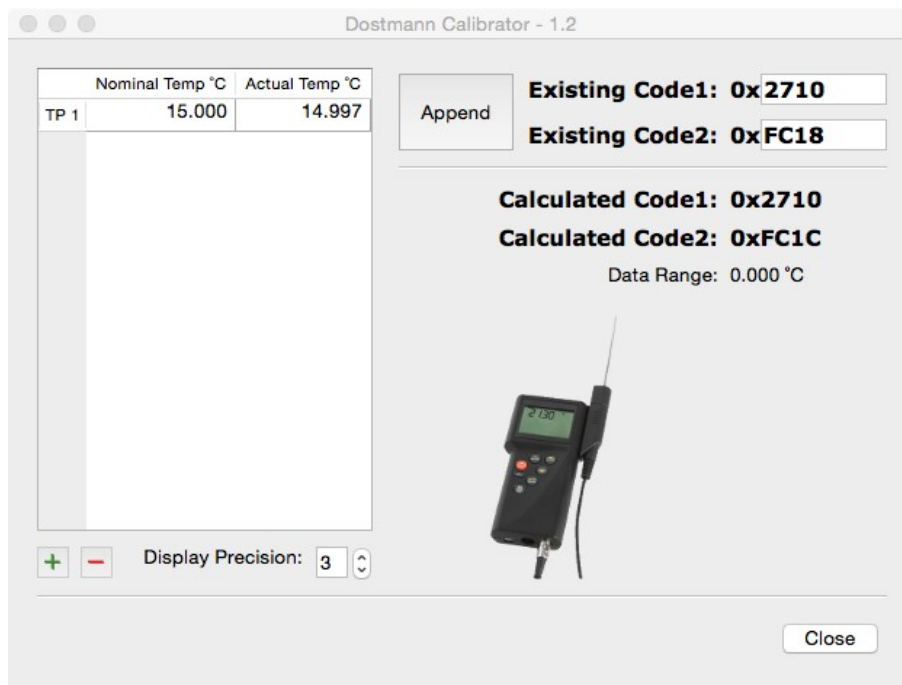
Figure 2: Example of an extrapolation error where measurement uncertainty increases the potential range of the offset code.

In the example shown in illustration 2 the measurement points are contained within a small range of 15 °C to 25 °C. The calculation of the slope is reasonable but when extrapolated to 0 °C the measurement uncertainty is amplified and increases the potential range of the calculated offset code.

The recommended procedure to deal with this is the following:

- Collect and enter into the Dostmann Calibrator utility program the two or more data points used to calculate *Code1* and *Code2*. Enter the new codes into the thermometer.
- Verify the first data point using the new codes. If a difference between the reference temperature and what is reported by the thermometer is found that is greater than expected then update the offset code by the following:
 1. Toggle the *Append/Replace* button to *Append* and enter the new *Code1* and *Code2* values that are currently contained in the thermometer.
 2. Remove all but one temperature sample input field and enter the nominal and measured temperatures. The *Code2* field will be updated with a new offset value while the *Code1* field will contain the existing *Code1* slope value. Update the thermometer with the new *Code2* value and retest.

Dostmann Calibrator Users Guide



Drawing 1: Example of updating using a single sample point.

The existing codes fields should always contain the codes that are currently installed on the thermometer.

Dostmann Calibrator Users Guide

Revision History

Date	Version	Changes
Jan 16, 2016	1.0	New Program
May 18, 2016	1.1	Added option to append to existing correction codes.
Aug 16 ,2016	1.1-1	Correction of documentation for null code values.
Sep 3, 2018	1.2	Added option for single input temperature for offset only calculations.