Sea & Sun Technology's Calibration Utility Program

CalUP 1.2

General :

The calibration of sensors for probes from "SST Sea & Sun Technology" , "ME Meerestechnik Elektronik" and "ADM Analoge Digitale Meßsysteme" is done by an approximation calculation of first to fifth order. The binary (integer) output of the selected sensor is compared to the physical value of a well-calibrated reference sensor at several levels of the intended range of the sensor. The integer values and the values of the reference sensor are logged in pairs and give the database for this calibration process. The more data is logged spread over the entire range of the sensor, the more accurate the calculated results are. The calculated calibrational coefficients are those of a polynom of the same order as the approximation. Most sensors are linear enough to use an approximation of first or second order, normally not more than third order approximation is used (e.g. for NTC) in the calibrational processes at the above noted companies.

The Main Menu :

The "File" menu gives the choice to start a new calibration from scratch ("New") or to load a previously generated file ("Open") for editing or new calculation. After the calculation process is complete, the entered or edited input data can be saved to file either by overwriting the previous contents ("Save") or by generating a new file ("Save as ... ").
With ("Exit") you leave the program after a safety confirmation question if any new data has been entered during program run.
The "Result" menu is accessible only after a calculation had been optained by use of the "Calculate" button. The results of a calibrational process can be written to a text file ("Write to file") and/or printed on (one of) the installed printer(s) ("Print").

The main window :

The CalUP program shows two memo-fields. At left is the memo to enter or edit the pairs of (integer) rawdata and (floating-point) reference values. In this field new values can be written or existing numbers can be edited just like in a word processor program. Data can be imported, too, by the clipboard functions of the operating system. One line contains one pair of values, the first value has to be the integer rawdata and the second the corresponding value of the reference sensor. The format of both numbers can be "integer", "floating point" or "scientific(with exponents)". Both numbers have to be separated by one or more "SPACE" characters. The sequence of the lines of pairs is irrelevant for the computation process. Any line starting with a semicolon ";" sign is ignored by the program and serves e.g. as a comment to remember the name of the

probe and the sensor and the date of the calibration. The total number of lines is virtually unlimited.
The input- and result windows can be resized by the use of the splitter between those windows and by resizing the application window itself.

The "ME-Offset" :

The CalUP program supports approximation up to fifth order and the use of the so-called "ME-Offset (32768)". This offset was introduced by company "ME" to overcome shortcomings of the compilers of past times using "Intel 8080" compatible microprocessors (8080, 8085, Z80) in the "DeckUnits" of that time. To maintain compatibility it was used by ME even after those times were gone and the "ME-Multipar" program was used on PC's. This offset has the effect of shifting the range of the rawdata integer values from 0 .. 65535 to the range -32768 .. 32767.

Note :

This offset is only necessary for ME-probes and their corresponding programs. SST's Standard Data Acquisition program SST-SDA can handle calibrational coefficients with and without "ME-offset". If a probe is defined as "produced by ME" this offset is used automatically by SST-SDA.

The calculation :

When all pairs of numbers are entered (or edited) the order of approximation shall be selected by using the up/down buttons of that field. Pressing the "Calculate" button then starts the computation process and writes the results in the right memo field. The result field lists the comments of the input data at the top, the use of an offset and the calibrational coefficients A[0] to A[5] (the actual number is depending on the selected order of approximation) .
Beneath that the result field lists the pairs of rawdata and reference values with a line-number and the value of the sensor calculated from the rawdata and the calibrational coefficients by a polynom of the selected order. The next column lists the difference between this calculated value of the sensor and the entered value of the reference sensor.
The squares of those differences are summed up and are calculated to give the "standard deviation" for this calibration as a quality characteristic. This is written at the bottom of the right memo field.
The "Calculate" button can be used several times with different values for order of approximation or use of the "ME-Offset" to compare the results of these calculations and choose the best approximation for this sensor and probe. Those results are appended to the previous results.

File output :

The entered or edited input data can be written to a file for documentation purposes with the "File" menu functions "Save" or "Save as ...". The result memo field can be saved to file and/or printed using the "Result" menu items "Write to file" and/or "Print".

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The resulting calibrational coefficients can be immediately transfered to other Windows programs (e.g. SST-SDA) using the clipboard functions.

Using the context-menu :

For an easy work with CalUP the operating system can be told to always open *.CID – files with CalUP.exe. This needs to be done only once. It is done by clicking on a *.CID file in the explorer window with the right mouse button and then using „Open with ...“. A selection window appears. Choose „Others..“ and point to the CalUP.exe program and confirm.
From now on a double-click on a *.CID – file as well as a click on the context menu item „Open“ will call CalUP.exe.