

Flocaltec CCS

Every test bench which Flocaltec supplies has been installed and calibrated with the Flocaltec Calibration Centre Software. This easy-to-operate software has evolved over the last 10 years into a highly efficient and state of the art operating system. Combining high performance hardware and accurately calibrated sensors, very low uncertainties (<0.25%) can be achieved, resulting in the perfect calibration equipment for your flow meters



Quality by measurement

All sources in the calibration process (being temperature, pressure or flow) are measured with a very high sample rate (upto 300 kHz.). The continuous stream of data is directly analysed by intelligent routines in the software for detection of stability and repeatability.

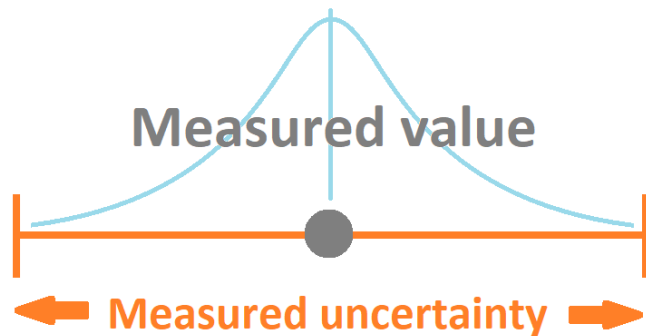
This way, validated measurements from the meter under test as well as the high end reference meters are transformed into mass flow to enable direct comparison. Individual test-results appear on the screen while the process is ongoing.

When finished, a full report will be saved into a database, can appear on screen or printed.



What is Uncertainty?

For those who are looking for explanation: No measurement is 100% exact. For example when a temperature is measured, the outcome depends on the quality of the measuring system, the procedure of the measurement, the operator skill, the environment, and other effects. If the temperature would be measured several times, using the same method and under the same circumstances, in general different temperatures would be obtained each time. (This assumes the measuring system has sufficient resolution e.g. 20,123°C instead of 20°C). The average of the repeated measurements, shown here as “Measured value” would present the best estimate of the true value. The measurement uncertainty is an absolute value, representing the “bandwidth” (e.g. 0,1°C) indicating the quality of the measurement result meaning that if the presented value would be 20°C, the true value could be in the range of 19,9 – 20,1°C.



The “Guide to the Expression of Uncertainty in Measurement” (also known as the GUM) is the descriptive document on this subject which is adopted by many National Metrology Institutes.

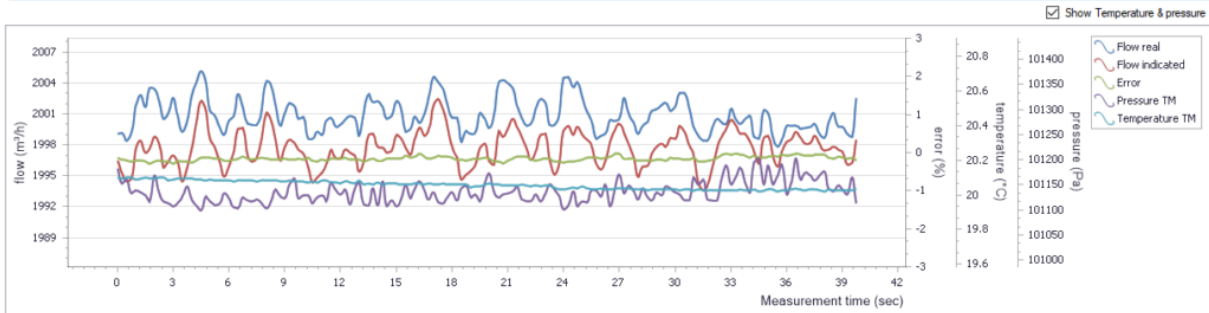
For the testbench, the total uncertainty calculation has been Validated by VSL (Dutch Metrology) and contains more than 15 contributing variables. During each calibration these factors are actively combined and calculated to present true uncertainty. (U_{tot})

Information in detail

An example of what can be achieved by the Flocaltec Calibration Centre Software is visualized by the screenshot below. The great amount of measurements being captured through the high sample rate are available to the user at the touch of a button. Per tested point they are showing the process and summary in full detail.

Here just 40 seconds of measurement time as shown in the graphic part, reveal even the smallest variations in flow, temperature and pressure. From all the measurements being taken, the summary details (top part) present the calculated minimum, maximum and standard deviations. These calculations from all sensors are forming the basis for the on board uncertainty contribution which is validated by VSL (Dutch Metrology).

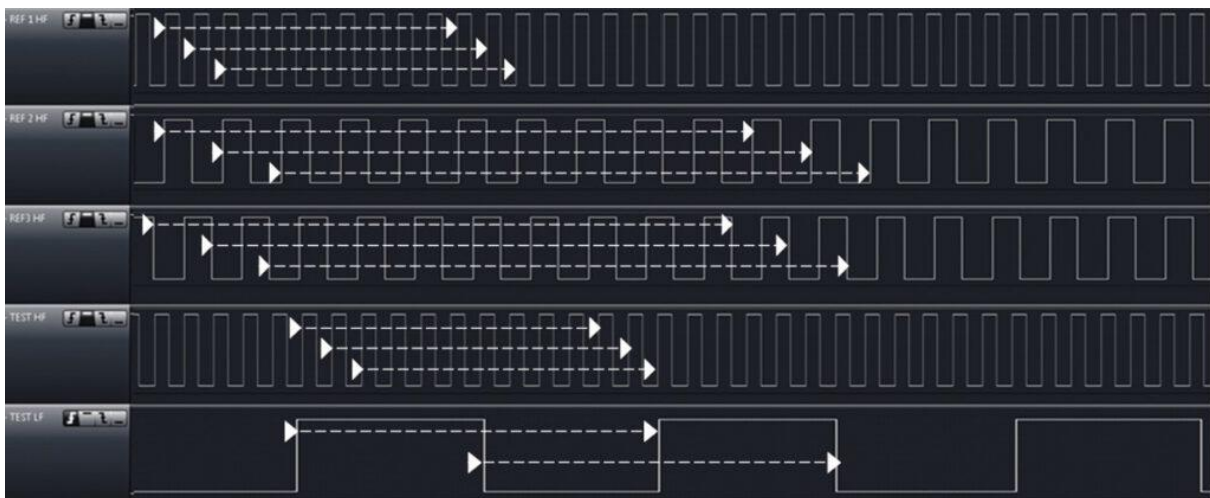
Testmeter sensor 1				Reference meter data			
Pressure				Reference meter		3	
Min / Max	(Pa)	101099 / 101203	Pulses	(pulses)	312232	Pulses	(pulses)
SDev	(Pa)	21.923	Time	(sec)	639.851	Time	(sec)
Temperature			PPU	(pulses/m ³)	879.365	PPU	(pulses/m ³)
Min / Max	(°C)	20.02 / 20.10	Flow indicated	(m ³ /h)	1997.71	Flow indicated	(m ³ /h)
SDev	(°C)	0.024	MassFlow	(kg/h)	2404.92	MassFlow	(kg/h)
Flow indicated			Pressure	(Pa)	101136	Pressure	(Pa)
Min / Max	(m ³ /h)	1993.59 / 2002.41	Temperature	(°C)	20.06	Temperature	(°C)
SDev	(m ³ /h)	1.702	Density	(kg/m ³)	1.20194	Density	(kg/m ³)
Flow real			Flow real	(m ³ /h)	2000.87	Flow corrected	(m ³ /h)
Min / Max	(m ³ /h)	1997.84 / 2005.11	Error	(%)	-0.16		
SDev	(m ³ /h)	1.626	Uncertainty	(%)	0.23		
			Repeats	(-)	39029		
			Measurement time	(sec)	40.0061		

Data samples testmeter


High accuracy pulse measurement

Using synchronous digital sampling for all pulse signals at extreme speed, precious information is gathered from the pulse train (flow pattern) during the test-run. By largely increasing the number of measurements and feeding the data through analysing routines, an even higher reliability of the measurement result can be achieved. To explain simply: Assuming that one revolution of a meter is producing 10 pulses. From each revolution of the meter, the Flocaltec Calibration Centre Software is able to calculate the actual flow

By starting new measurement cycles in parallel on each of the 10 pulses during a single revolution, not 10 but 100 pulses are available for each revolution during the process. By processing this data in a revolutionary way, the footprint of the meter is captured and can be used for high resolution measurement. Statistical treatment for data correlation is validated by VSL (Dutch Metrology) and is included in the resulting uncertainty contribution.

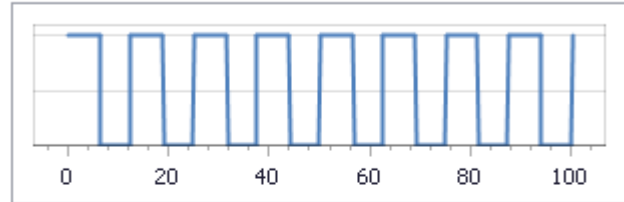


User friendly operation

Since Flocaltec CCS has been around for over 10 years it has been continuously improved. One of the main items that are taken into account is the user experience. Flocaltec highly appreciates the feedback from our customers and will use this for future updates and improvements.

Flocaltec CCS software is easy to operate and user friendly. Every person should be able to control the system and work with the test bench. Simple screens with clear instructions are easy to understand and work with. In addition User defined models are available to support recurring calibration jobs.

Sensor fingerprint



Wave	Up ratio	Down ratio
1	6.49%	5.97%
2	6.59%	5.88%
3	6.71%	5.85%
4	6.71%	5.86%
5	6.63%	5.81%
6	6.77%	5.69%
7	6.54%	5.89%
8	6.52%	6.11%

Integrated features are available to see what has occurred when the result does not meet the expectations. Was there something wrong with the flow or maybe with one of the sensors? Taking a look at the 'fingerprints' of the signals it can easily be solved.



Certified software

The Flocaltec testbenches have been analysed and verified by the Dutch National Metrology Institute (VSL) and certified according to the ISO 17025 accreditation. The metrological part (calculation of error, uncertainty, etc.) of the Flocaltec CCS software bears a separate version which will only be modified after verification and approval of VSL. Under the regime of Mutual Recognition Agreement (MRA), acceptance by other National Metrology Institutes should be easy.

For more information and members of the MRA, please refer to <https://www.bipm.org/en/cipm-mra>



Guarantee of software by Escrow

In this digital world of nowadays one of the most important questions is: How can we guarantee our business can continue? To answer this question Flocaltec offers an Escrow solution.

An Escrow agreement is worldwide know as a digital vault in which source codes can be stored to make sure they will not be lost if something happens to the developer.



Flocaltec also stored it's Flocaltec CCS source code in an Escrow vault and every three months the source code will be verified to determine this is the last version and still functional. Customers with an Escrow agreement regarding this source code are able to receive the source code if Flocaltec for some reason will not be able to give support or maintain the software anymore.

