Beamex

Calibration White Paper

www.beamex.com
info.beamex.com

07
January 2007

Calibrating fieldbus transmitters

beamex
World-class calibration solutions

Calibrating fieldbus transmitters

Fieldbus is becoming more and more common in today's instrumentation. But what is fieldbus and how does it differ from conventional instrumentation? Fieldbus transmitters must be calibrated as well, but how can it be done? Until now, no practical solutions have existed for calibrating fieldbus transmitters, but now Beamex has introduced the world's first fieldbus calibrator – the MC5 Fieldbus Calibrator.

Fieldbus is becoming more and more common in today's instrumentation. But what is fieldbus and how does it differ from conventional instrumentation? Fieldbus transmitters must be calibrated as well, but how can it be done? Until now, no practical solutions have existed for calibrating fieldbus transmitters, but now Beamex has introduced the world's first portable fieldbus calibrator – the MC5 Fieldbus Calibrator.

Conventional transmitters can deliver only one simultaneous parameter, one way. Each transmitter needs a dedicated pair of cables, and I/O subsystems are required to convert the analog mA signal to a digital format for a control system.

Fieldbus transmitters must be calibrated as well, but how can it be done?

Fieldbus transmitters are able to deliver a huge amount of information via the quick two-way bus. Several transmitters can be connected to the same pair of wires. Conventional I/O systems are no longer needed because segment controllers connect the instrument segments to the quicker, higher-level fieldbus backbone.

Being an open standard, instruments from any manufacturer can be connected to the same fieldbus as plug-and-play.

History of fieldbus

Back in the 1940s, instrumentation utilized mainly pneumatic signals to transfer information from transmitters. During the 1960s, the mA signal was introduced, making things much easier. In the 1970s, computerized control systems began to make their arrival. The first digital, smart transmitter was introduced in the 1980s, using first proprietary protocols. The first fieldbus was introduced in 1988, and throughout the 1990s a number of various fieldbuses were developed. During the 1990s, manufacturers battled to see whose fieldbus would be the one most commonly used. A standard was finally set in the year 2000 when the IEC61158 standard was approved. The Foundation Fieldbus H1 and the Profibus PA, both used in process instrumentation, were chosen as standards.

The Foundation Fieldbus and Profibus have begun to clearly dominate the fieldbus market.

For the most part, one can say that the Foundation Fieldbus is dominating the North American markets and the Profibus is the market leader in Europe. Other areas are more divided. There are also certain applications that prefer certain fieldbus installations despite the geographical location.

Future of fieldbus

Currently, a large number of fieldbus installations already exist and the number is increasing at a huge rate. A large portion of new projects is currently being carried out using fieldbus. Critical applications and hazardous areas have also begun to adopt fieldbus.

The Foundation Fieldbus and Profibus have begun to clearly dominate the fieldbus markets. Both Foundation Fieldbus and Profibus have reached such a large market share that both buses will most likely remain also in the future. The development of new fieldbuses has slowed down and it is unlikely that new fieldbus standards will appear in the near future to challenge the position of Foundation Fieldbus or Profibus.

Recent co-operation between Foundation Fieldbus and Profibus suppliers will further strengthen the position of these two standards.

Fieldbus benefits for industry

Obviously process plants would not start utilizing fieldbus, if it would not offer them benefits compared to alternative systems. One important reason is the better return on investment. Although fieldbus hardware may cost the same as conventional, or even a little bit more, the total installation costs for a fieldbus factory is far less than conventional. This is caused by many reasons, such as reduction in field wiring, lower installation labour cost, less planning/drawing costs, and no need for conventional I/O subsystems.

Another big advantage is the on-line self-diagnostics that helps in predictive maintenance and eventually reduces the downtime, offering maintenance savings. Remote configuration also helps to support reduced downtime. The improved system performance is important criteria for some plants. There are also other advantages compared to conventional instrumentation.

Fieldbus transmitters must also be calibrated

The main difference between a fieldbus transmitter for pressure or temperature and conventional or HART transmitters is that the output signal is a fully digital fieldbus signal.

The other parts of a fieldbus transmitter are mainly comparable to conventional or HART transmitters. Changing the output signal does not change the need for periodic calibration. Although modern fieldbus transmitters have been improved compared to older transmitter models, it does not eliminate the need for calibration.

There are also many other reasons, such as quality systems and regulations, that make the periodic calibrations compulsory.

Calibrating fieldbus transmitters

The word “c alibration” is often misused in the fieldbus terminology when comparing it to the meaning of the word in metrology. In fieldbus terminology, “calibration” is often used to mean the configuration of a transmitter. In terminology pertaining to metrology, “calibration” means that you compare the transmitter to a traceable measurement standard and document the results.

So it is not possible to calibrate a fieldbus transmitter using only a configurator or configuration software. Also, it is not possible to calibrate a fieldbus transmitter remotely.

Fieldbus transmitters are calibrated in very much the same way as conventional transmitters - you need to place a physical input into the transmitter and simultaneously read the transmitter output to see that it is measuring correctly. The input is measured with a traceable calibrator, but you also need to have a way to read the output of the fieldbus transmitter. Reading the digital output is not always an easy thing to do.

When fieldbus is up and running, you can have one person in the field to provide and measure the transmitter input while another person is in the control room reading the output. Naturally these two people need to communicate with each other in order to perform and document the calibration.

While your fieldbus and process automation systems are idle, you need to find other ways to read the transmitter’s output. In some cases you can use a portable fieldbus communicator or a laptop computer with dedicated software and hardware.

In many cases, calibrating a fieldbus transmitter can be cumbersome, time-consuming and may require an abundance of resources.

Until now, no practical way to calibrate fieldbus transmitters has existed.

MC5 Fieldbus Calibrator

Beamex has introduced a revolutionary MC5 Fieldbus Calibrator, which is a combination of a multifunction process calibrator and a fieldbus configurator. The MC5 can be used for calibrating Foundation Fieldbus H1 or Profibus PA transmitters.

With the MC5 Fieldbus Calibrator you can calibrate a fieldbus pressure and temperature transmitter, as the MC5 can simultaneously generate/measure the transmitter input and also read the digital fieldbus output of the transmitter. The MC5 can also be used to change the configurations of a fieldbus transmitter. If you find that the fieldbus transmitter fails in calibration, you can also use the MC5 to trim/adjust the fieldbus transmitter to measure correctly. Being a documenting calibrator, MC5 will automatically document the calibration results of a fieldbus transmitter in its memory, from where the results can be uploaded to calibration management software. This eliminates the time-consuming and error-prone need for manual documenting using traditional methods.

The MC5 is a compact, easy-to-use and field compatible calibration solution offering also a lot of other functionality.

The MC5 can be used for calibrating Foundation Fieldbus H1 or Profibus PA transmitters.

Main advantages of the MC5 Fieldbus Calibrator

The most important advantage of the MC5 Fieldbus Calibrator is the possibility to calibrate, configure and trim the Foundation Fieldbus H1 or the Profibus PA transmitters using a single unit. Because it is a combination of a calibrator and a fieldbus configurator, the MC5 is able to perform traceable calibration on fieldbus transmitters. Fieldbus configurators and configuration software are not able to do this; they can only be used to read/change configurations. Calibration can therefore be performed by one person instead of two.

The MC5 can be used for calibrating Foundation Fieldbus H1 and Profibus PA transmitters.

The MC5 is able to calibrate stand-alone transmitters, or when they are connected to a live fieldbus as with the Foundation Fieldbus. There is no need for a separate power supply because the MC5 includes an integral power supply for powering up a stand-alone transmitter during calibration. Therefore, the MC5 can also be used during commissioning when the fieldbus and control systems are still idle.

When new fieldbus transmitter models appear on the market, customers can easily update their MC5s by entering device descriptions into them. Therefore, the MC5 is never obsolete.

Beamex's MC5 has already been on the market for a few years now, but even the oldest MC5s can be upgraded to a MC5 Fieldbus Calibrator. Therefore, an MC5 owner may not necessarily have to buy a new unit.

All of the above-mentioned features assist the MC5 Fieldbus Calibrator in saving much time and money during commissioning and maintenance in a fieldbus plant. Being a multifunctional calibrator, the MC5 can be used for various other jobs as well.

General functions of the MC5

Beamex's MC5 is an all-in-one accurate documenting multifunction process calibrator for calibrating pressure, temperature, electrical and frequency signals. The MC5 also supports HART protocol and can calibrate, configure and trim HART transmitters. The modular construction of MC5 provides flexibility for user-specific requirements.

The most important features of an MC5 include accuracy, versatility, communication with calibration software, field compatibility (IP65) and modularity.