Calibration WORLD

BEAMEX CORPORATE MAGAZINE • 2021

NO MORE ERRORS

Tackling the problem of human error in calibration data entry

BEAMEX PEOPLE

Taija Maunumäki and the Beamex MC6-T

CERTIFIED SUSTAINABLE

Beamex turns silver into gold with latest Ecovadis rating

EFFICIENCY & ACCURACY

Why Slade Industries chooses Beamex

beamex

CEO'S LETTER

A year has passed since my last editorial and the pandemic is still rattling the world, but I believe that as a global society we have shown resilience and a willingness to adapt. At Beamex we have adapted well to the so-called 'new normal', with two thirds of our people working from home and embracing the benefits of digital technologies.

I'm proud to say that the entire Beamex team has shown exceptional commitment and adaptability, and as a result we have been able to continue to grow, gain new customers, and expand our product offering. In many ways we were also lucky that before the pandemic broke we had already begun to initiate projects and put new systems in place that have helped us to digitally transform our own ways of working and support our customers in their transformation.

In this edition of Calibration World you can read about the results of some of these projects, such as updates to our LOGiCAL subscription-based calibration software, new analytics tools for our CMX calibration management software, and the ability to use CMX in the cloud. I'm also very glad to, for the first time, share some unique stories from Beamex people that I hope will give you some insight into our culture and our focus on always finding 'a better way'.

I hope you enjoy this issue of Calibration World, and remember that we very much appreciate your feedback!

Jan-Henrik Svensson
CEO, Beamex Group

CALIBRATION WORLD

Published by Beamex Oy Ab
Ristisuonraitti 10, FI-68600, Pietarsaari, Finland
Phone +358 10 550 5000, Fax +358 10 550 5404
info@beamex.com, www.beamex.com

Details and subscriptions calibrationworld@beamex.com
Layout Tenfour

Calibration WORLD

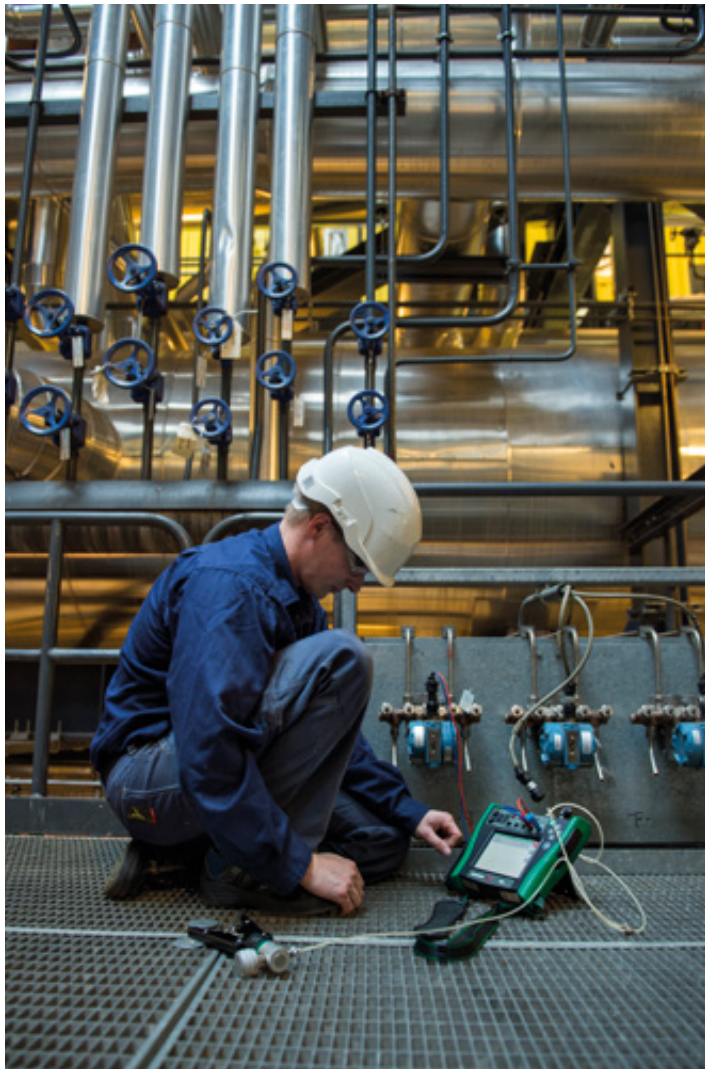
READ ONLINE
www.beamex.com/calibrationworld

NO MORE DATA ENTRY ERRORS


BEAMEX
WHITE
PAPER

NO MORE DATA ENTRY ERRORS

Many businesses still use a lot of manual entry in their industrial processes. This is despite the fact that it is commonly known and accepted that it is a slow and labor-intensive process and there are always human errors related to manual data entry.



It is commonly accepted that the typical error rate in manual data entry is about 1%. What does this 1% mean in practice in calibration processes, and how can you make it smaller, or even get rid of it? This article mainly focuses on industrial calibration processes and manual data entry related to these processes.

COMMON MANUAL DATA ENTRY STEPS IN CALIBRATION PROCESSES

To start with, let's take a look at the common ways in which data is handled in industrial calibration processes:

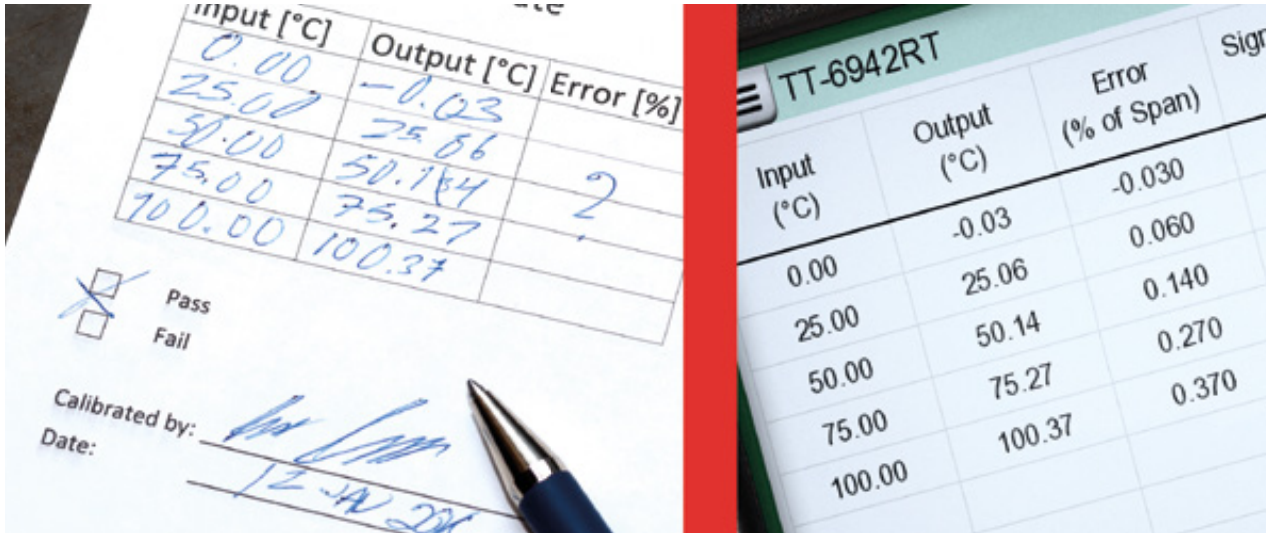
1. PEN & PAPER

It is still very common for calibration data to be captured in the field by writing it on a paper form during the calibration process. Later on, back in the workshop, the calibration data from the paper is manually typed into a computerized system, in some cases by another person.

So, with this very common process the calibration data is manually entered twice: first with a pen and paper and later when it is typed into the system.

2. MANUAL ENTRY INTO A CALIBRATION SYSTEM

Another common way is to document the calibration data by typing it into a computer system, using spreadsheet software like Microsoft Excel or dedicated calibration software. If you want to type straight into a software program you need to carry a



laptop in the field and you need to be connected to a network, which is not always possible in industrial environments.

If it is not possible to enter the data straight into the calibration application using a computer, in some cases it may be entered on a mobile device with a relevant application and then later electronically transferred into the calibration software. In this process the data is still entered manually, although only once, not twice like in the previous process.

3. ELECTRONIC STORING OF DATA

The most modern way is to use calibration equipment that can store the calibration data in its memory fully electronically. The calibration data can then be transferred from the calibrator's memory to the calibration software, again fully electronically.

This kind of process does not include any manual data entry steps. This eliminates all human error and is also faster as it does not consume the engineer's time.

This process works only for calibrations where the calibration equipment can measure (or generate/simulate) instrument input and output. If there are any gauges, indicators, displays, or similar that need to be read visually, some form of manual data entry is needed.

But even if some of the calibration data is manually entered into the calibrator, the calibrator may have a feature to check that the data is within accepted values and may also have an informative graphical indication of the data quality for easy verification.

The calibration data is then sent electronically from the calibrator to the calibration system.

In the above picture, the left side shows an example where the calibration data has been entered manually on a paper form. Possibly some numbers have been entered incorrectly, it is difficult to read some of them, and manual error calculation is difficult. Is it a pass or a fail? Who signed that? And so on.

On the right side you can see data from the same calibration performed with a Beamex MC6 Advanced Field Calibrator and Communicator. All calibration data is stored automatically and electronically in the calibrator's memory, errors are calculated automatically, the pass/fail decision is performed automatically, and the results are sent electronically to the calibration software for storing and certificate printing.

WHAT ABOUT THE 1% TYPICAL ERROR RATE?

It is obvious that there are errors in manual data entry. It seems to be a commonly accepted rule that in manual data entry human errors will cause a 1% average error rate.

This error rate is based on research published in several articles, but I must admit that I don't know the scientific background for it. While we can argue about what the real error rate is, we can all agree that there are always errors in manual data entry.

After reading about this 1% error rate in a few places, it got me thinking about what this means for calibration processes. So, let's stick with that 1% average error rate in the following considerations.

The error rate can grow quickly if the data to be entered is complicated, if the user is tired or in a hurry, and for many other reasons. For example, some people (like me) may have handwriting that is difficult for others to read.

To reduce errors, companies can train employees, highlight accuracy over speed, double-check the work, ensure optimal working conditions, and naturally try to automate their processes and get rid of manual data entry.

CALIBRATION PROCESSES

Calibration data includes a lot of numbers, often with many decimals. The numbers also typically fluctuate up and down with the decimals changing all the time. Very rarely is calibration data an easy-to-enter "even" number (20 mA is more likely to be 20.012 mA). This makes it challenging to manually enter data correctly.

When calibrating a process instrument, for example a transmitter, the input and output data should be captured at the same time, which is difficult. If the values are drifting, additional error will be introduced if the numbers are not recorded at the same time.

In a process instrument calibration both input and output need be recorded, typically at five calibration points (0%, 25%, 50%, 75%, and 100%). This already makes 10 calibration data points. Other data also needs to be entered during the calibration, such as the reference standards used, environmental data, date, time, signature, etc.

On average we can say that 20 data points need to be entered during the calibration process. With a 1% error rate, this means that every fifth calibration will include faulty data.

Every fifth calibration? Why is that? Because if one calibration includes 20 data points then five calibrations include 100 data points. A 1% error rate means that data is entered incorrectly once in every 100 data points entered. So, every fifth calibration will include a faulty data entry. Every fifth calibration means that 20% of the calibrations performed will be faulty, each including one faulty data point on average.

The above is true if the data is entered manually only once. But as discussed earlier, often the data is entered manually twice, first on paper in the field and then when it is transferred from the paper to the system in the workshop. This means that there are double the number of data entry points, with one calibration event having 40 data points to be entered instead of 20. This means that statistically, 40% of the calibrations made will include a faulty data entry!

Wow, so the modest-sounding 1% error rate in manual data entry means that often 40% of calibrations will include faulty data in practice.

To repeat: The 1% error rate just turned into 40%!

So, this means almost half of these calibrations will include faulty data.

If you do manual calibration data entry using the two-phase system, about 40% of your calibration records will most likely have errors. Let that sink in for a while.

In a typical process site that performs 10,000 calibrations annually, all manually entered using

the two-phase data entry process, statistically there will be 4,000 calibrations with faulty data!

Wow, that escalated quickly!

Naturally, the calibration process may be way more complicated and may contain many more data points.

If an instrument's calibration process includes 100 data points and the results are manually recorded, a 1% error rate means that statistically every calibration includes one faulty data entry! So statistically, 100% of the calibrations include a faulty data point!

SIGNIFICANT OR INSIGNIFICANT ERROR?

The significance of error varies according to the situation.

If the manually entered calibration data is wildly inaccurate it is likely going to be noticed at some point. For example, if the nominal 4 mA zero point of a transmitter is entered as 40.02 mA (wrong decimal point) that will most likely be noticed at some point, at the latest when the data is entered into the calibration system, assuming the system gives a warning when the error is too big.

But what to do then? Do you consider that it is ok to move the decimal and assume it is then correct, or does the calibration need to be repeated – which means going back to the field and doing the calibration again?

If the error is small enough, it may not be noticed anywhere in the process. Using the previous example, if the transmitter's zero point is erroneously recorded as 4.02 mA when it is actually 4.20 mA, that error may not be noticed at all. Even if the transmitter's current of 4.20 mA is out of tolerance, which should be noticed and corrective actions taken, it will not be noticed because the erroneously entered 4.02 mA is a good enough reading and the calibration will pass without any further action. This leaves the transmitter in the process continuously measuring with a too-large error.

So, in the worst-case scenario, human error in manual data entry will lead to a situation where a faulty calibration is considered as passed!

UNINTENTIONAL OR INTENTIONAL ERROR?

Most human errors in manual data entry are naturally unintentional.

It is however not totally impossible that calibration data could sometimes be intentionally entered incorrectly. Manual data entry gives the opportunity to falsify results, and it is almost impossible to stop that.

If the results are on the limits of being a pass or fail, it is possible that in some cases the data is entered so that it is a pass. Maybe a fail result would cause a lot of extra work, and maybe it is already late in the afternoon and time to go home.

For example, if you see a pressure transmitter calibration certificate with a pressure reading of 10.000 psi (or bar) and a current reading of 20.000 mA, it is probably too good to be true.

> Manual data entry is still being used in surprisingly many calibration processes, even in highly regulated industries such as the pharmaceutical and food and beverage industries, nuclear power, and many others.

I apologize for bringing up this kind of possibility, but this kind of information may be found in some publicly available audit reports. This is also something the US Food and Drug Administration (FDA) pays attention to when auditing the pharmaceutical industry.

But let's assume that the errors are unintentional human errors.

Manual data entry is still being used in surprisingly many calibration processes, even in highly regulated industries such as the pharmaceutical and food and beverage industries, nuclear power, and many others.

When entering data manually on a paper form, the paper form will not automatically alert the user if the entered data is outside of accepted tolerances. It is up to the user to notice it. The calibration system often has an alarm if the entered data is outside of accepted tolerances. At that point the calibration is already done, and it needs to be redone.

WOULD THIS ERROR RATE BE ACCEPTED IN OTHER SITUATIONS?

If we use manual data entry in our calibration processes and accept the risk of error that comes with it, would we accept the same error rate in other applications?

Would we accept that our salaries don't always come on time or are wrong? Or that our credit card repayments have a big error rate?

Obviously, these applications rely on electronic not manual data entry.

In most applications we would simply not accept the kind of error rate that comes with manual data entry. But like I said, many people still accept it in their calibration data entry process.

This article has about 15,000 characters, so with manual writing there would be about 150 errors (with a 1% error rate). Well, frankly with me writing, there would be a lot more!

Luckily I can use a computer with spellchecking and the text is also proofread by colleagues, but I am sure there are still some errors. In this text the errors don't have serious consequences, which they do with calibration data.

At the same time, industry is moving fast towards the world of digitalization, where data is more important than ever and decisions are based on data. We should also take a good look at the quality and integrity of the data we gather!

THERE HAS TO BE A BETTER WAY

What if you could avoid all human errors related to manual calibration data entry?

What if you could even avoid the intentional errors?

What if you could also save time by making the data entry process much faster?

What, you may ask, would be the cost for such a system? Can you afford it?

In return I would ask what are the costs of all the errors in your calibration data? What would be the value of such a system to you? Can you afford to be without it?

There has to be a better way.

THERE IS A BETTER WAY – THE BEAMEX WAY!

SO, WHAT ABOUT THE BEAMEX WAY? WHAT IS IT?
With the Beamex integrated calibration solution, you can replace manual calibration data entry with the most highly automated calibration data collection system on the market.

In a nutshell, the Beamex system comprises calibration software, documenting calibrators, and mobile data-entry devices, all of which communicate seamlessly. Also, the calibration software can be integrated with your maintenance management system (CMMS) to enable a paperless automated flow of calibration work orders from the CMMS to the calibration software and acknowledgement of the work done from the calibration software to the CMMS.

BEAMEX OFFERING

Visit our website to learn more about:

- The Beamex integrated calibration solution
- Beamex calibration software
- Beamex documenting calibrators
- Beamex mobile data-entry devices

RELATED ARTICLES

If you found this article interesting, check out these blog posts at blog.beamex.com:

- CMMS and calibration management integration - Bridging the gap
- Why use calibration software?
- How a business analyst connected calibration and asset management [Case Story]
- Do more with less and generate ROI with an Integrated Calibration solution
- Common data integrity pitfalls in calibration processes
- What is a documenting calibrator and how do you benefit from using one?

It all starts from you planning the work in the CMMS or the calibration software. When it is time to perform the calibration, the work orders are synchronized to documenting calibrators or to mobile devices (phones or tablets).

In the field, when you perform a calibration the calibration data is stored automatically in the documenting calibrator or manually entered on a mobile device.

If you work in a highly regulated environment, mobile devices can be provided with additional data security functions to ensure the integrity of the data. The Beamex calibration solution fulfills the requirements of 21 CFR Part 11 and other relevant regulations for electronic records, electronic signatures, and data integrity. This lowers the risk of ALCOA (data integrity) violations by identifying those using offline mobile devices by their electronic signature and by protecting the offline data against tampering – eliminating the possibility to falsify calibration records.

From the mobile devices, the calibration data can be synchronized back to the calibration software for storage, analysis, and certificate generation.

The calibration software can also send an automatic notification to the CMMS when the work is done.

Together with Beamex calibration software, the Beamex MC6 Advanced Field Calibrator and Communicator eliminates error-prone manual data-entry processes.

PRODUCT NEWS

ANALYZE
YOUR CALIBRATION DATA!

Data is today's gold. Data-based decisions should be the core of every business. The same goes for calibrations. Making strategic decisions based on data is a reliable and an efficient process. By analyzing your calibration data you will get a quick overview of all your calibrations. Do you know how well utilized your reference standards and modules are? Are the calibration intervals really optimized and how easily available are your calibration data for audits?

Beamex software data can be transferred into the Power BI analytics tool in order to make all your calibrations visible. The reports can be easily accessed, filtered, and adapted according to your specific needs. Harnessing the full potential of the calibration data will make your decision making easy. It doesn't matter whether you are a Director, Manager, Auditor, Technician or Engineer, you will all benefit from having the correct data for your daily work.

WHY USE CALIBRATION DASHBOARDS?

- **Gain quick access to your needed data and KPIs**
- **Filter data according to your needs**
- **Gain insights easily**
- **View all crucial calibration data in one place**
- **Detect potential risks/problems**
- **Access calibration history and predict trends**
- **Optimize your calibration interval**
- **Predict how an instrument will drift**
- **Schedule your work and your personnel resources**

WINNER
BEAMEX MC6-T RECEIVES INNOVATION AWARD

For 25 years the editorial staff at French magazine Mesures have judged the year's best technical innovations in categories that reflect the range of topics covered by the magazine. This year the Beamex MC6-T temperature calibrator was awarded the top prize in the physical measurements' category as the most innovative product of 2020.

The Beamex MC6-T is an extremely versatile portable automated temperature calibration system. It combines a state-of-the-art temperature dry block with a Beamex MC6 multifunction process calibrator and communicator technology. This gives it a versatility unmatched by other temperature calibrators on the market.

"We are very proud that the judges at Mesures recognized the unique innovation at the heart of the Beamex MC6-T, its originality, and the significant advantages it brings to users. The product's superior metrological specifications and performance combine temperature generation and measurement with electrical, temperature, and pressure calibration capabilities and field communicator functionality. This provides customers with a range of high-quality features in just one device," explains Jan-Henrik Svensson, CEO at Beamex.

VISIT THE MEASURE WEBSITE
www.mesures.com

LEARN MORE ABOUT THE
Beamex MC6-T

LEVEL-UP

BEAMEX MC6 FAMILY GETS A COMPREHENSIVE UPGRADE

Beamex is pleased to announce the launch of an upgrade to its HART-enabled MC6 calibrator and communicator family. The upgrade introduces a new firmware version, an upgraded processor board, and enhanced HART functionality.

The firmware upgrade includes an upgraded HART DD interpreter to enhance support for existing HART devices and ensure seamless compatibility with future devices. The new firmware can be installed free of charge on any existing MC6 family product with the optional HART communicator functionality. This functionality can be added easily thanks to the MC6's modular design.

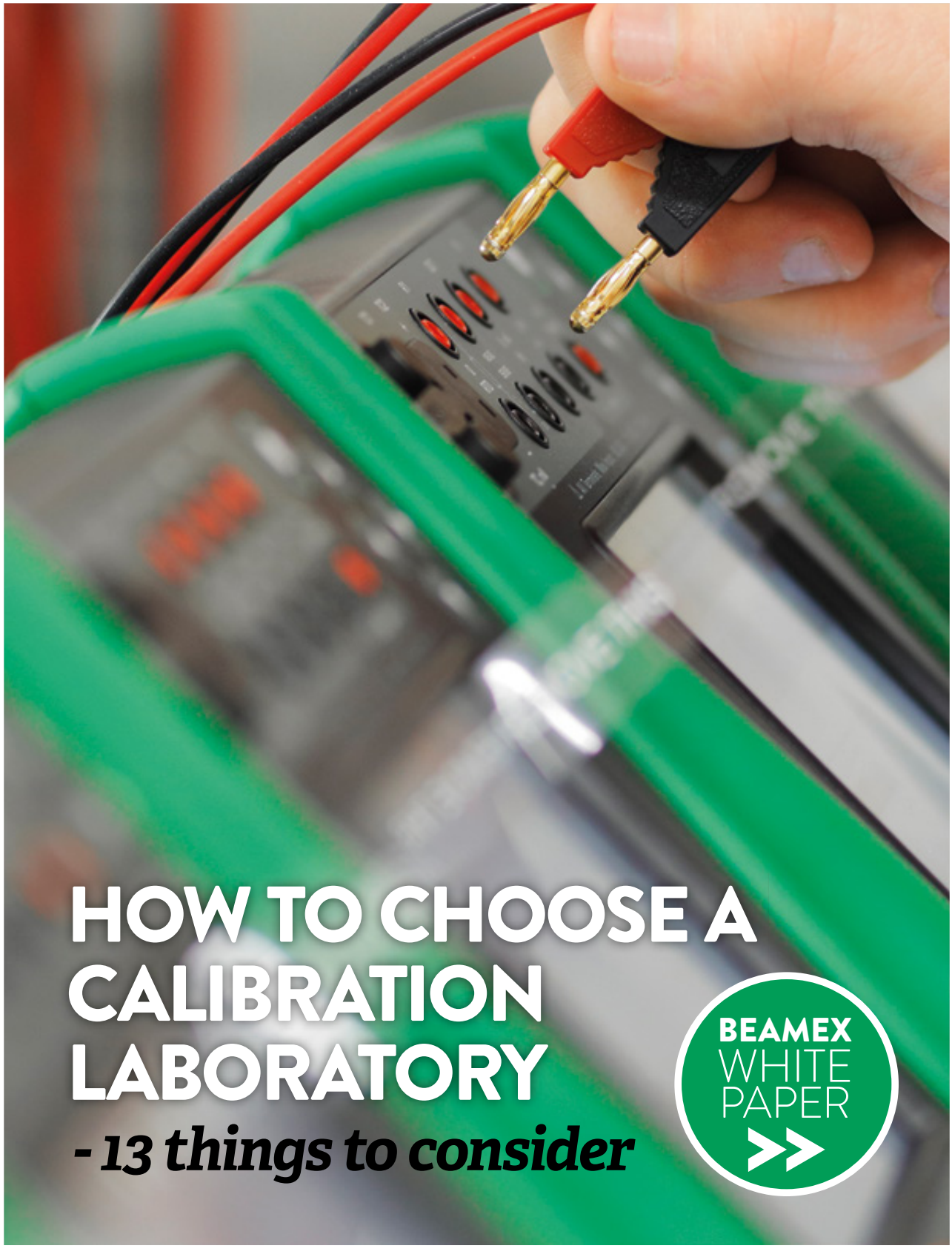
The upgraded main processor board increases the MC6's computing power and memory capacity, ensuring support for future advanced functionalities. The new main processor board will be gradually introduced for all products in the MC6 family with the exception of the MC6-Ex, which already includes the upgraded board.

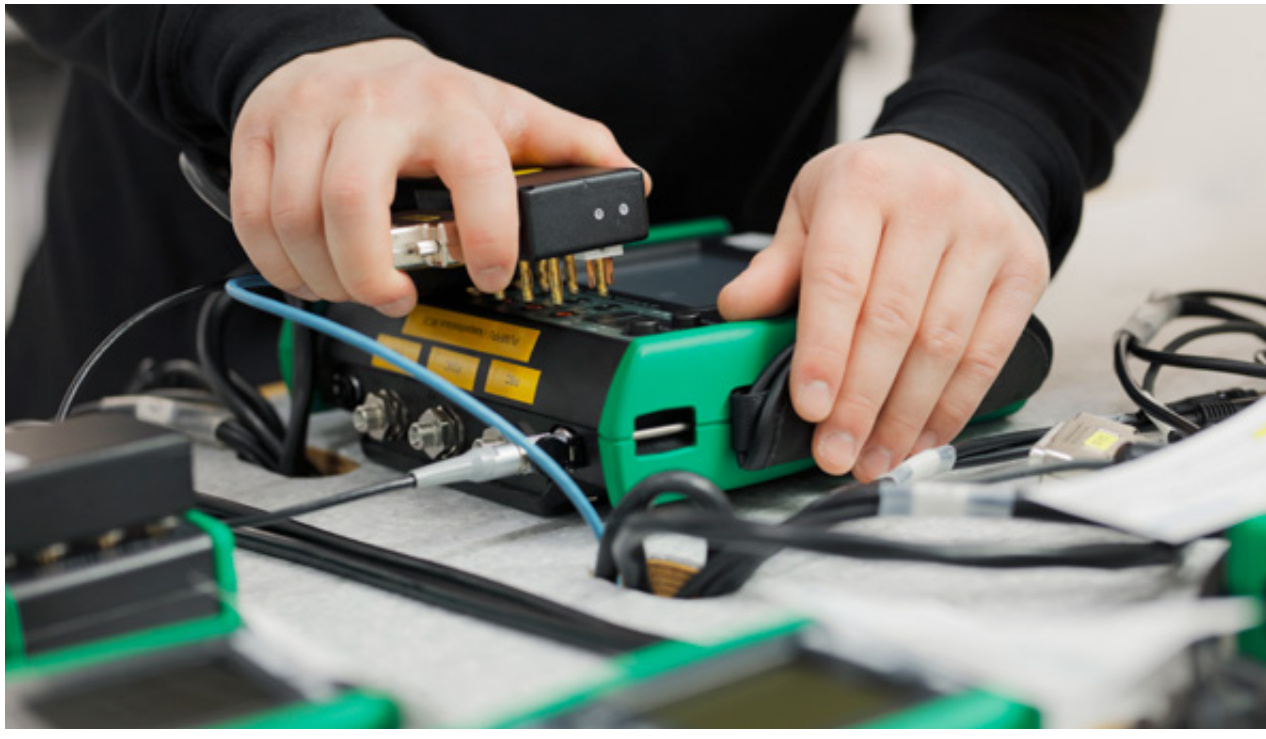
Customers with older MC6-family products can also take advantage of an upgrade package from Beamex to replace the main processor board with the upgraded version, allowing them to benefit from the new functionalities it introduces.

This upgrade further strengthens the position of the Beamex MC6 as the leading HART-enabled process calibrator and communicator on the market today.

THE MC6 PRODUCT FAMILY INCLUDES SEVERAL MODELS:

- **Beamex MC6 Advanced Field Calibrator and Communicator**
- **Beamex MC6-Ex Intrinsically Safe Field Calibrator and Communicator**
- **Beamex MC6-WS Advanced Workshop Calibrator and Communicator**
- **Beamex MC6-T Multifunction Temperature Calibrator and Communicator**


HOW TO CHOOSE A CALIBRATION LABORATORY
- 13 things to consider
BEAMEX
WHITE PAPER



So you have invested in some new, accurate calibration equipment. Great! But as with many other things in life, accuracy fades over time. To ensure that your calibration equipment serves you well and stays accurate throughout its lifetime, it needs to be recalibrated periodically. It also needs to be serviced and adjusted whenever necessary. When choosing a calibration laboratory or calibration service, you need to select one that is capable of calibrating your accurate equipment with sufficient uncertainty. We have seen the accuracy of calibrators destroyed in a non-competent laboratory. I want to help you to avoid that.

What do you need to consider when choosing a calibration laboratory? In this article I will discuss the most important things to consider to ensure accuracy for your precious calibrator or reference standard.

BACKGROUND

To match the ever-improving accuracy race of process instrumentation, calibration equipment is becoming more and more accurate. This puts more pressure on calibration laboratories as they also need to improve their accuracy to match these requirements with a sufficient accuracy ratio.

Many modern process calibrators are multifunctional, containing several quantities and multiple ranges. This is great for users as they only need to carry one multifunctional calibrator with them in the field.

But multifunctionality makes recalibration more challenging for the calibration laboratory. Not all laboratories can calibrate multiple quantities and ranges with sufficient accuracy and uncertainty.

> Multifunctionality makes recalibration more challenging. Not all laboratories can calibrate multiple quantities and ranges with sufficient accuracy and uncertainty.

Even if you choose an accredited calibration laboratory, it will not always offer the required uncertainty for all the ranges.

Something that we sometimes see in our calibration laboratories at the Beamex factory is that customers have bought the most accurate and multifunctional calibrator we offer (for example the Beamex MC6 Advanced Field Calibrator and Communicator) and calibrated it in a local calibration laboratory.

The MC6 calibrator is packed with several accurate pressure, electrical, and temperature ranges, so is not the easiest to recalibrate. In some cases, the laboratories have claimed that the calibrator does not fulfill its accuracy/uncertainty specifications, but when the case is investigated it is commonly found that the laboratory's uncertainty is worse than the calibrator's uncertainty!

And even worse, we have also seen local labs adjusting the calibrators with the intention of making them "more accurate". Next time our calibration laboratory calibrates the calibrator, it is discovered that the unit was adjusted incorrectly and it is out of specifications! In some cases the customer has already been using an out-of-spec calibrator for some time, which can have serious consequences.

HOW TO CHOOSE A CALIBRATION LABORATORY – 13 THINGS TO CONSIDER

1. MANUFACTURER'S LABORATORY

One good way to choose a calibration laboratory is to use the equipment manufacturer's laboratory, if that is practical. The manufacturer knows all the ins and outs of the equipment and has the capability to calibrate it, and they can also do any service or maintenance work that may be required. Also, using the manufacturer's calibration service does not jeopardize the warranty of the equipment; they may even offer an extended warranty.

It is however not always possible or practical to use the manufacturer's calibration laboratory, so let's discuss some other considerations.

2. LABORATORY ACCREDITATION

Choosing a calibration laboratory or service that has accreditation is the most important thing to start with, especially if it is not possible to use the manufacturer's calibration laboratory.

Calibration laboratory accreditation is carried out by a formal third-party authority to ensure that the laboratory meets all the requirements of the relevant standards. Laboratory accreditation is so much more than "just a piece of paper".

Formal accreditation guarantees many things that you would otherwise need to check if the laboratory didn't have accreditation. For example, accreditation ensures, among other things, that the laboratory fulfills the requirements of the relevant standards, has a quality system and follows it, has appropriate operating procedures, has a training program and training records for staff, can evaluate calibration uncertainty, and maintains traceability to national standards.

Without accreditation you have to take care of all these things yourself, which is a huge task.

Calibration laboratories are commonly accredited according to the international ISO/IEC 17025 standard.

ILAC is the international organization for accreditation bodies operating in accordance with ISO/IEC 17011 and involved in the accreditation of conformity assessment bodies including calibration laboratories (using ISO/IEC 17025).

It is important to remember that accreditation does not automatically mean that the laboratory has sufficient accuracy and uncertainty to calibrate your calibration equipment!

So, even though accreditation is an important box to tick, it is not enough on its own. The burden is still on you to judge the calibration laboratory's capabilities.

3. CALIBRATION UNCERTAINTY

Even when using an accredited calibration laboratory, you need to make sure that the laboratory can calibrate your calibration equipment with sufficient and appropriate uncertainty.

There are many accredited calibration laboratories that do not offer good enough uncertainty to calibrate all the ranges of a modern multifunctional calibrator such as the Beamex MC6 family of calibrators.

If the laboratory is accredited, it will have a public "Scope of Accreditation" document listing all the uncertainties they can offer for different quantities and ranges. That list should be evaluated before proceeding further.

If the laboratory is not accredited, you will need to discuss with the laboratory to find out what kind of uncertainty they can offer and if it is sufficient for your needs.

The calibration uncertainty needs to be documented on the calibration certificate. It is then up to you to decide what kind of uncertainty ratio you can accept between the laboratory's calibration uncertainty and the uncertainty specification of the equipment. The most common uncertainty ratio is 1 to 4, i.e., the laboratory is four times more accurate than the equipment to be calibrated, or the laboratory's uncertainty is only one quarter of the equipment's uncertainty. In practice that is often not possible for all ranges, so you may need to accept a smaller uncertainty ratio.

The most important thing is to know the laboratory's uncertainty, make sure it is better than the equipment's specifications, and ensure it is documented on the calibration certificate.

4. CALIBRATION CERTIFICATE

The calibration certificate is the document you get from the calibration, and it should include all the relevant information on the calibration.

Again, if the laboratory is accredited, you don't need to worry too much about the calibration certificate as an accredited laboratory will follow standards and the calibration certificate content is one of the many audited items included in the laboratory's regular accreditation audit.

The basic things on the calibration certificate include:

- **The title: "Calibration Certificate"**
- **Identification of the equipment that has been calibrated**
- **The calibration laboratory's contact information**
- **Identification of the calibration methods used**
- **Calibration data covering all the calibrated points, i.e., the laboratory's reference standard's "true value" and the indication of the equipment that has been calibrated**
- **The found error at each point, i.e., the difference between the reference standard and the calibrated device**
- **The total calibration uncertainty (presented in the same unit as that of the measurand or in a term relative to the measurand, e.g., percent) including all the calibration uncertainty components, not only the reference standard, preferably calculated separately for each calibration point**
- **Signature of the person(s) that performed the calibration, the calibration date, and details of the environmental conditions during the calibration process**

5. PASS/FAIL JUDGMENT

When you send your calibration equipment for calibration, you obviously want to know if the equipment fulfills its accuracy/uncertainty specifications. Although this sounds obvious, I have seen customers who have had their equipment calibrated and the calibration certificate archived without evaluating if the equipment is still as accurate as it is assumed to be.

So please make it a practice to carefully review the calibration certificate before filing it away and taking your calibrator back into use.

The Pass/Fail judgment is not all that common in calibration laboratories, accredited or not.

If the certificate does not include the Pass/Fail judgment, it is then your job to go through all the points on the calibration certificate and to compare the found error against the equipment specifications.

The calibration uncertainty also needs to be taken into account in this comparison – the equipment may be within the specifications, but when the calibration uncertainty is taken into account it is not anymore.

So, take a careful look at the found error and the total uncertainty for each calibration point.

There are different ways to take the calibration uncertainty into account in the Pass/Fail judgment. The ILAC G8 (Guidelines on Decision Rules and Statements of Conformity) standard specifies how accredited laboratories should take it into account.

6. ADJUSTMENT

When the calibration laboratory receives your equipment, they will first calibrate all the ranges of the equipment and document the results on the calibration certificate. This is often called the As Found calibration.

But what if the calibration equipment is found to fail at some point(s), i.e., it does not meet its accuracy specifications?

Naturally, the laboratory needs to be able to judge if some calibration points are out of the specifications.

Does the laboratory have the capability, tools, and know-how to adjust the calibration equipment so that all the ranges are within the specifications?

Is the equipment adjusted only if it fails the As Found calibration, or is it also adjusted if there is drift and a risk that it would drift outside of the specifications by the time of the next recalibration?

Most calibration laboratories do not optimize the equipment by adjusting the ranges if they are still within the specifications but have some error. This can cause the equipment to drift out of the specifications and fail before the next recalibration.

Some calibration equipment can be difficult to adjust and may require special tools and knowledge.

If the laboratory is not able to do this kind of adjustment you will need to send the equipment elsewhere, possibly to the manufacturer. This will obviously result in a delay and add costs.

If the laboratory can make the required adjustment, will it mean additional costs for you?

You should find out whether the laboratory can perform the required adjustments before sending your equipment for calibration.

This goes for accredited and non-accredited calibration laboratories alike.

7. AS FOUND / AS LEFT CALIBRATION

If the adjustment mentioned in the previous section is done after the As Found calibration, the equipment needs to be calibrated again after the adjustment is done. This is called the As Left calibration.

Will the calibration laboratory perform both As Found and As Left calibrations if necessary? Are both As Found and As Left calibration included in the calibration price, or do these cost extra?

8. TURNAROUND TIME

The turnaround time of the calibration laboratory is another consideration. This also includes the time for transportation both ways. You don't want your equipment to be out of service for too long.

9. BRAND AND REPUTATION

The calibration laboratory's brand and reputation are also something that will affect the choice you make, especially if you don't have previous experience of that calibration laboratory.

10. PRICE

Price is another factor in the selection process. Don't just compare prices, but take into account what you will get for that price.

11. REPAIRS, SERVICE, AND MAINTENANCE

Is the calibration laboratory also capable of performing repairs or other maintenance, if needed? This also includes firmware updates and other software updates.

12. WARRANTY

Is the calibration laboratory authorized to perform warranty service for your equipment if it is still under warranty?

Most likely the manufacturer's warranty is going to be void if a third-party company services the equipment. In some cases, using authorized calibration/service centers enables you to extend the warranty of your equipment without additional costs.

Is the calibration laboratory's work covered by some kind of warranty?

13. AGREEMENTS AND REMINDERS

Does the calibration laboratory offer the possibility to make a continuous agreement for future calibrations? Will the calibration laboratory send you a reminder when it is time for the next calibration?

WHAT DO WE DO AT THE BEAMEX CALIBRATION LABORATORY?

The Beamex factory calibration laboratory in Finland has been ISO 17025 accredited since 1993 and serves as the standard for the Beamex USA calibration laboratory with over 30 years of experience in calibrations and repairs.

Since our manufacturing facilities are in the same location as the calibration laboratory, we have a very good set of laboratory equipment and automated calibration systems that minimize the risk of human error. It would not be realistic to have that kind of equipment only for recalibration purposes.

Please note that we currently only recalibrate Beamex-manufactured devices.

Here is a short list of the things that we do at the Beamex factory calibration laboratory when we get a calibrator back for recalibration:

- **When a unit is received, it is properly cleaned and any minor service needs are taken care of.**
- **The unit is then calibrated (As Found) and an accredited calibration certificate is created.**
- **If the unit fails in some ranges, these range are adjusted; if the unit does not fail but there is some minor drift, the unit will be adjusted to improve its accuracy. If a unit passes but is close to its specification limits, it is adjusted to help prevent it drifting out of specifications by the time of the next calibration.**
- **If any ranges are adjusted, a new As Left calibration will be carried out. Most of the calibration work is automated, so we can offer a fast and reliable service.**
- **Finally, the firmware of the unit as well as any device description files are updated if needed.**

BEAMEX CARE PLAN

We offer Care Plan agreements for the calibrators we manufacture. A Beamex Care Plan is a contract for the recalibration and maintenance of Beamex equipment, ensuring the equipment stays accurate and reliable throughout its lifetime.

A Beamex Care Plan includes the following services:

- **A fixed-term contract (one or three years) – a single purchase order reduces unnecessary admin work and associated costs**
- **Annual recalibrations with an accredited calibration certificate (including As Found calibration, any necessary adjustments, and As Left calibration)**
- **Free express shipments to and from the Beamex factory**
- **Free repairs, even in the case of accidental damage**
- **Extended warranty**
- **Replacement of wear parts**
- **Annual email notification when a calibration is due – allowing you to schedule your recalibration needs around any potential outages**
- **Relevant updates of firmware, device description files, and so on, ensuring your device has the latest features**
- **Priority help-desk services**
- **Priority service – expedited turnaround times**

BEAMEX OFFERING

Visit our website to learn more about:

- The Beamex Care Plan
- The Beamex Service Portal
- Beamex Calibration and Repair Services

RELATED ARTICLES

If you found this article interesting, check out our article on Calibration uncertainty for dummies and more at blog.beamex.com.

A Beamex Care Plan helps to keep your equipment accurate and reliable.


Matti Hautakangas
beamex

PRODUCT NEWS

LOGiCAL
MAKES EVERYTHING EASIER

Beamex LOGiCAL, launched in mid-2020, is a modern subscription-based (SaaS) calibration software solution that helps companies streamline and digitalize their calibration processes. The software synchronizes with Beamex documenting calibrators and supports the Beamex bMobile calibration application. LOGiCAL is the culmination of Beamex's 40 years of experience in developing calibration software.

In the six months since its launch, LOGiCAL has already achieved tremendous success, with hundreds of users from companies of all sizes completing thousands of calibrations with the help of the software.

As evidence of Beamex's commitment to continuously developing LOGiCAL, a new update (2.0.2) has been released that introduces several improvements requested by users. These include improvements to calibration certificate layout and IDs, upgrades to work management and instrument data management, subscription enhancements, and enhancements to mobile device synchronization. It supports more than ten user-interface languages, and more are coming. In total, the update introduces almost 20 improvements and some fixes.

"The cost for LOGiCAL scales based on how much you calibrate, which makes it easy to understand and budget for. The price consists of a base subscription fee plus a fixed cost for each calibration result that is uploaded. We have also integrated the option to buy online, which means that you can adjust your plan whenever you wish. Since Beamex is hosting the service, you will not need to invest in comprehensive IT infrastructure. Basically, you just sign up and start using it, which has been made even easier with a free trial," highlights Jonas Heinola, Commercial Manager for LOGiCAL

LEARN MORE ABOUT
LOGiCAL

LOGiCAL communicates with calibrators and mobile phones/tablets, allowing seamless movement between on-line and off-line environments and enabling a digital calibration process even when there is no access to the internet. The software uses web service technologies that enable calibrations to be configured and performed using any device with a web browser connected to the internet. LOGiCAL is compatible with most browsers.

"We are excited to bring truly revolutionary technology to the market that delivers a very high value to customers that are currently using a pen and paper or manual processes for calibration. LOGiCAL makes it easy and inexpensive for everyone to take their first steps towards a streamlined and digitalized calibration process," says Jan-Henrik Svensson, CEO of Beamex Group.

WE CARE

PROTECT YOUR INVESTMENT WITH A BEAMEX CARE PLAN

A Beamex Care Plan offers an easy way for customers to maintain the accuracy and reliability of their Beamex calibration equipment throughout its lifetime. With a Care Plan in place, customers can ensure that the metrological traceability of their critical calibration equipment is maintained with periodical recalibrations. They also benefit from the assurance that necessary maintenance and repairs will be covered by Beamex. The new enhancements make purchasing a Beamex Care Plan easier and more affordable, with new fixed-price options available. For added flexibility, in addition to the existing three-year plan, customers can also purchase their plan annually.

In addition, the Beamex Service Portal has been updated to make it easier for customers to ship units to Beamex for Care Plan maintenance. Beamex calibrators covered by a Care Plan are recalibrated at the ISO 17025 accredited Beamex calibration laboratory in Finland, which offers the level of accuracy and uncertainty required by modern multifunctional calibrators.

> A Beamex Care Plan makes life as easy as possible for our customers by ensuring that their Beamex measurement equipment remains accurate and reliable throughout its lifetime. It gives our customers extra peace of mind and now, with our new options, even greater flexibility to purchase a Care Plan that fits their needs perfectly. Anders Nyman, Manager, Laboratory Services, Beamex.

FOR MORE INFORMATION ON THE BEAMEX CARE PLAN, PLEASE VISIT

www.beamex.com/services/equipment-care-plan/

How to calibrate a

TEMPERATURE SWITCH


BEAMEX
WHITE
PAPER

How to calibrate a

TEMPERATURE SWITCH

Temperature switches are commonly used in various industrial applications to control specific functions. As with any measuring instrument, they need to be calibrated regularly to ensure they are working accurately and reliably – lack of calibration, or inaccurate calibration, can have serious consequences. Calibrating a temperature switch is different from calibrating a temperature sensor or transmitter, for example. This article aims to explain how to properly calibrate a temperature switch. Let's start!

HOW DOES A TEMPERATURE SWITCH WORK?

In short, a temperature switch is an instrument that measures temperature and provides a required function (a switch opens or closes) at a programmed temperature.

One of the most common temperature switches is the thermostat switch in an electric radiator. You can set the thermostat to the required temperature and if the room is colder than the set temperature, the thermostat will switch the radiator on; if the room temperature is higher than required, the thermostat will switch the radiator off.

In practice, there is a small difference between the set and reset points so that the control does not start to oscillate when the temperature reaches the set point. This difference is called hysteresis, or deadband. In the above radiator example this means that when the thermostat is turned to 20 °C (68 °F), the radiator may start heating up when the temperature is below 19 °C (66 °F) and stop heating up when the temperature reaches 21 °C (70 °F), showing a 2 °C (4 °F) deadband.

Naturally, there are many different applications for temperature switches in industry.

THE MAIN PRINCIPLE OF TEMPERATURE SWITCH CALIBRATION

We will investigate the details of temperature switch calibration later in this article, but to start, let's briefly summarize the main principle to remember when calibrating a temperature switch.

To calibrate a temperature switch you need to slowly ramp the temperature at the switch input (the temperature-sensing element) while simultaneously measuring the switch output to see at which temperature it changes its state. Then you need to ramp the temperature back down to find the "reset" point where the switch reverts to its original state.

When the output changes state, you need to record the input temperature at that exact moment. The switch output usually only has two states, open or closed.

ESSENTIAL TERMINOLOGY

One term commonly discussed is whether a switch type is normally open (NO, or closing) or normally closed (NC, or opening). This indicates if the switch contacts are open or closed by default. Usually temperature switches are in their default position when measuring the environmental temperature. Operating points may also be referred to as set and reset points, or on and off points.

The temperature difference between the operation points is called deadband. Some difference is needed between the closing/opening operating points to prevent the switch from potentially oscillating on and off if they work at exactly the same temperature. For applications that require a very small deadband, additional logic is provided to prevent the switch from oscillating.

The switch outputs may be mechanical (open/close), electronic, or digital.

Dry/wet switches are also sometimes discussed. Dry means that the output is closed or open, while wet means that there is a different voltage level representing the two switch states.

Some switches have mains voltage over the contacts when the switch is open. This can be a safety issue for both people and test equipment, so it should be taken into account when testing the switch.

IS YOUR TEMPERATURE SENSOR SEPARATE OR ATTACHED?

As a temperature switch needs to measure temperature, it needs to have a temperature sensing element – or in other words, a temperature sensor. In some cases the temperature sensor is a separate instrument and can be removed from the switch, while in others the sensor is fixed to the switch so they cannot be separated.

These two different scenarios require very different methods to calibrate the switch.

As explained above, you need to provide a slowly changing temperature for the switch input. This will differ depending on whether the switch has a fixed temperature sensor or if the sensor can be removed.

Let's look at these two different scenarios next.

How you calibrate your temperature switch will depend on whether you are using a fixed or removable temperature sensor.

#1 - TEMPERATURE SWITCH WITH A SEPARATE/REMOVABLE TEMPERATURE SENSOR

In some cases you can remove the temperature sensor from the temperature switch. The sensor will often be a common standard sensor, such as a Pt100 sensor or a thermocouple. In these cases you can calibrate the switch without the temperature sensor by using a simulator or calibrator to simulate the Pt100 sensor signal, generating a slow temperature ramp (or a series of very small steps) as the input to the switch.

Naturally you also need to calibrate the temperature sensor, but that can be done using normal temperature sensor calibration at fixed temperature set points without needing to slowly ramp the temperature up and down, which makes the sensor calibration much easier (and results in less uncertainty).

In accurate applications, the switch may be compensating for RTD sensor error by using correction coefficients, such as ITS-90 or Callendar van Dusen, so when simulating the temperature sensor your sensor simulator should be able to take this into account.

You can calibrate the sensor and switch together as a loop; you don't have to calibrate them separately. But if you don't have a system that generates a slow, controlled temperature ramp, it is easier to calibrate them separately.

If the removable temperature sensor is a not a standard sensor type (neither an RTD nor a thermocouple), then you can't really calibrate the sensor and switch separately as you can neither measure nor simulate the signal of the non-standard sensor. In that case you need to calibrate them as one instrument when they are connected

#2 - TEMPERATURE SWITCH WITH AN INTEGRATED/FIXED TEMPERATURE SENSOR

If your temperature sensor is fixed to your temperature switch and cannot be removed, you need to calibrate the whole setup as one instrument. In that case you need to generate a temperature ramp with a temperature source that you insert the temperature sensor into.

HOW TO CALIBRATE TEMPERATURE SWITCHES

BEFORE CALIBRATION

As with any process instrument calibration, before starting, isolate the measurement instrument from the process, communicate with the control room, and make sure the calibration will not cause any alarms or unwanted consequences.

Visually check the switch to ensure it is not damaged and all connections look ok. If the sensor is dirty, it should be cleaned before inserting it into the temperature block.

GENERATE A SLOW TEMPERATURE RAMP AS INPUT

If you are calibrating the temperature switch and its temperature sensor together, you need to generate a slow enough temperature ramp in the temperature source where you install the switch's temperature sensor. This means you need to have a temperature source that can generate a controlled temperature ramp at a constant speed, as slow as the application requires.

In practice you can quickly reach a temperature set point close to the calibration range, let the temperature fully stabilize, and then start slowly ramping up the temperature across the calibration range. After the calibration you can quickly return to room temperature.

A temperature ramp like this is most commonly generated with a temperature dry block. Not all dry blocks are able to generate a suitably slow ramp. And you also need to be able to measure the generated temperature very accurately, while at the same time being able to measure the switch output signal.

In addition, the calibration system should have the capability to automatically capture the input temperature at the exact moment when the switch output changes its state.

Not all temperature calibration systems can do all this; the Beamex MC6-T Multifunction Temperature Calibrator and Communicator can do it all fully automatically. And not only that, it can do many other things too.

Check your equipment, take things slowly, and be sure to use an external reference sensor.

USE AN EXTERNAL REFERENCE TEMPERATURE SENSOR – DON'T USE THE INTERNAL ONE!

Temperature dry blocks always have an internal reference sensor, but do not use this when calibrating temperature switches! The internal reference sensor is located in the bottom part of the temperature block, which is heated and/or cooled. The internal reference sensor is also usually close to the heating/cooling elements, meaning that it responds quickly to any temperature changes.

From the temperature block, the temperature will transfer to the insert and from the insert it will transfer to the actual temperature sensor. This means that there is always a significant delay (lag) between the internal reference sensor and the sensor being calibrated, which is located in the hole in the insert.

In a normal sensor calibration done at fixed temperature points this delay is not so critical, because you can wait for the temperatures to stabilize. But for temperature switch calibration this delay has a huge impact and will cause significant error in the calibration result!

Instead of using the internal reference sensor, you should use an external reference sensor that is installed in the insert together with the switch's sensor to be calibrated. The external reference sensor should have similar characteristics to the temperature switch sensor so that they behave in the same way, with a similar lag.

At the very least make sure that the dimensions of the reference sensor and temperature switch sensor are as similar as possible (e.g., similar length and diameter). Ensuring that the sensors have the same length means they will go equally deep into the insert. Different immersion depths will cause error and uncertainty in the calibration. Naturally, the reference temperature sensor also needs to be measured with an accurate measurement device.

MEASURING THE SWITCH OUTPUT

Once you have the input temperature ramp figured out, you also need to measure the switch output terminals and their state.

With a traditional open/close switch, you need to have a device that can measure if the switch contacts are open or closed. If the switch is a more modern one with an electrical output, you need to be able to measure that. That may be current measurement for an mA signal, or voltage measurement for a voltage signal.

As the switch output has two states, you need to have a device that can recognize and measure both.

CAPTURING THE OPERATION POINTS

To calibrate manually you need to start the temperature ramp and monitor the switch output. When the switch's status changes, you need to read what the input temperature is, i.e., what the reference temperature sensor is reading. That is the operating point of the temperature switch.

Usually, you want to calibrate both operation points (the "set" and "reset" points) with increasing and decreasing temperatures to see the difference between them, which is the hysteresis (deadband).

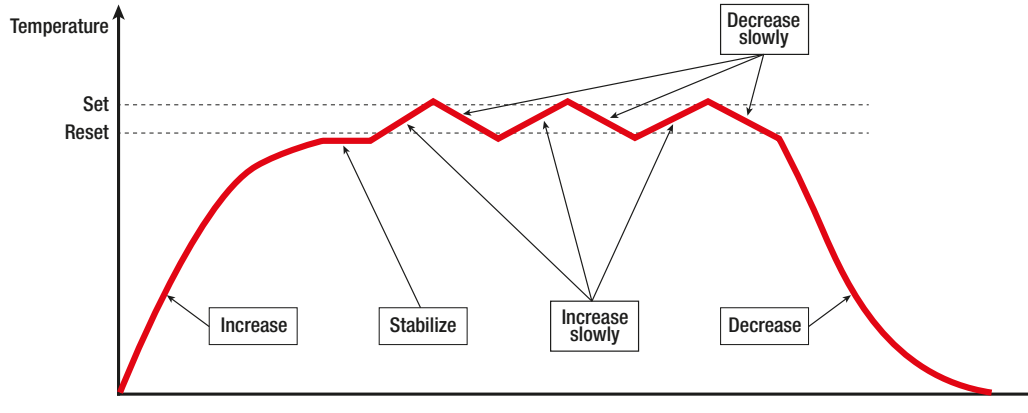
If you don't want to do that manually, then you need a system that can perform all of the required functions automatically, i.e., one that can:

- **Generate the temperature ramp up and down at the required speed within the required temperature range for the switch in question**
- **Measure the switch's output state (open/closed, on/off)**
- **Measure the reference temperature sensor inserted in the temperature source**
- **Capture the temperature when the switch changes state**

TEMPERATURE SWITCH CALIBRATION STEPS – A SUMMARY

Let's finish with a short summary of the steps needed to calibrate a temperature switch:

1. **Pre-calibration preparation (disconnect from process, isolate for safety, perform a visual check, clean the sensor if needed).**
2. **Insert the temperature switch's temperature sensor and a reference sensor into the temperature source.**
3. **Connect the switch's output to a measurement device that measures the switch's open/close status.**
4. **Quickly ramp the temperature close to the switch's operation range and wait for it to stabilize.**
5. **Very slowly ramp up the temperature across the switch's nominal operation range.**
6. **When the switch output changes status (set point), capture the temperature in the temperature source.**
7. **Slowly ramp the temperature down until the switch activates again (reset point). Capture the temperature.**



8. **Repeat steps 5 to 7 as many times as needed to find the repeatability of the switch. Typical practice is three repetitions.**
9. **Quickly ramp the temperature back down to room temperature.**
10. **Document the results of the calibration.**
11. **If the calibration fails and the switch does not meet the accuracy requirements, make the necessary adjustments, or repair or replace the switch.**
12. **Repeat the whole calibration process if adjustments were made in step 11.**
13. **Connect the switch back to the process.**

DOCUMENTING CALIBRATION, METROLOGICAL TRACEABILITY, AND CALIBRATION UNCERTAINTY

A few important reminders about temperature switch calibration, or indeed any calibration:

Documentation – calibration should always be documented; typically this is done with a calibration certificate.

Metrological traceability – calibration equipment should have valid metrological traceability to relevant standards.

Calibration uncertainty – calibration uncertainty is a vital part of every calibration process. You should be aware of how "good" your calibration process and the calibration equipment are and if the process and equipment provides low enough uncertainty for the calibration in question.

The graph illustrates an example temperature cycle during temperature switch calibration. In the beginning you can quickly reach a temperature point close to the calibration range, let the temperature fully stabilize, and then start slowly ramping the temperature up and down across the calibration range to capture the set and reset points. In this example three calibration repetitions were done to record the repeatability of the switch. After calibration you can quickly bring the temperature back down to room temperature.

BEAMEX OFFERING

Visit our website or contact us to learn more about:

- The Beamex MC6-T Multifunction Temperature Calibrator and Communicator
- Beamex CMX Calibration Management Software
- Beamex LOGiCAL Calibration Management Software

RELATED ARTICLES

If you found this article interesting, check out these blog posts at blog.beamex.com:

- Pressure Switch Calibration
- Calibration uncertainty for dummies
- Temperature Calibration [eBook]
- How to calibrate temperature sensors
- Temperature Calibration Webinars
- Metrological traceability in calibration - are you traceable?

The Beamex MC6-T Multifunction Temperature Calibrator and Communicator combines a state-of-the art temperature dry block with Beamex MC6 multifunction process calibrator and communicator technology.

LEARN MORE:
Learn how to calibrate a temperature switch automatically.

PRODUCT NEWS

CMX

CALIBRATION SOFTWARE NOW AVAILABLE IN THE CLOUD

CONTACT YOUR LOCAL BEAMEX REPRESENTATIVE TO LEARN MORE!

Did you know that Beamex CMX Calibration Management Software can also be used in the cloud?

Our all-in-one solution for planning, managing, analyzing, and documenting calibration work and assets can be used in cloud services provided by Microsoft (Azure), Amazon (Amazon Web Services), or Alibaba (Alibaba Cloud).

Using CMX in the cloud enables efficient scaling when you add new sites and means you can access the software from anywhere in the world.

GET FREE PDF COPIES OF YOUR CALIBRATION CERTIFICATES

For devices that have been calibrated in the Beamex calibration laboratory, you can request free PDF copies of the calibration certificate via our website.

This service is currently available for certificates that have a retrieval key and QR code printed on the front page and will be expanded to other products in the near future. To get your free PDF copies please complete the form at www.beamex.com/services/calibration-certificates/

Beamex CENTRiCAL

flexible, versatile calibration bench solutions

The Beamex CENTRiCAL range of workshop solutions includes motorized and fixed calibration benches, calibration trolleys, and table-top units. The modular design allows you to configure a CENTRiCAL solution for your specific needs.

beamex
A BETTER WAY TO CALIBRATE

CENTRiCAL solutions include:

- Calibration benches for temperature, pressure, and electrical signals
- Electrical benches for fault-finding and electrical repairs
- Trolleys for temperature and pressure calibration

Find out more by checking out the CENTRiCAL playlist on our official YouTube channel: @BeamexCalibration

www.beamex.com
info@beamex.com

THE BEST WAY IS THE RIGHT WAY – **TAIJA MAUNUMÄKI AND THE BIRTH OF THE BEAMEX MC6-T**

Taija Maunumäki's dedication to precision and perfection dovetails perfectly with Beamex's quest to provide better ways for its customers to perform and manage calibrations. In this article we explore how her head for numbers, thirst for knowledge, and knack for documenting anything and everything played a vital role in the development of the Beamex MC6-T Multifunction Temperature Calibrator and Communicator.

Taija Maunumäki has never seen herself as a typical engineer. Maybe that's the reason she's one of the brains behind the MC6-T – our versatile, portable automated temperature calibration system that combines a state-of-the-art temperature dry block with a Beamex MC6 multifunction process calibrator and communicator technology.

"Since I was a child I have loved mathematics, and I've always known that I wanted to work with numbers in some form. After studying mechanics at university I eventually ended up working as a design engineer, but also studied economics part time to satisfy my love of numbers," she says. Her Beamex story begins with a familiar theme: never being afraid to learn something new. "I saw there was a position open at Beamex for a design engineer in thermodynamics. I'd only taken a basic course in thermodynamics at university, but the role sounded like a very interesting one so I applied," she says.

THINGS START TO HEAT UP QUICKLY

Soon after starting at Beamex Taija embarked on a long and intensive research project followed by a product development project, both of which would allow her to indulge her appetite for knowledge and satisfy her passion for always finding a better way to approach things. "Beamex had been developing pressure and multifunction process calibrators for decades, and now the goal was to design and manufacture a temperature calibrator that would fully integrate with our seamless calibration solution," Taija explains.

> Since I was a child I have loved mathematics, and I've always known that I wanted to work with numbers in some form.

With no experience of developing temperature-generating systems, the learning curve was a steep one – not that this put Taija and her colleagues off. She hit the books once again: "With Beamex's full support I went back to university to study basic theories of heat transfer and fluid dynamics. For the first few years of the project it was mainly me and my colleague Mats Byggmästar taking care of everything, with the help of calibration engineer Toni Alatalo, who knew a lot about temperature measurement, temperature calibration, and temperature sensors," continues Taija. "Jyrki Mikkola, R&D Director and project manager for the research project, was also a huge help."

The dynamic duo of Taija and Mats set to work

devouring white papers and patent documents and analyzing and testing different ideas. When faced with a challenge, they divided up the tasks as they saw fit to help them solve it: "I took care of thermodynamics and mechanics while Mats looked after the electronics and software side of things. Every time we faced a new challenge or found a new thing to learn we just had to decide who had the time and competence to take it on!"

A CHALLENGING JOURNEY PRODUCES… EDAM?

Along the way the team developed multiple prototype setups, the first of which was a cumbersome construction named Edam 0.1. "It wasn't very pretty or stable, and it needed a trolley full of equipment to work, but it could generate temperatures of up to 600 Celsius so it was a huge step forward," Taija recalls with a smile.

> We had a fantastic team and a great team spirit, and the owners and management were very patient and supportive, giving us the time and space to just get on with doing our best work.

After a great deal of intense work Taija and Mats presented the results of their research and an analysis of the resources that would be needed to develop a new solution. Their arguments were enough to convince Beamex management to green-light a development project to create two different temperature calibrator models with completely different technologies for different temperature ranges. But they needed a project manager and, while Jyrki could see Taija was the obvious choice, she needed a lot of persuading. "I didn't have the self-confidence and I certainly didn't believe I had the skills, so at first I said no when Jyrki asked me to take on the role," she recalls. "But he really believed in me, and in the end he wore me down," she laughs.

FINDING THE BETTER WAY

Further down the road Taavi Pöldsam joined the team as a mechanics designer, and in 2018 things hit full speed with the release of the MC6-Ex Intrinsically Safe Field Calibrator and Communicator. This freed up development resources to expand the project team, allowing electronics designer Tuomo Heiskanen and mechanics designer Tuomo Vuoriainen to join the project, among others.

The newly expanded development team began to develop a range of new functionalities for the product, all the time remaining laser focused on doing their best work, tackling challenges together as they came along. "We never took the attitude that this is my problem and this is your problem; we just worked on solving things together," explains Taija.

"We had a fantastic team and a great team spirit, and the owners and management were very patient and supportive, giving us the time and space to just get on with doing our best work," Taija highlights.

This drive to do her best work meant Taija was always looking for a better way to do things. "I didn't want to just get things done, I wanted to get things done as well as possible and create not only a better way to calibrate, but also a better way to develop calibrators," says Taija.

Beamex LOGiCAL

Subscription-based calibration software

Why use a cloud-based calibration software?

- Using a cloud-based software like LOGiCAL is extremely cost-effective.
- You won't need to make any significant investments as you pay per use. Since the software is cloud-based, you will not need to install applications to your computer or server.
- The cloud-based software provides easy access anywhere you have an internet connection.

beamex
A BETTER WAY TO CALIBRATE

www.beamex.com
info@beamex.com

CASE STORY

HELPING SLADE INDUSTRIES TO PROVIDE THEIR CUSTOMERS WITH EFFICIENT AND ACCURATE SERVICE

SLADE INDUSTRIES, AUSTRALIA

Since 1975, Australian company Slade Industries has offered specialist instrumentation and calibration services to help their customers' businesses run at optimum efficiency. The company, which operates out of Brisbane, Queensland, sees many businesses whose assets have suffered from an overreliance on factory calibration. This has led Slade Industries to promote and provide regular expert recalibration for accurate process control. For businesses that need precise and reliable servicing for vital processes such as shutdowns or turnarounds, Slade Industries can use their extensive array of calibration equipment to deliver high-quality, accurate results.

EXACTING REQUIREMENTS FOR OPTIMAL RESULTS

"As instrumentation process control specialists, instrument calibrations are a crucial and integral part of our project and client asset services," explains Michael Slade, Managing Director of Slade Industries. "Every year we carry out approximately 5,000 calibrations to ensure that client plant instrumentation is working within its operational tolerances. If process instrumentation is not calibrated on a regular basis, there is no certainty that the plant is operating at optimum design capability. We help to make sure these calibrations happen."

With calibration such a central part of the work carried out by Slade Industries, it is essential that their equipment provides the highest standards of accuracy and efficiency. "For field calibration, we require solutions that are compact and fully functional, while still delivering efficiency and assisting with our quality assurance and control," explains Slade. The company provides complete process control instrumentation capability, so its calibration requirements are extremely broad. "This is why we require process calibration equipment that can provide a range of instrumentation calibration criteria in a robust and compact solution."

WHY SLADE INDUSTRIES CHOSE BEAMEX

"Our company performed extensive research and completed thorough due diligence as part of our calibration solutions review," points out Slade. "We chose Beamex as we feel the company is the industry leader when it comes to instrumentation calibration solutions. In addition, the majority of our clients use CMX software as their instrumentation database. By choosing Beamex we can provide a complete project solution including a CMX Quality Assurance Technician who can manage the instrumentation calibration package for our clients for a seamless and complete project delivery."

We chose Beamex as we feel the company is the industry leader when it comes to instrumentation calibration solutions. In addition, the majority of our clients use CMX software as their instrumentation database.

THE BENEFITS OF BEAMEX CALIBRATION SOLUTIONS

"Our company now owns a wide selection of Beamex products to facilitate the majority of our plant instrumentation calibration requirements," shares Slade. "We've found Beamex multifunction calibrators robust, easy to use, compact, and extremely reliable. The temperature calibrators can be used across a wide range of temperatures, sensors, and sensor sizes and can even be integrated with Beamex multifunction calibrators to provide a complete temperature calibration solution. Beamex hand pumps cover the majority of pressure ranges and can be adapted to most process connections. Finally, the CMX software ties the calibration solution together exceptionally well."

The quality of Beamex products, backed by their leading-edge software, allows us to deliver the high standards of accuracy and efficiency our customers have come to expect. This is why Beamex is our calibration solution of choice.

"Beamex fulfilled all our requirements with a complete package including field calibrators, equipment, and the CMX software solution," continues Slade. "This has helped us to execute our services more efficiently, which in turn means cost savings for our clients. We've also been able to eliminate data errors caused by manual data entry, including eliminating the ability to falsify a calibration result. It is very easy to download instrument calibrations to the field calibrators as well as to upload completed calibrations to the CMX system. Furthermore, accuracy is increased as calibration tolerances can be defined by the critical nature of the instrument function. This means that the Safety Instrument System or the instruments controlling the plant and equipment can have a tighter tolerance for accuracy. Because past calibration reports are saved in archive files, we have greater traceability for plant audits, which is extremely important to reduce liability for asset owners. Finally, the quality of service we've been able to provide to our clients has been noted on numerous occasions, and Beamex equipment has most certainly contributed to this."

The quality of Beamex products, backed by their leading-edge software, allows us to deliver the high standards of accuracy and efficiency our customers have come to expect. This is why Beamex is our calibration solution of choice.

THE BEST ON THE MARKET BY FAR

"We chose Beamex because it is the best instrumentation calibration solution on the market by far. Our company stands for high service quality and client satisfaction; the equipment we use as part of our service delivery is an essential part of our reputation. The quality of Beamex products, backed by their leading-edge software, allows us to deliver the high standards of accuracy and efficiency our customers have come to expect. This is why Beamex is our calibration solution of choice."

Slade Industries, Australia

BEAMEX PRODUCTS IN USE

- 2 × MC4 multifunction calibrators
- 11 × MC6 multifunction calibrators with the majority containing a range of internal pressure modules including additional communication options (FB/MB temperature communications, HART communication and documenting functionality)
- Temperature dry blocks
  1 × FB150R (–25 … 150 °C) including PT-100 high-accuracy temperature probe
  1 × FB660 (50 … 660 °C)
- 27 x external pressure modules (various ranges, –400 mbar up to 1000 bar)
- 19 pressure pumps:
  3 × PGL (–400 … +400 mbar) low-range hand pumps
  5 × PGV/PGM (0 … –0.95 bar) / PGM (0 … 20 bar) hand pump combined kits
  3 × PGC (–0.95 … +35 bar) hand pumps
  7 × PGXH (0 … 700 bar) high-range hand pumps
  1 × PGHH (0 … 700 bar) high-range hand pump

CASE STORY IN BRIEF

LATEST NEWS

CERTIFIED SUSTAINABLE

ECOVADIS – THE WORLD'S MOST TRUSTED PROVIDER OF BUSINESS SUSTAINABILITY RATINGS, INTELLIGENCE AND COLLABORATIVE PERFORMANCE IMPROVEMENT TOOLS FOR GLOBAL SUPPLY CHAINS – HAS AWARDED BEAMEX A GOLD RATING FOR CORPORATE SOCIAL RESPONSIBILITY (CSR) AND SUPPLIER SUSTAINABILITY.

Beamex already held a silver rating but this latest certificate is recognition of our 100% commitment to operating a responsible business. For us, sustainable development means:

- Valuing and respecting diversity, and supporting equal opportunities for our people
- Forming long-term partnerships that are focused on advancing sustainable business
- Doing business responsibly by creating a better workplace, being a better partner for our customers and suppliers, and being a better member of our community
- Reducing our environmental impact by making educated research and design choices; optimizing our processes to reduce waste; developing upgradeable products with a long lifespan; and minimizing energy consumption, emissions, and waste

Beamex also has an ISO 14001:2015-certified environmental management system covering our development, manufacturing, sales and marketing, software, systems, and services. ISO 14001 is an internationally agreed standard that helps organizations improve their environmental performance through more efficient use of resources and reduction of waste. Beamex's Occupational Health and Safety management system is ISO 45001 certified, demonstrating our commitment to ensuring safe working practices and continuous improvement in occupational health and safety.

PARTNERSHIPS

ICAUTOMATIZADOS AND RMC JOIN THE BEAMEX FAMILY

ICAutomatizados became a Beamex partner in March 2020. The company operates in Nicaragua and Panama, providing customers with a variety of power, control, and process automation system related equipment and services.

In March 2020 we also welcomed RMC as our new sales distributor for Morocco. The company is based in Casablanca and has more than 20 years' experience of serving the process industry. They offer a variety of products, process instruments, solutions and services to a wide customer base across Morocco.

Calibration Essentials: Pressure (eBook)

Download 40-pages of detailed strategies and resources for calibrating your pressure instrumentation.

What's Inside:

- A quick review of pressure types
- An online pressure unit converter
- Tips for calibrating a square rooting pressure transmitter
- How to choose the right pressure transmitter for your process
- Comprehensive guide to calibrating pressure gauges
- Step-by-step instructions for calibrating pressure switches
- Plus, how to set up pressure calibration schedules, ensure accuracy of measurement, and more

Get your eBook copy here:
resources.beamex.com/en/calibration-essentials-pressure

www.beamex.com
info@beamex.com

beamex
A BETTER WAY TO CALIBRATE