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White Paper

Improving efficiency with controller calibration

Calibration features on temperature and process controllers are not always used but correct use can achieve significant improvements in system efficiency and product quality. This paper explains the basics of input calibration and sets out some of the benefits that can be achieved.

It will provide a useful guide for those that have not used input calibration before and reveal the deeper level of benefit that it can bring to the system for those that have.

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Controller calibration

Why do I need to calibrate my controller?

West Control Solutions calibrates its controllers at the factory to the stated accuracy within the product specification. This calibrates the controller as an individual instrument but not the overall system where the controller is installed. There are many exterior influences that have an effect on overall system accuracy, for example sensor factors such as accuracy and positioning along with cable type and length can all introduce errors. To achieve the required overall system accuracy you can eliminate some of those errors by using the input calibration feature on the controller.

If you don't calibrate the controller for your system even a small error can have a serious effect on the quality of output. In the aerospace industry, which is highly regulated due to the extreme need for safety, precision is key and the success of a manufacturing business depends on meeting quality control requirements. In order for aviation manufacturers to achieve Nadcap (National Aerospace and Defense Contractors Accreditation Program) accreditation it is necessary to establish a thorough quality system, including well-documented process instructions and complete records for all production batches, including time and temperature data. Quality system accuracy tests are carried out regularly to ensure the system is correctly calibrated within the allowable parameters. The Food and Drug Administration demands similar system accuracy tests for pharmaceutical applications, while in life science applications maintaining temperature within narrow bands is critical to ensure experiments and testing are carried out at optimum temperatures. Sometimes, the need to maintain tight temperature tolerance is driven not by standards but the need to maximise efficiency in certain processes. No manufacturer wants to keep running product through a process multiple times to get the right result, or cause

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downtime because output on the production line is of poor quality. By ensuring that your system is accurate you will reduce the likelihood of these situations occurring.

How to use input calibration

A controller displays a measured process value from a sensor that is positioned as closely as possible to the product within the process equipment. The sensor provides an analogue signal through the sensor input which the controller converts to digital for displaying. To calibrate the controller the value displayed on the instrument is compared to a calibrated temperature measurement source to determine the error.

There are two ways to calibrate temperature sensors. One is single point, or zero shift, calibration, and the other is two-point calibration. Single point calibration is used in situations where you have an error value that is common to both the bottom point of your scale and the top end of your scale. This type of calibration is useful for detecting a linear relationship producing a constant error but the most accurate form of calibration is two-point, where the error at the top and bottom of the range is different.

When you are calibrating you should always work within the temperature band at which you want to operate the machine. For example, if your machine will always operate between 200 degrees and 400 degrees, your minimum calibration reading should be taken at 200 degrees and your maximum reading should be taken at 400 degrees. You should determine the error at those points so that your calculation is made within the window of temperature that you're actually going to use on your machine. So, even if the controller is capable of calibrating between 0 and 800 degrees, you should not take your reading at those extremes because the machine will never operate at those temperatures.

Zero shift or single point calibration is defined as the distance to which an instrument will move from zero when the temperature level changes. Zero shift should be set at the mid-point of your operating range (unless it is totally linear, in which case it doesn't matter because you get that relationship all the way through the range).

Certification

Some processes require certification of calibration – if so, you may have to ask an approved engineer to perform independent calibration services. In the UK this service is provided by UKAS (United Kingdom Accreditation Services), while other territories use their own accreditation body; for example, in the USA it is NIST (National Institute of Standards and Technology) and in Germany it is DakkS (Deutsche Akkreditierungsstelle).

Following calibration, an accreditation service will give you a certificate to show that your system has been calibrated to meet the requirements of your application.

A range of benefits

With the right calibration you can not only ensure that legislative requirements are met but also enjoy a range of benefits, from reducing waste to driving higher throughput on the production process by optimising the whole control system.

West Control Solutions is a global specialist in process and temperature control and can provide expert advice on calibration, and indeed any aspect of temperature control for industrial applications.

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For more details on the complete product range from West Control Solutions please contact your local distributor or visit **www.West-CS.com**.

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