Quality without Compromise

Calibration of thermometers and temperature measuring systems

Calibration laboratory for the measurand ‘temperatur’, DKD-K-05702
Calibration goods:
- resistance thermometers
- thermocouples
- hand-held thermometers
- complete temperature measurement systems

instrumentation
Manufacturing branches of industry are permanently faced with increasing competition. They thus have to look for more and more efficient processes.

Required conditions are:
- high-performance machinery
- commanded manufacturing processes
- continuously trained staff
- manufacturing considering economic and ecological aspects

Production processes can only be safely controlled if appropriate measurements have been planned and are continuously carried out. In order to carry out such measurements, reliable tools are needed: Measuring equipment of high precision.

The thermometer as a measuring tool
Like any other tool, measuring tools are durable articles and are, therefore, subjected to wear.

This is especially concerning to thermometers and their sensor elements, as they are directly exposed to the temperature to be measured and therefore subjected to an accelerated aging. Thermometers used at higher temperature show a more rapid aging process. The user become aware of these process and the resulting measurement errors only in rare cases, and continues to believe his measured values as being correct.

Whether the thermometer still meets the precision requirements, can only be answered by a calibration procedure. High level calibration services with low calibration uncertainties are one part of the obviously ABB Automation customer supporting services.

What does Calibration mean?
Calibration is the comparison of a test specimen (thermometer or other calibration objects) with reference to a so-called metrological standard. In this case the standard represents the „true” or „real” measurement value. If the calibration object does not show any deviation, the standard and the calibration object will have the same value of measurement.

Observed deviations between the standard an the calibration object are documented in the calibration certificate and can be taken into account for corrections when using the thermometer for temperature measurements. The quality level of the calibration process is reflected in the measurement accuracy, indicating the precision of the calibration result.

This precision basically depends upon the following factors:
- accuracy of the standard
- accuracy of the measuring data acquisition
- the amount of systematic errors of the process applied
- the personnel’s qualification

By investing in advanced technical calibration equipment, building the required laboratory facilities and employing experienced calibration personnel ABB Automation has created the stipulations for high level calibration services.

Who has the permission to perform calibrations?
Calibration is not a term or activity protected by law, which may only be carried out by authorized personnel (contrary to gauging which is under the competence of a gauging office). There are no legal provisions regulating calibration. As the demand for calibrations is increasing (among others as a result of the QM-system-requirements), the number of calibration services, too, has steadily increased during the last years. Unfortunately, their methodology does not always meet the requirements a customer may place on a reli-

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<th>measurand</th>
<th>range</th>
<th>measuring conditions</th>
<th>uncertainty</th>
<th>calibration goods</th>
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</thead>
<tbody>
<tr>
<td>temperature</td>
<td>-35°C up to + 180°C</td>
<td>calibration based on comparison with standard resistance thermometers in well stirred liquid baths</td>
<td>20 mK</td>
<td>platinum thermocouples</td>
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<td>+ 180°C up to + 350°C</td>
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<td>+ 350°C up to + 500°C</td>
<td>50 mK</td>
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<tr>
<td>-35°C up to + 500°C</td>
<td>1.0 K</td>
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<td>+ 500°C up to + 850°C</td>
<td>1.0 K</td>
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<td>+ 500°C up to + 1200°C</td>
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<td>+ 800°C up to + 1200°C</td>
<td>3.0 K</td>
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Calibration – One of Our Top Priorities

Calibration range of the laboratory (accredited by the PTB)

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<td>water triple point</td>
<td>5 mK</td>
<td>resistance thermometers</td>
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1) calibration goods means: sensor elements, thermometers with and without displays units, thermometers with and without transmitters, complete temperature measuring systems (measuring chains)
able calibration. Under the given circumstances it is not always easy to recognise a reliable calibration service provider. The calibration laboratories of the German Calibration Service (DKD = Deutscher Kalibrierdienst) can provide certainty in this area.

What stands DKD for?
The German Calibration Service is an association of calibration laboratories accredited by the Federal German physical-technical institute PTB (Physikalisch-Technische Bundesanstalt) on the basis of EN 45000 requirements. The DKD laboratories work self responsible but under the supervision of PTB and provide a system of highest metrological competence in Germany.

Calibration in the European Community
Within the European Body for Accreditation of Laboratories (EAL, now EA), DKD has signed a multilateral agreement for mutual acceptance of calibration results and certificates. DKD calibration certificates are accepted without reservation in nearly all important European countries. Furthermore, the DKD calibration certificates are getting more and more international acceptance. As a global company with worldwide activities, customers can obviously rely on international acceptance of calibrations carried out at ABB.

Traceability of calibration results
Results from different calibration laboratories can only be compared if all standards used for the calibration process in the laboratories are calibrated based on a common standard. These so-called national standards of highest precision are for Germany provided by the PTB and are periodically compared to the national standards from other countries especially the members of the EA. All results obtained in the several DKD calibration laboratories are traced back to a common standard in an uninterrupted chain of calibrations and standards. Thus they are collectively comparable.

Concerning ‘Measuring accuracy’
The highest degree of calibration accuracy, i.e. the greatest precision a DKD laboratory can achieve during a calibration process, has been certified by PTB within the accreditation procedure of the DKD laboratory. It is the final result of an exhaustive large-scale metrological comparison process between a laboratory and the PTB. Minimum measurement uncertainties indicate performant metrological equipment of the laboratory and qualified calibration staff. Furthermore calibrations with small measurement uncertainties stand for high safety tolerances for the user. Please consider well, especially these aspect when choosing a calibration service. With respect to the certified calibration uncertainties, given by PTB, the DKD-calibration laboratory of ABB takes a top position within the entire DKD.

Quality – a Topic with no Restrictions

What are the benefits to you as the customer?
Calibration of measuring equipment should not only be done, because it is a QM-system requirement. Calibrated measuring tools always have been a stipulation for the performance of reliable manufacturing processes. They stand for high process efficiency and low rejected rates, they avoid costs due to nonconforming products and reworking of parts and above all they can help to save your money. ABB produces and offers all the necessary devices for any kind of temperature measurement. You can get everything you need out of one hand, from sensor elements and thermometers up to electronics for signal processing, including an all-embracing calibration service. We are your one-stop-shop for all temperature measurements.

For further information or advice, please contact:

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Water triple point cells, the fundamental temperature reference point of the ITS 90-temperature scale.