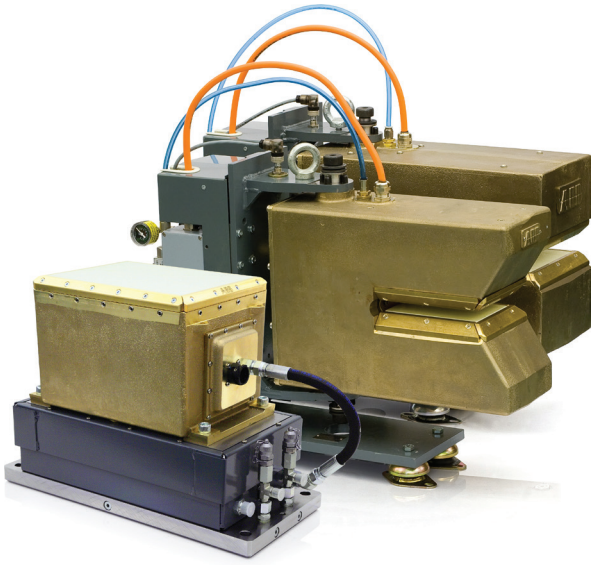
Measurement & Analytics

MTG Thickness Gauging systems Traceability and accuracy specification

The calibration process for the MTG site calibration plates involves two steps. First is the calibration of reference plates used by ABB. Second is the calibration of the site calibration plates included in the MTG system delivery.



The primary references used at ABB, for calibration of the reference plates, are gauge blocks calibrated with traceability to National standard labs like NIST, PTG or NMIJ. The following description of the calibration process refers to the figure on page 2.

The first calibration step takes place in an accurate mechanical measuring machine. The measuring machine, based on a Mitutoyo Laser Hologage, has been developed and designed by ABB in order to achieve the best possible accuracy.

In the second calibration step, the site calibration plates are calibrated by direct comparison with the reference plates. This comparison is done in a standard MTG gauge. The specified calibration uncertainty for the site calibration plates is calculated as the root mean square of the various sources of uncertainty, with a cover factor of 2. In order to achieve the lowest possible combined uncertainty, sources of uncertainty on the level of 0.01 µm must be considered significant.

Accuracy of the primary references

The gauge blocks have been calibrated at SP Technical Research Institute of Sweden using an interferometric method traceable to the international definition of length. The calibrated lengths have an expanded uncertainty of ± 0.03 µm with a coverage factor of 2.

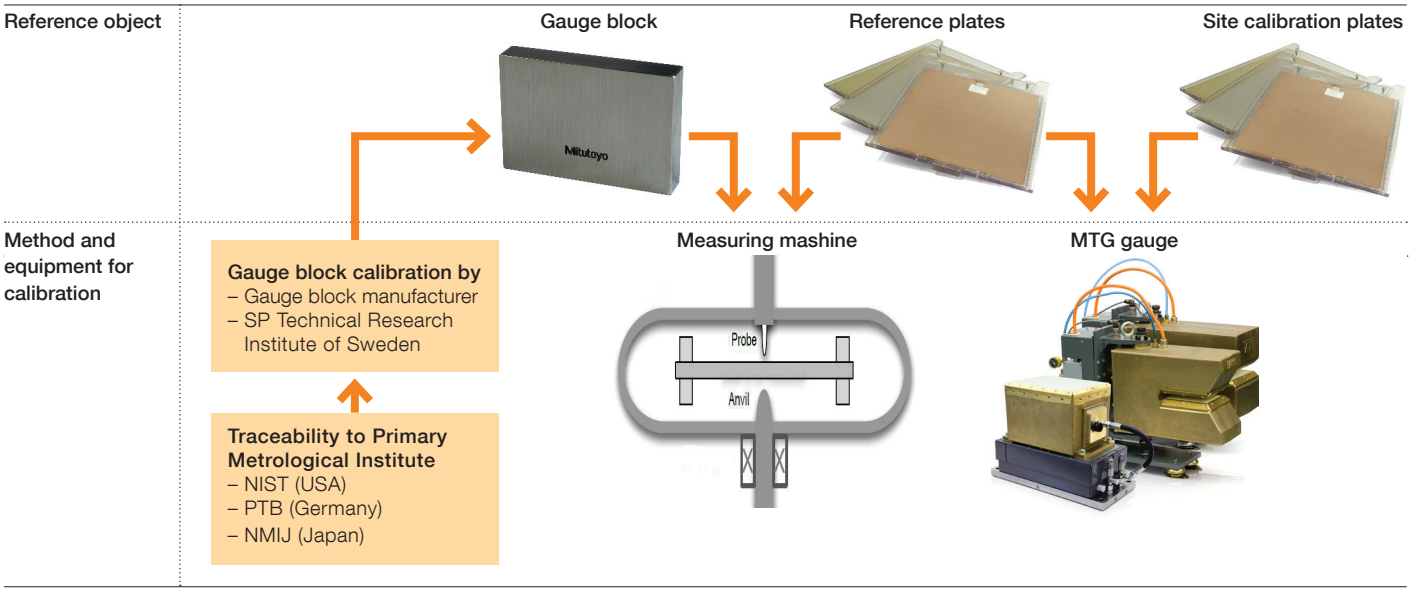
Accuracy of the reference plates at ABB

The reference plates have been selected to be very flat, smooth and to have an even thickness over the plate surface. They have also been grinded and polished in order to have a mirror-like surface with a very low surface roughness.

The following sources of uncertainty in the calibration of the reference plates have been considered:

- Dimension changes in the mechanical measuring machine frame due to mechanical load and ambient temperature.
- Non-linearity of the Mitutoyo Laser Hologauge.
- Repeatability in the measurement of gauge blocks and reference plates.
- Elastic deformation of gauge blocks and reference plates
- Correction for temperature expansion of gauge blocks and reference plates.
- Correction for surface roughness of the reference plates and for thickness variation over the measuring area.

The total combined uncertainty for the reference plates, with a cover factor of 2, varies between 0.2 µm and 0.6 µm depending on plate thickness. This uncertainty includes the uncertainty of the primary reference gauge blocks.



MTG site plate calibration process

Accuracy of the site calibration plates

A site calibration plate is calibrated by direct comparison with a reference plate of similar thickness and equal material properties. The comparison is made in an accurately calibrated and temperature stabilized MTG gauge, the same type of gauge that the site calibration plate is intended to calibrate. Because of these conditions for the comparative measurement, the accuracy in the calibration will mainly be related to noise, repeatability, short-term stability and local non-linearity.

The total combined calibration uncertainty for the site calibration plates, with a cover factor of 2, varies between 0.3 and 1.0 µm depending on the thickness of the site calibration plate. This uncertainty includes the uncertainty of the reference plates used for calibration. The actual uncertainty for each plate is specified on the calibration certificate.

For more information please contact:

ABB AB
Measurement & Analytics
Force Measurement
S-721 59 Västerås, Sweden
Phone: +46 21 32 50 00

www.abb.com/thicknessgauging

Note

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

3BSE086052R0001 2016-01