

Leica Geosystems Calibration Certificates White Paper



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- when it has to be **right**

Leica
Geosystems

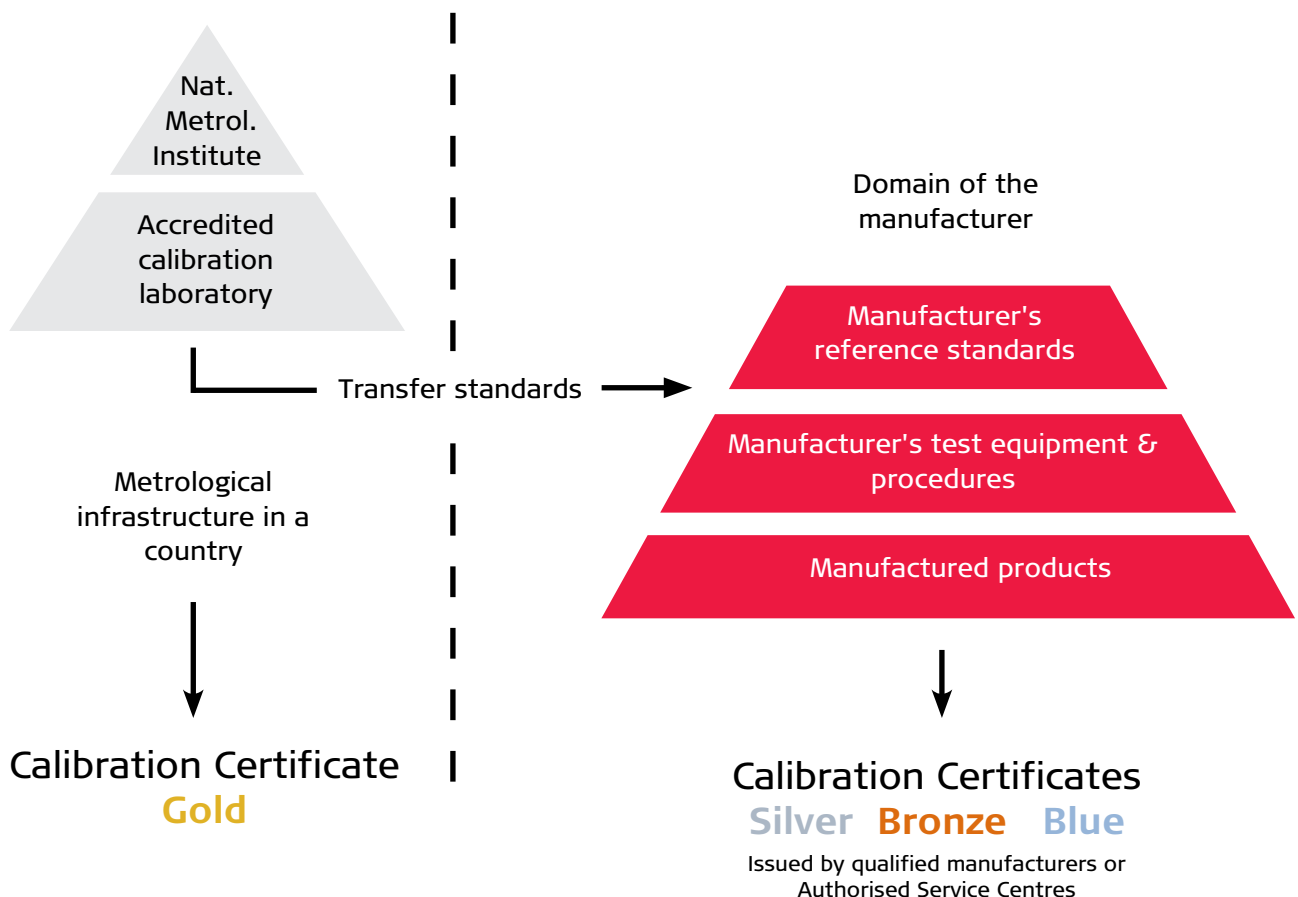
The overall demand for calibration certificates confirming the measurement quality of new or used surveying equipment is increasing. This is mainly due to the fact that more and more surveying companies or their contractors are becoming ISO 9001 certified and therefore need to confirm the accuracy of their equipment periodically.

A number of calibration certificates are available for Leica Geosystems total stations, laser scanners, digital levels, GNSS sensors and controllers - at the initial purchase of the equipment and periodic recalibrations at our authorised service centres. Leica Geosystems has Accredited Calibration Laboratories (SCS079) for distances and angles granted by the Swiss Accreditation Service (SAS) in accordance with the standard ISO/IEC 17025.

Leica Geosystems offers a large variety of calibration certificates at different levels. At the highest level, Calibration Certificates Gold are issued by the Accredited Calibration Laboratories, at the next level, Calibration Certificates Silver and Bronze and at the simplest level Calibration Certificates Blue.

Calibration Certificates Gold are internationally acknowledged certificates that are only issued by Leica Geosystems Accredited Calibration Laboratories in Heerbrugg, Switzerland.

Calibration Certificates Silver, Bronze and Blue are based on Leica Geosystems reference standards and test equipment and procedures and can be issued by production facilities and Leica Geosystems Authorised Service Centres.



Accredited Calibration Laboratories

Leica Geosystems has Accredited Calibration Laboratories for distances and angles. The accreditation (SCS 079) is in accordance with the standard ISO/IEC 17025 and is granted by the Swiss Accreditation Service (SAS).

The Swiss Accreditation Service is a member of the ILAC (International Laboratory Accreditation Cooperation) and signatory of the Mutual Recognition Agreement (MRA). The ranges and best uncertainties of measurement are listed in the official SCS-Directory of the accredited calibration laboratories. More information can be found on: www.sas.ch.

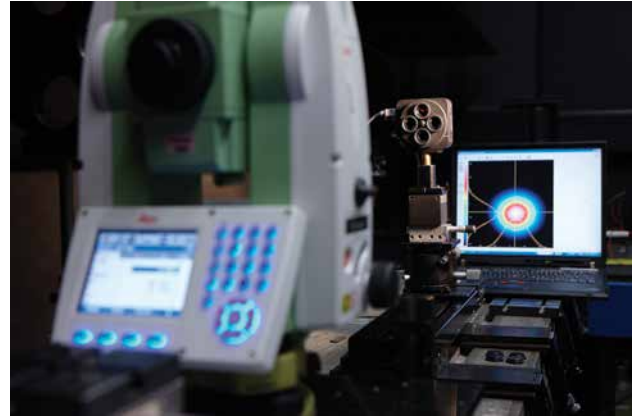


Currently, Leica Geosystems has the following Accredited Calibration Laboratories for distance measurements:

- Measurement laboratories for the determination of the linearity and the zero point correction
- 3000 m baseline for the determination of the standard deviation and for the verification of the zero point correction



- Frequency measurement laboratories to determine the measuring frequency at various temperatures



For angles, Leica Geosystems has the following Accredited Calibration Laboratory:

- An angle measurement laboratory (Theodolite Testing Machine "TPM2", designed and developed by Leica Geosystems) for the determination of the standard deviation of angle measurements (vertical and horizontal)



ISO 9001 / 14001 Certification

The Management System of Leica Geosystems has been certified according to the international standard ISO 9001. The certification applies to production and development locations and to most of the sales and service organisations.

The production facilities of Leica Geosystems also fulfill the requirements for environmental management standard of ISO 14001. The integrated management system also includes the requirements for social responsibility, work safety and health management.

Through regular internal reviews and audits as well as audits by an external, independent, accredited assessment and certification body, Leica Geosystems guarantees that the management system is regularly reviewed and updated to ensure continual improvement.








Calibration Certificates

Leica Geosystems offers a variety of calibration certificates at different levels. At the highest level Calibration Certificates Gold are issued by the accredited calibration laboratories, at the next level Calibration Certificates Silver and Bronze and at the simplest level Calibration Certificates Blue.

Calibration certificates are available for Leica Geosystems total stations, laser scanners, digital levels and GNSS sensors - for new equipment at initial purchase or for used equipment at Leica Geosystems Authorised Service Centres.






Calibration certificates are available to download on myWorld @ Leica Geosystems myworld.leica-geosystems.com and/or as a paper printout.

For **new** equipment the following calibration certificates are available:

	Blue	Bronze	Silver	Gold
Total Stations 	✓		○	○
GNSS Sensors 	✓			
Laser Scanners 	✓		✓	
Digital Levels 	✓		○	
Controllers 	✓			

- ✓ Always included (Available for download on myWorld and/or as paper printout)
- Option

For **used** equipment the following calibration certificates are available at Leica Geosystems Authorised Service Centres:

	Blue	Bronze	Silver	Gold
Total Stations 	✓	○	○*	○**
GNSS Sensors 	✓	○	○*	
Laser Scanners 	✓	○**	○**	
Digital Levels 	✓		○*	
Controllers 	✓			

- ✓ Always included (Available for download on myWorld and/or as paper printout)
- Option

* Not available in all local authorised service centres.
May require shipping equipment to central service location.
** Requires shipping to central service location.

Calibration Certificates Gold

Calibration Certificates Gold confirm that the product was inspected and explicitly state the traceability to national standards, the uncertainty of measurement and compliance of the measurement values with the published product specifications at the time of inspection. These certificates are supplemented by detailed measurement reports.

Calibration Certificates Gold are internationally acknowledged certificates that can only be issued by calibration laboratories with national accreditation. The accreditation (SCS 079) is in accordance with the standard ISO/IEC 17025 and is granted by the Swiss Accreditation Service (SAS), member of ILAC (International Laboratory Accreditation Cooperation).

The national accreditation is indicated by the registered accreditation mark (SCS) and number on the calibration certificate (079).

Calibration Certificates Gold can only be issued at the Accredited Calibration Laboratories in Heerbrugg, Switzerland, either at the initial purchase of the equipment or for periodic recalibration.

After successful calibration a sticker is placed on the instrument.



Total Stations

For total stations, the following tests are done at the Accredited Calibration Laboratories in Heerbrugg, Switzerland:

Distance (Prism)

- Laboratory (Measuring Base Distance): automated measuring of 24 to 28 distances up to 122 m, compare to reference distances measured with interferometer
- Field (Field Base "Rheindamm"): measure 21 distances between 7 pillars up to 500 m

Distance (Non-Prism)

- Laboratory (Measuring Base Distance): automated measuring of 12 distances up to 61 m, compare to reference distances measured with interferometer

Distance (Frequency)

- Laboratory: measure modulation frequency of EDM at different temperatures in climate chamber (from -20°C to +50°C)

Angle (Hz and V)

- Laboratory (Theodolite Testing Machine): automatic measuring of 36 V and 36 Hz angles



Calibration Certificates

Silver

Calibration Certificates Silver confirm that the individual product was inspected and that the published specifications were met at the time of inspection.

The certificate specifies the measurement standard deviation and includes a product specific summary of the relevant measurement values obtained, partly supplemented by measurement reports.

Calibration Certificates Silver are defined by the manufacturer based on the manufacturer's defined standards and comply with ISO 9001 requirements. The applied test procedures are traceable to national standards or to recognised procedures. Calibration Certificates Silver correspond to the Producer Inspection Certificate M in accordance with DIN 55 350 Part 18-4.2.2.

Calibration Certificates Silver are issued at laboratories using test procedures which are traceable to national standards or recognised procedures. Calibration Certificates Silver can be issued in Heerbrugg, Switzerland, either at the initial purchase of the equipment or for periodic recalibration at the Central Technical Service in Heerbrugg. Calibration Certificates Silver can also be issued for periodic recalibration at selected authorised Leica Geosystems service centres that are equipped with the respective testing facilities and competencies ("Lab Method").

Total Stations

For total stations, the following tests are done at the Accredited Calibration Laboratories in Heerbrugg, Switzerland and at Authorised Service Centres:

Distance (Prism)

- Laboratory (Baseline): measuring of 3 distances between 12 m and 150 m 3 times each

Distance (Non-Prism)

- Laboratory (Baseline): measuring of 3 distances between 12 m and 150 m 3 times each

Angles

- Laboratory (Collimators):
Hz: measuring 1 series of 3 sets with 5 directions in both faces to horizontally distributed collimators, total 30 measurements
V: measuring 1 series of 3 sets with 5 directions in both faces to vertically distributed collimators, total 30 measurements

GNSS

For GNSS, the following tests are available at Authorised Service Centres:

- Laboratory: measuring procedure and calculations according ISO 17123-8: 3 measurement series with 5 measurement sets with 90 min interval

Laser Scanners

For Laser Scanners the following tests are done at Production Facilities.

Distance

- Laboratory (Frequency Counter): The scale factor of the EDM device (ppm) is tested by checking the EDM time base with a frequency measurement generated by a calibrated frequency counter.
- Laboratory (Baseline): From three different collinear positions two planar targets, set up collinearly between the instrument's positions, are measured. Possible systematic deviations can be detected and the noise on each planar target is evaluated.

Angles

- Laboratory (Auto-Collimators): Two pairs of antipodally arranged auto-collimators are scanned in three runs, the scanner is tilted and rotated between each individual run. The angle measurement uncertainty is determined by comparing the angle measurements of the scanner to the detected laser spot positions on each collimator.



Calibration Certificates

Bronze

Calibration Certificates Bronze confirm that the individual product was inspected and that the published specifications were met at the time of inspection.

Calibration Certificates Bronze specify the measurement standard deviation and include a product specific summary of the relevant measurement values obtained.

Calibration Certificates Bronze are defined by the manufacturer based on the manufacturer's defined standards and comply with ISO 9001 requirements. They correspond to the Producer Inspection Certificate in accordance with DIN 55 350 Part 18-4.2.

Calibration Certificates Bronze are issued at Leica Geosystems Authorised Service Centres using test procedures defined by Leica Geosystems and can be issued for periodic recalibration.

Total Stations

For total stations, the following tests are done at Authorised Service Centres:

Distance (Prism)

- Laboratory (Baseline): measuring of 1 distance 5 times and compare to reference distance

Distance (Non-Prism)

- Laboratory (Baseline): measuring of 1 distance 5 times and compare to reference distance

Angles

- Laboratory (Collimators):
 Hz: measuring 2 series of 3 sets with 2 directions in both faces to horizontally distributed collimators, total 24 measurements
 V: measuring 2 series of 3 sets with 2 directions in both faces to vertically distributed collimators, total 24 measurements

Laser Scanners

For Laser Scanners the following tests are done at Authorised Service Centres.

Distance and Angles

In a combined check at least five different targets in a pre-defined configuration are scanned in both faces. This check determines possible angular deviations as well as distance deviations.

This test procedure is based on the "Procedure for standardised verification of terrestrial laser scanners" defined by the German Association of Surveying (DWW) and the HDS Check & Adjust field procedure defined by Leica Geosystems.



Calibration Certificates Blue

Calibration Certificates Blue confirm that the individual product was inspected and that the published specifications were met at the time of inspection.

Calibration Certificates Blue do not specify the measurement standard deviation and are not supplemented by measurement reports.

Calibration Certificates Blue are defined by the manufacturer based on the manufacturer's defined standards. Calibration Certificates Blue correspond to the Producer Inspection Certificate O in accordance with DIN 55 350 Part 18-4.2.1.

Calibration Certificates Blue are issued by laboratories using test procedures that are based on the manufacturer's defined standards. Calibration Certificates Blue are issued in Heerbrugg, Switzerland at the initial purchase of the equipment and for inspections, periodic maintenance or repairs at Leica Geosystems Authorised Service Centres.

SPECIMEN	
<small>- when it has to be right</small> 	
Leica Geosystems Calibration Certificate Blue	
<small>Calibration Certificate Blue without measurement values issued by Authorized Service Center</small>	
Product TC2081201+ R1000	Certificate No. 231705-01102013
Article No. 758451	Inspection Date 05.11.2012
Serial No. 231706	Order No. 5454344
Equipment No. 3252140	PO No. 45354
Issued by Authorized Service Center Leica Geosystems Limited Milton Keynes Great Britain	Ordered by LGT Singapore 2 woodlands sector 1 609916 Singapore
	Customer LGT Singapore 2 woodlands sector 1 609916 Singapore
Compliance The Calibration Certificate Blue without measurement values issued by Authorized Service Center corresponds to the Producer Inspection Certificate O in accordance with DIN 55 350 Part 18-4.2.1.	
Certificate We hereby certify that the product described has been tested and complies with the specifications of the product. The test equipment used is traceable to national standards or to recognized procedures. This is established by our Quality Management System, audited and certified to ISO 9001 by an independent national accreditation authority.	
 	Leica Geosystems Limited  Simon Metzler Service Supervisor
	1.10.2013  Patrick Kahl Service Technician
<small>Certificate No. 231705-01102013 Art. No. 554020 This Certificate may not be reproduced other than in full accord with your written approval of the issuing authority. Page 1/1</small>	<small>Leica Geosystems AG Heerbruggstrasse 8405 Heerbrugg 410 71 72 1101 Switzerland www.leica-geosystems.com</small>

Summary

Depending on the application and the ISO 9001 certification of the company, department or contractor many companies or departments are obliged to fulfill the verification aspects of a "control of monitoring and measuring devices" system.

Leica Geosystems Calibration Certificates confirm the accuracy of the surveying equipment to offer the highest level of confidence for surveying equipment.

	Service Report	Calibration Certificate Blue	Calibration Certificate Bronze	Calibration Certificate Silver	Calibration Certificate Gold
Pre-Authorised Leica Geosystems Service Centers	Always issued in combination with a repair or maintenance				
Authorised Leica Geosystems Service Centers	Always issued in combination with a repair or maintenance	Always issued in combination with a repair or maintenance	Can be issued in combination with a repair or maintenance		
Authorised Leica Geosystems Service Centers with "Lab Method" infrastructure	Always issued in combination with a repair or maintenance	Always issued in combination with a repair or maintenance	Can be issued in combination with a repair or maintenance	Can be issued in combination with a repair or maintenance	
Central Technical Service Heerbrugg, Switzerland	Always issued in combination with a repair or maintenance	Always issued in combination with a repair or maintenance	Can be issued in combination with a repair or maintenance	Can be issued in combination with a repair or maintenance	Point of contact for periodic re-calibration
Production Facilities, Heerbrugg, Switzerland		Always issued for initial delivery (myWorld)		Can be issued with initial delivery	
Calibration Laboratory Heerbrugg, Switzerland					Can be issued with initial delivery or for re-calibration

Leica Geosystems – when it has to be right

Revolutionising the world of measurement and survey for nearly 200 years, Leica Geosystems, part of Hexagon, creates complete solutions for professionals across the planet. Known for premium products and innovative solution development, professionals in a diverse mix of industries, such as aerospace and defence, safety and security, construction, and manufacturing, trust Leica Geosystems for all their geospatial needs. With precise and accurate instruments, sophisticated software, and trusted services, Leica Geosystems delivers value every day to those shaping the future of our world.

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 20,000 employees in 50 countries and net sales of approximately 3.8bn EUR. Learn more at hexagon.com and follow us @HexagonAB



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