

# ISO 17123-6 White Paper

The official standard for verifying accuracy of rotating lasers



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# The official standard for verifying accuracy of rotating lasers

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## Why is regular checking and calibration of rotating lasers important?

Construction sites are harsh environments that put incredible strain on rotating lasers. These instruments are not treated with a lot of care - they get dropped, knocked down or toppled over and may also become covered in dirt and concrete. In the majority of construction projects, rotating lasers face so many impacts during regular use that their accuracy can no longer be guaranteed. Like in other precision instruments, mechanical and optical parts are vulnerable to shocks and, in the worst case, might become loose upon impacts such as hard drops or heavy vibrations. This can cause inaccuracy due to the instability of the laser beam and thus, application mistakes may occur. As an example, a wrong reference height during concrete pouring can lead to structural and security issues. Such mistakes are expensive to fix and result in a reputation loss for a concrete contractor. Therefore, to ensure accurate and consistent performance and results, owners of rotating lasers should carry out periodic calibration and maintenance of their equipment.



Every Leica Geosystems rotating laser goes through a rigorous process before leaving the factory. This process evaluates if the laser has the same high accuracy over a series of repeated measurements. Only lasers with consistent, high accuracy leave the factory to be sold. Every Leica Rugby 800 series rotating laser is delivered with a Leica Geosystems Calibration Certificate Silver. This guarantees that the laser test procedure follows the test procedure described in the ISO 17123-6 standard under laboratory conditions. With the introduction of the Leica CalMaster laser calibration system, Leica Geosystems service locations around the world are able to check rotating lasers corresponding to the internationally recognised procedure described in ISO 17123-6.

More information can be found in the video:  
[http://leica-geosystems.com/calmaster\\_on\\_youtube](http://leica-geosystems.com/calmaster_on_youtube)



## Laser checking and calibration methods

Knowing about the harsh treatment of rotating lasers, various manufacturers offer checking and calibration possibilities to end users and service providers. A simple field test performed by an end user can easily verify if a laser needs to be adjusted. The majority of rotating lasers today can also be adjusted by end users – this however requires knowledge about pressing certain button combinations and is often perceived as complicated and prone to mistakes. Each laser manufacturer and service provider uses their own methods to perform laser check and calibration. After the check and calibration procedure is completed, an end user typically receives a calibration certificate.

Today's procedures and calibration certificates are not unified across different countries and service providers. Also, they often do not fulfill quality standards that customers can trust and rely on. It is a common situation that a customer does not receive any documentation following a laser test or a calibration certificate does not list measurement values or a description of the applied procedure. Therefore, some customers cannot be sure about reliability and quality of the service and as a result, the accuracy of their rotating laser.

**ISO 17123-6 is the internationally recognised standard that describes a comprehensive procedure to verify accuracy and repeatability of rotating lasers against manufacturing specifications.**

Since 2013, Leica Geosystems performs outgoing tests of rotating lasers with respect to the ISO 17123-6 procedure and delivers each Rugby 800 series laser with a Leica Geosystems Calibration Certificate Silver. This certificate for rotating lasers is also offered to laser owners and end users by the Leica Geosystems Service Centres and Service Partners around the world, who own the Leica CalMaster calibration system.

More information can be found in the video:

[http://leica-geosystems.com/opening\\_new\\_opportunities](http://leica-geosystems.com/opening_new_opportunities)



**Fig. 1.** Leica CalMaster – checking, calibration and certification system for rotating lasers.



**Fig. 2.** Leica CalMaster in use.



**Fig. 3.** Calibration Certificate Silver for rotating lasers – page 1.

### What is ISO 17123-6?

**ISO 17123-6** specifies field procedures to be adopted when determining and evaluating the precision (repeatability) of rotating lasers (...) when used in building and surveying measurements for levelling tasks. Primarily, these tests are intended to be field verifications of the suitability of a particular instrument for the immediate task at hand (...).

Source:

[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=56088](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=56088)

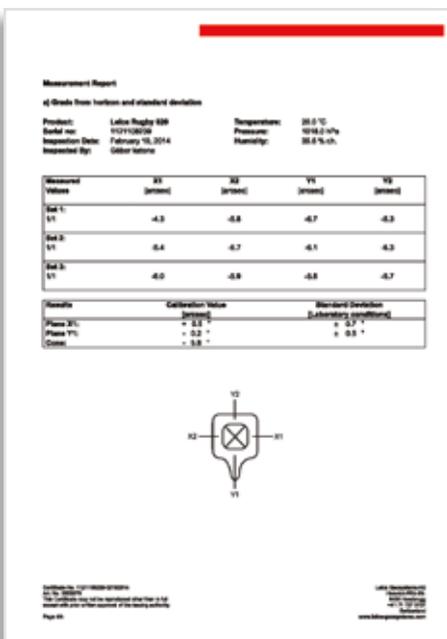
To summarise, the ISO 17123-6 standard describes a comprehensive test procedure for rotating lasers that focuses on two of their most critical attributes:

- Accuracy
- Repeatability

Those two attributes are the most important indicators in the assessment of rotating laser's quality and performance.

The Calibration Certificate Silver for rotating lasers offered by Leica Geosystems, can only be issued if a laser has been tested with respect to the procedure described in the ISO 17123-6 standard. The certificate is a 4-page document that includes:

- Description of the checking procedure and measuring equipment
- Results of the checking procedure with reference to the ISO 17123-6 procedure and its comparison to the accuracy specification claimed by the manufacturer (passed Yes/No and justification)
- All measurement values from the laser's checking procedure



**Fig. 4.** Calibration Certificate Silver for rotating lasers – page 4.

### Traceability to international standards (ISO)

The overall demand for calibration certificates confirming the measurement quality of new or used construction equipment is increasing. This is mainly due to the fact that more and more construction companies or their contractors are becoming ISO 9001 certified and therefore need to confirm the accuracy of their equipment periodically. It is important for Leica Geosystems that instruments fulfill the highest standards.

- **Calibration Certificates Blue** are issued at Leica Geosystems Authorised Service Centres to confirm that the individual product was checked and that the published specifications were met.
- **Calibration Certificates Bronze** are based on the manufacturer's defined procedures and confirm that the individual product was inspected and that the published specifications were met.
- **Calibration Certificates Silver** are based on the manufacturer's defined standards and the test procedures are traceable to national standards or to recognised procedures.
- **Calibration Certificates Gold** are internationally acknowledged and the test results are directly traceable to national standards (national accreditation of the calibration laboratory).

Today, Leica Geosystems offers Blue and Silver Calibration Certificates for rotating lasers.

Every Leica CalMaster produced is tested and calibrated using a Leica Geosystems total station with the Calibration Certificate Gold.

Every second year the total station is tested with respect to the ISO 17123-3 procedure for angle accuracy and is adjusted to fulfill a 0.5 arc second angle accuracy requirement. This is done in the Swiss Accredited Calibration laboratory SCS 079 located in Heerbrugg. This process is based on ISO/IEC 17025.

Every Leica CalMaster is tested for accuracy of grade from horizon in a two-face measurement process using this highly precise instrument and leaves the factory with a Calibration Certificate Silver for 3 arc second accuracy of grade from horizon.

The Leica CalMaster can issue Leica Geosystems Calibration Certificates Silver for rotating lasers after performing a measurements test procedure corresponding to ISO 17123-6 standard with an adapted number of measurements and under laboratory conditions.

Every year, the Leica CalMaster must be checked and calibrated in defined service locations around the world which also have a Leica Geosystems total station with a Calibration Certificate Gold.



**Fig. 5 and 6.** Accredited measurement and calibration laboratory in Heerbrugg, Switzerland.

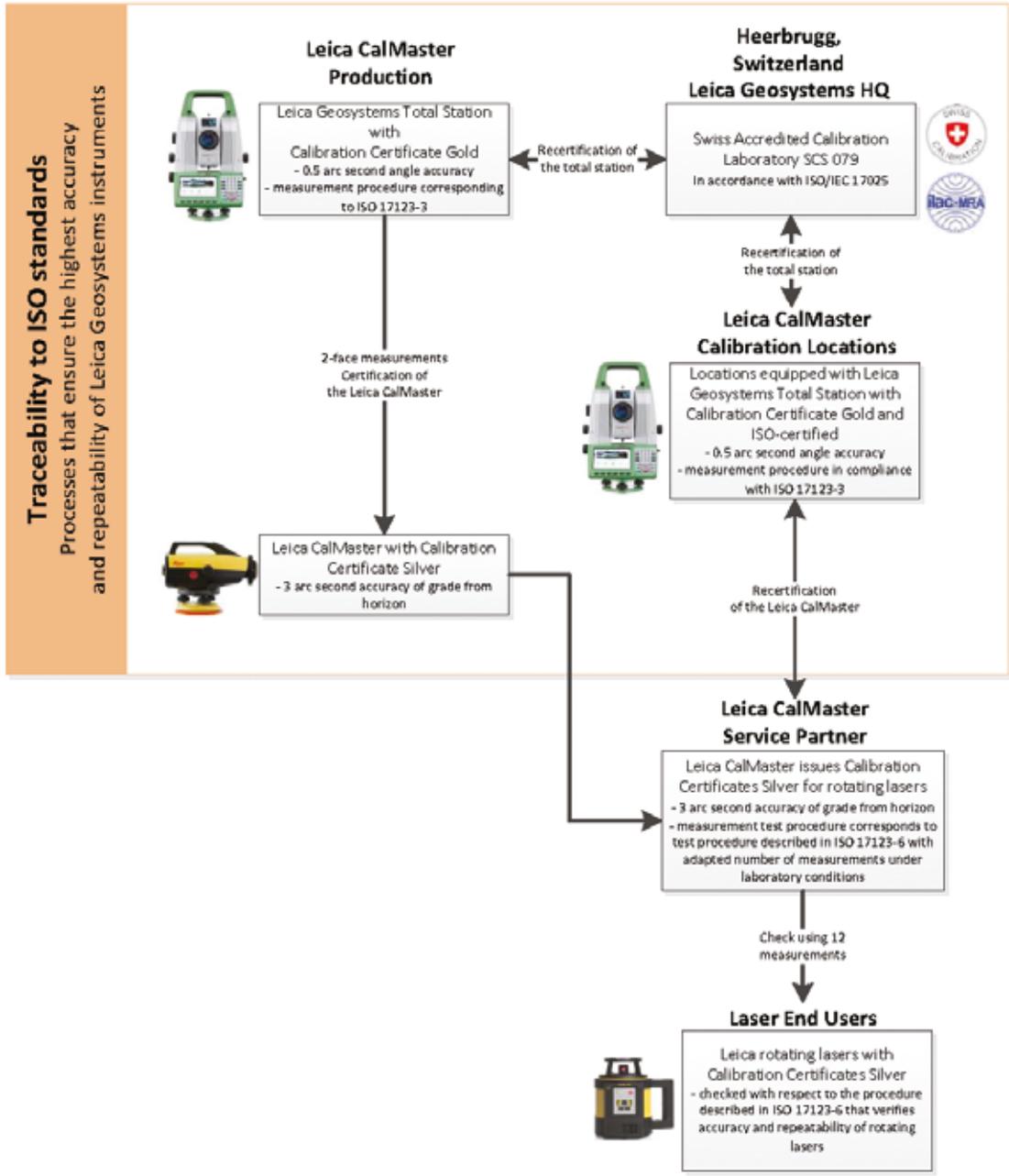


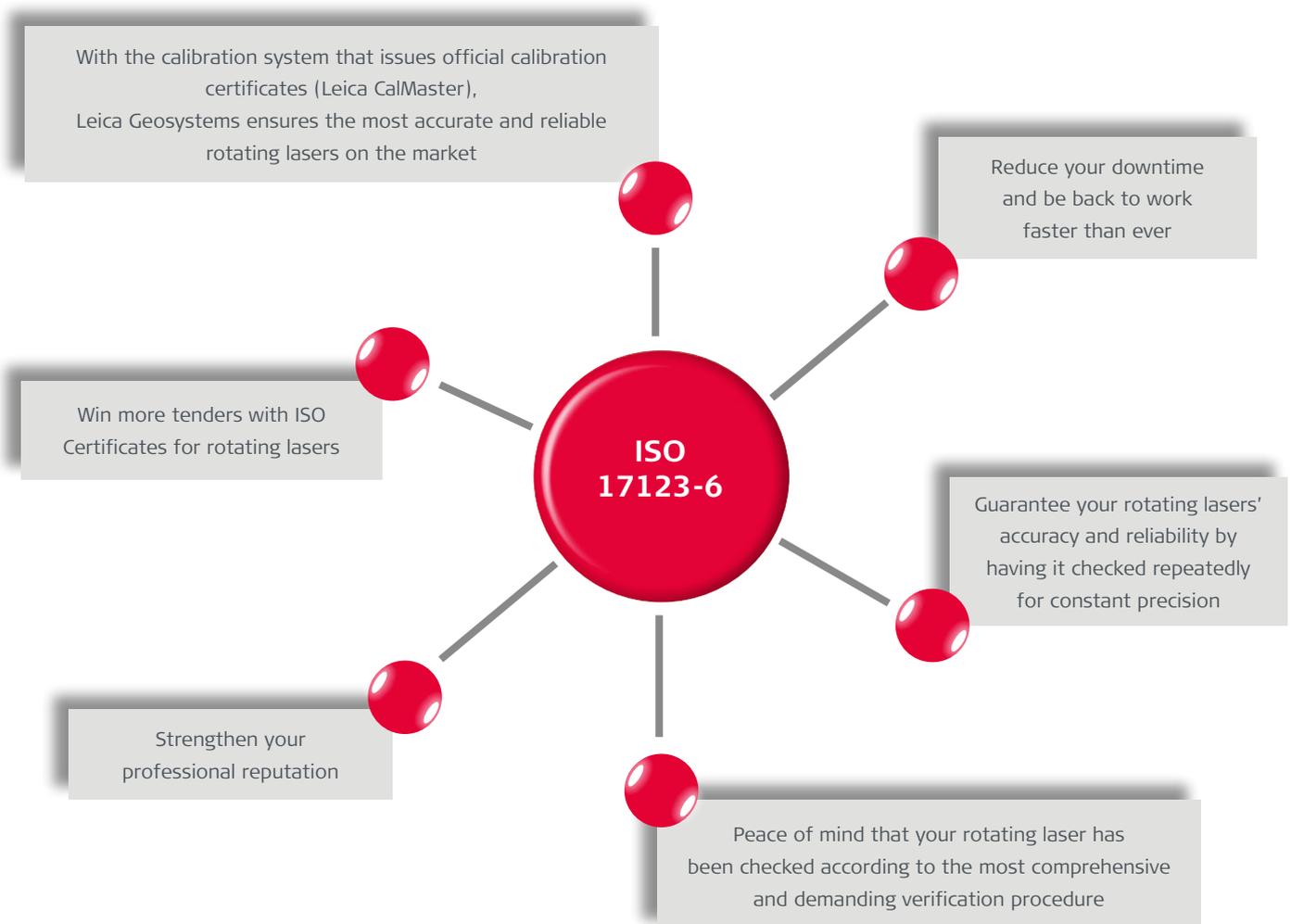
Fig. 7. Traceability to the ISO 17123-6 procedure.

## Leica Geosystems exceeds your expectations

With the certification corresponding to the ISO 17123-6 standard, construction companies and rotating laser owners can maximise their chances of winning construction tenders. For many projects, especially large ones it must be proven that instruments used in the project were verified for accuracy. A calibration with respect to ISO 17123-6 to determine the repeated accuracy of rotating lasers is the highest internationally recognised evidence for that. Also, having equipment verified according to the highest standards gives a more professional impression of a company and opens new opportunities in terms of winning new assignments and projects. Furthermore, certifications traceable to international standards ensure peace of mind to any laser owner.

Leica Geosystems is currently the leader in laser measuring technology and laser manufacturer that offers customers the possibility to check their rotating lasers corresponding to the ISO 17123-6 procedure and receive a valuable calibration certificate.

**Fig. 8.** Benefits of checking rotating lasers with respect to ISO 17123-6 standard.



Revolutionising the world of measurement and survey for nearly 200 years, Leica Geosystems 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 surveying and engineering, safety and security, building and construction, and power and plant, trust Leica Geosystems to capture, analyse and present smart geospatial data. With the highest-quality instruments, sophisticated software, and trusted services, Leica Geosystems delivers value every day to those shaping the future of our world.

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- when it has to be **right**

