Compensation, Calibration, and Certification Standards for FARO Devices

Overview

The terms *compensation*, *calibration*, and *certification* apply to how the accuracy of a FARO® device is defined and maintained. Often these terms are used interchangeably to mean compensation. But, each term means something very specific. To understand these terms, how they apply to your FARO device, and how you can get the most accurate measurement performance, see the sections below.

We’ve introduced a new way to schedule your service or certification for your FARO equipment online – our new **FARONow! Customer Portal**. FARONow! personalizes your experience and allows you to:

- Choose the asset(s) you want to certify
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Compensation

A process used to adjust the performance of a measurement tool, keeping its performance within a stated accuracy range.

FARO provides two levels of compensation adjustments: Minor compensation adjustments that you can do yourself and complete compensations adjustments that can only be done at a FARO Service Center.

**Do it Yourself**: Most FARO devices have both manual processes and integrated features that enable you to make small accuracy adjustments. Refer to your device setup/configuration, or if another operator used the device before you (the way you use the device may be different than the previous operator), or your work environment changes in some way (such as you move the device to a different work location), or if you have accuracy concerns.

**FARO Service Center**: It takes special equipment and training to algorithmically and mechanically compensate your FARO device. FARO Service Centers and technicians are fully equipped and trained to ensure your device meets original manufacturer’s accuracy specifications as stated in the device tech sheet.
Calibration

A test or series of tests that compare measurement values to known standards, typically defined and documented by an industry or developed and documented by a manufacturer based on stated quality requirements. The result of a calibration is a listing of comparison deviations. Results are considered passing if deviations are within the stated specification for the device. Deviations may be shown in a report.

FARO provides two levels of calibration comparisons: Test comparisons that you can do yourself and in depth certifiable calibration tests that can only be done at a FARO Service Center.

Do it Yourself: Most FARO devices have both manual processes and integrated features to check if the device is performing according to the accuracy technical specifications stated in the device tech sheet. Refer to your device user manual for accuracy test instructions. It is recommended that you use accuracy test processes and features to check the results of the do it yourself compensation features, or when you have accuracy concerns. How often you do these tests depends on your corporation’s quality requirements and processes.

FARO Service Center: ISO accredited FARO Service Centers provide standardized device calibration, ensuring that your device has been correctly and reliably calibrated. To review accreditation details, click here. All FARO devices are calibrated using artifacts that are traceable to the International System of Units (SI) through NIST or another recognized National Metrological Institute that is a participant of the International Committee for Weights and Measures (CIMP) Mutual Recognition Agreement. More information on the Mutual Recognition Agreement between National Metrological Institutes of different countries can be found here: http://www.bipm.org/en/cipm-mra/.

Certification

A document provided after a calibration is completed that shows the calibration comparisons, deviations, and pass/fail results. Accredited FARO Service Centers provide a calibration certificate whenever you send your FARO device in for servicing, compensation, calibration, and certification. This certificate validates that your device adheres to calibration standards and procedures that apply to your device. See the list of FARO products below to review the ISO accreditation and the applicable calibration procedures used for your device.
FARO Service Center Compensation, Calibration, and Certification

Your FARO device is a precision measurement tool. When you treat it according to the use and care instructions stated in the device user manual, it is designed to maintain its accuracy when exposed to the stresses and impacts in typical work environments. However, to ensure the repeatable accuracy of your FARO measuring devices, it is a best practice to periodically send your device to a FARO Service Center to get a complete and thorough compensation, calibration, and certification. How often you send in your device depends on your corporate quality policies and procedures for ensuring the performance of measurement devices.

It is a best practice to always keep your warranty up to date. When you purchase a warranty, you get one free calibration and certification with every year of warranty purchased. Click here for information about warranties.

To comply with the conditions stated in your warranty, only send your device to a FARO Service Center. The technicians at the service center perform a series of tests, a factory compensation, and a factory calibration using patented proprietary hardware and software to optimize the performance of your FARO device and ensure your device meets all the original factory technical specifications.

When your device is returned to you, you receive a calibration certificate that documents the calibration comparisons, deviations, and pass/fail results.

FaroArms® and ScanArms® with Laser Line Probes

- There are two types of compensation for FaroArms and ScanArms that you can do yourself: FaroArm compensation and probe compensation. For details and instructions, refer to the user manual for your model.
- There are two types of do-it-yourself tests that provide results that enable you to assess the accuracy of your measurement processes: SPAT test and volumetric test. For details and instructions, refer to the user manual for your model.
- It is a metrology industry best practice to perform a compensation whenever you change probes. The compensation determines the center of the probe tip relative to the FaroArm coordinate system. For the Quantum Series FaroArms, the kinesthetic mount maintains a high-level of accuracy as you change from one probe to another and may not require compensation. As you change probes for the Quantum Series FaroArms, compare the measurements you get without compensation and accuracy tests to your project quality specification to determine if you must compensate probes as you change from one to another.
- When FARO factory technicians perform a compensation, the true dimensions and kinematics of the FaroArm are determined and stored in the FaroArm memory.
- For the ASME B894.22-2004 calibrations, FARO follows this Standard’s recommendation, Appendix J, in the application of the decision rule to testing results. This appendix states "B89 standards that adopt standards referencing ISO 14253-1 as a normative standard shall explicitly state a different decision rule, where the 4:1 simple acceptance and rejection rule from B89.7.3.1 shall be the default rule unless a different rule is specified."
- For ISO 10360-12:2016 Calibration, FARO follows this Standard's recommendation, Introduction Clause, in the application of the decision rule to testing results. This clause states that "the default decision rules given in ISO 14253-1 apply to specifications made in accordance with this part of ISO 10360, unless otherwise indicated." The relevant decision rule in ISO 14253-1:1998 is given in Clause 5.2, "Rule for proving conformance with specifications."
NOTE: The Design ScanArm is not a metrology-grade measurement tool, so it does not need to be sent to a FARO Service Center for certification. To access the accuracy of your Design ScanArm, you can perform the do-it-yourself compensation and accuracy tests at any time. Refer to your user manual for details. If your Design ScanArm has sustained damage or you are concerned about its accuracy, you may request to send it in for repair. All repairs for your Design ScanArm are governed by FARO's ISO 9001:2015 accreditation.

Standards

<table>
<thead>
<tr>
<th>Model</th>
<th>Calibration Procedure</th>
<th>ISO 9001:2015</th>
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<tbody>
<tr>
<td>QuantumS, QuantumM, QuantumE</td>
<td>ISO-10360-12:2016 for FaroArms</td>
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<tr>
<td>Gage</td>
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<tr>
<td>Edge, Prime, Fusion, Platinum, Quantum, Titanium, Gage Blue Tooth</td>
<td>ASME B89.4.22 for a FaroArms and ScanArms including these tests.</td>
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<td>• Effective Diameter Test</td>
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<td>• Single Point Accuracy Test</td>
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<td>• Volumetric Performance Test</td>
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<td>Click here to see a sample report</td>
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<td>Gage Plus, Gage Standard, Power Gage</td>
<td>ISO 10360</td>
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<tr>
<td>8-Axis</td>
<td>Test based on methods from ISO 10360-8 Annex D</td>
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<tr>
<td>Laser Line Probe (LLP)</td>
<td>Test based on methods from ISO 10360-8 Annex D</td>
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<tr>
<td>Laser Line Probe (LLP) HD V6*, Edge ES V5, Edge V4</td>
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<tr>
<td>Laser Line Probe (LLP) V3</td>
<td>FARO proprietary process that uses traceable known measurement artifacts to confirm LLP meets published specifications</td>
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* HD V6 when serviced alone or with a FaroArm other than the QuantumS
Click here to review accuracy standards and technical specifications contained in model-specific techsheets.

See Also

- Refer to the user manual for your model FaroArm or ScanArm
- Refer to the user manual for your model Gage
- Request Service, 15-Point Check, or Certification for FaroArm, ScanArm, or Gage
- Compensating the Laser Line Probe (LLP) Using USB FaroArm Driver 6.1.0 and Later

Laser Trackers

- The ASME B89.4.19 System Calibration is a standardized method of calibrating a Laser Tracker using NIST traceable artifacts. It was officially released by the American Society of Mechanical Engineers in December 2006, several years after the FARO Laser Tracker was developed and began production. The standard consists of a comparison of the Absolute Distance Meter (ADM) system of the Laser Tracker (and IFM system if equipped) to a NIST traceable interferometer as well as scale bar measurements at specific locations and with specific geometries.
- The B89 calibration provides a more complete Laser Tracker calibration certificate than the standard certificate. It is 12 pages long and contains 6 pages of Laser Tracker measurements, but will only be performed on a Laser Tracker after successful completion of the standard calibration. One primary reason for this is that the B89 standard requires all the angular accuracy measurements be performed at a distance of 6 meters or closer and uses only one sized Spherically Mounted Retroreflector (SMR). The testing that goes along with the FARO standard calibration method does more extensive accuracy checks at further distances with multiple sized SMR's.
- If you request the entire B89.4.19 procedure, it is not included in your warranty.

Standards

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<tr>
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<td>ION®, Xi, X, Si</td>
<td>FARO proprietary process that uses traceable known measurement artifacts to confirm tracker meets published specifications</td>
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Optional upon request
Entire B89.4.19 procedure

https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices
Updated: Mon, 24 Aug 2020 15:46:25 GMT
Click here to review accuracy standards and technical specifications contained in model-specific techsheets.

See Also

- Refer to the user manual for your model of Laser Tracker
- Calibration FARO Standard (ACC-00) and ASME B89.4.19 System Calibration (960-02589) for the Laser Tracker ION, Xi, X, and SI
- Calibration Certificate Does Not Contain Measurements of a NIST Traceable Artifact for the Laser Tracker ION, Xi, X, and SI
- Traceability of Key Components for the ION, X, and Xi Laser Tracker

3D Imagers

- The user manual for your model Cobalt has step-by-step instructions about how you can compensate your Cobalt.
- The Cobalt 3D Imager does not have to be sent back to the FARO factory for periodic calibration and certification unless you want to have it certified. This certification is optional and is not covered by your warranty.
- The matching dot plate for the Cobalt 3D Imager does require periodic calibration and certification. FARO factory technicians certify your dot plate using high-accuracy photogrammetry and traceable scale bars. When the dot plate is returned to you, you get a new calibration file. Load this file to your system before you do a compensation.
- Per the recommendation of VDI/VDE 2634-2:2012, Annex 4.3.5, the relevant decision rule in ISO 14253-1:1998 is given in Clause 5.2, "Rule for proving conformance with specifications."

![Dot Plate Image](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)

Standards

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</table>
Click here to review accuracy standards and technical specifications contained in model-specific techsheets.

See Also

- Refer to the user manual for your model of 3D Imager
- Dot Plate Template and Compensation Instructions for the Cobalt 3D Imager

### Laser Projectors

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<td>FARO proprietary process that uses traceable known measurement artifacts to confirm projector meets published specifications</td>
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Click here to review accuracy standards and technical specifications contained in model-specific techsheets.

See Also

- Refer to the user manual for your model of Laser Projector

### 3D Laser Scanners

- Click here for instructions about how to use do-it-yourself Onsite Compensation to adjust your Focus S 70/150/350.
- Click here for details about what is covered when you send in your Laser Scanner for factory compensation, calibration, and certification.

### Standards

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<td>-Focus S 70/150/150 Plus/350/350 Plus</td>
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<td>-Focus 3D X HDR 30/130/330</td>
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https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices

Updated: Mon, 24 Aug 2020 15:46:25 GMT
### Model Calibration Procedure

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<td>-Focus 3D S 20/120</td>
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<tr>
<td>-Focus 3D 20/120</td>
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</table>

Click here to review accuracy standards and technical specifications contained in model-specific techsheets.

### See Also

- Refer to the user manual for your model of Laser Scanner
- Calibration, Certification, and Maintenance Services for the Focus
- Environmental Standards for 3D Laser Scanners

### Scan Localizers

The Scan Localizer does not require compensation, calibration, or certification. However, it can be repaired or serviced, which is certified ISO 9001.

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<td>All Models</td>
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Click here to review accuracy standards and technical specifications contained in model-specific techsheets.

### See Also

- Refer to the user manual for your model Scan Localizer

### Freestyle Hand-Held Scanners
## Standards

**Model**  | **Calibration Procedure** | **ISO** | **ISO/IEC**
--- | --- | --- | ---
Freestyle | FARO proprietary process that uses known measurement artifacts to confirm scanner meets published specifications | 9001:2015 | 17025:2005

## See Also

- [Warranty Plans for FARO Hardware](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [Servicing or Repairing Your FARO Device FAQs](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [Calibration Due Date Does Not Appear on Calibration Certificates](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [FARO Factory Service, Repair, and Certification Workflow](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [Retention Policy for Certification Documentation of FARO Devices](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [FARO Technologies ISO Certification](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [FARO Factory Manufacturing and Service ISO Accreditation-Certification](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [FARO ANSI NCSL Z540 Accreditation Information](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [China Compulsory Certification for FARO Hardware](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [CE Certification Documentation for FARO Devices](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [Certification or Repair by Other Companies](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [FARO Factory Service Locations and Products They Service](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)
- [FARO Global Technical Support and Hours of Availability](https://knowledge.faro.com/Essentials/Hardware/Compensation_Calibration_and_Certification_Standards_for_FARO_Devices)

## Keywords

- certify, validate, metrology standards, proof of certification, check up, factory servicing, factory service, traceability, trace, certification, traceable, nist, calibration Interval, Cal interval, cal due date, ANSI/NCSL Z540, Guide 25, calibration certificate, EPEAT, IEEE, checkup, maintenance, adjustment, cleaning, inspection, repair, schedule annual calibration