Agilent.
We know your instrument.

Bob Brown
Metrologist
United States

Bob is an expert metrologist at the Agilent Technologies Standards Lab. His job is to oversee some of the most sensitive and accurate voltage and resistance measurement equipment in the world. It is this commitment that ensures that your Agilent equipment receives the most precise calibration possible to give you the right measurement every time.

ISO 17025 and Accredited Calibrations

essential information that will help you win

Agilent Technologies

ISO 17025 and Accredited Calibration Services

An Agilent Technologies guide to selecting the right calibration services for your business

ISO 17025 – an Introduction

By now you will have probably heard the term ISO 17025 used when discussing calibration services. This standard will have a huge impact on the way you consider and buy calibration services. ISO 17025 has been introduced for good reasons – it is designed to help you, and as you understand it more you will embrace it as an essential and useful tool.

If you're not fully up to speed with it now – **don't worry** – that's what this guide is for. Use the following few pages to get to know ISO 17025 and arm yourself with the information you need to make the right calibration choices for you and your company. **A little time invested now could result in the saving of both money and reputation.**

ISO 17025 - Important facts that affect you

ISO 17025 is the single most important metrology standard for test and measurement products.

It is the global standard for the technical competence of calibration and test laboratories.

It will help to give you confidence in the calibration decisions you make.

ISO 17025 is here to help you - use it to your advantage.

ISO 17025 – in detail

ISO 17025 *(more specifically ISO/IEC 17025:2005)* is an international standard for calibration and testing labs. It requires labs to demonstrate that they:

- Operate a quality system covering processes, documentation and management.
- Generate technically valid results taking account of the equipment, procedures, and personnel.

This standard is an evolution of the former ISO Guide 25. It replaces EN45001 in Europe and has been adopted in the U.S. as an ANSI Standard that provides a migration path to international standards from the older Z540-1994.

All national accreditation bodies have adopted ISO 17025 as a way to ensure standardization. Several industries or countries have incorporated it into their industry-specific or application-specific regulations, for example:

- QS-9000 and ISO/TS 16949: quality standards for the automotive industry.
- FCC Part 15: U.S. government regulation for the qualification testing of computers and peripherals.

An important step forward

The standard enables key advantages to specifiers and users of calibration services.

You can now determine the relative quality and capability of different calibration laboratories. With ISO 17025 it is easier to compare the measurement expertise from different calibration suppliers, and for multi-national companies to compare suppliers in different countries.

As a result, companies gain a higher confidence level in the calibrations they purchase, which in turn gives them higher confidence in their finished product quality.

The quality and competence of the calibration and testing service sold by a provider is now independently verified through the accreditation process. This can eliminate the need for supplier auditing and provides you with greater confidence in your supplier decisions.

The four ‘faces’ of ISO 17025

There are four main aspects or ‘faces’ of ISO 17025, all of which can legitimately result in the answer “yes” to the question: “Are you an ISO 17025 supplier?”

1. **An ISO 17025 process-compliant laboratory**
2. **An ISO 17025 accredited laboratory**
3. **An ISO 17025-conformant service**
4. **An ISO 17025 accredited service**

Many customers that are asking for “17025” are happy to be getting a service from a supplier using ISO 17025 compliant processes, and they don’t really need (or want) the additional deliverables associated with the “conformant” service.

The following is an assessment of where each ‘face’ fits with your needs:

1. An ISO 17025 process-compliant laboratory

This satisfies the needs of people who just need to be confident that the lab is competent and has adequate quality built into its processes.

An internal audit program is necessary to claim process-compliance, but no external review is required.

2. An ISO 17025 accredited laboratory

This satisfies people who although not necessarily requiring an accredited service, believe that an accredited lab, having been independently assessed, will provide higher quality calibration than one that is non-accredited. The presence of an ISO 17025 ‘badge’ augments that feeling of confidence.

Being accredited is a prerequisite for selling an accredited service, but it is no guarantee that the service provided is accredited. In fact, in the electronic instrument calibration environment most suppliers are to some extent accredited, but less than 10% of services sold by them are accredited.

By identifying which situation most closely represents your own, you will be in a better position to decide the type of lab and service that is best for your particular business.

3. ISO 17025-conformant service

This is a service which delivers to the requirements of ISO 17025 and includes measurement uncertainties which expose the adequacy of measurements. If a statement of specification-compliance is made, it should take those uncertainties into account (although such a statement is not mandatory).

The more rigourous requirements of ISO 17025 provide assurance that the procedure used is appropriate to the capabilities of the instrument.

Similarly to the ‘accredited’ situation, many labs will have ISO 17025-compliant processes but will not necessarily sell a service that conforms to the 17025 standard.

4. ISO 17025 accredited service

With the accredited service, all measurements are performed using processes that have been assessed by the external auditing body, and that audit process will have also ratified the measurement uncertainties displayed on the calibration certificate. This gives the highest degree of confidence that the measurements are trustworthy. Companies whose business depends on the measurements they make, such as calibration labs, EMC conformance testing labs etc, generally require this service.

Most labs are accredited but it is the parameters that they measure, not the entire lab, that is accredited. It is important to establish that the lab has the relevant accreditation for the instrument you wish to have calibrated. See ‘Scope of Accreditation’ on page 4 for more on this subject.

Measurement Uncertainties explained

Despite what some suppliers may often claim, no measurement can be guaranteed to be perfect!

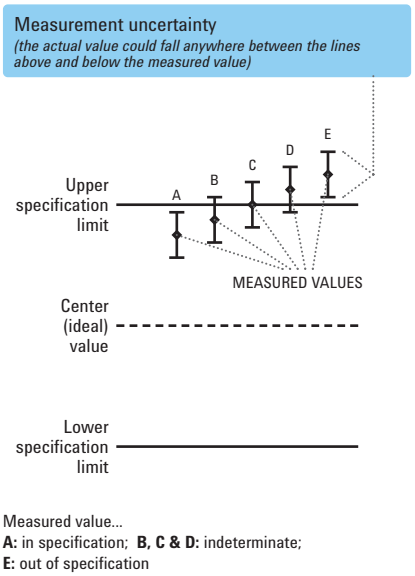
An uncertainty is a figure of merit associated with the actual measured value; the boundary limits within which the 'true' value lies. Contributors to this "potential for inaccuracy" include the performance of the equipment used to make the measurement, the test process or technique itself and environmental effects.

Additional imprecision may result from behaviour of the phenomenon or item being measured. A skilled metrologist will assess and combine these various components in an uncertainty budget. To prove that a product complies with specification (or doesn't), the uncertainty must be less than the unknown's specification.

Uncertainty illustration

In the following example, the same measurement is performed on five different devices: A, B, C, D and E. The results of these measurements are shown in the illustration below. Without taking measurement uncertainty into account we would state that devices A and B are within specification, device C is borderline and devices D and E are out of specification.

However, when taking uncertainty into account, we can say that device A is within specification (if the actual value is anywhere within the uncertainty it will still fall between the specification limits) devices B, C and D could be either in or out of spec - the specification status is indeterminate, and device E is out of specification.



Measured value...
A: in specification; **B, C & D:** indeterminate;
E: out of specification

Agilent's position on 'indeterminate' points:

In the real world the 'indeterminate' situation is largely impractical.

Agilent has considered this situation at great length, in conjunction with input from its customers. The result is an approach that strikes a good balance between what is metrologically precise, and what customers really want, creating a realistic, commercially acceptable service.

Thus with an ISO 17025 calibration from Agilent, the assessment of A, B, C, D and E will be:

A = "PASS"

Performance is better than or equal to product specification. It is labelled PASS and a statement of conformity is issued.

B, C = "PASS #"

Performance falls within the measurement uncertainty guard band on the 'in-specification' side. The customer is notified on the measurement report that:

"All measured values indicated by this data report lie within specification. Due to measurement uncertainty, the true values of one or more of these points may lie outside of the specification, but there is a high probability that these values lie within specification."

A certificate of calibration stating that the instrument meets specifications is issued. B and C are not adjusted to be closer to center.

D, E = "FAIL"

Performance falls within measurement uncertainty guard band on the 'out-of-specification' side and is considered a *FAIL*.

A statement of conformity is issued only if D and E are adjusted to be in specification.

Measurement Uncertainties with ISO 17025

The uncertainty illustration also serves to show that the measurement uncertainty should be smaller than the range of the specification (in this case it is approximately one quarter of the specification). If the uncertainty were larger than the specification, there could never be a clear-cut case 'A' PASS.

This leads to a further consideration when choosing a calibration supplier – the supplier may have processes that are compliant to ISO 17025, and may also be accredited. As previously noted, the accreditation is applicable to specific measurements made by the lab, not the lab as a whole. It is not sufficient to establish simply that the lab has the capability for the measurements or calibrations you require, but to determine how good that capability is.

Scope (or Schedule) of Accreditation

One way to achieve this is to review the 'Best Measurement Capability' detailed in the "Scope" or "Schedule" of accreditation, posted on the website of the local accrediting agency.

This is the independently assessed record of that lab's ability to make the measurements for which it has become accredited.

With a non-accredited lab, the measurement uncertainties for ISO 17025-conformant calibrations are self-assessed, so there is no easy way to determine how good the best measurement capability is other than by asking or performing a technical audit.

This is not to say that a non-accredited calibration is going to be any more or less accurate than an accredited one from a given supplier, just that it lacks the independent verification of the quality of the measurements.

Also worth noting is that a lab's best measurement capability is a real, achievable capability, but it isn't necessarily applied to all calibrations. In many cases it is achievable only in a Standards Lab environment, whereas the routine calibration work will be done in the main laboratory using different equipment where the measurement uncertainty will be worse.

Summarising measurement uncertainties

- These are required deliverables with 17025-conformant and Accredited calibrations
- The smaller the uncertainty, the more credible the result
- 'Scope (or Schedule) of Accreditation' shows the Best Measurement Capability for a given lab
- These are the only practical way to compare the capabilities and skills of different labs
- A lab that is 'Accredited' may only have accreditation for a few basic parameters, in which case it would be unable to provide a fully accredited calibration for anything but the most basic of instruments
- Non-accredited labs can perform 17025-conformant calibrations. The uncertainties will be self-declared.

Calibration deliverables from Agilent Technologies

Agilent has ISO 17025 compliant processes in all of its calibration delivery locations.

Broadly speaking there are three types of service that can be purchased from a lab claiming 17025 process-compliance:

A. Calibration services from a 17025 compliant lab
(satisfy the group illustrated in'Face 1'. Will also satisfy the group illustrated in 'Face 2' if the lab is accredited)

Agilent's service:
Agilent Calibration

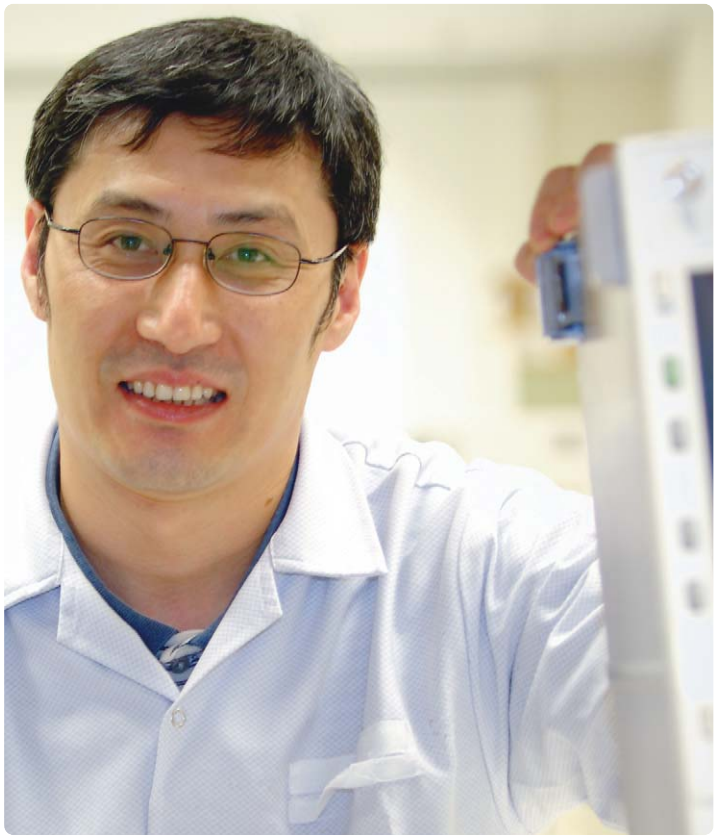
B. 17025-conformant calibration services
(satisfy the group illustrated in'Face 3')

Agilent's service:
17025 Calibration

And if the lab is also 17025 accredited:

C. Accredited calibration services
(satisfy the group illustrated in'Face 4')

Agilent's service:
Accredited Calibration



Liu Biao
Senior Engineer & Repair Team Leader
Singapore

For Liu and his team, repair and calibration is only part of the service – to them service is all interaction with the customer, whether it's over the phone or face to face. He is able to solve customer's problems with his friendly confidence, and by working hands-on with them. This includes looking at all aspects of their work environment to make sure they are getting the most out of their equipment.

The table shows the deliverables from each of these services.

	Agilent Calibration	17025 Calibration	Accredited Calibration
Measure all parameters specified by the manufacturer	✓	✓	regional variation
Data report showing instrument performance as received by the lab (before corrective adjustment)	✓	✓	✓ **Accredited**
As-received report includes measurement uncertainties	no	✓	✓ **Accredited**
Corrective adjustments and/or repairs to restore full specification compliance (additional charges may apply)	✓	✓	regional variation
Data report showing instrument performance as shipped back to the user	✓	✓	✓ **Accredited**
As-shipped report includes measurement uncertainties	no	✓	✓ **Accredited**
Calibration certificate	✓	✓	✓
Statement concerning instrument specification compliance	✓	✓	regional variation
Calibration label	✓	✓	✓
Safety label	✓	✓	✓
Tamper-proof seals	✓	✓	✓

Agilent – the global market leader

Agilent has 40 calibration delivery locations around the world. All of them are using ISO 17025 compliant processes and most are accredited to ISO 17025.

(See back cover for list)

Each year we perform more than 200,000 instrument calibrations. Agilent constantly invests in the latest technology to enable quality calibration of the latest high-precision instruments. This ensures that the measurement uncertainties are as small as possible to optimize calibration accuracy. Ultimately, with Agilent, you can be more confident in the accuracy of the measurements that you make with your calibrated equipment.

Agilent provides calibration for both Agilent and non-Agilent manufactured instruments, and has precisely managed processes to keep calibration turnaround times down as low as practical, helping to minimise your downtime.

We also provide our calibration at your site using specially designed mobile calibration systems, delivering the same high quality, while reducing downtime to just the time it takes to calibrate each instrument – ideal for high throughput production test environments and any other situations where losing the equipment for even a few days would be a problem.

For more information about many aspects of calibration and measurement, including measurement uncertainty calculations, techniques, standards, accreditation etc visit the Agilent Metrology Forum www.metrologyforum.com (more than 1,000,000 hits worldwide!) THE reference site for electrical measurement professionals.

Service ordering options:

Purchase with new equipment:

- Factory Calibration Option delivered with your new hardware (option 1A7)
- ISO17025 Calibration Upfront Plan (R-50C-016-3, available for 3 years)

Purchase for existing equipment:

- 17025 Cal Service Agreement (R-50C-516)
- 17025 Per-Incident Service (R-50G-516)

Get ahead in the race for ISO 17025 Services!

Contact your local Agilent office NOW.
We will be delighted to provide you with more information and can set up a site visit where we can run through your calibration options in detail.

Agilent Service Centers

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● Sao Paulo

Canada
● Montreal

Mexico
● Mexico City
▲Reynosa

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■ Chung-Li

Thailand
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■ **Full Service Site** ● **Focused Site** ▲ **Onsite Service Location**

Agilent Technologies' Test and Measurement Support, Services, and Assistance
Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help
you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise
Our Promise means your Agilent test and measurement equipment will meet its advertised performance and
functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you receive your new Agilent equipment, we can help verify that it works properly and help with initial product operation.

Your Advantage
Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a
competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and onsite education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

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