



THE HUMAN SIDE OF CALIBRATION

A White Paper Series on Biomedical Metrology, Calibration, and Trust

BITS White Paper • Think About It – S09 •

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Accredited ISO/IEC 17025:2017 Calibration and Testing Laboratory (ANAB ACT-3400)

WHY THE MOST IMPORTANT MEASUREMENT STANDARD IS NOT THE INSTRUMENT, BUT THE PERSON USING IT.

The Assumption Behind Every Measurement

When people think about calibration, they often think about equipment first. Reference standards, test tools, calibration certificates, and accreditation usually follow.

These are all essential parts of a reliable calibration process. However, one important element is often overlooked: the person performing the work.

Every measurement begins with a person.

Before a result appears on a calibration report, someone must:

- Select the appropriate method
- Connect the equipment
- Read and interpret the readings
- Evaluate the results
- Decide whether the outcome makes sense

Technology plays a critical role, but it does not make decisions. **People do.**

The Instrument that is Often Overlooked

Organizations invest heavily in measurement systems because accuracy matters. They purchase:

- High accuracy standards
- Advanced analyzers and test instruments
- Traceable equipment
- Accredited calibration services

These investments are indeed important, but even the best instrument cannot compensate for poor judgment.

An accurate reference standard is only as reliable as the person using it.

“Measurements come from instruments. Confidence comes from competence.”

Why Competence Matters More Than We Realize

Two technicians can use the same equipment and follow the same procedure yet produce different results.

This happens because measurement is not purely mechanical. It requires understanding, observation, interpretation, and professional judgment. Technicians must recognize when conditions are unusual, identify potential sources of error, and determine whether a result is reasonable.

Without these skills, even well-designed measurement systems can become vulnerable to error.

The Difference Between Qualification and Competence

A common misconception is that training automatically creates competence. It does not.

Qualification establishes that an individual has met defined educational, training, certification, or other formal requirements for a particular role. However, qualification alone does not necessarily demonstrate competence.

Competence is demonstrated through consistent and effective performance. It develops through the practical application of knowledge, relevant experience, ongoing evaluation, and continuous improvement.

A certificate or qualification may confirm that an individual has completed or met established requirements, but competence is demonstrated by how well that individual performs the work.

“Training teaches procedures. Competence applies them correctly when conditions aren’t perfect.”

The Human Factors Behind Measurement Errors

When measurement failures occur, equipment is often blamed first. Sometimes that is justified, but the source of an error may be elsewhere.

Human factors can contribute to:

- Incorrect equipment setup
- Misinterpretation of readings
- Data entry errors
- Incomplete documentation
- Missed calibration intervals
- Incorrect application of procedures

These mistakes rarely happen because people intend to make them. They happen because human performance is influenced by experience, workload, communication, working conditions, and other factors.

A strong quality system must recognize these realities and build safeguards around them.



Why Good Procedures Are Not Enough

Organizations often assume that documented procedures guarantee consistency.

Procedures are essential, but they cannot replace human judgment. A procedure cannot always:

- Recognize unusual conditions
- Identify a suspicious result
- Understand unexpected behavior
- Apply critical thinking to a situation

A procedure provides direction. A competent person provides the understanding needed to apply it correctly.

Both are necessary for reliable calibration.

The Value of Professional Skepticism

One of the most important qualities in measurement science is skepticism or what we called doubt. This does not mean cynicism or distrust. It means having the discipline to pause, question a result, and investigate when something does not appear right.

A competent technician should be willing to ask:

- Does this result make sense?
- Is this reading reasonable?
- Could something have changed?
- Is there a possible source of error?
- Should this result be investigated further?

Many significant measurement errors can be prevented when someone takes the time to question an unexpected result instead of simply accepting it.

“The most valuable calibration tool is the ability to recognize when something doesn’t look right.”

Why Accreditation Places So Much Emphasis on Personnel

Standards such as ISO/IEC 17025 place significant emphasis on personnel competence for a reason.

Equipment can be purchased. Procedures can be documented. Facilities can be upgraded. But competence must be developed through training, experience, assessment, and continued professional development.

This is why personnel qualification, authorization, training, and ongoing competency assessment remain important parts of laboratory quality systems.

Reliable calibration depends not only on having the right equipment, but also on having people who know how to use it correctly and understand the results it produces.

The Organizations that Get It Right

Organizations with strong quality cultures understand that reliable measurement is not created by equipment alone. They invest in their people through:

- Technical training
- Mentoring
- Knowledge transfer
- Competency assessments
- Professional development

These organizations treat personnel as measurement assets, not simply operational expenses.

This approach creates measurement systems that are more resilient, consistent, and trustworthy.

Beyond Technical Skills

Competence extends beyond technical knowledge. It also involves integrity, accountability, attention to detail, communication, and professional ethics.

A technically skilled individual can still compromise a quality system if they lack integrity or accountability.

Trust depends on both capability and character.

“The quality of a measurement reflects both the skill of the technician and the integrity of the process.”



Why This Matters Beyond Calibration

The human side of calibration affects more than the accuracy of a measurement result. It can also influence:

- Patient safety
- Regulatory confidence
- Organizational reputation
- Quality of decision-making
- Public trust

Behind every measurement is a person whose actions can directly influence the outcome.

Recognizing the human role in calibration helps organizations build stronger quality systems, reduce measurement risks, and improve confidence in the data they use to make important decisions.

Ultimately, reliable measurement is not simply a matter of having the right instrument. It is about having the right people, the right processes, and the competence to bring them together.

Think About It:

The most important calibration standard in any organizations may not be sitting on a laboratory bench; it may be the person standing beside it.

Final Thoughts

- Standards can guide.
- Procedures can instruct.
- Equipment can measure.
- But people ultimately determine whether quality is achieved.

Read more:

[In-house vs Accredited Calibration](#)
[Traceability ≠ Accreditation](#)
[Accuracy vs Precision](#)
[Calibration vs Verification vs Validation](#)
[Measurement Uncertainty Matters](#)
[The Truth About Traceable Tools](#)
[Audit Readiness vs Daily Readiness](#)
[The Hidden Cost of Non-Compliance](#)

References

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- **ISO 10015:2019** – *Quality Management – Guidelines for Competence Management and People Development*.
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About the Authoring Organization

This paper is written from the perspective of an ISO/IEC 17025–accredited calibration and testing laboratory that works closely with healthcare institutions, laboratories, and engineering teams to strengthen measurement confidence, support quality management systems, and promote personnel competence.

Drawing from practical experience in calibration, testing, and laboratory quality systems, this paper encourages organizations to recognize that reliable measurement depends not only on equipment and procedures, but also on the competence, judgment, and integrity of the people performing the work.

Supporting Sustainable Quality

Quality is not achieved through reliable equipment and documented procedures alone, but through competent people who know how to apply them correctly.

Organizations that invest in technical training, competency assessments, and continuous professional development create quality systems that are more consistent, resilient, and trustworthy.

For organizations seeking guidance on calibration, measurement assurance, or strengthening their QMS, partnering with an ISO/IEC 17025–accredited laboratory can provide independent technical expertise and confidence in measurement results.