

A GAMBICA TECHNICAL GUIDE

CHOOSING A CALIBRATION PROVIDER

FOR ELECTRONIC
TEST & MEASUREMENT EQUIPMENT

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Choosing a calibration service

Introduction

This Guide is to enable industry:

- to choose calibration services and calibration providers to meet their own specific calibration requirements
- to procure the appropriate calibration in a timely manner, at a cost effective price and to eliminate delays for costly re-work including that resulting from non-compliances raised by clients or quality assessors.

GAMBICA

GAMBICA is the trade association for the instrumentation, control and automation industry. Member companies of the sector group, Test and Measurement Equipment, provide a wide range of measuring instruments, calibration equipment and calibration services on a world-wide basis. GAMBICA members are concerned at industry's use of inappropriate calibration services. These services are often selected purely on cost grounds and by purchasing staff who may be unable to technically review the services being offered. This lack of control and knowledge within the calibration arena has a consequent adverse effect on the quality of products. In certain applications, there are concerns with the need to meet regulatory requirements including Health and Safety regulations.

Obtaining a valid calibration is vital

The calibration of the test and measuring equipment used in a company is a vital link in ensuring that products manufactured meet their published performance specification. In fact careful selection of the appropriate calibration service should save you money, therefore do not choose a calibration service on price alone. This guide sets out how to ensure that you are getting the level of service you require to enable you to be confident in the specification of your product and to enhance the position of your product in the world-wide market place. Valid traceability of calibration to national and international standards is important on a global sales basis.

Calibration and Product Quality

Because the provision of calibration services is not fully regulated, the quality of products and processes evaluated using inadequately calibrated equipment may be adversely affected. Some service companies provide calibration which does not fully verify whether the instrument meets the specification published by the instrument manufacturer, which may mean that the instrument may be put back into service providing untrustworthy information. Companies who operate an ISO 9000 Quality Management System [see ref. 1] should be able to demonstrate that an instrument's calibration is appropriate for the use of that instrument.

The International Standard

Fortunately the need for a guiding standard to help regulate this complex area was recognised and an International Standard developed. The International Standard ISO/IEC 17025 'General requirements for the competence of testing and calibration laboratories' - specifies how laboratories demonstrate that they operate a quality system, are technically competent and able to generate technically valid results. [see ref. 2 & 3]

What calibration do I need?

The question most often asked by users is "Do I need a certificate of calibration for every item of my test equipment?" The answer is: "not necessarily". That decision should be based on how the equipment is used e.g. whether it is used as a general tool or used in the final testing of a product. The same decision criteria should be used to determine which type of service to choose for each instrument. An accredited calibration is the safest choice for items of test equipment used for establishing traceability of measurements of the user's product or service. The calibration may need to be very specific to a particular measurement parameter or be to the manufacturer's recommended calibration procedure to demonstrate compliance with the manufacturer's published performance specification.



As a general guide, an accredited certificate of calibration is required if the device to be calibrated is:

- A reference standard, in a standards or calibration laboratory.
- A reference standard used to validate equipment used on a production line.
- Equipment used in a testing or service environment for which traceability of measurement is required.

If a non-accredited calibration is chosen it is important to ascertain whether performance data should be recorded before any adjustments are undertaken. This will provide equipment performance history essential to satisfy ISO 9000 requirements for a product recall process.



Procurement and cost of calibration

Actual calibration costs should be a secondary factor as they are relatively small when compared to the cost of a product recall or damaged brand integrity. When comparing prices ensure that the extent of the calibration work is the same from different calibration providers. Contracts, terms and conditions should cover the following elements:-

- Ensure that all calibration providers receive the same calibration requirements in writing and that you are specific about what you want, e.g. establish:
 - that calibration methods are adequately defined, documented and understood;
 - that the specification is agreed for the calibration work;
 - that the relevant manufacturer's handbook is available;
 - that the service is accredited or not [see later sections for more detail on this fundamental difference];
 - that the policy on the recording of before and after adjustment calibration results is agreed;
 - that the policy on the optimisation (adjustment to specification every time) of instruments and for dealing with 'typical' or 'better than' instrument specifications is agreed;
 - whether adjustments, minor repairs etc are or are not included in the price;
 - whether a collection and delivery service are or are not included in the calibration cost.
- Establish that the laboratory has the capability, equipment resource, skilled personnel and expertise for the calibration needed.
 - Visit the laboratory with a technical expert, to see the calibration procedures used by the laboratory.
 - Ask to see an example of the calibration provider's certificate of calibration for the product(s) you wish to be calibrated.
- Ensure that the supplier agrees to and complies with the following with respect to subcontracting.
 - A calibration provider should obtain client agreement before sub-contracting calibration work.
 - If advised by the calibrator of his intention to use a sub-contractor, establish that he has conducted a quality audit on the sub-contractor.
 - Specify that your company address as well as the calibration provider's address appears on the certificate of calibration.
 - The calibration provider shall supply the sub-contractor's original certificate of calibration.

Calibration to the instrument manufacturer's specification

This is the most common request for calibration and as such satisfies most user requirements. A manufacturer's recommended calibration procedure may be assumed to be the minimum calibration requirement necessary to ensure that the equipment is operating correctly and within the limits of manufacturer's published performance specification. This service is based on the manufacturer's adjustment and calibration procedures in the service manual. It is important to be aware that a calibration to a manufacturer's recommended calibration procedure may not cover the full calibration need when the equipment is being used. Some additional calibration may be needed to meet a specific calibration measurement. For example, an additional attenuation measurement at a specific frequency on a signal generator or a procedure to meet a particular regulatory calibration need for Electromagnetic Compliance testing. Under ISO 17025, if the calibration purchaser specifies that the calibration should be to the manufacturer's full specification it is the obligation of the calibration provider to advise of any parameters they are unable to measure.

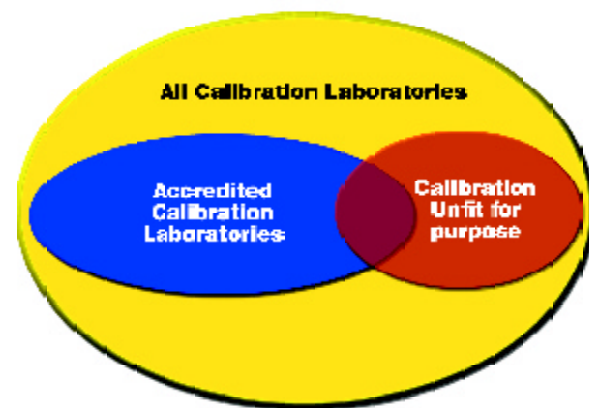
Limited calibration

A limited calibration may be restricted to cover certain parameters, at the user's request, to meet a special calibration requirement. Limited calibration may restrict the use of the instrument for other measurement purposes. The instrument or equipment should be labelled by the user to identify its restricted use. A Limited calibration normally reduces the cost.

Is an accredited laboratory better than a non-accredited one?

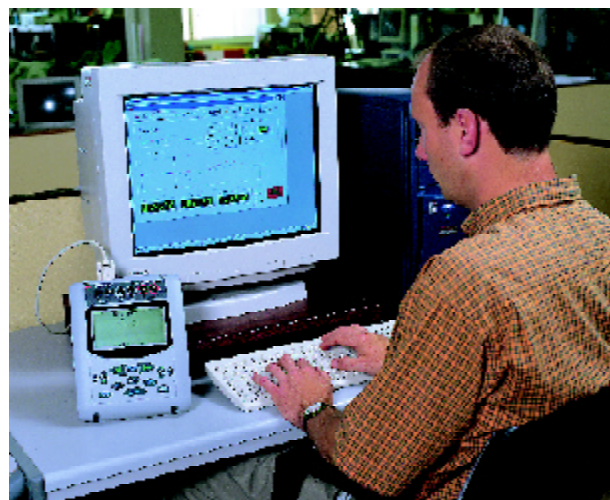
GAMBICA member companies are instrument manufacturers. Some manufacturers have chosen to be accredited for parts of their calibration service, others have not. GAMBICA recognises that the OEM (original equipment manufacturer) is likely to be the most knowledgeable about its own products, and that whether or not it has chosen to take the accreditation route, it will have the appropriate tools and processes in place to calibrate its own products properly, with adequate measurement uncertainty for the measured parameters.

An accredited calibration laboratory is one that has demonstrated to an accreditation authority, UKAS in the UK [see ref.4] that it is technically competent to perform specified measurements and to issue certificates of calibration to meet ISO/IEC 17025 requirements. Such a laboratory can only issue an accredited calibration for the measurement parameters for which it holds accreditation. If you require an accredited calibration certificate it is necessary to specifically request it, since accredited laboratories also perform non-accredited calibrations. Some companies may require that calibration is obtained for certain key items of equipment from an accredited laboratory.



Non-accredited calibrations can be equally fit for purpose, and may well be better (in terms of extent of calibration and measurement uncertainty) than an accredited calibration. So it is important to establish what you require and what the laboratory will provide whether or not you ask for an accredited calibration. Provided the measurements and associated measurement uncertainties are relevant to the instrument to be calibrated, the accredited laboratory is able to provide a more trustworthy calibration than a non-accredited one for the same instrument.

However it is important to check that the laboratory has accreditation for the appropriate parameters for the equipment, and that the measurement uncertainties are appropriate for the specification. It is quite possible for an accredited laboratory to supply a certificate that is unfit for purpose (although such an occurrence is more likely to be from a non-accredited laboratory due to the lower degree of control to which they are subjected).



Turn around time

Consult the calibration provider and thereby be realistic in your scheduling of the workload to allow for test equipment being away for calibration. Agree the turn around time in advance for critical items.

Certificates of Calibration

Assessors require evidence that companies are contracting appropriate calibration in order to justify the company's declared quality assurance level. This is partly demonstrated by meeting the requirements of ISO/IEC 17025. ISO 9000 assessors will also establish if the quality manual procedures meet the calibration requirements in the standards.

On receipt of the certificate of calibration ensure that a technically competent person verifies that it meets the calibration requirement, and that the instrument is therefore 'fit for purpose'.

The assessors may accept the presence of an accredited logo on the equipment's certificate of calibration as implying evidence of traceability but may not necessarily agree the 'fitness for purpose' of the calibration. Ensure that the traceability of measurement on the certificate is to an appropriate recognised national, international or consensus standard. Ensure the instrument user in your company is aware of any limitations in the calibration obtained.

Measurement Uncertainties

ISO 17025 requires that either:

- measurement uncertainties, or
- a statement of compliance to specification which takes into account measurement uncertainties, shall be shown on all certificates of calibration.

Measurement uncertainties must be calculated using the internationally agreed methods [see ref. 5]

Traceability of Measurement

A calibration is incomplete without a statement concerning the measurement uncertainty. A calibration laboratory shall establish traceability of its own measuring standards and measuring instruments to the International System (SI) of units, by means of an unbroken chain of calibrations or comparisons linking them to primary standards.

Calibration providers must have an established programme and procedure for the calibration of their equipment.

Traceability of measurement can also be established to a consensus standard. A consensus standard is a standard agreed by all users where it is not strictly based on SI units but may be derived as a ratio or by definition. [see ref 6]

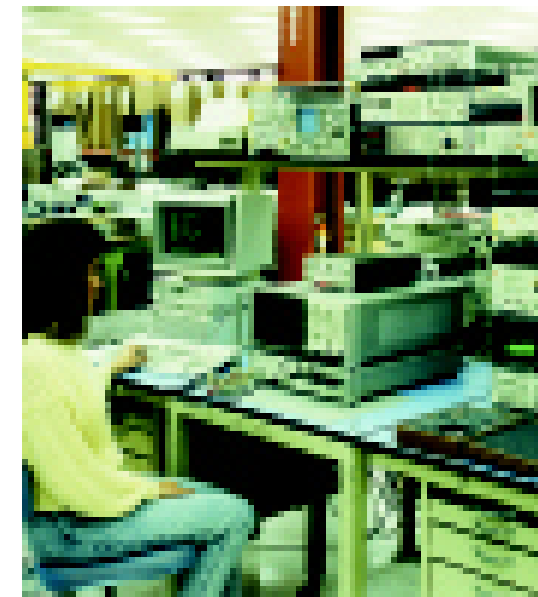
Multilateral agreements and memorandums of understanding

Certificates of calibration issued by other national calibration laboratories and their acceptance may be covered by memorandums of understanding or by mutual recognition agreements between countries. [see ref 7]

In general, certificates of calibration issued by a national metrology institute (e.g. National Physical Laboratory in the UK) in a country are acceptable.



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REFERENCES

- 1) International Standards Organisation (ISO) 9000 Quality Management Systems
See clause 7.6 Control of monitoring and measuring devices
- 2) ISO/IEC 17025:2000 - supersedes ISO Guide 25 and EN45001 - calibration providers approval to ISO 9000 will claim compliance to ISO 10012 (BS 5780 part 1+2)
- 3) International Electrotechnical Commission (IEC)
- 4) United Kingdom Accreditation Service (UKAS)
- 5) ISO/IEC 17025 section 5.6. and 5.6.2.1.2
- 6) To comply with the ISO/IEC 17025 (section 5.10.4 Calibration Certificates).

Measurement uncertainties must be calculated using the internationally agreed methods described in the following documents.

World wide: ISO/TAG4/WG 1995: ISO Guide to the Expression of Uncertainty in Measurement (GUM).

In the UK: UKAS M3003 Edition 1 December 1997: The Expression of Uncertainty and Confidence in Measurement.

In Europe: EA-4/02 December 1999: Expression of Uncertainty of Measurement in Calibration.

In the USA: ANSI/NCSL/Z540-2-1997: U.S. Guide to the Expression of Uncertainty in Measurement.

- 7) A multilateral recognition agreement came into effect 31/1/2001 between members of the International Laboratory Accreditation Co-operation that supersedes earlier MRA's between the accreditation bodies of individual countries or economic regions. The signatories of this ILAC Arrangement were:

Australia, Belgium, Brazil, Canada, People's Republic of China, Czech Republic, Denmark, Finland, France, Germany, Hong Kong China, India, Ireland, Italy, Japan, Republic of Korea, Netherlands, New Zealand, Norway, Singapore, South Africa, Spain, Sweden, Switzerland, Chinese Taipei, United Kingdom, United States of America, Vietnam.

Contact points for further information

For a list of **GAMBICA** members who offer calibration services for electrical/electronic test and measurement equipment view the GAMBICA Web site: www.gambica.org.uk

Contact **NPL** for free independent advice on techniques, practices and standards for measurement , call **NPL** Helpline on Tel. 020 8943 6880, Fax. 020 8943 6458 and E-mail enquiry@npl.co.uk

For the **National Measurement Partnership (NMP)** Programme managed by the NPL on behalf of the Department of Trade and Industry, for the promotion of good measurement practice call the NMP Helpline on Tel. 020 8943 7070.

For information on **UKAS** accreditation including a list of UKAS accredited laboratories contact UKAS on Tel. 020 8917-8400, Fax. 020 8917 8500, Web site www.ukas.com

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