A Guide to Industrial Temperature Calibration: Traceable Calibration

For best practice, the thermometer (or thermometers) under test are placed into the calibration volume alongside a calibrated standard. This is so that the test thermometers “can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons”. This “traceability” meets the requirements of quality systems including that of ISO 9000.

Using the Calibrator itself as the Reference (or standard) raises a number of issues, such as how is temperature difference between the test thermometer and the calibrator display determined - how can this ‘uncertainty value’ be known?

International Guidelines have been published from EURAMET that give guidance, and requirements, for the calibration of Dry Blocks EURAMET/ cg-13/v.01 (formerly EA10-13) and Isotech Calibrators meet the calibration capacity requirements of EURAMET/cg-13/v.01.

We recommend that a reference probe is used, the same method as used in secondary temperature laboratories. For less demanding calibration, and the quick testing of sensors, the Calibrator can be used without a reference probe, refer to the unit's Evaluation Report for typical performance data.

Pre-purchase check list

1. Does the supplier have an accredited laboratory? UKAS accreditation, “the means by which, in the public interest, the integrity and competence of independent evaluators is confirmed and declared”. Isotech can issue a UKAS certificate with the performance expressed in the manner that you will need, not to some confusingly expressed specification that is made with no confirmation of integrity and competence.

2. Experience
   Does the producer have experience? Do they understand the difference between accuracy and uncertainty? Can they tell you how to calculate the uncertainty of a probe being calibrated in the block? Isotech can.

3. Expandable
   Can the Dry Block be used with other sensors? Are there accessories available for future expansion? With Isotech products they are.

4. PC Support
   Can it be connected to a computer? Is there software available, can it be automated? Isotech Dry Block Calibrators have a range of software options.

5. Documented
   Is the bath fully documented? Can you download a full evaluation report from the Web Site? Does it come with a comprehensive handbook and tutorial? Is training available? Isotech provide all of these free of charge.

6. Practical
   Isotech Dry Blocks are practically designed with a strong metal case, and are a compact portable size. If you are going to carry it around don’t forget to check the size and weights. It is surprising how large some other blocks are, even though they take the same number of probes. Beware if the specification does not include the weight.

7. Value
   Check the prices, all the above come at an amazingly competitive price when you choose Isotech.
Alternative methods of using Isotech Portable Calibrators

- A Basic Dry Block Calibrator
  The thermometer under test is compared to the dry block controller value. Useful for moderate temperature ranges and quick testing.

- An ISO 9000 Calibration System
  A thermometer under test is compared to a calibrated standard, for true traceability and clearly meets the requirements of ISO9000.

In addition to the temperature control system with its display the Isotech SITE model includes a separate temperature read out for the Standard (Reference) probe.
- **Isotech ADVANCED Calibrator**
  Isotech ADVANCED models have inputs for both the test thermometer and a calibrated standard.

- **Using an External Indicator**
  Similar to the previous configuration but an external indicator is used - one instrument can be used with many calibration baths - the bath or baths do not need a calibration certificate, but they need an evaluation report.
An example of Multiple Sensor Calibration
You can add a scanner for multi-probe calibration - the system can then be automated.

Isotech - award winning flexible solutions for all sensor types from -45°C to 1200°C
By adding different accessories the 4000 Series can be used in up to six different modes - Dry Blocks, Liquid Baths, Ice Bath, Surface Sensor Calibrator, IR Thermometer Calibrator and even with ITS-90 Fixed Point
Isotech 4000 Series

Available in three different versions

Isotech calibrators are available in three different versions; they all feature the same rugged casing with award winning calibration volumes. The range of features varies with the ADVANCED offering extra performance in terms of resolution and temperature stability. All models have common block sizes, interchangeable options and benefits providing calibration volumes with superior temperature uniformity and capacity for industrial probes.

Choose to suit your application:

**MODEL**

**BASIC**

- Calibrate the entire loop by using a heat source rather than an electrical simulator, a test instrument and sensor can be calibrated as a system
- Simple To Use and Outstanding Value
- Rugged Case
- Calibrate all Sensor Types
- Ramp to Set Temperature
- Supply Voltage Power Correction and Digital Filtering
- PC Interface and Software

**MODEL**

**SITE**

- As Basic but adds independent temperature indicator for reference probe
- Thermostat Testing, Stand Alone or with PC
- Configurable Units °C, °F or K
CALIBRATION SOLUTIONS

**MODEL ADVANCED**

- **Best performance**
  - Benefit from advanced temperature controller that provides best performance
  - Resolution to 0.001°C - Superior Stability
  - Control parameters automatically optimised with temperature

- **View easily in all conditions**
  - Large Bright Colour Display
  - Similar to Smartphone
  - Crystal clear display with full colour graphics

- **View from anywhere**
  - 21st Century Connectivity with Ethernet and inbuilt webserver
  - Connect to the network and view the calibrator from anywhere, on your Notepad, Tablet or Smartphone

- **Save time and money**
  - AUTOMATIC TEMPERATURE CYCLING
    - Program the ADVANCED with the temperature points you need, store commonly used ranges. The calibrator can then automatically follow these points and log your data

- **Safely store and secure all the data you need**
  - Massive Internal Memory can safely store all your data
  - Store a lifetime of data on a USB Drive
  - Choose Open CSV Files or Tamper Proof Data with Secure File Format for Data Security

- **Supports five languages**
  - English, French, German, Italian and Spanish
  - Simple to use with clear user interface

- **Connect more probes**
  - UP TO 3 INPUT CHANNELS
    - Inbuilt reference system with two universal inputs for PRT, Thermocouple or Process Input and a third thermocouple input

- **Offset elimination**
  - Connect a reference probe to one of the external probe inputs and the calibrator can trim the block temperature to remove offsets
  - Block adjusted to reference probe value
  - Remove offsets
  - Use in combination with automatic cycling

- **Thermostat testing**
  - Test Two Thermostats Simultaneously

- **The software you need**
  - PC tools for reviewing data with support for secure file format, managing temperature programs, easy configuration and data logging.
Introduction: 4000 Series

The 4000 series includes the Isocal-6 multifunction calibration system

The ISOCAL-6 consists of a range of temperature calibrators designed to calibrate all temperature sensors. As a multifunction temperature calibrator it can be used as a Dry Block with accessories added to allow use as a Stirred Liquid Bath, a Blackbody Source, a Surface Temperature Calibrator, an ITS-90 Fixed Point System and for low temperatures a Stirred Ice Bath.

A Metal Block Bath

A Metal Block Bath, (Dry Block Calibrator) provides fast and clean calibration of thermocouples, PRTs and other industrial temperature sensors. Isotech blocks use a combination of multi zone and advanced materials technology to ensure constant temperature zones to enable high accuracy calibration. Interchangeable 35mm diameter blocks allow several sensors to be calibrated simultaneously with fast heat up and cool down. For larger probes blocks are available up to 65mm diameter and with immersion depth of up to 300mm. An unmatched combination of leading performance and calibration capacity.

A Stirred Liquid Bath

Remove the metal block and the Isocal-6 can be converted to a stirred liquid bath. Liquid bath operation allows angled or awkward shaped probes to be calibrated. Accuracies are improved over Dry Blocks alone and with a suitable reference probe performance of 0.005°C is achievable. In stirred liquid bath mode a reference probe should be used.

A Stirred Ice / Water Bath

The ISOCAL-6 models that operate below 0°C can be used to provide a 0°C stirred ice / water bath. This provides a simple low cost way of checking that standards have not drifted in between calibrations.
**Blackbody Source**

Adding the blackbody target allows the testing of infrared thermometers. Low cost non-contact IR thermometers are increasingly being used in industry and the ISOCAL-6 is ideal to test and check these devices. The IR thermometer is focused on the target and compared to a reference probe in the block pocket.

**Surface Sensor Calibrator**

With the Surface Sensor Kit the test sensor is compared to a platinum resistance thermometer located just below the surface of the block. Again save the cost of buying additional equipment by adding accessories as required to expand the ISOCAL-6 for new calibration applications.

**ITS-90 Fixed Point Apparatus**

For the best possible performance with uncertainties to 0.0005°C (0.5mK) add an ITS-90 Fixed Point Cell. The most popular is the B8 Water Triple Point Cell, it is surprisingly affordable and simple to use - the triple point can be both created and maintained in the apparatus without the need for any other equipment or supplies.
Calibration Options

Isotech’s UKAS accredited calibration laboratory was established in 1980 and has grown to be a full scale laboratory providing calibration to the smallest of uncertainties. Isotech certificates are formally recognised in over 70 countries and carry the ILAC-MRA logo.

We can provide different certificates, reporting the temperature only (UKAS-TEMP), additionally we can include the inbuilt temperature indicator channels calibrating by electrical simulation, (UKAS-SYST) or we can just calibrate the input channels (UKAS-SIM).

<table>
<thead>
<tr>
<th>The following Calibration Options are Available</th>
<th>Code</th>
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<tbody>
<tr>
<td>BASIC, SITE and ADVANCED</td>
<td></td>
</tr>
<tr>
<td>5 point calibration for block temperature; includes reference probe values when ordered with Site or ADVANCED</td>
<td>UKAS-TEMP</td>
</tr>
<tr>
<td>ADVANCED</td>
<td></td>
</tr>
<tr>
<td>5 point calibration for block temperature and reference probe (when ordered) and electrical simulation of indicator</td>
<td>UKAS-SYST</td>
</tr>
<tr>
<td>ADVANCED</td>
<td></td>
</tr>
<tr>
<td>Calibration of input channels, electrical simulation only</td>
<td>UKAS-SIM</td>
</tr>
</tbody>
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Included Software

<table>
<thead>
<tr>
<th>Model</th>
<th>Software</th>
<th>Connection</th>
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<tbody>
<tr>
<td>BASIC and SITE</td>
<td>Cal Notepad and I-Cal Easy LOG: Log and Monitor Calibrator</td>
<td>Serial</td>
</tr>
<tr>
<td>ADVANCED</td>
<td>I-Cal Easy LOG: Log and Monitor Calibrator</td>
<td>Ethernet</td>
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<tr>
<td>ADVANCED</td>
<td>Review Lite: Manage Log Data, supports secure data format</td>
<td>Ethernet</td>
</tr>
<tr>
<td>ADVANCED</td>
<td>Set Point Program Editor: Manage ADVANCED set point programs</td>
<td>Ethernet</td>
</tr>
<tr>
<td>ADVANCED</td>
<td>Isotech ADVANCED Block Configuration Utility: Fast configuration from a PC</td>
<td>Ethernet</td>
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Download: [http://www.isotech.co.uk/downloads](http://www.isotech.co.uk/downloads)

Isotech Innovation

We have been providing calibration solutions for more than 30 years, from Primary Standards for National Metrology Institutes through to handheld calibrators for service engineers.

Our portable calibrators have set a number of world firsts, the first Dry Blocks to feature an independent inbuilt temperature indicator and the first Dry Blocks to reach -100°C. The award winning ISOCAL-6 was the first calibrator to offer both Dry Block and Liquid Bath use. It remains the only device to offer six modes of calibration.

Isotech Dry Block Range - expanded and upgraded

- New Rugged Lightweight Outer Cases
- Custom moulded components brings lighter and stronger Portable Calibrators
- New ADVANCED model - more features than ever before

The ADVANCED Models include automatic temperature cycling which saves time and money with the calibrator automatically logging data over a series of calibration points
Temperature Cycling and Logging
Features of the ADVANCED models

Automatic Temperature Cycling

- Save Time
- Save Money
- Store up to 100 Programs

Calibration temperatures and dwell times can be combined into ‘programs’ for the ADVANCED calibrator to follow, up to 100 programs can be stored, with each program having up to 25 segments.

Programs can be edited from the front panel or on a PC with Set Point Program Editor.

As the program runs all measurements are recorded to the large internal memory.

*Automatic temperature cycling saves time and money with the calibrator automatically logging data over a series of calibration points*

Data Logging

- Large Internal Memory to Store Your Data
- Creates CSV Files For Spreadsheets
- Creates Secure Tamper Proof Data to aid compliance to standards

The ADVANCED models log data to internal memory, the data is logged in a CSV format that can readily be opened and edited.

Data is also recorded in a secure tamper proof format as a binary ‘UUH File’. These files can be opened with Review Lite software – download from our website. If the records are found to have been tampered with then Review Lite will reject the record as corrupt.

Data files can be shared automatically across the network via FTP, transferred manually via USB or ‘pulled’ into Review’s database.

For users working in regulated industries these features, when used in conjunction with company procedures and other equipment or process, aids compliance to standards such as FDA, 21 CFR 11 and AMS2750E.