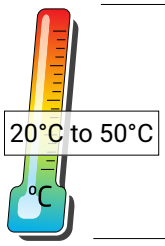
ISOTECH

Tympanic Thermometer Checker

991



Tympanic Thermometer Checker **991**

- **Cost-Effective** - A fraction of the cost of a full laboratory setup
- **Portable** - Easy to use in clinics and field settings, with compact equipment
- **User-Friendly** - No specialised training needed, perfect for quality control and checks

Addressing Calibration Challenges
Traditional calibration methods using stirred water baths are cumbersome, expensive, and not easily portable, creating logistical and financial burdens for medical facilities, especially those needing to perform frequent calibrations or validations outside a laboratory setting.

Calibrating Tympanic Thermometers
Traditional Calibration Methods
According to ISO 80601-2-56:2017 Part 2-56: Particular requirements for basic safety and essential performance of clinical thermometers for body temperature measurement, clinical thermometers, both contact and infrared types, are recommended to be calibrated using a stirred water bath. This method ensures a stable and thermally uniform medium, making it the preferred approach. However, the cost and size of the equipment can be a barrier, especially when full accuracy is not critical.

For Full Accuracy Requirements
For effective calibration, the water bath must:

- Maintain thermal uniformity within 0.01 °C.
- Ensure stability within ±0.02 °C.

Additionally, the reference thermometer must:

- Be in good thermal contact with the blackbody source.
- Have a calibration uncertainty of 0.02 °C (k=2).

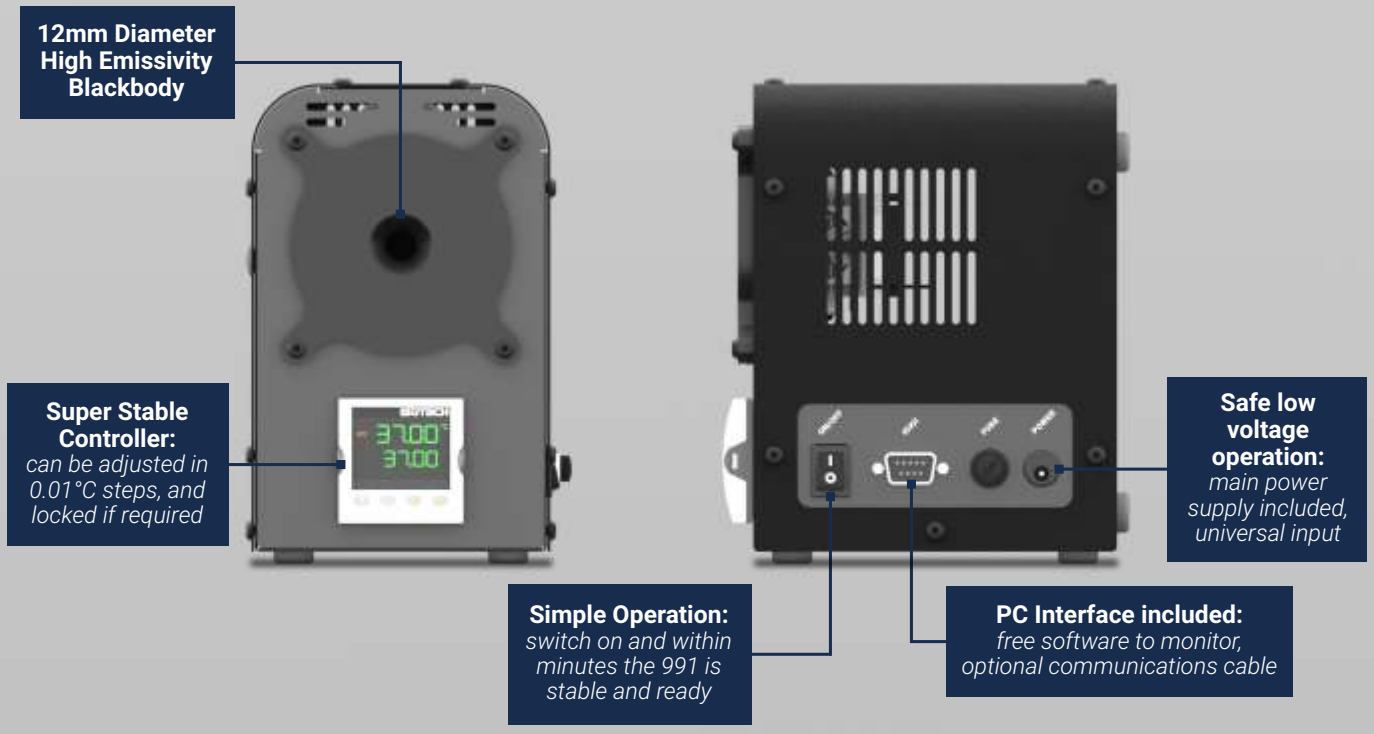
Equipment meeting these standards is available from Isotech, although it requires significant investment and is suited to a laboratory environment. Some thermometer manufacturers offer dedicated calibration devices for their models, but these may not be compatible with other brands.

Isotech's Portable Solution
Model 991 Temperature Checker
To address these challenges, Isotech has introduced a portable checker for validating tympanic thermometers. This innovative solution alleviates the pain points associated with traditional calibration methods:

Cost-Effective: Priced at less than a tenth of a full laboratory setup, it provides an affordable alternative without compromising essential accuracy for most practical purposes.

Compact and Portable: Its small size and simplicity make it convenient for use in various settings, including in-field and in-clinic, eliminating the need for cumbersome water baths.

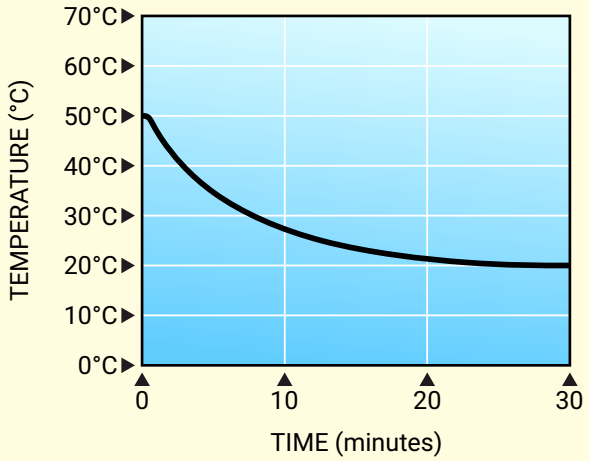
User-Friendly: The device is straightforward to operate, requiring no specialized training, making it accessible for a wide range of users.



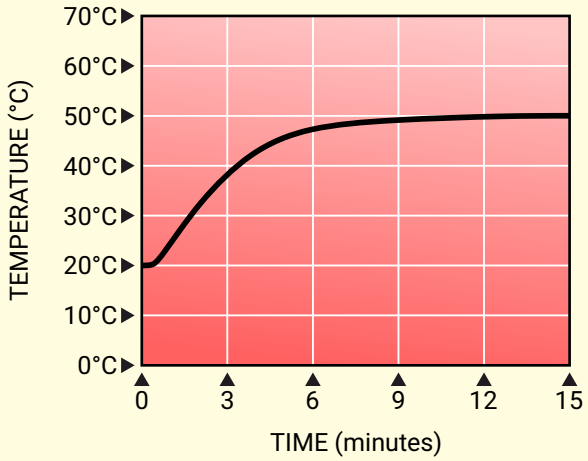
Model	991
Temp Range	20°C to 50°C
Resolution	±0.01°C
Aperture Size	12mm Diameter
Emissivity *(1)*	≈0.999
Controller Accuracy: Temperature Range	0.5°C *from 20°C to 42°C*
Extended Temperature Range	0.7°C *from 42°C to 50°C*
PC Interface	Included, RS422 *(optional RS232 convertor lead)*
Units	°C, °F, K
Temperature Stability *(2)*	<0.01°C
Display	Three Colour LCD, Temperature and Set Temperature
Set Point Lock	Set temperature can be locked and password protected
Automatic Start Up	No user intervention required
Set Point Ramp Rate	Included: *switch on to control heating and cooling rates*
Self Test	Automatic: *Scrolling text diagnostic display*
Power	60 Watts
Voltage	12 Vdc
Dimensions	H 200mm x W 135mm x D 170mm
Weight	2.3kg

(1) Calculated NPL Report, calculated with commercial software
(2) Determined by a contact thermometer inserted into the calibration block

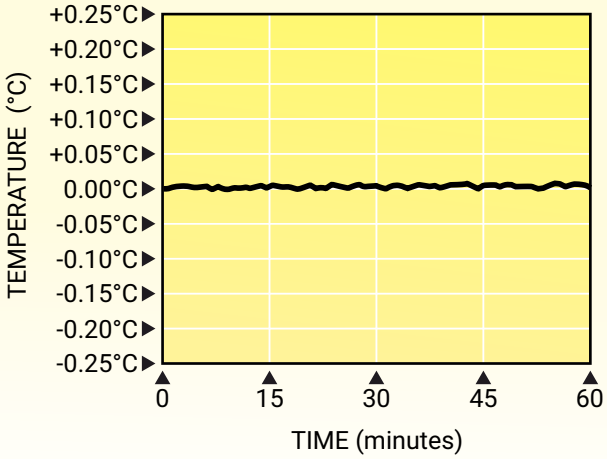
Cool Down Graph (50°C to 20°C)



Heat Up Graph (20°C to 50°C)



Temperature Stability at 36°C



Stability determined by a contact thermometer inserted into the calibration block

Blackbody Design Collaboration

Under Innovate UK's Analysis for Innovators (A4i) program, which aims to help companies solve complex technical problems and enhance their productivity or competitiveness, Isotech partnered with the National Physical Laboratory (NPL), a world-leading metrology institution in the UK, to develop a blackbody for the Model 991.

New Blackbody Design – in collaboration with NPL.
NPL developed a new blackbody cavity design:

- 45mm long with a 120° cone
- Estimated emissivity of ≈0.999
  (Based on a thermally uniform cavity with a high emissivity coating)

This design was compared against NPL's Primary Ear Thermometer Calibration Source (PET-C).

Isotech's Model 991 is a user friendly device capable of checking all tympanic ear thermometers. It is ideal for:

- Checking thermometers between calibrations.
- Quality checking batches of new thermometers.
- Simple, non-laboratory checks without requiring proprietary devices.

Performance and Credibility:

Precision in Temperature Calibration: the Isotech Tympanic Thermometer Checker was calibrated by the National Physical Laboratory (NPL), exemplifies high standards in temperature calibration. Calibrated between 20°C and 43°C using the NPL Primary Ear Thermometer Calibration (PET-C) source, the device ensures reliable and consistent measurements.

(The NPL certificate of calibration applies to the prototype only and is not included with the Model 991)

NATIONAL PHYSICAL LABORATORY

Certificate of Calibration

Isothermal Technology Ltd. blackbody source

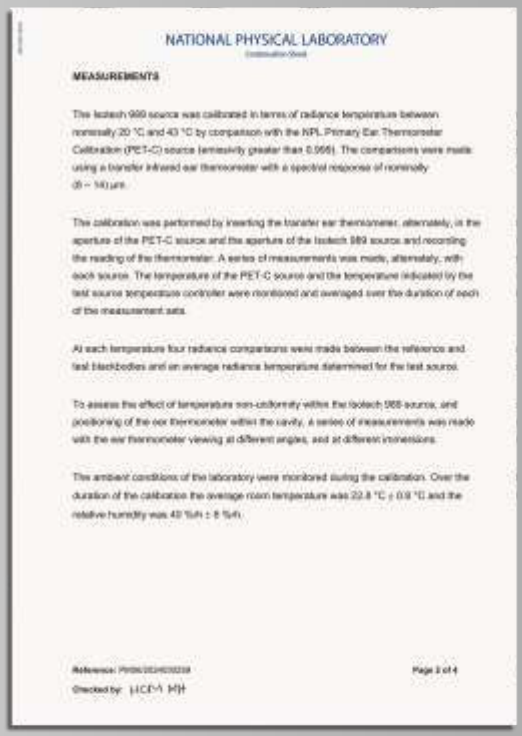
Type: 889 S/N: 41634/1

FOR: Isothermal Technology Ltd.
42a St. Lukes Road
Southport
PR8 6AP
United Kingdom

FOR THE ATTENTION OF: Jim Brown

DESCRIPTION: Isotech Model 889 blackbody source
Serial number: 41634/1

DATE(S) OF CALIBRATION: 7th to 10th May 2024



NATIONAL PHYSICAL LABORATORY

MEASUREMENTS

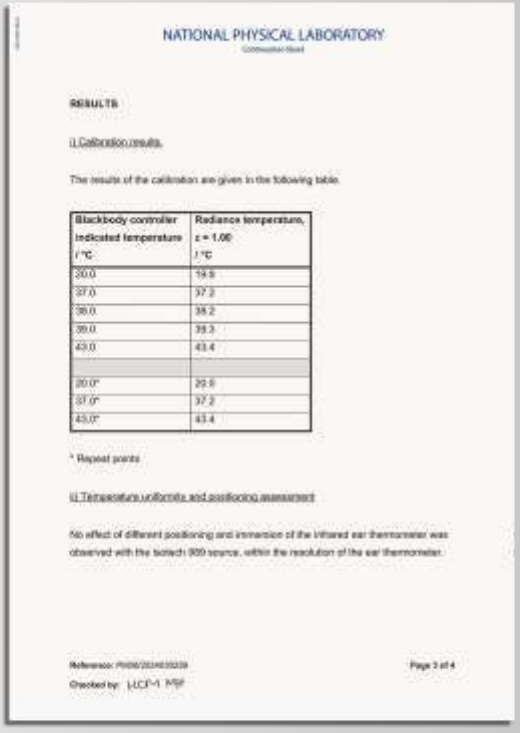
The Isotech 999 source was calibrated in terms of radiance temperature between nominally 20 °C and 43 °C by comparison with the NPL Primary Ear Thermometer Calibration (PET-C) source (emissivity greater than 0.999). The comparisons were made using a transfer infrared ear thermometer with a spectral response of nominally (8 – 14) µm.

The calibration was performed by inserting the transfer ear thermometer, alternately, in the aperture of the PET-C source and the aperture of the Isotech 889 source and recording the reading of the thermometer. A series of measurements was made, alternately, with each source. The temperature of the PET-C source and the temperature indicated by the test source temperature controller were monitored and averaged over the duration of each of the measurement sets.

At each temperature four radiance comparisons were made between the reference and test blackbodies and an average radiance temperature determined for the test source.

To assess the effect of temperature non-uniformity within the Isotech 999 source, and positioning of the ear thermometer within the cavity, a series of measurements was made with the ear thermometer viewing at different angles, and at different immersions.

The ambient conditions of the laboratory were monitored during the calibration. Over the duration of the calibration the average room temperature was 22.8 °C ± 0.8 °C and the relative humidity was 40 %rh ± 5 %rh.



NATIONAL PHYSICAL LABORATORY

RESULTS

i) Calibration results

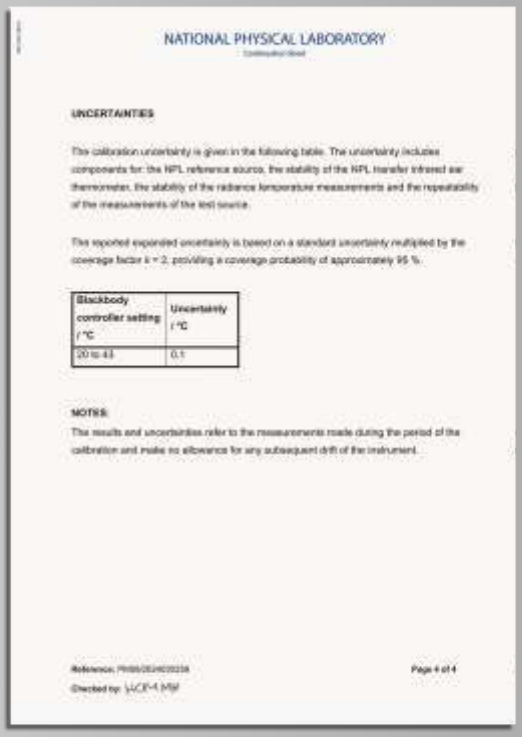
The results of the calibration are given in the following table.

Blackbody controller indicated temperature / °C	Radiance temperature, ε = 1.00 / °C
20.0	19.9
37.0	37.2
38.0	38.2
39.0	39.3
43.0	43.4
20.0*	20.0
37.0*	37.2
43.0*	43.4

* Repeat points

ii) Temperature uniformity and positioning assessment

No effect of different positioning and immersion of the infrared ear thermometer was observed with the Isotech 999 source, within the resolution of the ear thermometer.



NATIONAL PHYSICAL LABORATORY

UNCERTAINTIES

The calibration uncertainty is given in the following table. The uncertainty includes components for: the NPL reference source, the stability of the NPL transfer infrared ear thermometer, the stability of the radiance temperature measurements and the repeatability of the measurements of the test source.

The reported expanded uncertainty is based on a standard uncertainty multiplied by the coverage factor k = 2, providing a coverage probability of approximately 95 %.

Blackbody controller setting / °C	Uncertainty / °C
20 to 43	0.1

NOTES

The results and uncertainties refer to the measurements made during the period of the calibration and make no allowance for any subsequent drift of the instrument.

For Successful temperature calibration...
Trust Isotech for the complete laboratory solution

milliK Precision Thermometer

- Supports a Wide Range of Sensors
- High Accuracy
- Logs and Controls Isotech Temperature Sources Massive logging capacity

The milliK Precision Thermometer from Isotech sets a new standard for the high accuracy measurement and calibration of Platinum Resistance Thermometers, Thermistors, Thermocouple and Process Instrumentation (4-20mA) over the range -270°C to 1820°C.

Blackbody Source Model 989

- Improves accuracy of Fever Detection Systems
- Check Non-Contact Thermometers
- Uses a solid state thermoelectric heat pump so that the block can be both cooled and heated

Model 989 has the same performance as the earlier 988 but is smaller and has two easy mounting points fitted allowing for easy mounting. When used in conjunction with IR cameras the device can easily be suspended from above or below using standard tripod mounting brackets.

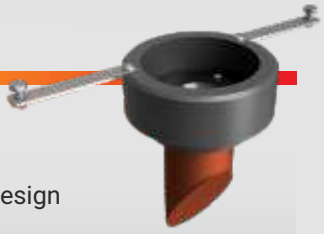
Hyperion R Portable Blackbody 982

- Spans medical range
- 50mm diameter cavity
- 0.995 Emissivity

The Hyperion R Portable Blackbody Calibration Source allows for calibration of non-contact infrared thermometers over the temperature range -20°C to 125°C.

One application is the calibration of non-contact medical thermometers. With the sudden step increase in the demand to check and calibrate medical thermometers we have supplied many units for both portable and laboratory testing relating to the coronavirus outbreak.

Blackbody for Hydra 798 & Orion 796



- Blackbody Accessory
- Fits Isotech Hydra & Orion Baths

This accessory allows the calibration of infrared (IR) thermometers. The geometry and design ensure a high emissivity.

The assembly is fastened to the top of the calibration bath and extends into the liquid volume. To ensure excellent emissivity the copper block is internally coated with Pyromark paint.

ISOTECH

About Us

The world leader in temperature metrology, with over 40 years' experience.

Our clients include the world's leading laboratories including National Laboratories, leading ISO 17025 Accredited Laboratories and users in all industries.

Why Choose Isotech?

- Isotech has solutions for all calibration needs, from Primary Laboratories maintaining National Standards to the needs of field engineers calibrating industrial sensors on site. Isotech is truly "The Source for Calibration Professionals".
- Global Network - local support. Isotech has over 90 authorized sales agents worldwide! No matter where you are, we can offer local support.
- The world's leading National Metrology Institutes choose Isotech - shouldn't you?

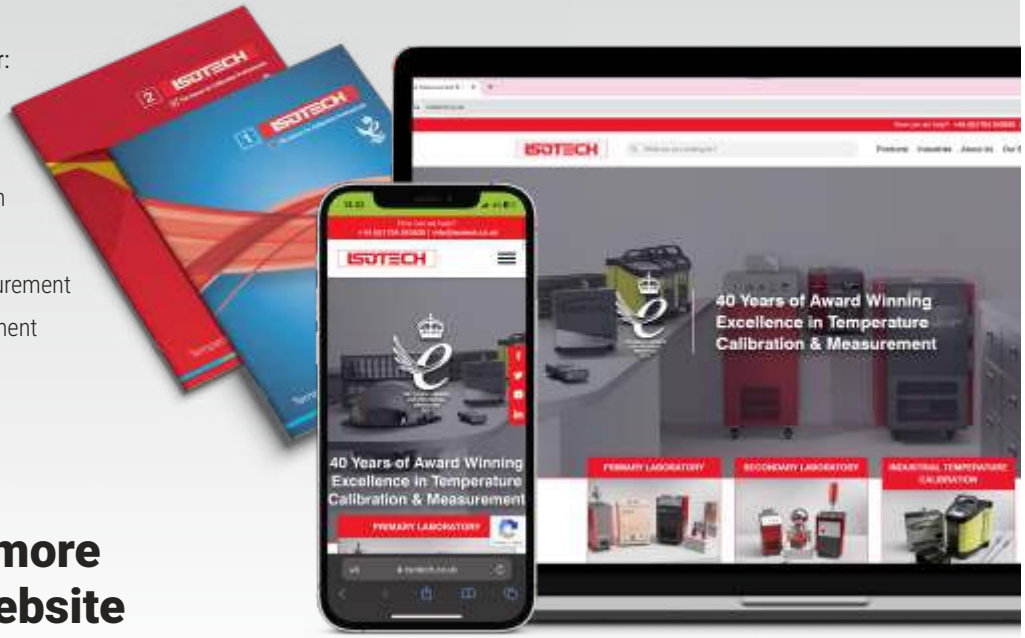
"As a leading thermocouple manufacturer, it's crucial for us to check with the utmost precision. Isotech equipment consistently provides the accurate measurements we rely on. We've partnered with Isotech for over 30 years, appreciating not just their high-accuracy products but also their exceptional customer service, insightful advice, and genuine feedback."

Stephen Holt, Technical & Quality Manager, Scott Precision Wire Ltd

Temperature Metrology Solutions for:

- ITS-90 Primary Standards
- Industrial Sensor Calibration
- Secondary Temperature Calibration
- Infrared Thermometers
- High Accuracy Temperature Measurement
- Thermocouple Referencing Equipment

ISO 17025 calibration services to the smallest of uncertainties and with international recognition



Find out more on our Website

For more information: ISOTECH.CO.UK

UKAS Calibration Options ISO 17025

Telephone: +44 (0)1704 543830
Email: info@isotech.co.uk Web: www.isotech.co.uk
Isothermal Technology Limited Pine Grove, Southport, Merseyside PR9 9AG England