
ISOTECH
allowing discerning users to
benefit from research
Specialist Products Portfolio

Isotech Innovation

Isotech has been providing calibration solutions for more than 30 years with a notable number of world firsts. With three decades of experience in producing primary standards, secondary equipment and industrial temperature equipment we have carried out a great deal of research which has led to our successful product range from ITS-90 Fixed Point Cells, furnaces, instruments and industrial calibrators.

Products like the patented ISOTower, Model 670 Primary SPRTs, microK Thermometry Bridges and others are well known commercial solutions that provide innovative cost effective methods for successful calibration.

■ Research Portfolio

A portfolio of products developed during our research into thermal metrology problems. Now available to clients with specific requirements.

■ Research Products

Copper Point SPRT

The ITS-90 specifies the SPRT to the Silver Point, 961.78°C. This is the maximum temperature to which we can calibrate an SPRT. For higher temperatures we can calibrate thermocouples including Platinum / Palladium types and issue with calibration at low uncertainties.

Yet the output from thermocouples is low, SPRTs can be used to measure much smaller changes in temperature. As part of our research into improved Copper Fixed Point Cells (1084.62°C) for contact thermometers we needed a new type of thermometer to compare Copper Point Cells. The result is our Copper Point SPRT, and we can offer this research thermometer to other metrologists who are carrying out research at the copper point. This distinct from our Primary SPRTs that we can supply with fixed point calibration up to the Aluminium or Silver Points.

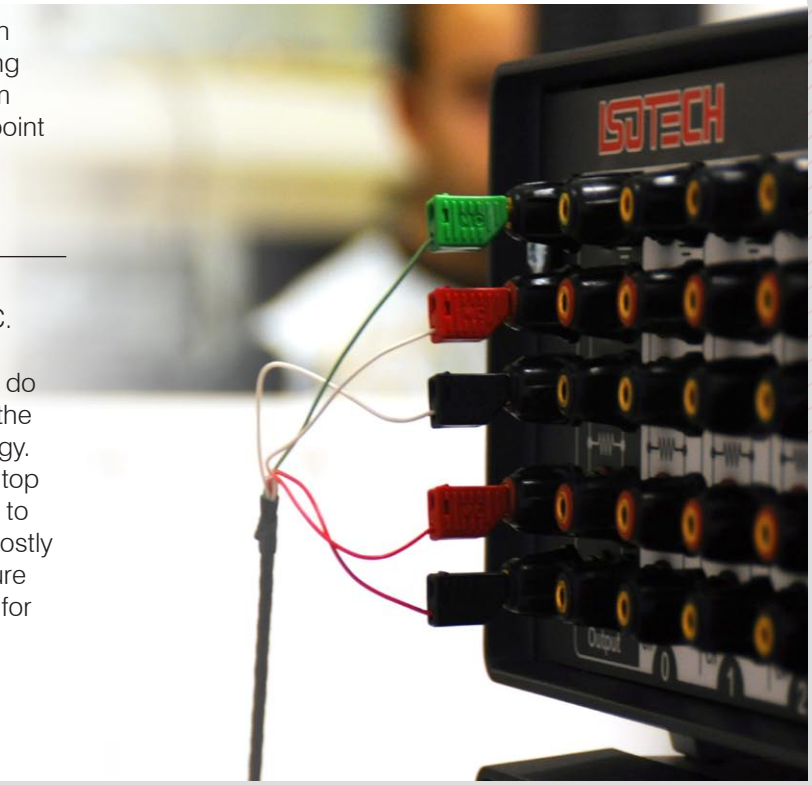
Silver Point ISOTower

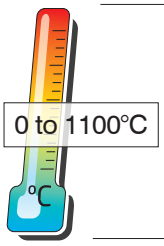
This is a bench mounting solution that provides a robust self-contained calibration point at 961.78°C. The Silver Point ISOTower was developed for a specific application in the aerospace industry. We do have larger furnaces at similar prices which have the benefits of lower uncertainties for Primary Metrology. Yet for our aerospace client they needed a bench top solution to calibrate thermocouples that was easy to use. They replaced an earlier system which was costly to operate requiring regular replacement of the pure silver. The Sliver ISOTower has proven successful for them and we can offer it for similar applications.

Special Fixed Point Cells

For the range of the SPRT the ITS-90 specifies the use of Argon, Mercury, Water, Gallium, Indium, Tin, Zinc and Sliver Cells. Isotech have solutions for these points to suit every need which are found in our catalogues and are used in the world's leading laboratories.

There additional points that can be used, Lead (327.5°C), Antimony (630.7°C) and eutectic points, mixtures of elements, such as Gallium/Indium, Gallium/Tin, Gallium/Zinc, Copper/Aluminium and many more. These points in general are more difficult to realise and have less defined freezing points but are useful in research applications. We have extensive stocks of the most pure metals and can fabricate to special order a range of slim or optimal sized cells. We have been researching and supplying such cells for many years and can discuss research requirements.





Copper Point SPRT
Model 108462

- Novel Design
- Sapphire Mandrel
- Pressurized Sheath

The ITS-90 specifies the SPRT to the freezing point of silver, 961.78°C. Thermocouples can be used beyond this temperature but it is difficult to see small changes in temperature. For a Type R thermocouple the voltage sensitivity at the copper point is 14μV/°C; a change of 1 μV is equivalent to a voltage change of 71mK. When using thermocouples electrical noise limits the ability to follow small changes in the copper freezing plateau and so attention was turned to the development of a new resistance thermometer allowing better measurements to be made.

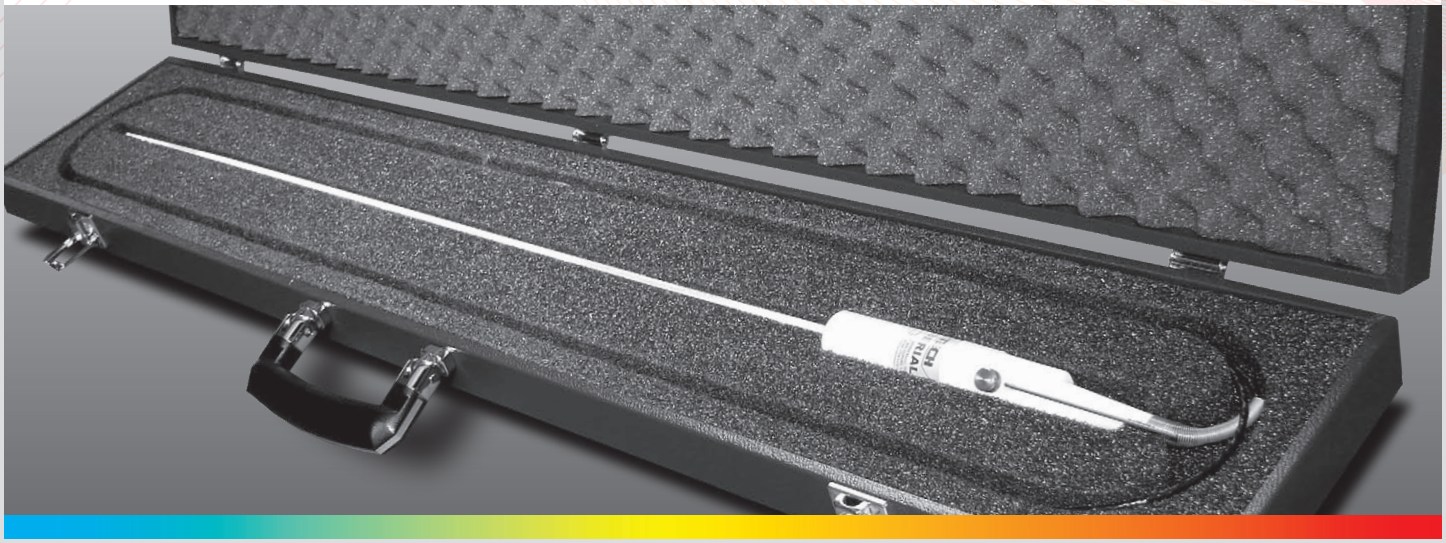
Isotech has a long history of making SPRTs to the Silver point (Model 96178) and this experience was combined with new research to produce the new copper point SPRT (Model 108462).

Ro is nominally 0.25Ω the same as the silver point SPRT but the platinum winding is held in place on a new type of synthetic sapphire mandrel. The platinum 'loves' oxidising but 'hates' reducing atmospheres. The thermometer sheath is made of alumina. It is air filled and hence surrounded by 20% oxygen. Uniquely the sheath is connected to a small air pump to pressurise the 108462 with air so that any leakage is outwards, whilst maintaining an oxygen rich atmosphere around the winding. This is what gives the thermometer its stability.

The four platinum lead wires are separated with tubes of quartz glass and passed through four bores. In use the winding is biased to +9V DC with the included ioniser.

Following around 30 years of research, with earlier results formally presented at TEMPMEKO & ISHM 2010 and at the 9th International Temperature Symposium (ITS9) Isotech have commercialised the design to allow other researchers to benefit from the technology and novel design.

http://www.isotech.co.uk



Specification

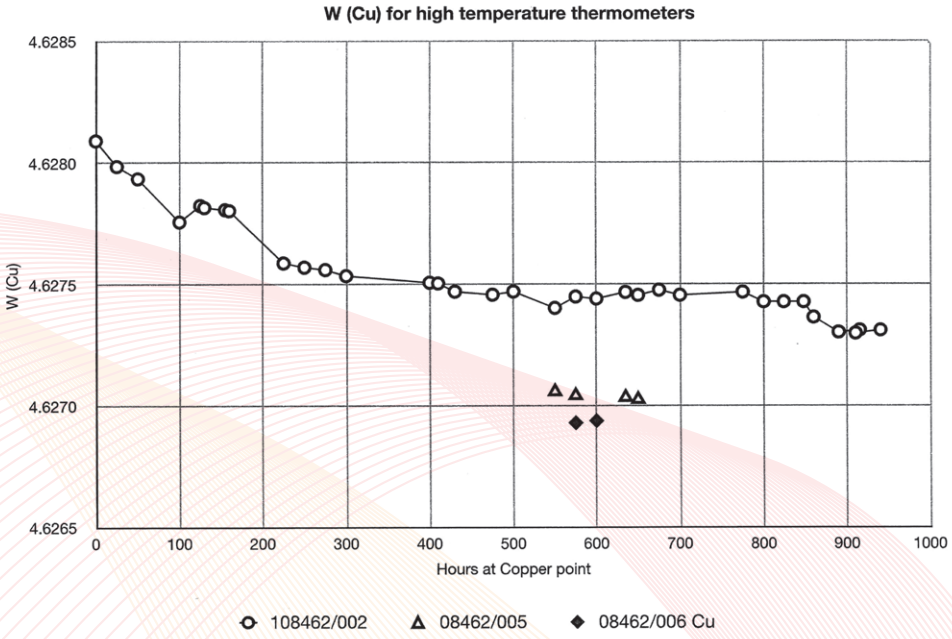
Model	**108462**
Measuring Range	0°C to 1100°C
Ro	0.25Ω
Length	650mm
Diameter	7.5mm

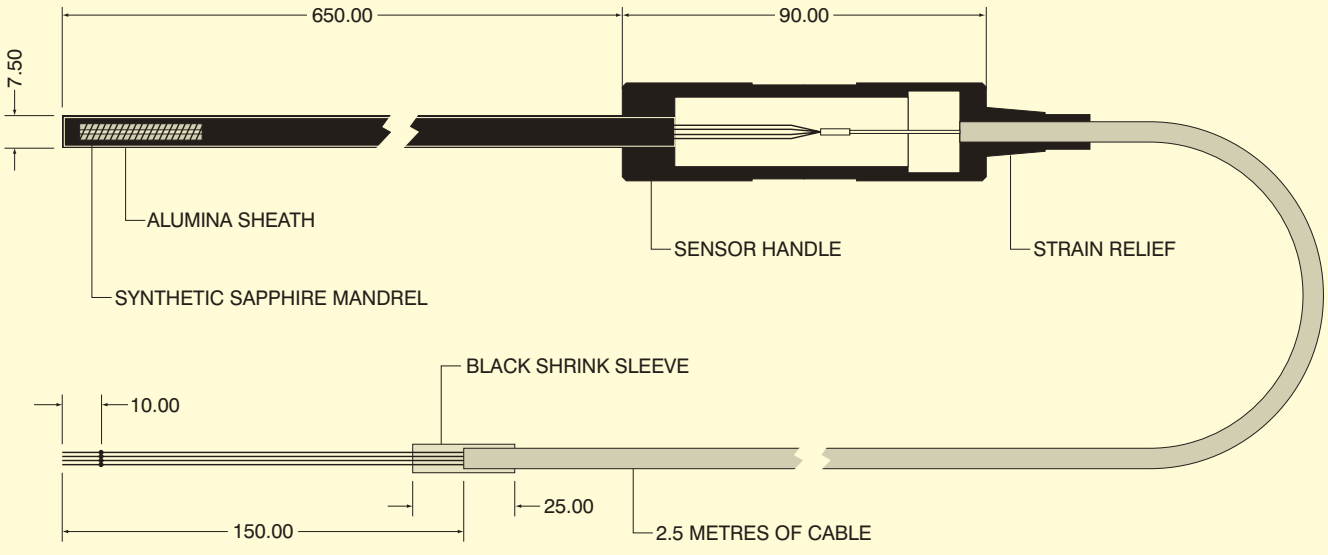
Performance

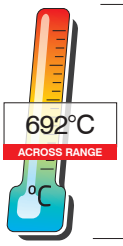
These devices are offered as research thermometers and the performance is described in the paper available on the Isotech website.

"Investigations into the performance of copper point standard resistance thermometer"

J.P. Tavener







ITS-90 Isothermal Towers
Silver Point ISOTower

- High accuracy at 962°C
- Fast to temperature
- Simple to use

The new ISOTower Model 494 extends the range of the original models to the Silver Point, 961.78C. It has taken five years of development and testing to discover and define the performance of such a combination of pure silver in a graphite crucible sealed in a metallic enclosure.

The design eliminates the use of quartz glass resulting in a rugged design that can easily be transported and avoids the devitrification associated with glass covered cells.

Like the lower temperature ISOTowers, Indium, Tin, Zinc and Aluminium, the patented bench top device uses a heatpipe combined with the fixed point cell to offer uncertainties comparable to those realised in Primary Laboratories using large Heatpipe furnaces.

The ISOTower includes an immersion compensator that sits on top the heat siphon/cell to fully compensate for the immersion characteristics of the unit under test.

Isothermal Towers are simple to use, and very robust. Operation is risk free, as a combined apparatus there is no need to handle a fragile cell. No need for specialist training courses. Isothermal Towers remove the mystery from fixed point calibration.

ISOTower offer a new and unmatched solution for the calibration of HTSPRTs and Thermocouples offering both lower uncertainty and a safe, robust operation.

Perfect Audit Item

As an audit item, an accreditation authority can send the device to laboratories for intercomparison.

Because the cell, apparatus and immersion compensator are a single entity, the performance is unambiguous unlike existing systems where cell and apparatus are often separated during intercomparison. Accreditation authorities love them.

Transportable

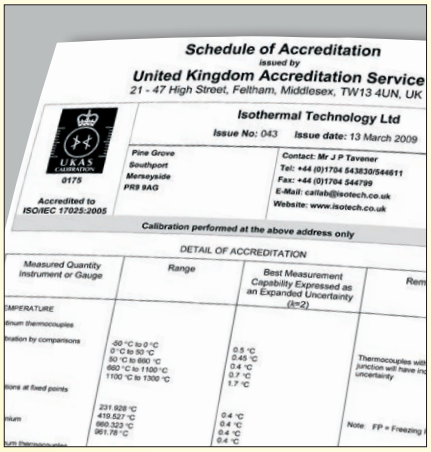
ITS-90 Isothermal Towers are transportable by carrier; there are no fragile glass parts!

- Isothermal Towers include a traceable calibration certificate.

  This includes a graph of one freeze, one melt plateau and a certificate of purity for the metal inside the siphonic cell.

  UKAS calibration is available.

  Full data available at www.isotech.co.uk/isotower



Schedule of Accreditation
issued by
United Kingdom Accreditation Service
21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

Isothermal Technology Ltd
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Pine Grove
Southport
Merseyside
PR9 9AG

Contact: Mr J P Tavener
Tel: +44 (0)1704 543830/544611
Fax: +44 (0)1704 544799
E-Mail: callab@isotech.co.uk
Website: www.isotech.co.uk

UKAS CALIBRATION 0175

Accredited to ISO/IEC 17025:2005

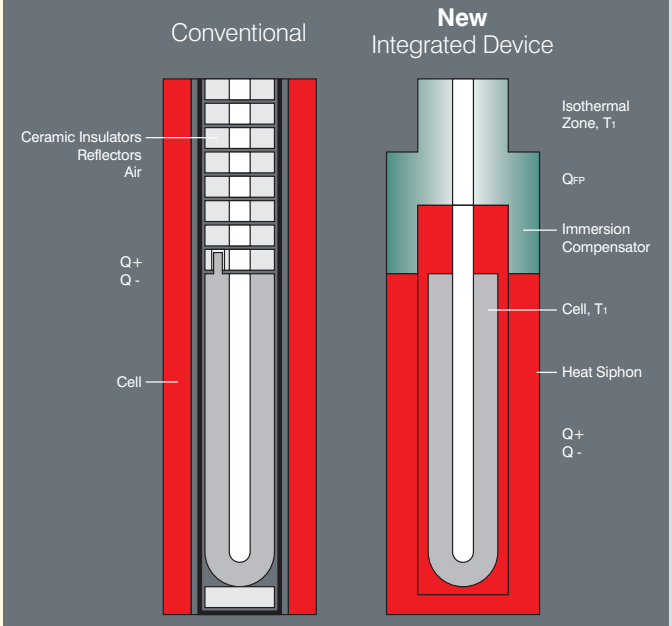
Calibration performed at the above address only

DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty (k=2)	Rem
EMPERATURE			
tinum thermocouples			
bration by comparison	-50 °C to 0 °C 0 °C to 50 °C 50 °C to 660 °C 660 °C to 1100 °C 1100 °C to 1300 °C	0.5 °C 0.48 °C 0.4 °C 0.7 °C 1.7 °C	Thermocouples with junction will have in uncertainty
tions at fixed points			
nium	231.928 °C 419.527 °C 660.323 °C 961.78 °C	0.4 °C 0.4 °C 0.4 °C 0.4 °C	Note: FP = Freezing
um Thermocouples			

Patented

The Siphonic Cell and Immersion Compensator are both patented



A fixed point cell is not long enough to eliminate heat conductance along the thermometer calibrated in it. Currently, using long furnaces, heat shunts and reflective baffles an attempt is made to reduce these losses.

The ISOTower uses a combined metal clad fixed point cell and heat siphon, which when heated provides an isothermal environment for the metal within to change state. The outer wall of the cell becomes the inner wall of the heat siphon with cost as well as performance benefits.

Additionally an Immersion Compensator is used to compensate for the stem conduction problems caused when a thermometer under test is not sufficiently immersed into a fixed point cell.

Benefits of the ISOTower over a conventional Quartz Cell and Apparatus

ISOTower

- Robust - no glass parts
- Easily Transported
- Integrated Device - known immersion characteristics
- Uniquely integrated cell, apparatus and correction for thermometer stem conduction
- Simple and safe to use with increased confidence in results

Previous Quartz Cell and Apparatus

- Fragile and Risk of Breakage
- Difficult and expensive to Transport
- Cell certified separate from apparatus, stem conduction unknown

Specification

Model	494
ITS-90 Point	Silver
Temperature	961.78°C
Metal Purity	6N
Plateau Duration	Up to 6 hrs
UKAS Uncertainty	40mK (k=2)
Heating Time	4 hrs
Pocket Diameter	8 mm
Total Immersion Depth	290 mm
Depth of metal surface to bottom of reentrant tube	180 mm
PC Interface	Supplied with PC Cable and Software
Power	900 Watts
Voltage	110 Vac or 230 Vac 50/60Hz
Dimensions	H 500 mm x W 420 mm x D 285 mm
Weight	17kg

** UKAS Calibration is Optional, Uncertainties apply to whole system*

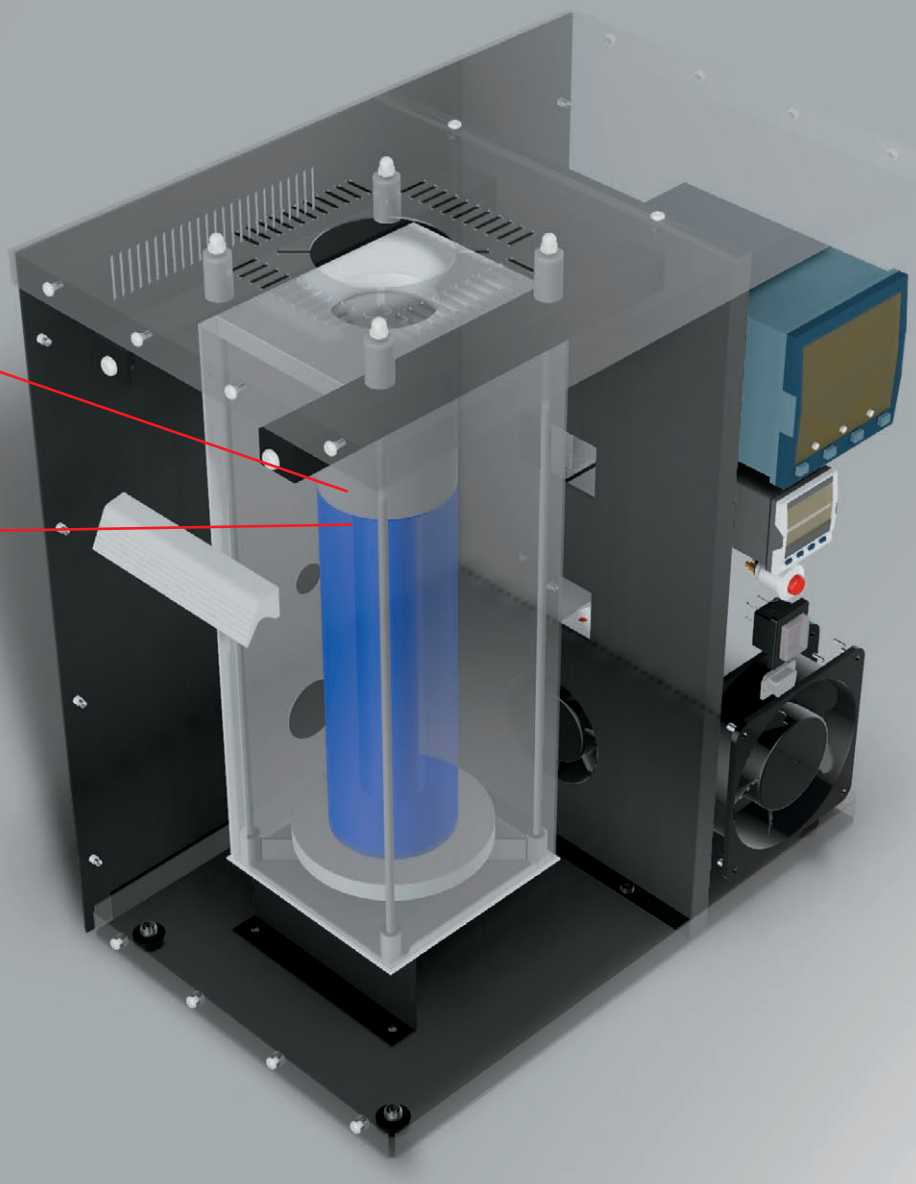
Immersion Compensator

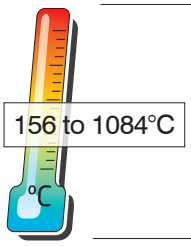
Fully compensates for the immersion characteristics of the thermometer under test.

Siphonic Cell

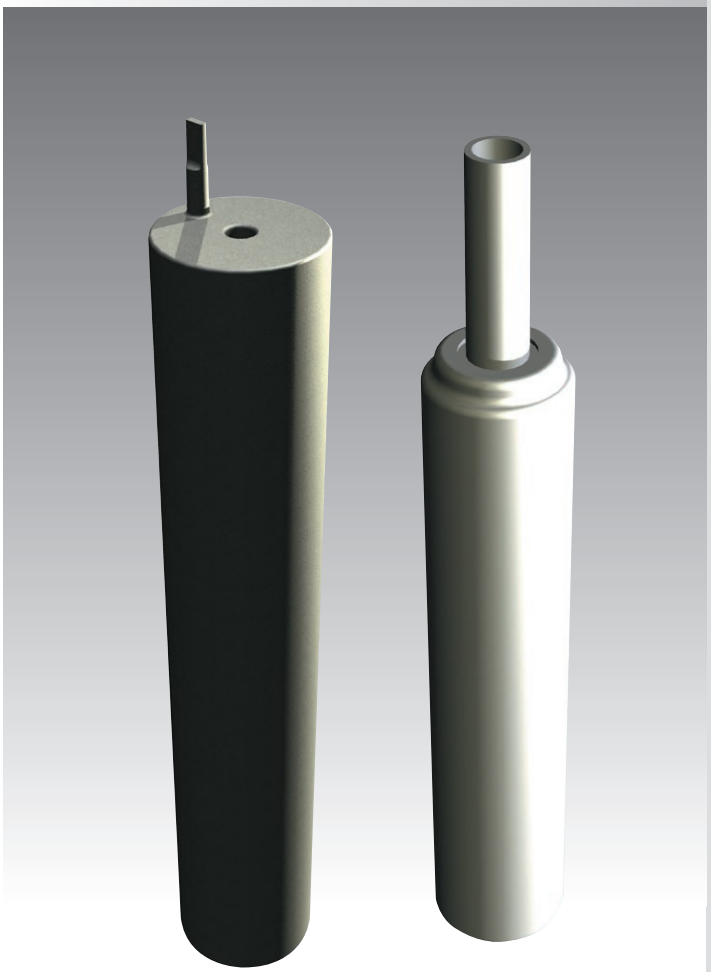
A combined Fixed Point Cell and Heat Pipe

The outer wall of the fixed point cell is the inner wall of the heat pipe or siphon, thus integrating the cell and its apparatus, giving a guaranteed performance from the cell.





Special
Fixed Point Cells



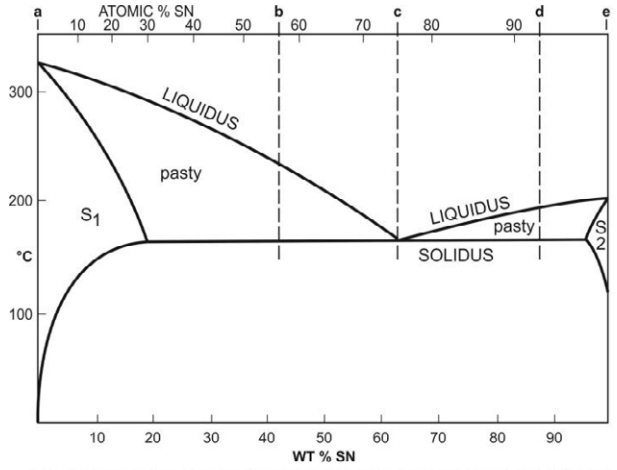
In addition to the ITS-90 Fixed Points there additional points such as Lead (327.5°C), Antimony (630.7°C). Metrologists are generally interested in a single pure metal.

There are binary alloys that allow for a system with a eutectic composition in which the alloy goes from a complete solid to a complete liquid upon ascending temperature; which is always lower then than the melting points of the constituent metals. For more information see, “Fundamentals of Thermometry Part VII, Metal Melting and Freezing Equilibria Phase, Phase Diagrams and Cryoscopic Constant, Isotech Journal of Thermometry, available at www.isotech.co.uk.

We can offer eutectic points close to ambient, Gallium/ Indium, Gallium/Tin, Gallium/Zinc or higher temperatures such as Copper/Aluminium.

These points in general are more difficult to realise have less defined freezing points but are useful in research applications.

We have extensive stocks of the most pure metals and can fabricate to special order a range of slim and optimal sized cells. We have been researching and supplying such cells for many years and can discuss research requirements.



THE COMPLETE PHASE DIAGRAM OF THE LEAD-TIN BINARY SYSTEM

Contact us - **Telephone** +44 (0)1704 543830
Facsimile +44 (0)1704 544799 **Email** info@isotech.co.uk **Website** www.isotech.co.uk
Isothermal Technology Limited, Pine Grove, Southport, Merseyside PR9 9AG England