

# Introduction to SPRTs and Standard Thermocouples

The **ITS-90** specifies the use of platinum resistance thermometers over the range -259°C to 962°C

*Between the triple point of equilibrium hydrogen (13,8033 K) and the freezing point of silver (961,78°C)  $T_{90}$  is defined by means of platinum resistance thermometers calibrated at specified sets of defining fixed points and using specified interpolation procedures.*

And

*An acceptable platinum resistance thermometer must be made from pure, strain-free platinum, and it must satisfy at least one of the following two relations:*

$W(29,7646^\circ\text{C}) \leq 1,118\ 07$  (8a)  
 $W(-38,8344^\circ\text{C}) \leq 0,844\ 235$  (8b)

*An acceptable platinum resistance thermometer that is to be used up to the freezing point of silver must also satisfy the relation:*

$W(961,78^\circ\text{C}) \leq 4,2844$  (8c)

In practise Standard Platinum Resistance Thermometers, SPRTs, are constructed to cover sub ranges of the ITS-90 and SPRTs are available in different construction types.

Isotech offer the 670 family as SPRTs recommended for Primary Applications and the 909 Family for Secondary Laboratories.

These families span from -200°C to 670°C, for higher temperatures, up to 961.78°C the freezing point of Silver Isotech offer the 96178 HTSPRT.

## Standard Thermocouples

Whilst no longer a part of the temperature scale thermocouples are widely used in calibration laboratories. Isotech can supply Standard Thermocouples to 1600°C, either in platinum / platinum rhodium or platinum /gold materials.

## The 670 Family

### Ultra Stable SPRTs - The 670SQ Range

This new quartz sheathed SPRT range from Isotech is the ultimate SPRT for the most exacting measurements over the range of -200°C to 670°C. The same ultra stable element is now available in metal sheaths.

The Model 670SH covers -80°C to 670°C

The Model 670SL covers -200°C to 165°C

## 909 Family

Working Standards - The 909 Range

In addition to our popular quartz sheathed 909 SPRT covering the temperature range -200°C to 670°C. Isotech have introduced two new metal sheathed versions for 2007.

The **909H** works from -80°C to 670°C and can be provided with either 25.5 Ohm or 100 Ohm  $R_0$  to ITS-90.

The **909L** works from -200°C to 165°C and also is available with  $R_0$  25.5 or 100 Ohms to ITS-90.

## UKAS Calibration Options

All of the SPRTs described on this datasheet can be accompanied by one of three UKAS Calibration options.

1. **By comparison**, accuracies of just a few milliKelvins, ideal for the 95 Range.
2. **Standard Fixed Point Calibration**, suitable for most SPRTs including the 909 Range.
3. **Premium Fixed Point Calibration**, suitable only for most stable SPRTs such as the 670 Range and the 96178

## Thermocouples

Model 1600 Platinum / Platinum Rhodium

Available as Type R or Type S these thermocouples are housed in a 99.7% recrystallized alumina sheath, 300 or 600 mm long and can be used to 1600°C

## Platinum / Gold Thermocouple

This model offers smaller uncertainties than Type R or S using only pure metals in the construction. An economical alternative to HTSPRTs.

<http://www.isotech.co.uk>



**SPRT Calibration with ITS-90 Fixed Points: Premium Service**  
**ISOTECH UKAS Calibration Uncertainties ( $k=2$ )**

Suitable only for Isotech 670SQ Models or other Primary Standard SPRTS of similar stability

Fixed Point	°C	Range 1	Range 2	Range 3	Range 4	Range 5	Range 6 <sup>1</sup>
<b>Typical Uncertainties ±</b>							
TP Argon <sup>2</sup>	-189.3442		1mK	1mK	2mK	2mK	
TP Mercury	-38.8344	0.6mK	1mK	1mK	1mK	2mK	
TP Water	0.01	0.5mK	1mK	1mK	1mK	2mK	4mK
MP Gallium	29.7646	0.6mK					
FP Indium	156.5985		1mK	1mK			
FP Tin	231.928			1mK	1mK	2mK	4mK
FP Zinc	419.527				1.2mK	2mK	4mK
FP Aluminium	660.323					2mK	4mK
FP Silver	961.78						7mK

**SPRT Calibration with ITS-90 Fixed Points: Standard Service**  
**ISOTECH UKAS Calibration Uncertainties ( $k=2$ )**

Suitable for Primary and Working SPRTS - Isotech 670 & 909 families and other SPRTS of similar stability

FIXED POINT Fixed Point	°C	Range 1	Range 2	Range 3	Range 4	Range 5	Range 6 <sup>1</sup>
<b>Typical Uncertainties ±</b>							
BP Nitrogen	-195.798		10mK	10mK	10mK	10mK	
TP Mercury	-38.8344	2mK	2mK	2mK	2mK	5mK	
TP Water	0.01	1mK	1mK	1mK	2mK	5mK	10mK
MP Gallium	29.7646	2mK					
FP Indium	156.5985		3mK	3mK			
FP Tin	231.928			3.5mK	3.5mK	5mK	10mK
FP Zinc	419.527				3.5mK	5mK	10mK
FP Aluminium	660.323					10mK	25mK
FP Silver	961.78						40mK

**Note 1:** Model 96178 or other HTSPRTS of similar stability

**Note 2:** Alternatively in place of TP Argon the BP Nitrogen point can be used, the uncertainty increases to 5mK for Ranges 2 to 4 and 6mK for Range 5.

**Note:** TP = Triple Point            MP = Melting Point  
 FP = Freezing Point            BP = Boiling Point

The latest schedule can be found on the Isotech website or at [www.ukas.org](http://www.ukas.org).

