

Why Laboratories need Water and Gallium Fixed Points

If you use resistance thermometers, either a Standard Platinum Resistance Thermometer (SPRT) or a high quality Industrial Platinum Resistance Thermometer then you will benefit from owning Water and Gallium Fixed Point Cells.

If you are sending your thermometers to an external lab to be calibrated, perhaps to Isotech's Primary Lab - NTPL, then you can rely on us to calibrate your thermometers to the smallest uncertainties.

But what about the period in-between calibrations? What if during transit back to you the thermometer is badly handled and it shifts in value? What if after six months there is a shift? Well if this only came to light at the next calibration period the consequences could be very serious.

R_{TPW} = Resistance at Water Triple Point

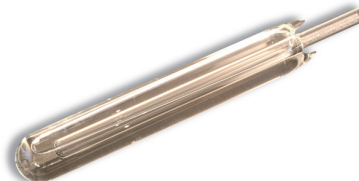
W_{Ga} = Ratio of the Resistance at the Water Triple Point to the Resistance at the Gallium Point

If you discovered that all your measurements were suspect would you have to recall instruments, would manufactured product be suspect, will there be a risk to equipment or people?

Calibration is about confidence, and by regularly checking the thermometer the nightmare scenario above is eliminated.

Water Triple Point Checks

Monitoring the resistance at the Water Triple Point is the first step. This is easily accomplished and readily gives an uncertainty to better than 0.001°C . A thermometer can be checked at the water triple point after being received back from calibration and then at regular intervals.



A Water Triple Point Cell

By keeping a control chart showing any shift in the thermometer and by comparing the values to a limit confidence in the thermometer is both gained and quantified.

If you are relying on a thermometer or bridge the latest R_{TPW} for the probe can be programmed into the instrument.

The Gallium Point

Using the Gallium Point allows us to measure the resistance of the probe at 29.7646°C , again a task easily achieved to a very small uncertainty. With the Gallium and Water points we can calculate W_{Ga} - the ratio of the resistance of the probe at the Gallium Point to the Water Triple Point.

This value, W_{Ga} is very useful and again increases our confidence.

An SPRT calibrated at a Primary Lab such as Isotech's NTPL will receive a calibration report including a "W Table". This is a table showing the ratio of the resistance of the thermometer at the Water Triple Point to the resistance of the thermometer over its calibrated range.

A secondary lab can use the latest water triple point value with the W Table to give resistance versus temperature.

But what if the W table is changed? Measuring W_{Ga} allows you to check the W table.

Strain for example will increase the R_{TPW} and decrease the W values. Such knowledge would indicate that the SPRT needs to be annealed. Annealing decreases R_{TPW} and restores W_{Ga} to its original annealed value.

Using software such as Icarus it is possible to print out a complete table - even up to $660^{\circ}C$. This is because, for example, the WTP and Ga points are so accurate the calculated value will be within $0.004^{\circ}C$ of the actual W table at the Zinc Point, $420^{\circ}C$.

So the Gallium Point can be used as a check of the whole W Table.

This represents a great cross check that the SPRT is still giving good results over all of its range, not just up to $29.7646^{\circ}C$

Benefits of Making R_{TPW} and W_{Ga} Measurements

- Save Money - extend the time between calibrations
- Increase the confidence level within the laboratory
- Avoid Making Bad Measurements

If a secondary laboratory has a number of SPRT's and by the use of R_{TP} and W_{Ga} measurements can extend recalibration times from 1 to 2 years. The cost of the two fixed points can be saved in the first 2 years.

A further plus is the saving in transport, both cost and risk of damage to the SPRT.

If you do not have this facility Isotech have put together a package to help you

Your new check facility will have a certified uncertainty of 0.5mK or less.

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