The Libra Liquid Calibration bath is a deep immersion calibration bath that covers the temperature range -40° to +300°C with two variants:

Libra M: -40°C to +125°C
Libra H: +35°C to +300°C

The Libra M has built in refrigeration to facilitate the lower temperature and the Libra H is a heat only bath. The liquid is circulated using a variable speed stirring mechanism around the deep immersion, 485mm, calibration volume.

This evaluation report describes the performance of the Libra that can be used as a guide to the laboratory performance.

The performance of the bath will vary depending on liquid type, stirring speed and other outside influences. Due to the limitations of liquids and the inability to cover the full temperature range available, the liquids have been changed at certain temperatures to cover the full temperature range.

Stability

The stability of the Libra bath is variable with respect to temperature and liquid type.

Generally the performance of a liquid bath can be improved with the addition of an equalising block. It also provides a convenient method of support and ensures equal immersion depth for the thermometers. The smallest uncertainties are obtained if there are two thermometers connected to an instrument simultaneously and the ratio between the two recorded. This method of comparison stability see the same variation of temperature and other errors are eliminated or reduced to a value determined by the time constants between the two probes.

The Absolute stability of the bath is the variation of temperature of the bath over a given time period. This is usually measured by a single thermometer either immersed directly in the liquid or into an equalising block. The thermometer is usually a fast response thermometer such as the Isotech 935-14-95 RTD.

Chart 1 below outlines the Absolute stability of the Libra M using a 935-14-95 thermometer immersed directly into the liquid to a depth of 300mm:

Temperature (°C)	Liquid	Absolute Stability (°C)
-40.00	Ethanol	± 0.005
0.00	Ethanol	± 0.006
50.00	C10 oil	± 0.003
125.00	C10 oil	± 0.004

Chart 1.

Chart 2 below shows the data for the Libra H.

Temperature (°C)	Liquid	Absolute Stability (°C)
50	Water	± 0.002
100	VH oil	± 0.004
150	VH oil	± 0.005
240	VH oil	± XXXX
280	VH oil	± 0.010

Chart 2.

Uniformity

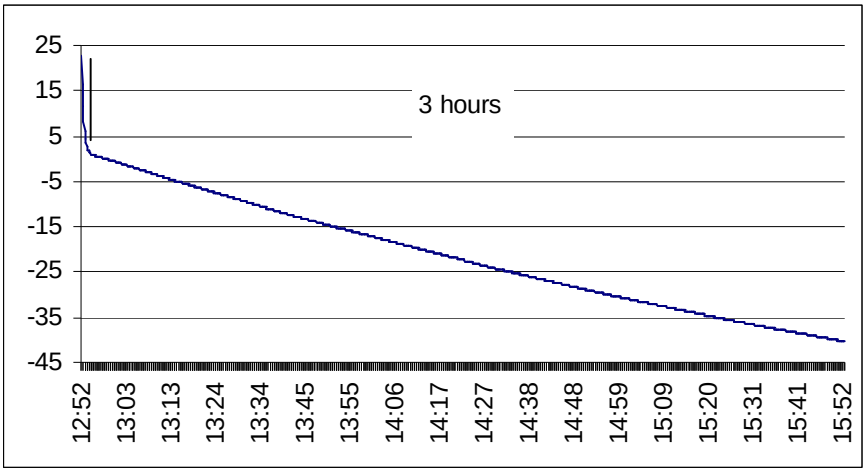
The uniformity is the variation in temperature of the working volume of the liquid.

Test method

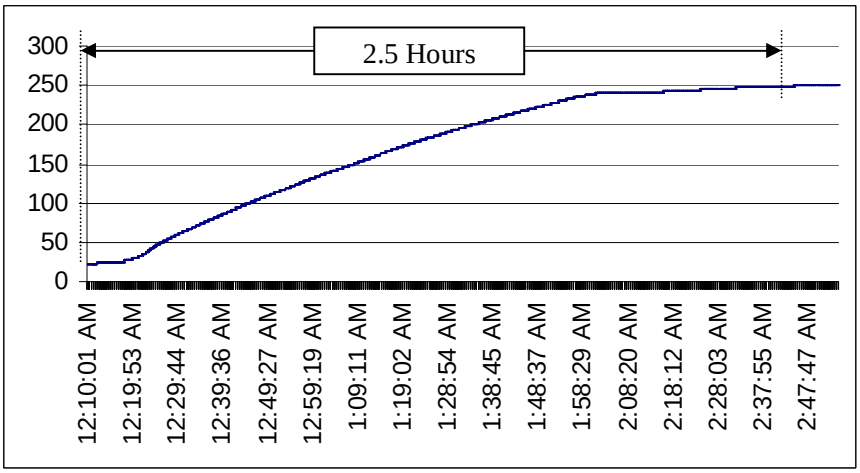
Two 935-14-95 thermometers were immersed to 300mm, one is withdrawn in 25mm steps to provide a thermal survey over a 150mm depth.

Temperature (°C)	Temperature variation (°C)
-40 (Ethanol)	± 0.XXX
0.0 (Ethanol)	± 0.XXX
50 (Water)	± 0.001
200 (VH Oil)	± 0.013

Heat up and Cool down times



The above graph shows the typical cool down data for the Libra M. The liquid medium was Ethanol and the setpoint -40°C.



The above graph shows the warm up time of the Libra H from 23°C to 250°C. The liquid medium is Isotech VH oil.