**Doc No: 100ER05 Rev: 00**

# CALsys -100/40 Evaluation Report

**An evaluation report of CALsys -100/40 Dry block Temperature calibrator**

**Manufactured by Tempsens Instruments (I) Pvt Ltd**

## INTRODUCTION

The CALsys -100/40 is the latest version of Tempsens makes Portable, highly accurate low temperature FPSC system based Dry block Calibrator for Industrial/ Laboratory field use. It offers a wide temperature range from -100 Deg C to 40 Deg C.

The main purpose of this Evaluation Report is to provide as much as necessary information to our valuable customers and to provide a transparent basis for accountability for results, for learning, for drawing lessons and for improvement. And for this we have spent a lot of time for evaluating this special product.

This evaluation report describes the performance of the Tempsens make CALsys -100/40 that can be used as a guide to the laboratory performance.

## A. Radial Temperature Homogeneity:

### What is Radial Temperature Homogeneity and why it is important to measure

Radial uniformity refers to temperature differences between wells of the block or sleeve. This nonuniformity is strongly influenced by the difference between the block and ambient temperature. A larger temperature difference from ambient will result in a larger potential temperature calibration error. Therefore radial in homogeneity should be measured at extremes (relative to ambient temperature) in an instrument's temperature range.

### Test method:-

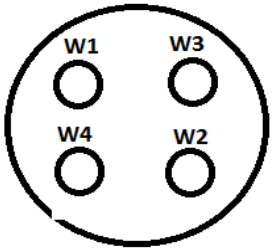
The temperature differences between the zones in the individual bores provided for the measurements are measured with one or several suitable thermometers at three different temperature representative of the field of application and covering the extreme temperature which may occur. If there is only one bore no measurement has to be carried out.

For CALsys -100/40, we consider -100 Deg C, -90 Deg C and 0 Deg C respectively. As example at 0 Deg C two RTD (designed for small steam conduction) were placed in each of the holes. Measurements were recorded and then the probes were interchanged between the two pockets and repeat measurements made. The temperature Difference was calculated to remove the small offsets between the two probes.

For calibrators having fewer than four wells, it may be necessary to determine differences by cyclic exchange. The difference between two wells with two thermometers may be determined with the following Formula:

Temperature Difference = [((P1W1 – P1W2) + (P2W1 - P2W2)) / 2}]

Note: P1 = probe 1, W1 = well 1 and so on. P1W1 is read as the value of probe 1 in well 1.



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## Radial Temperature Homogeneity for CALsys -100/40

| Temp (Deg C) | Sensor | Hole 1 | Hole 3 |
|---|---|---|---|
| -100 | RTD Sr. No. 014 | -99.77 | -99.66 |
| | RTD Sr. No. 1270 | -99.31 | -99.53 |
| Radial Uniformity : +/-0.055 | | | |

| Temp (Deg C) | Sensor | Hole 1 | Hole 3 |
|---|---|---|---|
| -90 | RTD Sr. No 014 | -89.80 | -90.00 |
| | RTD Sr. No 1270 | -89.65 | -89.55 |
| Radial Uniformity : +/-0.050 | | | |

| Temp (Deg C) | Sensor | Hole 1 | Hole 3 |
|---|---|---|---|
| 0 | RTD Sr. No. 014 | 0.71 | 0.68 |
| | RTD Sr. No. 1270 | 0.51 | 0.47 |
| Radial Uniformity : +/-0.035 | | | |

## B. Temperature Stability

Temperature stability is measured with a thermometer and readout with adequate sensitivity and resolution to measure the control fluctuations in the block. A typical time period for stability measurements of a dry-well is about 30 minutes at any specific temperature. Other time periods may be applied depending on how the calibrator is to be used. Temperature stability may vary at different temperatures. The instrument should be characterized over its range, and typically three sets of stability measurements are adequate. Dry-wells that are heated only (that is they utilize no cooling systems to achieve below-ambient temperatures) are measured at their maximum and minimum temperatures and at the midpoint of their ranges. Stability measurements for cold dry-wells are made at their maximum and minimum temperatures as well as near room temperature. Specific temperatures of interest by the user may also be incorporated.

**Test Method:**

Stability is the measure of the temperature deviations over the measurement period, after temperature control has stabilized. The stability data can be viewed in two ways (see Figure 3). What may be called “peak” stability is often evaluated as plus or minus (±) one-half the difference between of the maximum and minimum values of the data set:

**Peak Stability = ± (Tmax – Tmin) / 2.**

| Temp Set Point | Maximum | Minimum | Peak Stability |
|---|---|---|---|
| -90Deg C | -89.87 | -89.79 | 0.04 |
| 0 Deg C | 0.50 | 0.44 | 0.03 |

## C. COOL DOWN Time

### COOL DOWN TIME

Ambient (25° C) to -90° C 50 Min

Ambient (25° C) to -100° C 60 Min

| Cool Down Time | |
|---|---|
| Time (Min) | Temp (Deg C) |
| 0 | 25.0 |
| 5 | -10.0 |
| 10 | -30.0 |
| 15 | -50.0 |
| 20 | -70.0 |
| 25 | -80.0 |
| 35 | -90.2 |
| 50 | -90.0 |