SUBJECT : STANDARD OPERATING PROCEDURE FOR ENVIRONMENT CHAMBER, OVENS, AUTOCLAVE, FURNACE (MULTI POINT) USING WITH DATA LOGGER WITH SENSOR		
PROCEDURE No. ML/SOP/TM002	Effective Date	02/03/2012
	Last Amendment No.	04
	Last Amendment Date	12/06/2020
THERMAL DEPARTMENT	Next Review Dt.	12/06/2021
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PURPOSE:	➢ The purpose of this procedure is to provide general instructions for the calibration of ovens by using nine point calibration methods.
SCOPE:	➢ This general procedure shall be used in the absence of any specific calibration procedure for Ovens by using nine point calibration methods. Range Up to 1200 °C.

PRELIMINARY INSTRUCTIONS AND NOTES:

- ➢ The IUC will hereafter be referred as the Instrument Under Calibration.
- ➢ Verify the details of IUC as per Service Request Form (Form - 3) for all requirements including any special requirement of the customer.
- ➢ Read this entire procedure before beginning the calibration.
- ➢ Ensure that the following environmental conditions are maintained during the calibration and soaking of instrument to be calibrated.

At Lab	Temperature: 25 ± 4 °C	At Site	Temperature: 25 ± 10 °C
	Humidity: 50 ± 20% RH		Humidity: 50 ± 20% RH

- ➢ Verify that the IUC is clean.
- ➢ Visually examine the IUC for any condition that could cause errors in the calibration and check the range, resolution and record the primary details of instrument in the Raw Data Sheet (Form – 21/A-1)
- ➢ If a defect is observed while visual inspection, the calibration procedure will is discontinued and necessary corrective action taken.
- ➢ If all above terms and conditions are satisfied then the do the soaking of instrument.
- ➢ Record the environmental conditions during calibration of instrument in the raw data sheet (Form – 21/A-1)

REFERENCE DOCUMENTS:	➢ DKD-R5-7 ➢ NABL 130: Specific Criteria for Site Testing & Site Calibration Laboratories
RESPONSIBILITY AND AUTHORITY	➢ All custodians as defined in record control Matrix Lab. ➢ Calibration Engineer

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NAME	HITESH PATEL	RANJIT ROHIT
SIGNATURE & DATE		18/06/2020
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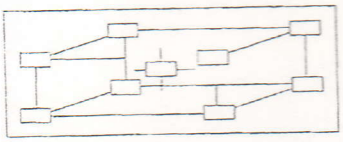
EQUIPMENT REQUIRED:

Master	Range	At Site & At Lab
Precision Temperature Scanner or Data logger with Temp. Sensor (T/RTD Type)	-80 to 400° C	At Site
Precision Temperature Scanner or Data Logger with N Type Thermocouple	400 to 1200° C	At Site

PROCEDURE IN DETAIL:

Block Diagram:



- Before calibration of the oven, open the door and allow it to reach at ambient temperature.
- Remove all the material and secure nine sensors as shown in the figure, at eight corners of the oven and one at the centre.
- The selection of sensor thermocouple depending upon the calibration point of the oven. From -80C to 200°C T type sensors, from 200 to 600°C RTD Sensors are used & above 600°C to 1200°C, N type thermocouples are used.
- The sensor quantity will be decided by the size of the chamber. If the chamber size up to 2000 liter nine point method is used. Above 2000 liter for each liter add one sensor.
- Connect the sensor's output to the temperature data logger.
- Set the data logger to required input type (thermocouple).
- Close the door of the IUC.
- Set the desired temperature and allow the oven to reach at set temperature.
- After stabilization, note down the five readings for each set point at an interval of 15min.
- Data also stored in the Data logger automatically.
- Calculate difference between minimum & maximum temperature at each sensor position from the readings taken.
- Stability of oven is calculated by the following formula.
  Stability of Oven = Average of difference between minimum & maximum temperature at each sensor position.
- Uniformity of oven/Furnace is calculated by the following formula.
  Uniformity of Oven/Furnace = Maximum difference between temperature measured at sensor located at the center position and temperature measured at each sensor.

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REFERENCE RECORDS:	➢ Service Request Form (Form - 3) ➢ Equipment Movement Register ((Form - 18)(For Site Calibration) ➢ Raw Data Sheet (Form – 21/A-1) ➢ Customer Feedback Form (Form - 7)

UNCERTAINTY COMPONENTS:	➢ Uncertainty due to over all Means. (Type A). ➢ Uncertainty due to Master instrument's Uncertainty from the calibration certificate (Type-B). ➢ Uncertainty due to Accuracy of Masters used (Type-B). ➢ Uncertainty due to Resolution of IUC (50%) (Type-B). ➢ Uncertainty due to Stability of IUC (Type B). ➢ Uncertainty due to Uniformity of IUC (Type B).

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