



RESEARCH ARTICLE

AN INNOVATIVE DESIGN OF VERY HIGH TEMPERATURE (UPTO 1500°C) DRY BLOCK CALIBRATOR (MOBILE)

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ABSTRACT

Precise and Reliable Temperature Measurement is CRITICAL Particularly in High Temperature (eg. 1200°C to 1500°C) Processes like Steel / Metallurgical / Glass / Ceramic etc. Periodic Calibration of the High Temperature Sensors used for such Measurements is Essential to Counter the Effect of Ageing and Drift. Article Describes Innovative Techniques of Achieving Fast, Reliable and Accurate Calibration of these High Temperature Sensors.

INTRODUCTION

Control and Maintenance of Temperature within close limits is very essential for any process and is an all the more important criteria in high temperature processes like in Steel / Glass / Ceramic / Semiconductor manufacturing. Noble Metal Thermocouples (Types R / S / B etc.) and sometimes even Type K / N Thermocouples are used for Temperature Measurement / Control in such processes involving temperatures higher than 1200°C. These thermocouples invariably Age over time of usage and may Drift due to frequent temperature Cycling etc. Thus periodic Calibration of these thermocouples assumes importance. It is not easy to generate / simulate temperatures higher than 1200°C and is much harder to achieve / reach such high temperature in reasonable time and to maintain it within close limits to provide Stability during Calibration process. Conventional High Temperature Calibration is through Heavy / Bulky Furnaces with High Wattage and Very Long Heating / Cooling Times. Invariably, the Media of this Calibration is Air which is bound to introduce Transfer Lags / Losses and Errors. Article below Describes an Innovative Technique/Method - A

Reliable Solution - State of the Art - for this long felt need for a Fast, Stable and Accurate Ultra High Temperature Calibration System to Check / Calibrate Type S / R / B Thermocouples etc. - At 1200°C to 1500°C.

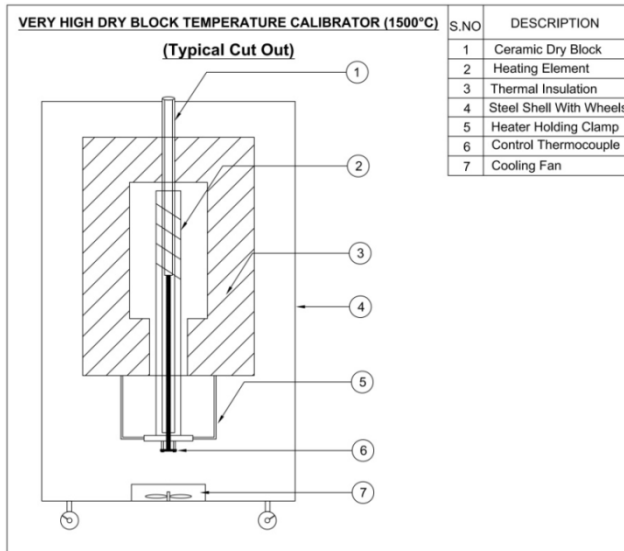
Technique/Method

This Calibration Technology uses a Contoured High Alumina Ceramic Dry Block which is heated by a Silicon Carbide Heating Element. The single ended Silicon Carbide heating element with an extended heating zone is deployed to ensure uniform Temperature through the Dry Block and to keep overall size and Power consumption low!. The High Alumina Ceramic Dry Block can be Designed to accommodate Interchangeable (Ceramic) Thermo wells (eg. 7, 9 and 13 mm) or a Multihole Dry Block with 4 to 6 holes to suit the Thermocouple (inserts) sheaths. Extended Immersion Depth ensures Faster Heat Transfer and Minimal Immersion Errors. Using a very stable built-in Reference Sensor and Auto-tune PID Controller, the Temperature can be maintained Stable within $\pm 2^\circ\text{C}$ with 0.5% Accuracy. The accuracy of measurement can be enhanced thro' use of Standard / Reference Thermocouple and Digital Indicator in Comparison Mode. RS-232 Computer Interface and Custom Designed Calibration Software (that enables automatic Calibration routines / procedures) can be Added. Switch Test Facility, Transmitter Power Supply, Over Temperature Protection, Temperature Read Out in $^\circ\text{C}$ / $^\circ\text{F}$ are other similar Standard

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Features of such Calibration can be incorporated in this Calibration System. A Heavy Duty Variant with a Ceramic Dry Block that can accommodate additionally Interchangeable Thermo wells of Higher Diameter - like 17 and 21 mm Dia. can also be Designed and Developed to suit. Of course such a Heavy Duty Model will invariably have a Higher Wattage!. With the Sturdy Steel Shell Mounted on Wheels, this High Temperature Calibrator can be Moved (of course Carefully-Considering the Silicon Carbide Heating Element) to Site Locations, affording Mobility.



RESULTS

This Calibration Technique reduces Calibration time per Sensor and thus offers Checking at more Calibration points per hour than traditional heating furnaces – which are Heavy/Bulky, High Wattage and with Longer Heating / Cooling Times.

Conclusion

Reliable, Fast, Precision Temperature Calibration of High Temperature Sensors Used in High Temperature Parameters – like Ceramic / Glass / Semi-Conductors / Industrial Process is Facilitated with this Calibration Technique.

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