

Annexure 1:

Spherical Black Body Furnace

The scope of supply:

Supply, installation and commissioning of spherical black body furnace at purchaser's site for calibration of thermal sensors.

Table 1: Specifications of Spherical black body furnace

1.	Spherical Black body specifications		
1.1.	Shape of cavity	:	Spherical
1.2.	Temperature Range	:	200°C to 1100°C or higher
1.3.	Diameter Spherical cavity	:	~230 mm or higher Note: If the offered diameter of the spherical cavity is different from the above dimension, the party is requested to specify the same in the technical bid with details if any.
1.4.	Aperture diameter	:	45 mm or higher
1.5.	Emissivity	:	>0.998 The party shall submit test certificate of black body from internationally accredited laboratory such as NIST/UKAS etc. Details shall be submitted along with technical offer.
1.6.	Temperature stability	:	±0.1°C for a duration of 30 minute.
1.7.	Input power availability	:	Power supply provision available in VSSC are 230V, 50Hz for single phase or 415V, 50Hz for three phase. Party is requested to specify the power requirements for the equipment along with technical bid.
1.8.	Operating ambient temperature	:	25 °C to 30 °C
1.9.	Display resolution	:	Minimum display resolution shall be 0.1°C up to 999.9°C and it shall be 1°C from 1000°C. Better display resolution is acceptable.
2.	Blackbody temperature controller	:	The temperature of the furnace shall be controlled as per the given specifications of black body using PID logic/controller. The controller shall be dual display, one display shall indicate the cavity temperature, and the other display shall indicate the set point temperature.

3.	Furnace Body	: Furnace body shall be made with suitable stainless steel grade material. If the material is other than stainless steel, the party has to mention the same along with technical bid. If the furnace body is not stainless steel, suitable coating shall be applied on the body to prevent the corrosion. Details of coating shall be provided along with technical bid. Coating shall be applied after obtaining approval from purchaser. Coating material shall be changed, if purchaser recommends a better one than the coating specified by the party.
4.	Furnace Insulation	: The furnace insulation system should be designed such that the external body surface temperature does not exceed 40°C at any point of time. If by design the external surface temperature of the black body exceeds above 40°C, an additional protective guard shall be provided around the furnace for operator safety. If a protective guard is essential for the offered black body, details shall be provided along with technical offer.
5.	Pre delivery inspection (PDI)	: The Pre-delivery inspection of the black body shall be carried out within 6 months from the date of acceptance of PO. The party should inform their readiness for PDI to purchaser well in advance (preferably 2 weeks before the scheduled activity). The following operations shall be demonstrated during the same, i) Verification of supply items. ii) Demonstration of the black body temperature stability at two different temperatures (200°C & 400°C). During the above test, black body temperature shall be measured using a separate pyrometer and standard thermocouple. All the above inspection (1-2) shall be carried out in the presence of purchaser representatives only. The PDI shall be either online or offline depending upon the party's worksite location.
6.	Packing, handling and transportation	: The total system shall be properly packed and transported to purchaser's site. Care shall

			be taken to prevent handling and transportation damages. Supplier is responsible for the safe delivery of the system at purchaser's site.
7.	Delivery	:	Within 2 months from the completion of PDI and with clearance from purchaser's recommendation.
8.	Installation and commissioning		The black body shall be installed and demonstrated at purchaser's site within 2 weeks after intimation from purchaser on site readiness.
9.	Acceptance at purchaser's site	:	The following activity will be carried out for final acceptance of the system after installation of the same at purchaser's site. Demonstration of the black body temperature stability at three different temperatures (500, 800 and 1000 °C).
10.	Warranty	:	Shall be offered for minimum period of 1 year from the date of installation and commissioning at purchaser's site.
11.	<p>Note: Party's heritage in the realization and supply of spherical black body shall be communicated for information along with their offer. The party shall provide the details of supply of spherical black body by them to different agencies including ISRO with order details.</p> <p>Since this is being a source for calibration of sensors, the pedigree of party in supply of black body with spherical cavity and its usage by various laboratories will be considered as the acceptance criteria for finalizing the technical bid.</p>		