



**INDIAN INSTITUTE OF TECHNOLOGY BOMBAY**  
**MATERIALS MANAGEMENT DIVISION**  
Powai, Mumbai 400076

**Purchase Requisition No. 1000012250 (SRM/RFX No. 6100000279)**

**Technical specifications for Walk-in PV Module Test Chamber**

Sl. No.	ITEM	PV module test chamber along with accessories
1	Temperature Ramp Rate	<p>Temperature change rate: A1) Cooling from 0 °C to -40 °C at rate ranging minimum 40 °C/h to maximum 100 °C/h B1) Cooling from +100 °C to 0 °C at a rate ranging from minimum 40 °C/h to maximum 100 °C/h B2) Cooling from +120 °C to 100 °C at a rate ranging from minimum 40 °C/h to maximum 200 °C/h C1) Heating from 0 °C to 100 °C at a rate ranging from minimum 40 °C/h to maximum 100 °C/h C2) Heating from 100 °C to 120 °C at a rate ranging from minimum 40 °C/h to maximum 200 °C/h D1) Heating from -50 °C to -40 °C at rate ranging minimum 40 °C/h to maximum 200 °C/h D2) Heating from -40 °C to 0°C rate ranging minimum 40 °C/h to maximum 100 °C/h</p> <p>Under full load conditions:(modules + fixture weight = 300 Kg(approx)) Damp Heat Test, Thermal cycling Test and Humidity Freeze Test as per IEC 61215:2016</p>
2	Inner Dimensions	1.3 m x 1.5 m x 2.5 m (WxHxD) approximately
3	Full outer dimension of the chamber.	Height less than 2.7 m, Approximate Width: 1.6 m, Depth less than 4.3 m.
4	No. of Modules to be tested simultaneously	5 modules (minimum)
5	Standards	Chamber shall be capable of conducting Damp Heat Test, Thermal Cycling Test, Humidity Freeze Test as per IEC 61215:2016 (Please also refer user's requirements)
6	Temperature Operating Range	less than or equal to -50 °C to more than or equal to +120 °C
7	Humidity Range	30-95% RH
8	Temperature Accuracy:	± 1 °C

	Temperature uniformity	$\pm 2\text{ }^{\circ}\text{C}$
9	Humidity Stability	$\pm 5\text{ \% RH}$
10	Humidity Accuracy	$\pm 1\text{ \% RH}$
11	Controller	<p>A) Touch screen based controller</p> <p>B) PID / PLC Programmable through software (Serial interface RS 232 / USB for connection for bidirectional communication)</p> <p>C) Multiple level of password protection.</p> <p>D) Capability to store at least 100 programs</p> <p>E) Recording of Temperature, humidity vs time in csv format or easy access to excel format</p> <p>F) Ethernet port</p> <p>G) Remotely monitor and / or control the chamber anytime, anywhere access from any device (PC, Smartphone etc.)</p> <p>H) Display error events, total time of current program, elapsed time, process value, set value and date and time.</p> <p>I) Real time trend display graph with adjustable time and minimum / maximum values</p>
12	Chamber Temperature and Humidity Sensors	Temperature Sensors: 2 (1 for control, 1 for safety), Humidity Sensors: 1
13	Refrigerant	CFC Free
14	Cooling System	2 stages, Water cooled refrigeration system, compressor on anti -vibration pads
15	Power Supply and power cable	415 Volt $\pm 15\%$ , 3 Phase (Star connection), 50 Hz
16	Cables for Voltage Biasing of Test Device (PV Module)	<p>Minimum 7 pairs (Cables shall be capable of withstanding the temperature and humidity in the chamber and shall terminate in a socket at the outside wall of the Chamber)</p> <p>Feed through with connectors for the 14 (7 pairs) cables.</p>
17	Port hole	two port holes of standard size ie 125 mm and 50mm diameter
18	Internal lighting	Interior illumination with a lamp would be desirable
19	List of critical spare list (including quantity)	To be Provided by the Vendor along with the Bid.
20	Vendor Experience	1) Vendor must have supplied at least 15 chambers to

		<p>reputed organizations in India or abroad with following or better configuration: Internal Volume: more than or equal to (1.3 m x 1.5 m x 2.5 m = 4.87 cubic meters). Specifications: Temperature range: -40 °C to 85 °C, RH range: 30%-95%, Temperature heating / cooling rate: min 40 °C/hr, max: 100 °C/hr.</p> <p>Names and contact details of the responsible persons in these organizations along with the specifications and size of the chamber supplied to them must be provided.</p> <p>2) The feedback of end users of already supplied such type of chamber shall be considered for further evaluation of quotation.</p> <p>3) Vendor should have strong service back up preferably from Mumbai / Pune region and have an inventory of spare parts available at mentioned location for any contingency. The service calls should be attended and addressed within 48 hours during the warranty period.</p> <p>4) The chamber should have a service life of minimum 10 years and OEM / supplier shall guarantee for maintenance of up to 10 years with available to spares. An undertaken from OEM or supplier shall be furnished along with the quotation.</p>
21	Maximum Internal heat dissipation by the load at full load	3 kW
22	Weight of chamber	To be provided by vendor
23	Chamber Acceptability Tests at Vendor's Facility:	Should be performed at full load conditions by putting an appropriate power source inside the chamber.
23.1	Damp Heat Test	All the tests must be conducted at the factory for duration of one day during pre-dispatch inspection.
23.2	Thermal Cycling Test	
23.3	Humidity Freeze Test	
23.4	Low Temperature Test	
23.5	High Temperature Test	
23.6	Others	The raw temperature and humidity data from the chamber during these tests along with the test report shall be shared with IIT Bombay authorized person for approval before dispatching the chamber to IIT

		<b>Bombay. IIT Bombay personnel may be present during the pre-dispatch tests at the vendor's facility.</b>
<b>24</b>	<b>Warranty</b>	<b>1 year warranty</b>
<b>25</b>	<b>Chamber Acceptability Tests at IIT Bombay</b>	<b>Will be performed at full load conditions by putting 5 PV modules inside the chamber</b>
<b>25.1</b>	<b>Damp Heat Test</b>	<b>1000 hours at 85% RH and 85 °C as per IEC61215:2016</b>
<b>25.2</b>	<b>Thermal Cycling Test</b>	<b>50 Thermal Cycles (from -40 C to +85 C) as per IEC 61215:2016</b>
<b>25.3</b>	<b>Humidity Freeze Test</b>	<b>10 Humidity-Freeze Cycles as per IEC 61215:2016</b>
<b>25.4</b>	<b>Low Temperature Test</b>	<b>Cooling down to -50 °C with ramp rates within specifications and continuous operation at -50 °C for 48 hours.</b>
<b>25.5</b>	<b>High Temperature Test</b>	<b>Heating to +120 °C with ramp rates within specifications and continuous operation at 120 °C for 48 hours.</b>
<b>26</b>	<b>Utilities Required</b>	<b>Vendor has to provide</b>
<b>26.1</b>	<b>Water Requirement for Humidity System</b>	<b>Vendor has to provide the TDS value</b>
<b>26.2</b>	<b>Chamber Drain</b>	<b>Vendor has to provide</b>
<b>26.3</b>	<b>Solar Panel Fixture</b>	<b>Vendor has to provide to accommodate 5 modules (minimum)</b>
<b>26.4</b>	<b>Power Supply (Cooling tower/ DM water system) Air compressor etc)</b>	<b>Vendor has to provide</b>
<b>27</b>	<b>Ambient Condition</b>	<b>The chamber should be designed considering, ambient temperature range from 25 °C to 40 °C, and humidity up to 90% RH</b>
<b>28</b>	<b>Module holder / Rack</b>	
<b>28.1</b>	<b>Module holding capacity</b>	<b>Accommodation for Minimum 5 modules each of maximum size up to 2.25 m x 1.25 m (D x H)</b>
<b>28.2</b>	<b>Design Features</b>	<b>a) Design module rack of proper ventilation to maintain homogeneity of temperature and humidity b) The rack should allow easy sliding and clamping of modules to the rack c) The modules should remain dielectrically insulated from each other and the chamber walls</b>

		<b>d) The rack should withstand continuous temperatures up to 120 °C and humidity 95% RH</b>
<b>29</b>	<b>Viewing Window</b>	
<b>29.1</b>	<b>Size</b>	<b>minimum 40 cm x 40 cm (W x H)</b>
<b>29.2</b>	<b>Removal of Condensate</b>	<b>Wiper or some other technique for cleaning the condensate on the viewing window from inside</b>
<b>30</b>	<b>Chamber Material</b>	
<b>30.1</b>	<b>Internal</b>	<b>a) Stainless steel grade as suitable for requirements and protected from corrosion b) Chamber surfaces should not accumulate condensed water. Appropriate draining should be provided so that there is no accumulation of water on the chamber floor during testing. c) All surfaces should be resistant to corrosion</b>
<b>30.2</b>	<b>Exterior material</b>	<b>Double coated galvanized steel sheet suitable for corrosion resistance in tropical climates Exterior finish should be single or two coloured powder coated (Supplier to indicate)</b>
<b>30.3</b>	<b>Max weight of test PV modules along with the fixture</b>	<b>300 kg</b>
<b>31</b>	<b>Door</b>	
<b>31.1</b>	<b>Hinges</b>	<b>Hinged on left, with latching arrangement along with excellent seal to stop conditioned air leakage</b>
<b>31.2</b>	<b>Lifetime</b>	<b>Withstand 50,000 operations without fail</b>
<b>32</b>	<b>Protections</b>	
<b>32.1</b>	<b>Heaters</b>	<b>Permanently memorized overheating safety thermostat</b>
<b>32.2</b>	<b>Humidifier</b>	<b>Protection for Humidifier against Overheating</b>
<b>32.3</b>	<b>Power Supply</b>	<b>Each functional circuit should have its own safety device, which, in the event of malfunction, turns off the entire cabinet. The cause of the malfunction must be visually displayed on the monitor.</b>
<b>32.4</b>	<b>Wiring</b>	<b>Wiring and electrical parts should strictly conform to International standard (CE mark) safety regulations for electrical installations and materials.</b>
<b>32.5</b>	<b>Interlock</b>	<b>An interlock mechanism between test space and door opening shall be provided to shut down the chamber.</b>
<b>32.6</b>	<b>Thermal safety</b>	<b>High and low temperature safety</b>

<b>33</b>	<b>Documentation</b>	
<b>33.1</b>	<b>Calibration certificates for all measuring devices and systems</b>	<b>Vendor has to provide</b>
<b>33.2</b>	<b>Calibration of Temperature and Humidity - ISO 17025</b>	<b>Vendor has to provide</b>
<b>33.3</b>	<b>Manuals</b>	<p>a) Vendor to provide detailed operation manuals (2 sets) , maintenance manuals (2 sets) and manuals for troubleshooting of equipment</p> <p>b) All the manuals must be complete with drawings, parts list with part codes, circuit diagrams with ratings of components and list of the do's and don'ts for the main equipment as well as for the sub-systems.</p> <p>c) The maintenance manuals should contain list of suppliers along with addresses for the bought parts, troubleshooting charts, programs of built in controllers etc. for the main equipment as well as for the sub-systems.</p> <p>d) All the content in the manuals must be in English Language.</p> <p>e) Soft copy of all manuals is required.</p>
<b>33.4</b>	<b>Acceptability certificate</b>	<b>The acceptability certificate, signed by the QA engineer of the manufacturer, should be provided with the manuals</b>
<b>34</b>	<b>Training</b>	<b>Vendor's engineers have to train operators at IIT Bombay for the safe operation of the equipment. The training shall be video-recorded for future reference of IIT operators.</b>
<b>35</b>	<b>Timeline</b>	<b>Total timeline from reception of purchase order to the testing at IIT Bombay should be provided by the vendor</b>
<b>36</b>	<b>Other terms and conditions</b>	<b>Payment will be released only if the chamber passes the“Chamber Acceptability Tests at IIT Bombay” described in 25.</b>