



**INDIAN INSTITUTE OF TECHNOLOGY BOMBAY**  
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Ref. PR No. 1000051545

Rfx. No. 6100002550

**Item Description: Dynamometer (Qty 1)**

| Sr. No | Item Description                                | Detailed Technical Specification  | Technical Compliance (Yes / No) | Additional Information (if any) |
|--------|---|---|---------------------------------|---------------------------------|
| 1.     | <b>Dynamometer (Qty 1)</b>                      |   |                                 |                                 |
| A.     | <b>The system should include the following:</b> | <ul style="list-style-type: none"> <li>• A loading machine along with its cooling system</li> <li>• The necessary drive unit that interfaces the grid to the loading motor along with its cabinet and cooling system.</li> <li>• An industrial computer with necessary hardware and software to control the loading motor, drive unit, motor under test (MUT) and inverter of MUT, and the DC power supply.</li> <li>• Torque flange with its calibration and scaling setup (software and hardware).</li> <li>• The locked rotor testing mechanism.</li> <li>• A test bed and the necessary mounting structures to mount the loading machine, the Motor Under Test (MUT), the torque sensor, encoder for speed measurement and all the necessary coupling mechanisms to couple them.</li> <li>• Temperature sensing module with 8 channels and temperature sensors.</li> <li>• System should have emergency stop button in hardware and software. Hard emergency-stop buttons, located in close proximity of test bed. Each will independently produce a controlled emergency shutdown of all high power equipment, including the stopping the rotation of all the mechanical parts.</li> <li>• Mechanical shaft locking assembly to allow measurement of MUT at locked rotor condition.</li> <li>• Suitable user manuals and drawings of the test bed</li> </ul> |                                 |                                 |
| B.     | <b>Control and Automation System:</b>           | <ul style="list-style-type: none"> <li>• The software should accept the necessary inputs from the user to control the necessary equipment/peripherals like load machine, torque sensor, drive unit, MUT inverter, Bidirectional DC power supply, power analyser and other to have the necessary control for the desired testing.</li> </ul>   |                                 |                                 |

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|           |                                | <ul style="list-style-type: none"> <li>• Necessary drivers for devices like loading motor, drive unit, power supply, power analyser, etc. to control and monitor the automation system.</li> <li>• Suitable graphical user interface that is configurable.</li> <li>• The software should be able to do data logging of torque, speed, voltage, current, input/output power Vs time and should also be able to export the data to an Excel file.</li> <li>• System should work in both manual and automatic modes.</li> <li>• Automatic operation through pre-defined test cycles.</li> <li>• Test cycle and test sequence creation through means such as state flow in GUI, editing, importing from excel and visualisation should be possible.</li> <li>• There should be a basic safety system which works in closed loop and should communicate with different peripheral devices and take the necessary action during fault.</li> <li>• The automation system shall continuously monitor dynamometer system; Bi-directional DC power Supply take appropriate action in an event of a fault to protect the system.</li> <li>• Limit monitoring of parameters such as temperature, etc. and the system should perform the with user defined actions in the event of any set limit is crossed.</li> <li>• Automation system should have provision to connect with a DAQ system and should be able to log the data.</li> <li>• The automation system must include the interface for DAQ system to configure and control the DAQ system such as the configuration of channels, sampling rate, formula channel configuration, DAQ start/stop, etc.</li> <li>• The system must include formula channels that perform mathematical operations and functions (comparison formula, addition, subtraction, multiplication, division, trigonometric functions, etc.) on a parameter monitored by the automation system</li> <li>• The automation system must generate test reports.</li> <li>• Torque sensor scaling and calibration software</li> </ul> |  |  |
| <b>C.</b> | <b>LOADING MOTOR:</b>          |   |  |  |
| C.1       | <b>Continuous Power rating</b> | ≥ 39 kW   |  |  |
| C.2       | <b>Cooling</b>                 | Liquid cooled. Cooling system included.   |  |  |
| C.3       | <b>Speed</b>                   | <ul style="list-style-type: none"> <li>• Rated Speed value: 2000 rpm to 2500 rpm</li> <li>• Maximum speed: 15,000 rpm or higher</li> </ul>  |  |  |
| C.4       | <b>Torque</b>                  | A. Continuous torque ratings:   |  |  |

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|           |  | <ul style="list-style-type: none"> <li>• <math>\geq 160</math> Nm up to Rated Speed</li> <li>• <math>\geq 9</math> Nm at maximum speed</li> </ul> <p>B. Peak torque ratings: <math>\geq 270</math> Nm</p>   |  |  |
| C.5       | <b>Torque sensor</b>                         | <ul style="list-style-type: none"> <li>• Measurement range: 500 Nm</li> <li>• Accuracy: 0.05% or lower</li> <li>• Nominal rotational speed: 20000 rpm or higher</li> <li>• Torque sensor scaling and calibration setup (hardware and software)</li> <li>• The torque sensor output terminals must be accessible for external measurement equipment's like data loggers, controllers, etc.</li> </ul>  |  |  |
| C.6       | <b>Temperature monitoring</b>                | Temperature sensor in the stator winding  |  |  |
| C.7       | <b>Encoder</b>                               | Incremental encoder 1024 pulses/rev<br>The encoder output terminals must be accessible for external measurement equipment's like data loggers, controllers, etc.  |  |  |
| C.8       | <b>Inverter and Regenerative drive unit:</b> | A suitable system to be included to power the loading motor to operate as per the above mentioned requirements.   |  |  |
| <b>D.</b> | <b>Power Analyzer</b>                        | <ul style="list-style-type: none"> <li>• The power analyzer must be able to measure the DC input power to the MUT drive, 3 phase MUT Drive output power/motor input power and the motor's mechanical output power (torque and speed) simultaneously.</li> <li>• The power analyser must communicate with the automation system to read the measurements done by the power analyser.</li> <li>• Display: 10.1" TFT colour LCD (1280 × 800 dots) or bigger</li> <li>• Number for power measurement channels: 4 or more</li> <li>• Measurement Frequency Band: DC, 0.1Hz to 600kHz or higher</li> <li>• Voltage and current ADC resolution: 16-bit or higher</li> <li>• Voltage and current sampling frequency: 2.5MHz or higher</li> <li>• Current Probe: AC/DC 1000A with bandwidth of 1.5MHz or higher, Quantity – 3</li> <li>• Current Probe: AC/DC 500A with bandwidth of 2MHz or higher, Quantity – 1</li> <li>• Voltage Chord: 1500 V DC CAT II, 1 A, 1000 V CAT III, 1 A, banana – banana, alligator clip, approx. 3 m (9.84 ft.) length, Quantity- 8</li> </ul> |  |  |
| <b>E.</b> | <b>Test bed</b>                              | <ul style="list-style-type: none"> <li>• A suitable test bench and mounting arrangements to accommodate mount the loading motor, MUT.</li> <li>• Test bench should accept motors of various mounting types such that foot mounted, flange mounted and hub motors.</li> </ul>  |  |  |

|           |                  |   |  |  |
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|           |                  | <ul style="list-style-type: none"> <li>• Suitable couplers and other components to interface the loading motor, MUT and the torque flange.</li> <li>• A safety cover to protect unintentional contact with the rotating parts. A protection feature such that guarantees that system runs only when the safety cover is closed properly.</li> <li>• The test bed must have vibration isolation pads used for levelling the whole test bed to a perfectly horizontal position.</li> <li>• In-person 40 hours training at IIT Bombay</li> <li>• The supplier should mandatorily have experience of manufacturing/supplying Electric Motor Testing equipment of 10 or more number of the systems for similar specification, (30 kW or above, 15,000 rpm or above). If the supplier does not have experience of manufacturing/supply as per tender documents, we reserve the right to reject the quotation of such vendors.</li> <li>• Mere compliance of the specifications is not sufficient. Supplier/Manufacturer should provide a detailed brochure/ technical specification.</li> </ul> |  |  |
| <b>F.</b> | <b>Delivery:</b> | <ul style="list-style-type: none"> <li>• Within 32 weeks of getting the PO</li> </ul>   |  |  |
| <b>G.</b> | <b>Warranty:</b> | 3 years' warranty on site from the date of commissioning including parts, labour and shipping.  |  |  |