INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

MATERIALS MANAGEMENT DIVISION

Powai, Mumbai 400076.

Ref. PR No. 1000051627 **RFx. No. 6100002720**

Technical Specification: Transient Dynamometer

Technical Description: Transient Load simulation test setup for load control of EV motor and SRM motor: 1 set

Sr. No		Item Description and Detailed Technical Specification	Technical Compliance (Yes / No)	Additional Information (if any)
1	1.1	Electromechanical unit of Low inertia AC (Alternating Current) Regenerative dynamometer mounted on base frame. Max power 22kW Rated torque 70 Nm Max speed 8000 RPM		
	1.2	**Dynamometer Construction:** (i) Rotor: Low inertia type rotor assembly supported on rolling contact bearings. Lock rotor test facility for measurement of lock torque. (ii) Stator: Stator assembly mainly consists of stack of laminated yoke stampings on which armature is wound. Armature is wound from super enameled copper wire with class F insulation. Winding temperature sensors are embedded in stator winding for monitoring winding temperature of the dynamometer.		
	1.3	Torque calibration kit for calibration of torque indication. Reaction torque sensor for measurement of torque. Mounting arrangement for HBM make or equivalent torque flange consisting of stator and rotor assembly, for the purpose of accurate and precise measurement of shaft torque. Torque sensor rating 100 Nm.		
	1.4	Forced air cooling arrangement.		
	1.5	Rigidly fabricated dynamometer base frame, precisely machined, for dynamometer and motor under test.		
	1.6	Dynamometer junction box housing electrical connections of dynamometer and sensors mounted on the dynamometer.		
	1.7	**Set of various sensors which should be mounted on the dynamometer for measurement, control and safety:** a) Temperature sensors - stator windings – 1 set.		

		b) Optical encoder – 1No. c) Air flow (cooling) safety switch – 1No.		
	1.8	Encoder – 1 No.		
2	2.1	**Electronic controller for alternating Current (AC) regenerative dynamometer with modular printed circuit boards construction:** Proportional Integral Derivative (PID) control provided on inverters which should be used for close loop control of Speed & Torque. Demand signal and torque feedback signal, Input 200 to 230 VAC, single phase, 45 Hz to 60 Hz)		
	2.2	**The following safety with Visual alarms should incorporated as standard supplies:** i) High dynamometer body temperature trip / winding temperature safety with LED indication, high Temperature (HI-T) ii) Forced air cooling failure safety with LED indication low pressure (LO-P), high Pressure (HI-P), iii) High speed trip with LED indication, high speed (HI-N) iv) Fault reset facility, (RESET Push button) v) One set of potential free changes over contacts. vi) Relay should operate when fault condition occurs. At fault condition, dynamometer excitation should cut-off. vii) One set of potential free contacts that need to be provided may be used to shut off motor/engine or for any other action.		
	2.3	**Digital speed indication** Digital speed indicator suitable for speed measurement in the following range: Range: 1 to 9999 rpm with least count of 1 rpm. 4-digit LED display.		
	2.4	**Digital torque indication** Accuracy of torque measurement +/- 0.25% of full scale		
3	3.1	**Power Unit for alternating current (AC) regenerative dynamometer with following standard features:** Power control unit Technical Specification: The System should be designed for the following Supply and Environmental Condition. (i) Power control unit Input Voltage: 380-480 V +/ -10% (ii) Frequency Range: 48-65 Hz (iii) Ambient Temp: - 15 ºC to 40 ºC (iv) Altitude: 1000 meters (v) Overload limits: 150% for 60 Sec		
	3.2	**Power control Unit Panel will receive AC power from PCC/MCC and will comprise the following major components as below:** (i) Switch Fuse unit (ii) HRC Fuses (or) MCCB		

		(iii) Input Reactor (iv) Input Side		
	3.3	**Inverter Side:** Power electronics-based Converter and inverter stages with digital controller and firing circuits suitable for Open and Close Loop Control of AC regenerative dynamometer.		
	3.4	**Programmable digital PIDs.** 150% Overload capacity for 60 Seconds.		
	3.5	**Others** (i) Control Transformer with protections (ii) Auxiliary contactor for sequencing and interlocking (iii) Various chokes & switching filter frequency inductor, switching filter frequency capacitor, at input and output of power unit Incoming supply conditioning & protection circuits consisting of single phasing preventor, overload protection, mains supply ON / OFF controller, emergency stop control, phase indication lamps. Semiconductor fuses, Varistors, RFI filter, Indication lamp motor ON, Indication lamp converter fault, Control transformer. (iv) Power control unit should have a built in Digital apparatus for measuring voltage, current, speed, frequency, Power, Energy consumed/Hour etc. (v) Automatic digital control scheme for Torque and Current Control		
	3.6	**Power control unit panel Specifications** (i) The Control panels for the power control unit converters should be housed in rigid free standing, floor mounted sheet steel enclosure. This enclosure should be provided with hinged door on front Side. All components and switch gears should be clearly labelled, and all the cables should be marked with suitable ferrules on both the ends, and the cables should be terminated on easily replaceable terminals. (ii) Blank detachable gland plates should be fitted to the cubicle, and all the cables should have entry from bottom. Suitable approachable grouting holes should be provided. (iii) The equipment must be designed for ease of maintenance and provide for simple trouble shooting and repair procedure by semi-skilled electrical technician. The cubicle will contain all necessary equipment for the proper control, operation, protection and sequencing of the drive as is required for proper operation. (iv) The converters must be force air ventilated. (v) The panels must be housed in a pressurized room, to avoid dust and dirt.		
	3.7	**Wiring:** (i) Control wiring should be done by 1.5 sq mm copper wires. (ii) Wherever electronic signals are taken out of the panel, shielded wires should be used. (iii) All wires must carry ferrules on both the ends for easy		

		identification. (iv) All wiring should be enclosed with PVC channels wherever possible and should be neatly bunched. (v) Segregation of cables of different level of voltages must be done as far as possible to reduce interference problems. (vi) Separate grounding bus must be provided at the bottom of the panel, for grounding the shield of the external shielded cables.		
4		**The product must have minimum 1 year warranty from the date of installation.**		
5		**The item should have minimum 20% local content. The same should be declare in Annexure – IV of NIT Document.**		