

Detailed Technical specifications of the Traction grade Test bed Controller for testing Permanent Magnet Motor / Induction Motor for Electric Vehicle applications

Sl. No	Description	BHEL Requirement
1	Application	The liquid cooled 3-Ph Traction grade Test bed Controller/Drive will be used in testing Permanent Magnet Motor and Induction Motor.
2	Scope of supply	
	<p>A) Traction Inverter with Controller</p>	<p>1) Liquid cooled 3-Phase Traction Inverter system with integrated DSP Controller. The system consists of (a) 3-Phase IGBT power module comprises of IGBT connected in 3-Phase Inverter topology, DC link capacitor, temperature & current sensors for each phase, DC link voltage sensors, gate drivers and liquid cooled heat sink. (b) TI make DSP based Controller.</p> <p>2) The total system should be enclosed in IP67 enclosure with water cooling provision having suitable inlet and outlet for liquid flow.</p> <p>3) The required control & protection signals from or to DSP to other internal sub-system should be wired. The DSP controller should have provision to communicate with other external system through CAN/RS 232.</p> <p>4) All the power terminals of DC link (positive and negative) and 3-Ph line terminals shall be brought out on to the enclosure for external connection. The control interface I/O signals which are configured externally with DSP shall be brought out on to the enclosure through a connector. The detailed list of signals are given in Table-1 of Annexure-1 enclosed.</p>
	B) Drive Control Software with HMI interface for Permanent Magnet (PM) Motor	The scope also includes the Drive Control Software for the V/Foperation and sensed (or) sensorless vector control operation for both Induction Motor and Permanent Magnet Motor. The HMI should also be part of the Control Software for monitoring and changing the system parameters.
3	Quantity of supply	<p>1. Traction Grade Inverter with Controller - 1 Set</p> <p>2. Complete Drive Control Software - 1 Set.</p> <p>3. HMI/Programmable Software for interface & hardware tools - 1 Set</p>
4	Continuous Power	170 kVA
5	Peak Power Output	220 kVA for 10 sec for every 5 minutes duration.
6	Input DC Voltage range	500 VDC to 750 VDC
7	Operating frequency Range	5 Hz to 500 Hz
8	Type of Cooling	Liquid Cooling
9	Switching frequency	Operating switching frequency is 6 kHz
10	DC Capacitance	minimum of 1.25 mF
11	Enclosure	IP67
12	Control supply for electronics	18- 32 V
13	Communication to external world	The DSP controller should have CAN Interface communication/ RS-232.

14	Configuration of Controller	The Controller shall have the provision of changing software parameters for drive control application by the user for operating different motors.
15	Gate driver Circuit	The inverter shall be supplied with compatible gate driver circuits with dv/dt and di/dt protections.
16	Hydraulic & Temperature data of cooling system	The supplier should mention the hydraulic data like flow rate, pressure, pressure drop and temperature details like input temperature, temperature gradient etc. The cooling system arrangement is given in Annexure-1.
17	Protection features	The Inverter system shall have the protection functions against the DC over voltage, over current and temperature limits.
18	Drive Control Software	
	A) Features of Drive Control Software	The Drive Control Software should operate for both Induction Motor and IPM Motor and shall have the latest vector control with sensor (or) sensorless control feature, V/F control, Catch on fly and other drive control features. The Software shall have the provisions to change the control loop PI gains, ramp-up/down and feeding the machine parameters. The Software shall run with different ratings of Motors by only changing their parameters.
	B) HMI system	The HMI Software shall be a Windows based application software. The HMI Software shall have the provision of programming the control software by the user, monitoring the parameters of the Inverter and also monitor the waveforms (like a scope). The CAN communication configuration has to be enabled or established using the software.

General Specifications

1	Size and weight of the Inverters	The weight should be less than 35 kg and the size should fit into 500 x 500 x 200 mm (LxBxH). However the Inverters size and weight shall be as less as possible.
2	Instruction Manual	The supplier shall provide the hard copy of the instruction, troubleshooting and commissioning manuals.
3	Warranty	The supplier shall provide the warranty of 18 Months from the date of supply or 12 months from the date of commissioning, whichever is earlier.
4	Tools for maintenance	If any special tools are required for assembly and maintenance purpose, the same shall be offered separately.
5	Test reports	Prior to Inspection, test reports of the Inverter testing has to be submitted, based on the submitted test reports, BHEL will decide whether to carry out the inspection or not.
6	Inspection	Inspection shall be carried out to witness the Drive control operation on one of the Motor and Inverter thermal design. If the facility is not available, the same shall be carried out at BHEL R&D, Hyderabad.