GLOBAL AUTOMOTIVE RESEARCH CENTRE

ENSURING SAFE DRIVE

TENDER DOCUMENTS FOR

"Supply, Installation, Commissioning, Training & Acceptance of Battery Emulators"

TENDER NO. 439/GARC/EV/2022-23/Battery Emulator/23

Annexure IV- Technical Condition of Contract

Supply, Installation, Commissioning, Training & Acceptance of Battery Emulator

Global Automotive Research Centre, Plot E1,
SIPCOT Industrial Growth Centre,
Oragadam, Mathur Post, Sriperumputhur Taluk,Kanchipuram – 602 105,Tamil Nadu

Phone: +91-44-27143500 Email: rajeswar.tripaty@garc.co.in,
Website www.garc.co.in

BATTERY EMULATORS

1.0. Scope of Supply details

Supply
Battery Emulator & Accessories (300 kW)
Battery Emulator & Accessories (600 kW)

1.1. Battery Cycler Functional requirements

Dimensions and main characteristics.

The characteristics listed below shall be considered minimum requirements apart from any other characteristic required for the compliance with the standards and/or feasibility to perform the tests in the described manner.

This equipment is intended to be used for more than one test.

1.2. Battery Emulator Functional requirements

a. Battery Emulator -600kW:

Dimensions and main characteristics.

The characteristics listed below shall be considered minimum requirements apart from any other characteristic required for the compliance with the standards and/or feasibility to perform the tests in the described manner.

This equipment is intended to be used for more than one test.

Sr. No.	Parameter	Requirement
1.1	Total Power	600kW
1.2	Charge Voltage (DC, V)	10V to 1000V
1.3	Discharge /Charge voltage accuracy	±0.1%
1.4	Discharge/Charge Circuit Current (DC, A)	0 to 1000A with
1.5	Discharge/Charge current & Accuracy	± 0.1%
1.6	Charge Power per channel	300 kW (approx)
1.7	Discharge Power per channel	300 kW (approx)
1.8	No. Of Channels	2 (Should have provision for paralleling the channels to raise the current limit of any no. of channel with similar voltage range.)

1.9	Battery Chemistry to Be tested	▪ Lithium-ion (including LFP& NCM) ▪ Lead acid ▪ Ni-MH ▪ Ni-Cd ▪ Other popular chemistries
2.0	Test cases/Modes	The system would be used both as battery tester and Battery emulator as per the following modes (Sr. No. 2.1 & Sr.No.2.2)

	Parameter	**Requirement per Channel**
2.1	Discharge modes	a) Constant current (CC) mode b) Constant voltage (CV) mode c) Constant power (CP) mode d) Constant voltage-limit current mode (CC-CV) e) Rest f) User Defined Cycle
2.2	Charge Modes	a) Constant current (CC) mode b) Constant voltage (CV) mode c) Constant power (CP) mode d) Constant voltage-limit current mode (CC-CV) e) Rest f) User Defined Cycle
3	System Architecture	Whole system should be supplied in racks/Rack Modules
4	Battery tester type	Battery tester should be regenerative type
5	Parameters to be monitored	Ah, Wh, Number of cycles, steps and step times, total time, power, current, temperature, battery terminal voltage, mode of operation
6	Input Power	3Ø 415 VAC, 50 Hz
7	Test leads for measuring the individual Cell /battery voltages	Minimum 3 meters length/circuit.
8	Emergency Stop	Input to disconnect AC power in case of emergency to be provided.
9	Digital temperature readout	Facility to read temperature of the cell/battery to be provided.
10	Measurement of internal resistance	Provision to measure internal resistance of the cell/battery to be provided.
11	Temperature Logging	Battery tester must be having temperature logging of minimum 1temperature channel per Charge Discharge Channel with accuracy of ±2%.
12	Data protection	Protection against data loss in case of power failure or computer communication loss.

13	Warranty	Warranty for 24 months should be available standard.
14	Data processing	Data should be available for post processing in the excel format /EBC /ASCIIA.
15	Sampling rate	Data acquisition at the rate of 10 readings per second should be possible for Voltage and Current Readings
16	Software support & Communication Protocols	Windows 10/ Windows 11 compatible , USB/Ethernet communication between PC and Supplied Test System. CAN Interface for BMS and other ECU to be provided with at least 2 inputs for integration with the supplied system (data logging, Command exchange through CAN)
17	Software Features	It shall be possible to operate system in Automatic mode through control software. The Automation Software shall be used for testing of battery & electric vehicle Components, It should have a User friendly interface for programming all parameters listed in Sr.2.1 & 2.2
18	Allowable ambient temperature & Humidity	5°C to +40°C 10 % – 90 %
19	General Equipment Compliances	CE or equivalent markings for both Electrical and EMC Compliances
20	Test System Connections	All cables for System to Mains and other connections are to be done with Shielded copper cable from GARC Main Isolator panel. In case of no power cord Switch connection for the test system, the electrical utility work for the same to be carried out. The electrical scope not only covers the main test system, it also covers any relevant sub systems.
21	Calibration System	Calibration certificates of all components in the equipment should be traceable to ISO 17025:2005 or equivalent. Calibration certificate should be provided for period of 1year from the date of acceptance of equipment.
22.	Industrial PC/Laptop	High End Configuration System with Dual Monitor System: Windows 10 Pro for Workstations Atleast 2 x NVIDIA® Quadro® RTX 8000 Atleast 32 GB DDR4 2933 MHz, 16 DIMM Atleast SSD- 1 TB Minimum 4 x USB 3.1 Gen 1 (Type A) & 2 x USB-C/Thunderbolt 3 (optional) Microphone Headphone Rear 4 x USB 3.1 Gen 1 (Type A), 2 x USB 2.0 Serial Parallel,2 x PS/2 ,2 x Ethernet, Microphone-in Audio line-in Audio line-out, Intel® Dual Band Wireless- 8265 AC 802.11 a/c, 2 x 2, 2.4 GHz / 5 GHz + Bluetooth® 4.0.

		The system should be capable of Running Basic analysis and compatible software supplied with the battery Test system along withCapability to store Test Data (for both channels) for at least 60 Days.
23.	Power Failure	In case of Power failure , test should resume from the same test point after the power is resumed
25.	Protection of Thermal Shock Chamber	Emergency Stop Circuit breaker Over Voltage, Under Voltage Protection etc.
26.	Warranty	Warranty for 24 months should be available standard.

3. Documentation:	
A	One set of Operation Manual complete with drawings, parts list (with part codes), diagrams with list ratings of components and list of do's and don'ts for the main equipment as well as the sub-systems.
B	These manuals should be in the form of hard (printed) copy in English Language as well as in electronic storage form (disc, pen drive etc).
4. General :	
a	Installation, training and trails to demonstrate proper functioning of the system will be the responsibility of the supplier.
b	Preference shall be given to the supplier who have their local service agents in India

b. Battery Emulator -300kW:

Dimensions and main characteristics.

The characteristics listed below shall be considered minimum requirements apart from any other characteristic required for the compliance with the standards and/or feasibility to perform the tests in the described manner.

This equipment is intended to be used for more than one test.

Sr. No.	Parameter	Requirement
1.1	Total Power	300kW
1.2	Charge Voltage (DC, V)	10 to 1000V
1.3	Discharge /Charge voltage accuracy	±0.1%
1.4	Discharge/Charge Circuit Current (DC, A)	0 to 600A with
1.5	Discharge/Charge current & Accuracy	± 0.1%
1.6	Charge Power per channel	300 kW (approx)
1.7	Discharge Power per channel	300 kW (approx)
1.8	No. Of Channels	1 (Should have provision for paralleling the channels to raise the current limit of any no. of channel with similar voltage range in future)
1.9	Battery Chemistry to Be tested	▪ Lithium-ion (including LFP& NCM) ▪ Lead acid ▪ Ni-MH ▪ Ni-Cd ▪ Other popular chemistries
2.0	Test cases/Modes	The system would be used both as battery tester and Battery emulator as per the following modes (Sr. No. 2.1 & Sr.No.2.2)

	Parameter	**Requirement per Channel**
2.1	Discharge modes	a) Constant current (CC) mode b) Constant voltage (CV) mode c) Constant power (CP) mode d) Constant voltage-limit current mode (CC-CV) e) Rest f) User Defined Cycle
2.2	Charge Modes	a) Constant current (CC) mode b) Constant voltage (CV) mode c) Constant power (CP) mode d) Constant voltage-limit current mode (CC-CV) e) Rest f) User Defined Cycle
3	System Architecture	Whole system should be supplied in racks/Rack Modules
4	Battery tester type	Battery tester should be regenerative type
5	Parameters to be monitored	Ah, Wh, Number of cycles, steps and step times, total time, power, current, temperature, battery terminal voltage, mode of operation
6	Input Power	3Ø 415 VAC, 50 Hz
7	Test leads for measuring the individual Cell /battery voltages	Minimum 3 meters length/circuit.
8	Emergency Stop	Input to disconnect AC power in case of emergency to be provided.
9	Digital temperature readout	Facility to read temperature of the cell/battery to be provided.
10	Measurement of internal resistance	Provision to measure internal resistance of the cell/battery to be provided.
11	Temperature Logging	Battery tester must be having temperature logging of minimum 1temperature channel per Charge Discharge Channel with accuracy of ±2%.
12	Data protection	Protection against data loss in case of power failure or computer communication loss.
13	Warranty	Warranty for 24 months should be available standard.
14	Data processing	Data should be available for post processing in the excel format /EBC /ASCIIA.
15	Sampling rate	Data acquisition at the rate of 10 readings per second should be possible for Voltage and Current Readings
16	Software support & Communication Protocols	Windows 10/ Windows 11 compatible , USB/ Ethernet communication between PC and Supplied Test System.

		CAN Interface for BMS and other ECU to be provided with at least 2 inputs for integration with the supplied system (data logging, Command exchange through CAN)
17	Software Features	It shall be possible to operate system in Automatic mode through control software. The Automation Software shall be used for testing of battery & electric vehicle Components, It should have a User friendly interface for programming all parameters listed in Sr.2.1 & 2.2
18	Allowable ambient temperature & Humidity	5°C to +40°C 10 % – 90 %
19	General Equipment Compliances	CE or equivalent markings for both Electrical and EMC Compliances
20	Test System Connections	All cables for System to Mains and other connections are to be done with Shielded copper cable from GARC Main Isolator panel. In case of no power cord Switch connection for the test system, the electrical utility work for the same to be carried out. The electrical scope not only covers the main test system, it also covers any relevant sub systems.
21	Calibration System	Calibration certificates of all components in the equipment should be traceable to ISO 17025:2005or equivalent. Calibration certificate should be provided for period of 1year from the date of acceptance of equipment.
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23.	Power Failure	In case of Power failure , test should resume from the same test point after the power is resumed

25.	Protection of Thermal Shock Chamber	Emergency Stop Circuit breaker Over Voltage, Under Voltage Protection etc.
26.	Warranty	Warranty for 24 months should be available standard.
3. Documentation:		
A	One set of Operation Manual complete with drawings, parts list (with part codes), diagrams with list ratings of components and list of do's and don'ts for the main equipment as well as the sub-systems.	
B	These manuals should be in the form of hard (printed) copy in English Language as well as in electronic storage form (disc, pen drive etc).	
4. General :		
a	Installation, training and trails to demonstrate proper functioning of the system will be the responsibility of the supplier.	

b	Preference shall be given to the supplier who have their local service agents in India

INSTALLATION & COMMISSIONING

The supplier shall install equipment at site. Also the supplier(s) shall demonstrate the working of equipment as per Final Acceptance Protocol (mutually agreed between buyer and supplier) with Trials in order to complete the Commissioning Process. Hands on training to be provided at site by company engineer on complete system and accessories.

The supplier to provide required support to GARC while working on atleast two initial customer project execution.

Calibration of Devices and Certificates.

Calibration devices traceable to international standards for Battery emulator 600kW and 300kW shall be supplied. These devices have to include the needed calibration certificates.