ANNEXURE - I

Technical Specification

1. Blower Cooled Hysteresis Dynamometer

Specification No.: 0001

Sl. No.	Parameter	Specification	Remarks
1	**Blower Cooled Hysteresis Brake**		
1.1	Rated Torque	24 Nm	Essential
1.2	Rated Speed	3000 rpm	Essential
1.3	Rated Power (continuous)	6000 W	Essential
1.4	Maximum Speed	12000 rpm	Essential
1.5	Nominal Power	57 W	Essential
1.6	Braking system	Hysteresis Brake	Essential
1.7	Drag Torque @ 1000 rpm	< 0.15 Nm	Essential
1.8	External Inertia	0.0112 kg-m^2	Essential
1.9	Torque to Inertia ratio	2140	Essential
1.10	Environmental requirement		
1.10.a	Operating temperature	- 40 ^{0}C to +85 ^{0}C	Specify
1.10.b	Relative Humidity	Up to 90 % without condensation	Specify
1.11	Mounting	Base mount	Essential
1.12	Max Sound Pressure (1m)	< 110 dB	Essential
1.13	Rotation	Bi-directional	Essential
2	**Compatible Torque Sensor**		
2.1	Sensor Type	Non-Contact(without sliprings)	Essential
2.2	Rated Torque	30 Nm	Essential
2.3	Rated Speed	12000 rpm	Essential
2.4	Accuracy	0.1 % or better	Essential
2.5	Overload capacity	200%	Specify
2.6	Breaking limit	> 400%	Specify
2.7	Torsional stiffness	2400 Nm/rad	Essential
2.8	Moment of Inertia	< 1.5 x 10^{-4} kgm^2	Essential
2.9	Combined Error (upto 100% of RT)	< ± 0.10% of RT	Essential
2.10	Combined Error (100% - 200% of RT)	< ±0.15% of RT	Essential
2.11	Operating Temperature	-40^{0}C to +85^{0}C	Specify

2.12	Protection	IP 44	Essential
2.13	Balancing Quality	G1 (ISO 1940)	Essential
3	**Cooling System**	**Blower**	
3.1	Blower Rating	240 VAC, 50 Hz	Essential
3.2	Weight with blower	< 100 kg	Essential
4	**Connecting Cables**	**> 5 m**	Essential
5	**Common Controller Unit & Software (See Specification No.: 0003)**		Essential
6	**Instruction Manual**	**3 SETS**	Essential
7	**Additional Requirements**		
7.1	Connecting cable between torque sensor and dynamometer controller is of 5 meters minimum along with necessary connectors directly connecting to the equipment		Essential
7.2	Torque sensor and brake should be of same make with that of controller to ensure the compatibility		Essential

Note:

*Attach detailed Technical Catalogue of the product with tender.

2. **Eddy Current Dynamometer**

Specification No.: 0002

Sl. No.	Parameter	Specification	Remarks
1	**Eddy Current Dynamometer**		
1.1	Maximum Torque	100 Nm @ 3000 rpm	Essential
1.2	Minimum Torque	10 Nm @ 100 rpm	Essential
1.3	Maximum Power	30 kW @ 3000 - 15000 rpm	Essential
1.4	Minimum Power	0.1 kW @ 100 rpm	Essential
1.5	Rated Speed	3000 rpm	Essential
1.6	Maximum Speed	18000 rpm or above	Essential
1.7	Drag Torque	1.2 Nm	Essential
1.8	Rotor Inertia	< 0.03 kg-m^2	Essential
1.9	Braking	Electro-Magnetic Brake	Essential
1.10	Excitation Current	5 A	Essential
1.11	Voltage (20^{0}C)	24 V	Essential
1.12	Motor Weight	< 200 kg	Essential
1.13	Rotation	Bi-directional	Essential
1.14	Accuracy	0.5 %	Essential
2	**Dynamometer Excitation Unit**		
2.1	IP Rating	IP 66	Essential
2.2	Connecting cables	7m	Essential
2.3	Power Rating	240 VAC	Essential
2.4	Operating Temperature	0^{0}C to +50^{0}C	Specify
2.5	Certification	IEC 61326-1 Class-B	Essential
3	**Torque and Speed Conditioner**		
3.1	Accuracy	±0.5 % of FS or better	Essential
3.2	Supply Voltage	±20 V to ±30 V	Essential
3.3	Presets	0 (Zero), CW, CCW	Essential
4	**Torque Sensor**		
4.1	Torque sensor should be inbuilt and should be compatible with Torque and Speed Conditioner		
5	**Chiller cooling water system for Motor Testing**		
5.1	Cooling Power	23 kW	Essential

5.2	Max input pressure	2 bar	Essential
5.3	Minimum water flow	Required	Specify
5.4	Max inlet temperature	Required	Specify
5.5	Max Noise at 1m	< 70 dB(A)	Essential
5.6	Power Rating	400 VAC, 50 Hz	Essential
6	**Common Controller Unit & Software (See Specification No.: 0003)**		
7	**Instruction Manual**	**3 No.s**	Essential
8	**Additional Requirements**		
8.1	Dynamometer excitation supply and torque-speed conditioner should be separate from controller to prevent EMI issues.		Essential
8.2	Temperature thermostat should be in-built into the dynamometer to prevent over heating of dynamometer		Essential
8.3	DES should include 1.5 meter connecting cable to the dynamometer; 5 meter to the controller.		Essential
8.4	The connectors should be part of the dynamometer without any other connections in between		Essential
8.5	It should provide an electrical alarm to the controller in case of any problem in the dynamometer and DES.		Essential
8.6	Torque and Speed signals have to be amplified with Torque speed conditioner		Essential
8.7	Common Controller Unit should able to control 1 dynamometer when it is required		Essential
8.8	Different PIDs should be able to set for both the dynamometers separately		Essential
8.9	Common Controller Unit for both the dynamometers should able to communicate with the software on the control point and provide the required torque-speed-power data of 2 motors simultaneously		Essential
8.10	The software shall have the provision for step load test. In curve test, any control parameters should be dictated and controlled like output power, torque and speed.		Essential
8.11	The software shall provide the option of operating relays for motor on/off through software programming		Essential
8.12	The software shall enable the user to set the different PID's when they test different motors with the dynamometer.		Essential
8.13	The system shall be plug and work type. No external wiring should be made.		Essential

Note:

*Attach detailed Technical Catalogue of the product with tender.

3. **Common Control Unit & Software**

Specification No.: 0003

1	**Common Controller Unit**		
1.1	Control	Simultaneous control of both dynamometers	Essential
1.2	Display	The torque, Speed and Power of both dynamometers simultaneously	Essential
1.3	Channels	Dual-Channel	Essential
1.4	I/O Options	4 relays, 6 digital inputs, 4 digital outputs, 4 analogue inputs and 4 analogue outputs	Essential
1.5	Sampling Rate	500 Hz	Essential
1.6	Power Supply	240 VAC 50/60 Hz	Essential
1.7	Mounting	19" rack mountable	Specify
2	**Software**		
2.1	Compatibility	Windows 10 or above	Essential
2.2	Operation	Both dynamometers simultaneously with cyclic loading	Essential
2.3	Temperature monitoring	Temperature hardware via USB/Profinet	Essential
2.4	Graphical representation	5-axis with any parameter on X and Y axes	Essential
2.5	NI LabVIEW compatible drivers should be supplied along with the necessary NI Hardware. The controller should support custom data logging (Temperature, Speed, torque, currents and power etc.,) with NI hardware software -Specify required NI hardware for the same.		Essential

1	**General Instructions**
1.1	Major items like dynamometer, torque sensor, dynamometer controller, software should be of same manufacturer to ensure the compatibility and future updates of hardware and software.
1.2	Dynamometer should deliver the rated torque within 1 second
1.3	All the components have to be standard and should be standard item, regularly being used.
1.4	All the necessary electrical cables, connectors and other operational accessories to be estimated for optimum operation of all units and to be included in the quote.
1.5	All necessary test equipment, meters and devices to be included in the quote as optional items
1.6	System should cover a warranty of 1 year from the date of commissioning or 18 months from date of invoice whichever is earlier
1.7	Certificates, Standards for compliance and Test reports to be provided wherever required
1.8	Installation and Commissioning should be done at CMTI Bangalore
1.9	Training on Operation, Programming and Maintenance of the instruments to be provided
2.0	Delivery lead time should be 10-12 weeks or earlier

ANNEXURE - II

ACCEPTANCE CRITERIA

1. Blower Cooled Hysteresis Dynamometer

Sl. No	Parameter	Specification	Test Method	Remarks
1	Torque	upto 30 Nm	Torque Sensor	
2	Speed	upto 12000 rpm	Tachometer	
3	Current	2.4 A	Clamp-on Meter/Multimeter	
4	Controller input Voltage	240 VAC	Clamp-on Meter/Multimeter	
5	Continuous Power	6000 W	Motor Power Analyser	
6	5 min Power	7000 W	Motor Power Analyser	
7	Sound Pressure	110 dB	Sound Level Meter	
8	System Temperature	< 85 ^{0}C	Temperature Sensor/Thermograph	
9	Cable Length	5 m	Visual/Meter Scale	
10	Torque Sensor speed	upto 12000 rpm	Tachometer	
11	Torque Sensor Balancing	G1 (ISO 1940)	Dynamic Balancing Analyser	
12	Blower Rating	240 VAC	Clamp-on Meter/Multimeter	

2. Eddy Current Dynamometer

Sl. No	Parameter	Specification	Test Method	Remarks
1	Torque	upto 100 Nm	Torque Sensor	
2	Speed	upto 18000 rpm	Tachometer	
3	Excitation Current	5 A	Clamp-on Meter/Multimeter	
4	Controller input Voltage	240 VAC	Clamp-on Meter/Multimeter	
5	Power	30,000 W	Motor Power Analyser	
6	Chiller Noise	< 70 dB(A)	Sound Level Meter	
7	Chiller Supply Rating	400 VAC	Clamp-on Meter/Multimeter	
8	System Temperature	< 50 ^{0}C	Temperature Sensor/Thermograph	
9	Cable Length	7 m	Visual/Meter Scale	

Annexure-III

Terms & Conditions

1	Acceptance and Warranty Terms	• Calibration certificates from the manufacturer to be submitted for individual dynamometers with the Standards for compliance & test procedures. • Physical verification and functionality check during installation & commissioning time at CMTI Bangalore. • Should meet all technical specifications mentioned in ANNEXURE - I • Unconditional warranty of a minimum of 1 Year from the date of acceptance, including free replacement, in case of any failure to be provided. • 3 years exclusive warranty of products to be quoted as an option.
2	Payment terms	• 80% after delivery and inspection of all items, 20% after installation, commissioning, training and satisfactory demonstration of use cases.
3	Delivery	• All items should be supplied and installed within 6-8 weeks from the date of P.O. • Use case development and demonstration should be completed within 8 weeks from the date of P.O.
4	Manuals and reports	• 3 sets of Hardcopies of Operation Manuals in English should be supplied • 3 sets of Hardcopies of Maintenance manuals to be supplied in English only • All training-related materials use case demonstration materials to be supplied in hard copies 10 sets.
5	Additional Accessories	• All the necessary electrical cables, connectors and other operational accessories to be estimated for optimum operation of all units and to be included in the quote.
6	Additional terms	1. If the bidder is not a manufacturer, the bidder must provide an authorized distributor certificate. 2. All the components have to be standard and should be standard item, regularly being used. 3. Installation, Commissioning and Training at CMTI Bangalore. 4. Installation , commissioning and training should be done free of cost at CMTI by the trained engineers.
7	Acceptance Criteria	1. The vendor should meet all technical specifications to qualify the bid. 2. Final acceptance is based on acceptance tests conducted at CMTI.

8/12/21 8/12/2021 08/12/21.