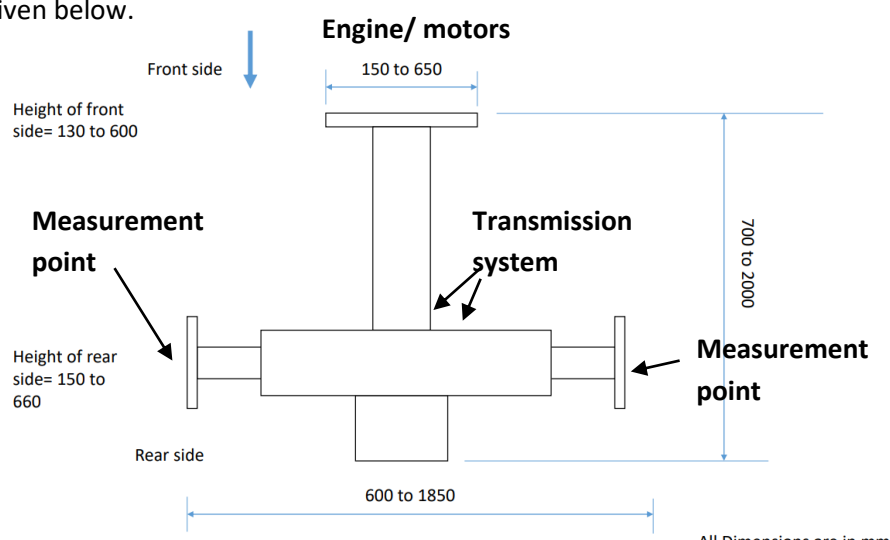
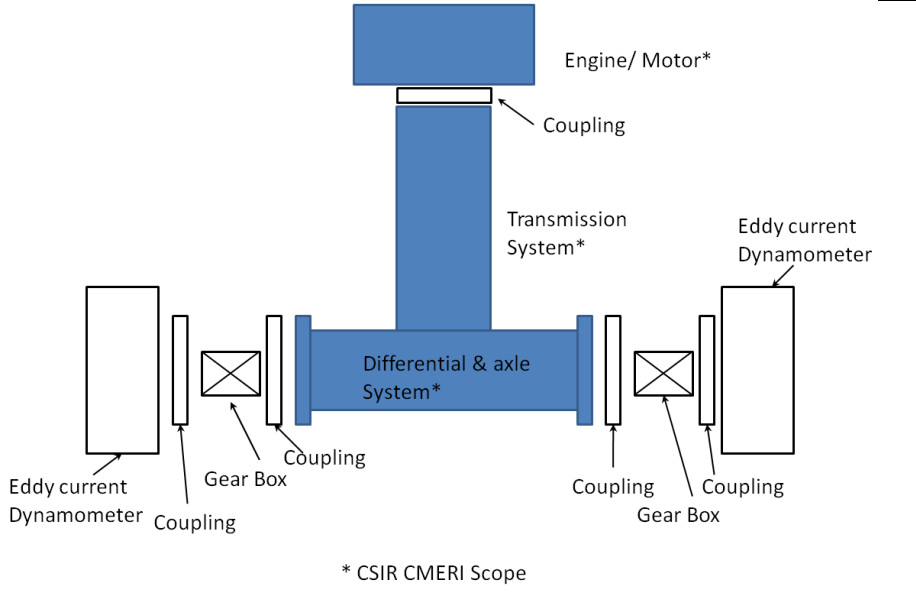


**Technical Specifications for Supply, Installation and Commissioning of Regenerative AC Dynamometer Test Bench along with its AC regenerative drive and Transmission Test Rig**

SL. No	Parameters	Specifications
<b>A) Regenerative AC Dynamometer Test Bench along with its AC regenerative drive for Motor Performance Testing of Electric Vehicles Applications</b>		
A.1	Applications/ End use	To study performance characteristics of test motors used for electric vehicle and other traction applications
A.2	Motor Under Test (MUT) control operation	To be used for speed or torque control operation
A.3	Operational mode of Dynamometer	Four (4) quadrant operation - Regenerative type to plot the characteristics in Motoring and generating mode
A.4	Load motor and drive type	AC induction motor driven by AC regenerative driver
A.5	Rated power	30 kW or higher
A.6	Rated speed	3000 rpm or higher
A.7	Maximum speed for rated constant power	6000 rpm or higher
A.8	Maximum mechanical speed	10000 rpm or higher
A.9	Speed resolution	±1 rpm or better
A.10	Maximum torque	100 Nm or higher
A.11	Speed corresponding to maximum torque	Up to rated speed or higher
A.12	Torque measurement precision	±0.25% of full scale (FS) or better
A.13	Direction of rotation	Clockwise and counter-clockwise
A.14	Structures for dynamometer and test-motor mounting	Suitable structures/frame for mounting dynamometer and motor under test (MUT) on a common base frame. The common frame should maintain workable centre height of AC dynamometer and motor under test at approx 1 meter from the ground level. The common base frame is to be designed to ensure easy and quick alignment of dynamometer with respect to test motor. Suitable bracket (at least 2 numbers) for mounting different types of test motors having flange should be provided.
A.15	Couplings	High speed disc coupling suitable for max rated torque of the motor and maximum speed of 10000 rpm is to be supplied between the AC dynamometer and the test motor. Additional coupling arrangement (such as half couplings etc) should be provided to adapt other test-motors having

		different shaft dimensions
A.16	Dynamometer cooling	Forced air cooling
A.17	Safety	Electrical, mechanical, machine and operator safety should be considered in the design. Suitable sheet guard/safety cover against rotating assemblies along with quick release mechanical lock for safety of the operator should be provided.
A.18	Fault conditions	Fault conditions should be defined using audio-visual alarm. Suitable arrangement should be provided to shut off the system when emergency is actuated. Fault reset facility should be provided.
<b>B) Details of Transmission test rig for the testing of mechanical drive train system &amp; tractor PTO system</b>		
B.1	Application	To determine the performance characteristics of mechanical drive-train (Transmission + axles) system for the test vehicle using gear box or belt pulley arrangement
B.2	Type of dynamometer	Eddy current Dynamometer Two units of dynamometers for measurement of given points (as shown in SL no.4)
B.3	Type of unit under test	Mechanical drive-train (Transmission + axles) Prime mover for drive trains like motors, engine etc, Power Take off (PTO) system. With gear box cooling system
B.4	Bed size	<p>Bed size should be adjustable from minimum to maximum dimensions as given below.</p>  <p>The diagram illustrates the proposed test rig layout. It features a central horizontal component labeled 'Transmission system'. Above this, a vertical shaft is connected to a horizontal bar labeled 'Engine/ motors'. The 'Front side' of the rig is indicated by a downward arrow. The 'Rear side' is indicated by an upward arrow. Two 'Measurement point' locations are marked with arrows pointing to the ends of the transmission system. Dimensions are provided for various parts: the width of the engine/motors bar is 150 to 650 mm; the height of the front side is 130 to 600 mm; the height of the rear side is 150 to 660 mm; the total width of the transmission system is 600 to 1850 mm; and the total height of the transmission system is 700 to 2000 mm. A note at the bottom right states 'All Dimensions are in mm'.</p>
B.5	Test rig setup Details	Proposed test rig layout

		 <p style="text-align: center;">* CSIR CMERI Scope</p>
B.6	Direction of rotation	Anticlockwise & clockwise both (Bi-Directional)
B.7	Dynamometer Specification details	<ol style="list-style-type: none"> <li>1. Water Cooled - Eddy Current Dynamometer</li> <li>2. Power rating of each unit : 150 kW from 2000 to 8000 rpm</li> <li>3. Max. Torque of each unit: 500 Nm from 1500 to 3000 rpm</li> <li>4. Dyno Inertia = Not Greater than 0.093 Kg.m<sup>2</sup></li> <li>5. Tooth wheel with magnetic pick up sensor to measure speed. (Tooth on the wheel 60 or more will be preferred)</li> <li>6. Torque calibrating arms and set of weights</li> <li>7. Corrosion resistant coating on water passages inside the dynamo.</li> <li>8. Heavy duty water filter with Glycerin filled pressure Gauges.</li> <li>9. Water Inlet Pressure Switch.</li> <li>10. Strainer at water inlet.</li> <li>11. Cooling medium water or better than water.</li> <li>12. Torque measurement precision = <math>\pm 0.25</math> FS%, 0.1 Nm or better</li> <li>13. Speed measurement precision = <math>\pm 0.5</math> FS %, 1 RPM or better</li> <li>14. Torque transducer ~2 mV/V output.</li> <li>15. Operating Temperatures: - 10 to 60°C</li> <li>16. Maximum Humidity: 75 % or more Non-Condensing</li> <li>17. Max mechanical speed required for dyno 10000 RPM</li> </ol>
B.8	Load Requirement at measurement point (shown in SL no 4)	Torque - 0.5 to 4 KN-m, Speed - 20 to 50 rpm
B.9	Safety	<p>Electrical,Mechanical,environmental, machine &amp;operator safety should be considered as per standard, Fault condition can be detected by audio visual alarms. All rotating parts should be covered with safety metal sheet guard( pf thickness 5 mm or more) . All the electric equipments (Dynamometer, controller etc) should be CE marked for the safety against electrical hazards.</p> <p>Interlock should be provided for overheating of dynamometer &amp; coolant system of gear box system.</p> <p>Safety against over speed of the drive motor/ engine.</p>

		Safety against dry running (without water) of eddy current dynamometer.
B.10	Emergency stop	Should be disconnected and the Drivetrain system shall come to standstill when emergency is actuated and system should shut off.
B.11	Measuring Parameters	<ol style="list-style-type: none"> <li>1. Output power during test cycle</li> <li>2. Output torque during test cycle</li> <li>3. Output speed during test cycle</li> <li>4. Prime mover &amp; Drivetrain efficiency</li> </ol>
B.12	Calibration	<ol style="list-style-type: none"> <li>1. The Dynamometer should have CE certification <ol style="list-style-type: none"> <li>a) 73 / 23 / EEC: Low voltage directive</li> <li>b) 98 / 37 / EC: Machinery directive</li> </ol> </li> <li>2. All Indicators &amp; sensors must have calibration certificates.</li> </ol>
B.13	Structures for dynamometer and test-motor/drive train mounting	The test bed should accommodate 2 number of dynamometers, test equipments such as drive train systems, reduction gear box (if required) with necessary fixtures. Levelling cum anti vibration mounts should be provided between the test bed and the ground to minimize the amplitude of vibrations (15 mm/s max).
B.14	Couplings	High speed disc couplings for connecting all driver and driven parts, Additional two sets coupling should be provided for connecting PTO drive.
B.15	System run time without interruption	4 hrs or more
B.16	Power supply connections	Single/Three Phase, AC 230/ 415 V, 50Hz
B.17	Control access	External Ethernet interface to control the test rig, log the data and generate report through PC.
B.18	Control panel lock out and tag out facility	Control drive panel door and power ON/OFF switch should be lock out and tag out facility as per the Industry safety standards
<b>C) Controllers &amp; DAQ systems</b>		
C.1	Dynamometer controller	<p>PLC based control for constant speed operation, constant torque operation, test sequencing etc. Program the controller to load the motor speed/torque characteristics as per Indian Drive Cycle (IDC) (as per ARAI standard) or other user defined load cycle etc.</p> <p>Technical requirements</p> <ul style="list-style-type: none"> <li>• Work memory min 125KB of Reputed Make</li> <li>• 24VDC power supply with DI14 X 24VDC SINK/Source, DO 10 x 24VDC and AI2 and AQ2 on board</li> <li>• Minimum 4 or higher high speed counters</li> <li>• Signal board expands on-board I/O (Expandable upto 32 I/O's)</li> <li>• Min 3 communication modules for serial communication</li> <li>• Min 8 signal modules for I/O expansion</li> <li>• 0.04 ms/1000 instructions</li> <li>• 2 PROFINET ports for programming HMI and PLC to PC Communication</li> <li>• Control panel should be protected with IP 57</li> <li>• 13 BIT Analogue signal resolution (Min)</li> </ul>
C.2	Data acquisition and report generation	PC based motor /drive train test data acquisition and report generation using suitable software for manual and automated data logging. Motor and drive train test parameters such as output power, torque, speed etc is to be logged by the system during test cycle in manual or auto mode.

C.3	Hardware and computer interface	HP/DELL or equivalent, latest generation processor and operating system, 8 GB RAM, 1 TB hard drive, 23" Monitor, keyboard, mouse, printer, UPS ,Ethernet port, USB 3 Drive or latest version etc.
<b>Note: BothA) AC dynamometers andB) Trans axle rig will be controlled through a single PLC based controller whose specification are detailed in (C) on time sharing basis, i.e. Controller and DAQ system will be shared by both A) AC dynamometer and B) Trans axle rig. For AC dynamometer, the controller will interface with the 4-quadrant AC regenerative drive.</b>		
<b>D) Pre-Delivery Inspection (PDI)</b>		
	<b>A) AC Regenerative dynamometers</b> - One motor of suitable rating will be supplied to the vendor and its performance parameters should be verified. <b>B) For Trans axle test rig</b> - 30HP or more -tractor PTO performance testing by both the dynamometers and its performance parameters should be verified.	
<b>E) Installation, Commissioning and Demonstration</b>		
	The system is required to be installed, commissioned and demonstrated at the buyer's site (i.e. CSIR-CMERI, Durgapur) by factory trained engineer. Maintenance and training manuals should be supplied.	
<b>F) Warranty</b>		
	1. One year comprehensive onsite warranty (including spares) from the date of installation. 2.Product support and spares for period of warranty period, to be ensured by OEM.	
<b>G) Qualification criteria</b>		
	<ul style="list-style-type: none"><li>• <b>Manufacturer:</b> Bidder should be manufacturer of Eddy Current Dynamometers for more than 5 Years.</li><li>• Bidder should have supplied at least 2 transmission test rig set-up using Eddy Current Dynamometers and at least one Regenerative AC Dynamometer to OEM / research labs to any of the leading institutions and national laboratories in India such as IISc/IIT's/CSIR/IISER/NIT/Central Universities/DRDO/DAE/MNRE/ISRO and other Govt. establishments or leading automobile/farm machinery equipment manufacturers in India within last 10 years. Full contact details of end users (designation, department, email, phone no etc) and/or PO copies are required to be enclosed along with the technical bid</li><li>• <b>ISO Certified:</b> Firm should be ISO 9001: 2015 Certified</li></ul>	
<b>Note: PDI, Installation, Commissioning and Demonstration, Warranty&amp; Qualification Criteria etc. will be common for A) AC Regenerative dynamometers and B) Trans axle rig.</b>		