



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
Powai, Mumbai 400076

Purchase Requisition No. 1000011420 (SRM/RFX No. 6100000175)

Technical specification of Multidrive Rheometer

A 'Modular' Rheometer cum DMTA is required with possibility to accommodate different geometries. It should be possible to control all the setup through one PC. DMTA and rheometer should have the following specifications. Price for each should be quoted separately.

MAIN INSTRUMENT	
RHEOMETER MEASURING HEADS	1) SINGLE ROTATIONAL / OSCILLATORY MOTOR FOR COMBINED MOTOR TRANSDUCER MODE 2) DUAL ROTATIONAL / OSCILLATORY MOTOR FOR SEPARATE MOTOR TRANSDUCER MODE AND COUNTER MOVEMENT MODE
DMTA MEASURING HEAD TYPE	LINEAR MOTOR WITH MAGNETIC SUSPENSION AND/OR AIR BEARING
FORCE / TORQUE RANGE	0.005 N to 25N FOR LINEAR MOTOR 0.5nNm to 230mNm FOR ROTATIONAL / OSCILLATORY MOTORS
FORCE / TORQUE RESOLUTION	0.0005 N FOR LINEAR MOTOR 0.1nNm FOR ROTATIONAL / OSCILLATORY MOTORS
ACTUATOR / MOTOR BEARING	AIR BEARINGS ON ALL MOTORS
FREQUENCY RANGE	10E-6 to 600 rad/s
LINEAR MOTOR DISPLACEMENT RANGE	0.5 micron to 5000 micron
STRAIN SENSORS	OPTICAL ENCODER (LINEAR AND ROTATIONAL / OSCILLATORY)
LINEAR MOTOR DISPLACEMENT RESOLUTION	5 nm
MODES	STRAIN AND STRESS CONTROL OSCILLATORY, ROTATIONAL, EXTENSION, TORSIONAL & TRANSIENT
MEASUREMENT TYPES	OSCILLATORY MODES STRAIN CONTROLLED & STRESS CONTROLLED.
GAP/LENGTH CONTROL (STANDARD)	AUTOMATIC THERMAL EXPANSION COMPENSATION
MEASURING SYSTEM CONNECTION	CLAMPING FIXTURES OR QUICK FIT FIXTURES
SAMPLE LOADING	MANUAL PC CONTROLLED OR AUTOMATED USING TOUCH CONTROL

PC INTERFACES	DIRECT USB INTEFACE, ETHERNET AND SERIAL INTERFACE
SPECIAL INTERFACES	EXTERNAL THERMOCOUPLE, PT100 INPUTS, 4-ANALOG OUTPUTS AND 3 AUXILLARY INPUTS TO READ EXTERNAL DEVICE PARAMETRS.
AIR DRYER:	MULTISTAGE TYPE WITH MICROFILTERS
STANDARD SAMPLE:	STANDARD OIL 5 cP & 1000cP Gel : Appropriate gel

TEMPERATURE CONTROL SYSTEM

TEMPERATURE CONTROL	CONVECTION OVEN DEVICE OR RADIANT OVEN
OVEN TEMPERATURE RANGE	-160 °C TO 600 °C
LOW TEMPERATURE OPTION	WITH LIQ.N ₂ ACCESSION & 100 LITRES DEWAR
HEATING RATE	0.5 TO 30 °C/min
COOLING RATE	0.5 TO 20 °C/min
GAS CONSUMPTION	20 L/min MAXIMUM
NITROGEN CONSUMPTION	6 L/min MAXIMUM

MEASURING SYSTEMS / FIXTURES

SHEAR DMTA	SHEAR SANDWICH PLATES OR PARALLEL PLATES
DMTA TORSION FIXTURE	SOLID RECTANGULAR FIXTURE FOR BARS.
TENSILE FIXTURE	TENSILE DMTA FIXTURE FOR BARS FILMS & FIBRES
COMPRESSION FIXTURE	PARALLEL PLATE FIXTURE
CURING STUDIES FIXTURE	DISPOSABLE FIXTURE TO MEASURING CURING PROFILE
THERMOMECHANICAL SETUP	EXPANSION COEFFICIENT OF SOLIDS
SHEAR RHEOLOGY FIXTURE	CO-AXIAL CYLINDER FIXTURE, DOUBLE GAP FIXTURE, PARALLEL PLATES AND CONE & PLATE SETUP (25 & 50 mm DIA) – 2 No. s PARALLEL PLATES 50 mm SANDBLASTED 2 No. CONE & PLATE SETUP 25 mm SMALL ANGLE CONE & PLATE SETUP 50 mm 2 DEG. (SANDBLASTED) PROFILED BOB FOR COUETTE COUETTE CUP

SOFTWARE

ARCHITECHTURE	TEMPLATE BASED WITH ATLEAST 50 BUILT-IN TEMPLATES PRE-PROGRAMMED FOR ALL TYPES OF MATERIALS
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ACCESSORIES TO BE OFFERED ALONG WITH THE MAIN SYSTEM

SN	Accessory Title	Short Specification
1	Microscopy	<ol style="list-style-type: none"> 1) Optical Microscope with Eyepiece magnification of 2.0X 2) Air Cushion Mount of Optical Microscope on Pre-aligned optical bench 3) Glass Thickness Corrected 20x Objective. 4) Optical Resolution of 0.7 microns with 1.6micron depth of field 5) Field of view of 440 x 330 microns 6) Focusing From Either Bottom side of Lower Plate or from Side into the Gap

		<ul style="list-style-type: none"> 7) Analog and Digital Control of Differential Speeds of Upper & Lower Plate for tracking the Stagnation Plane. 8) Shadowfree illumination using a LED Light Source and Fibre Optic Illumination path. 9) 9) Built-in Polarizers before and after light source to adjust the Cross polarization and improve Contrast. 10) 10) Digital Camara with C-Mount have 30 FPS speed and 1.3MP Resolution using a 2/3" CCD Chip 11) Glass Parallel Plate Rheology geometries for operation upto 200C. 	
2	SALS	<ul style="list-style-type: none"> 1) a) Laser wavelength: 658 nm b) Laser intensity: 2-6 mW adjustable c) Minimum scattering angle: ~ 2.5° d) Maximum scattering angle: ~ 12° e) Minimum scattering vector: ~ 0.4 1/im f) Maximum scattering vector: ~ 2 1/im g) Measuring geometries: Optical Glass Concentric cylinder & Parallel-plate h) Protective Interlocked Housing with CE Certification for the Full Rheometer system 	
3	UV Curing Cell	<ul style="list-style-type: none"> 1) Convection temperature Control -160C to 600C 2) UV Source with Synchronized Shutter Control from Rheology Software 3) Fast Data acquisition of Rheology for measuring fast kinetics as low as 2-3sec for Full cure cycle. 4) Liquid filled Fiber optic for UV transmission 5) UV light source, 6) Parallel-plate and cone-plate systems with diameters up to 50 mm 	
4	PIV	<ul style="list-style-type: none"> 1) Measuring Cup – BK7 Glass 2) Measuring Bob – Anodized Aluminum. 3) Temperature Control 10C to 70C 4) Measuring Gap: 5mm or more 5) Compatible to any PIV system 	
5	Di-Electro Rheology Device	<ul style="list-style-type: none"> 1. Compatible to Convection Temperature Device Temperature range: -160 to 600°C 2. Dielectrical Measuring Cell Measuring Geometry: Parallel Plate <ul style="list-style-type: none"> a. Capacitance plate/earth: less than 0.5 pF b. Capacitance geometry/earth: less than 0.5 pF c. Resistance insulation material bottom plate: 10¹⁶ ohm x cm 	
6	Magneto Rheology Device	<ul style="list-style-type: none"> 1) Temperature range: 10C to 170C 2) Magnetic Field range: 0 to 1.0 Tesla 3) Magnetic Field generator Power supply fully controlled through Rheology software 4) Integrated Degaussing Mechanism. 5) Automated Magnetic Field Calibration. 6) Titanium Parallel Plate 20mm Diameter 	
7	Electro Rheology Device	<ul style="list-style-type: none"> 1) Temperature Range : 0 to 200C 2) Electric Field range: 0 to 10KV 3) Electric Field Contact: Gold Plated Spring Wire Contact 4) Direct Control of High Voltage Power Supply thru Rheology Software. 5) Calibration of High Voltage Power supply 6) Insulated Parallel Plates 50mm and 25mm 	
8	POWDER RHEOLOGY CELL	MEASURING CELL	<ul style="list-style-type: none"> -ITO COATED MEASURING TUBE -HAVING SAMPLE VOLUME UP TO 140 ML

	TEST	MEASURING SYSTEMS	-TWO BLADE STIRRER – ONE NO. -WARREN SPRINGS GEOMETRY-ONE NO. - PISTON GEOMETRY – ONE NO.
		GLASS FRIT	WITH TWO DIFFERENT POROSITIES SHOULD BE SUPPLIED
		DUST PROTECTION HOOD	
		PARTICLE SIZE RANGE	D ≥ 5 um PARTICLES, 100 % DUSTPROOF; 5 um > D ≥ 1 um PARTICLES, 90 % TO 95 % DUSTPROOF
		AIR SEAL	A LOW GAP AIR SEAL IS TO REQUIRE ENSURING COMPLETE SEALING OF THE POWDER MEASURING TUBE AND MAINTAINING TORQUE SENSITIVITY UPTO 10nNm.
		DUST FILTER	STANDARD FILTER: PARTICLE FILTER CLASS F8 TO PREVENT DUST FROM LEAVING THE CELL
		POWDER RHEOLOGY SOFTWARE	
		POWDER CELL TEMPLATES	A. COHESION STRENGTH MEASUREMENT FOLLOWED BY FLUIDIZATION STEP FOR POWDER MEMORY REMOVAL B. SEGEGRATION TEST C. COHESION STRENGTH MEASUREMENT POST CONSOLIDATION WITH COMPRESSION GEOMETRY D. WALL FRICTION TEST UNDER CONSTANT LOAD OF 3 KPA, 6 KPA AND 9 KPA E. PENETRATION TEST- TO QUANTIFY PENETRATION WORK ENERGY F. FLUIDIZED BED POWDER VISCOSITY G. DEAERATION TEST
9	HIGH PRESSURE CELL	<ol style="list-style-type: none"> 1) Maximum Pressure 150 Bars 2) Temperature Control: Ambient to 200C 3) Measuring Geometries: Single Gap Co-Axial Cylinder System 4) Gas Pressurization Manifold 5) Magnetic Coupling of Geometry up to 125mNm of Torque 6) Maximum Speed up to 1500 RPM 7) Pressure Gauge integrated on the manifold 	
10	INTERFACIAL RHEOLOGY CELL	<ol style="list-style-type: none"> 1) Measuring geometry: Bi-cone with radius of 34.14 mm and bi-cone angle of 10° (2 x 5°) 2) Temperature range 5 °C to 70 °C 3) Software: Interfacial Flow Field Analysis 4) Sample Cup: Glass 	
11	IMMOBILIZATION CELL	<ol style="list-style-type: none"> 1) Lower Measuring Plate with Perforation 2) Lower Holder for clamping substrate samples 3) Vacuum pump to facilitate controlled drying 4) Parallel plate 50mm with profiled surface -2 No.s 	

Warranty : 5 years warranty for instrument , software and all the accessories supplied.