

CORRIGENDUM

Tender Enquiry: IIT/SRIC/MME/SHW/RM/17-18/EQ-3, Dated: 12.03.2018

Subject: Revised detailed technical specifications for closed loop high frequency testing machine for pre-cracking, fatigue crack growth and variable loading fatigue tests

Note: Items 1.0, 2.0, 2.1, 2.2, 2.3, and par of 2.4 (2.4.1 and 2.4.2) were missing in the original tender enquiry, and have been included in the revised technical specifications provided as follows:

Sl. No.	Item Description
1.0	Supply, installation & commissioning, and user training for closed loop high frequency resonance testing machine for pre-cracking, fatigue crack growth and variable loading fatigue tests. The machine should be with the following capacities (1) Load bearing capacity: 50 kN Cyclic frequency range : 40 Hz (or less) to 220 Hz (or more)
2.0	Detailed SPECIFICATIONS The machines and accessories are for (1) Pre-cracking as per the ASTM E647, E1820 at ambient. (2) Fatigue crack growth testing (as per the ASTM E647) at ambient temperature (~25°C) with (a) Compact Tension (CT) - 1CT, 1/2CT and 1/4CT (b) 3-point bend (TPB) with different thicknesses from 6.25 mm (1/4") to 12.7 mm (1/2"). (c) Cylindrical threaded end (M16) specimens
2.1	Load frame Capacity : 50 kN Dynamic load : 50 kN (± 25 kN) Max. static load : 50 kN Dynamic stroke : 4 mm (± 2 mm) or more; Frequency range : ≤ 40 Hz - ≥ 220 Hz variable in ≥ 8 steps
2.2	Load Cells - Fatigue rated Capacity (1) 50kN, Dynamic load : ± 25 kN (2) 10 kN, Dynamic load : ± 5 kN (additional) Accuracy : $\leq 0.5\%$ above 10% of capacity ; 1% at or below 10% of the capacity? Resolution : $\leq 0.025\%$ over 25 % of capacity Stability:0.1% of the range (over 10-min)
2.3	Controllers Data Acquisition and control loop update : ≥ 25 kHz Digital input and digital output channel : ≥ 8 Resolution: ≥ 24 bit Frequency change detectability : ≤ 0.005 Hz Simultaneously strain measurement channels: ≥ 2 Remote hand control unit Adaptive PID gain control, limit and event detectors, system trips Crack length measurement methods (1) Compliance (2) DCPD (3) CRACK GAGES (COD gauges with gauge length of 5 mm and travel ± 1.0 mm)
2.4	Software modules The basic software along with the following software modules required for

	(1) Machine Control, DATA acquisition and post processing (2) Status display for current control mode, limits, transducer calibration and power Live display of transducers values, saving of test settings in software & online help.	
2.4.1	Block loading program for customized variable loading fatigue test	
2.4.2	Pre-Cracking software Pre-cracking of fracture mechanics samples according to standards ASTM E647, E1820	
2.4.3	FCG Software Crack propagation (da/dN) software for FCG test according to ASTM E647, with FCG cyclic programs for the following types of tests. (1) Constant K_{max} control (2) Constant Load control (3) ΔK -decreasing-constant R (load ratio) (4) ΔK -decreasing-constant K_{max} (5) ΔK -decreasing-constant K_{mean} (6) ΔK -increasing-constant R (7) ΔK -increasing-constant K_{max} (8) ΔK -increasing-constant K_{mean} tests (9) Constant ΔK . Test termination criteria: Crack length, applied ΔK , change in PD Display of the termination criteria by which test has stopped. Provision for post processing & incorporating crack closure correction	
2.5	Pull rods/Grips/Three point bend Fixtures (Nimonic 105 or equivalent grade)	
2.5.1	Pull rods rated to operate at 1100°C with suitable adapters to connect to the machine (1) 50 kN (for future provision to use at high temperature) (Optional)	
2.5.2	Three point bend fixtures with roller supports 20 kN (Oscillating force : 0 to -20 kN, Span : 20-200 mm	
2.6	Gages	
	Room temperature Clip-On Gage with signal conditioner, Gage length : 5 mm Measuring range : 0 to +2.5 mm. (Other ranges optional) Specifications: 1. Excitation Voltage : 5 to 10 Volts DC. 2. Output Voltage : 2 to 4 mV/V nominal. 3. Linearity : minimum 0.2 % of the measuring range. 4. Resolution : Better than $\pm 1\%$ in full range 5. Measurement cable: 2500 mm. length minimum. Wiring diagrams and calibration details shall be provided.	2 Nos. each
2.7	Safety features Manual override to stop test and return to no load. Tripping on overload and mains failure Furnace to machine interlock (to trip the system, in case of temperature overshoot)	
2.8	Operator terminal and output data recorder with minimum configuration Processor Intel Core i5 or higher DDR4 RAM 8GB or higher SATA Hard disk 1TB Seagate make Display unit, Cabinet with 450 watts SMPS and necessary accessories. Latest suitable data output recorder for generating data report	2 Nos.
2.9	Pre-dispatch Inspection :One scientist / engineer representing the buyer shall visit the manufacturer's site pre-dispatch inspection. The calibration of load and , stroke, proper	

	<p>operation of the machine & accessories, practicing safety norms, handling the software for operation, data acquisition and maintenance procedures should be indicated in the offer & quoted with break-up.</p> <p>Acceptance Criteria: Successful demonstration of</p> <ol style="list-style-type: none"> 1. Dynamic Load calibration 2. Pre-cracking of a CT and TPB specimens (to demonstrate the software, alignment of the load train and the fixtures) <p>FCG test as per ASTM E647 (ΔK, K_{max} increasing decreasing, crack length by COD gauge /compliance (Optional DCPD)with CT and TPB specimens (to demonstrate performance of the test at room temperature.</p>
2.10	<p>Sales and Service Requirements</p> <p>Calibration certificates: For the load, stroke measurement (COD) gauges. Test certificates : For materials for all the pull rods, grips, fixtures, pins etc Operation & Maintenance: The supplier shall make available a trained engineer at user site to operate and maintain the equipment for 2 years (plus 1 year of AMC period). The amount towards this shall be indicated separately in the offer.</p>
2.11	<p>Spares and tools</p> <p>The offer shall quote separately the following:</p> <ul style="list-style-type: none"> • Spares for 5 years of trouble-free and smooth operation of the systems. • A complete set of tools normally required for the operation and maintenance of the machines shall be included, especially any special spanner and tools <p>Spares and optional accessories will not be considered for evaluating the lowest offer</p>
2.12	<p>Installation & Commissioning-Installation requirement</p> <p>Quotation shall include installation & commissioning of the equipment at users' site. Demonstrate the performance of the equipment to the specifications by conducting trial tests. 3 scientist/engineers should be provided training by the manufacturer at user site for proper operation and maintenance of the machine & accessories, practicing safety norms, handling the software for testing and data acquisition</p> <p>Complete set of manuals for installation, commissioning and safety along with circuit/block diagrams shall be provided along with the technical details.</p> <p>Quotation shall clearly indicate the delivery schedule, crate size, weight after packing, space requirement, special civil requirement, electrical requirements in terms of current, voltage and power supply connections, earthing, water supply for cooling requirements for safe operation of the machine,etc</p>
2.13	<p>Guarantee</p> <p>The equipment with major accessories shall be guaranteed for a period of 24 months from the date of installation and commissioning</p>
2.14	<p>Bidder evaluation criteria :</p> <ul style="list-style-type: none"> • Only the original manufacturers of the equipment or their authorized Indian agent (in the case of foreign manufacturers) shall quote. • Those bidders who have supplied similar equipment with the accessories in the past 5 years only shall qualify. A list of such supplies in the past 5 years (preferably in India) with details of contact persons shall accompany the quotation. Failure to comply with this shall result in rejection of the bid.
2.15	<p>Final acceptance criteria</p> <p>Final acceptance at site will be based on successful installation and commissioning with</p>

	<p>integration of the accessories, and demonstration of the following:</p> <ol style="list-style-type: none"> (1) Pull rods alignment and dynamic load calibration at user site. (2) All 9 types of FCG tests (as per ASTM standard E647), with 3 crack measurement methods, at 25 °C with CT and TPB specimens at room temperature <p>Success of the test will be based on the completion of test procedure and data acquisition as per the requirements given in test input details, and temperature accuracy and stability during the test.</p>
2.16	<p><i>After sales service</i></p> <p>Any updates in the software should be provided during the warranty period. The supplier shall indicate the type of maintenance required for the system and quote for non-comprehensive annual maintenance contract (AMC) for a period of 5 years, applicable after guarantee/warranty period.</p>
2.17	<p><i>Operation and maintenance manual</i></p> <p>A copy of operation and maintenance manual with following instructions in English. Safety, general information about system, testing procedure, routine and periodical maintenance, operation, error message manual, machine calibration manual, preventive maintenance manual, trouble shooting manual, electrical and electronic circuit diagrams, complete list of parts with identification numbers</p>
3.0	<p>Special Instructions, if any, to Purchase Section</p> <p>Quotation should indicate available service centers in India for repair/maintenance after guarantee period</p> <p>File may be processed as a two-part public tender</p> <p>Optional accessories shall not be considered for evaluating the lowest offer</p>
4.0	<p>Any Other Relevant Information :</p> <p>Quotations from the original manufacturers of the equipment or their authorized Indian subsidiary (in the case of foreign manufacturers) only shall be entertained. Those bidders who have supplied similar equipment with the accessories in the past 5 years only shall qualify. A list of such supplies in the past 5 years (preferably in India) with details of contact persons shall be sought with the quotation.</p>
5.0	<p>Sound proof cabins for the machine. (Optional)</p>

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