corrigendum

Technical Specification for Servo-Controlled High Fatigue Rated Universal Testing Machine (UTM) of 1000 kN Capacity with Digital Controller

Sl. No	Parameter	Original specification	Revised specification
1.	Fatigue rated and static loading capacity	• Dynamic load capacity: ±1000 kN • Static load capacity: 1200 kN	• Dynamic load capacity: ±1000 kN
4	Type of actuator	• Double ended double acting fatigue rated actuator cross head mounted with load cell and built-in LVDT. • The machine should be hysteresis-free in quasi-static and cyclic operation with alternating forces up to nominal value.	• Double ended double acting fatigue rated actuator cross head mounted with load cell and built-in LVDT. • The machine should be hysteresis-free in quasi-static and cyclic operation with alternating forces up to nominal value. • **Actuator to have an internally mounted LVDT/Linear Encoder for displacement measurement.** • **Actuator to include a locking feature that holds actuator in position, if power is lost.** • **The LVDT//Linear Encoder should be factory calibrated.** • **LVDT//Linear Encoder accuracy should meet or exceed 0.5% or ASTM-E-2309 class A complied.**
5.	Loading frame and test space	• Sturdy self-straining and floor standing column type frame with integrated ¢T¢ slotted base plate on the floor (4 slots) of minimum size 800 mm x 1000 mm. • Minimum vertical test space without hydraulic grips 2000 mm. • Minimum clearance between side columns 600 mm (i.e. clear width available for testing) • Total height of the test system should not exceed 5500 mm. • The nominal load frame stiffness to be (minimum) 15×10^8 N/m or stiffer	• Sturdy self-straining and floor standing column type frame with integrated ¢T¢ slotted base plate on the floor (4 slots) of minimum size 800 mm x 1000 mm. • **"T" slotted base plate should be solid not hollow.** • Minimum vertical test space without hydraulic grips 2000 mm. • Minimum clearance between side columns 600 mm (i.e. clear width available for testing) • Total height of the test system should not exceed 5500 mm. • The nominal load frame stiffness to be (minimum) 15×10^8 N/m or stiffer at

		at one-meter height from base level of the load frame. • Vibration isolation pads should be placed at the base of load frame to minimize the vibrations during fatigue testing. • Moveable crosshead with hydraulic lift and lock control to be provided.	one-meter height from base level of the load frame. • Vibration isolation pads should be placed at the base of load frame to minimize the vibrations during fatigue testing. • Moveable crosshead with hydraulic lift and lock control to be provided.
8.	Force transducer\ Load Cell capacity	• Dynamic force +/- 1000 kN, • Static Force: 1200 kN • Nonlinearity ≤ 0.15 %	• Dynamic force +/- 1000 kN, • Nonlinearity ≤ 0.15 %
10	Hydraulic Power Unit/Pack	• The equipment should have suitable hydraulic power unit (HPU) of minimum capacity 85 LPM (should have provision to extend for the future needs) with high pressure variable volume pump and motor assembly submerged in hydraulic oil reservoir. • Noise level of HPU at full operation time should be less than 65 dB • The HPU should have Operating and Visualization Panel. • With emergency stop. • Stainless steel plate type heat exchanger to be provided.	• **The equipment should have suitable hydraulic power unit (HPU) of minimum capacity 85 LPM (should have provision to extend for the future needs) with high pressure variable volume pump / gear pump and motor assembly.** • **Safety standard should be incorporated as per EN ISO 13849-1 or equivalent.** • Noise level of HPU at full operation time should be less than 65 dB • The HPU should have Operating and Visualization Panel. • With emergency stop. • Stainless steel plate type heat exchanger to be provided.

13	Hydraulic wedge Grips	The load frame should have appropriate hydraulic grips to hold the specimens with constant gripping force to minimum slippage for performing tensile test (static/cyclic), compression test (static/cyclic) and fully reversible fatigue test (tension – compression).
		Dynamic force capacity of grip: 1000 kN.
		Static force capacity of grip: 1200 kN.
		  -Wedges for flat specimen of thickness 0-20 mm or more.
		  - Round specimen of diameter 6-10 mm, 10-25 mm (28 and 32 mm, if possible)
			The load frame should have appropriate hydraulic grips to hold the specimens with constant gripping force to minimum slippage for performing tensile test (static/cyclic), compression test (static/cyclic) and fully reversible fatigue test (tension – compression).
			Dynamic force capacity of grip: 1000 kN.
			-Wedges for flat specimen of thickness 0-20 mm.
			- Round specimen of diameter 6-10 mm, 10-25 mm.
			-Compression platens of minimum 300 mm dia. for compression test.
			-The grip system must maintain axial alignment and load uniformity**.**

		-Compression platens of minimum 300 mm dia. for compression test.	**-It should also comply as per ASTM E467/E1012/E8 or equivalent.** **-For Metal: Tensile test as per ASTM E8, high cycle fatigue as per E466/ISO1099, Bending test as per ASTM E290.** **-For Concrete: Compression test as per ASTM C39 or equivalent, flexural test ASTM C78/C293 or equivalent.**
16	Electronic Controller and Software	• The Electronic controller should have control system for stroke length, load or strain control modes. • The digital electronic controller should have provision for servo hydraulic station upgrade upto two station and channel expansion up to four channels. • Auto and manual tuning facility. • Auto identification of sensors. • High speed computer interface, USB or Ethernet. • Transducer signal conditioners for load, stroke and external strain sensors to provide high accuracy, low drift and low noise transducer signal with user selectable standard filters. • Digital sensor conditioners providing minimum 16-bit data resolution across the complete span of the sensor. Interlocks and indicators are to be provided for transducer excitation failure and conditioner saturation. • Automatic transducer recognition and calibration. • All adjustments on the signal conditioners are to be made by software. • Programmable limit detection, error detection, display meters, display scopes, providing the user the flexibility of programming the parameter to be displayed on the meters. • The user should be able to select the following parameters for display cyclic/ramp signal track, mean,	• The Electronic controller should have control system for stroke length, load or strain control modes. • The digital electronic controller should have provision for servo hydraulic station upgrade upto two station and channel expansion up to four channels. • Auto and manual tuning facility. • Auto identification of sensors. • High speed computer interface, USB or Ethernet. • Transducer signal conditioners for load, stroke and external strain sensors to provide high accuracy, low drift and low noise transducer signal with user selectable standard filters. • Digital sensor conditioners providing minimum 16-bit data resolution across the complete span of the sensor. Interlocks and indicators are to be provided for transducer excitation failure and conditioner saturation. • Automatic transducer recognition and calibration. • All adjustments on the signal conditioners are to be made by software. • Programmable limit detection, error detection, display meters, display scopes, providing the user the flexibility of programming the parameter to be displayed on the meters. • The user should be able to select the following parameters for display cyclic/ramp signal track, mean, amplitude, min, max, peak, valley, current cycle count, total cycle count, segments etc. Pre-programmable

		amplitude, min, max, peak, valley, current cycle count, total cycle count, segments etc. Pre-programmable automatic mode changing to any transducer connected to the machine.
		• Minimum 3 digital I/O and 4 analogue outputs of ±10V per channel of controller. The user should be able to configure any of the following parameters for analogue outputs load, stroke, command, servo drive, ground etc.
		• Minimum two analogue inputs of ±10V per channel controller for data acquisition of external analog signals.
		• Continuous synchronous data acquisition at user selectable sampling rate with maximum 5 kHz on all internal and external channels.
		• Specimen protection feature
		• The application software for running static, high cycle fatigue, dynamic tests and data acquisition should have the following features:
		  ➢ Strain-controlled cyclic fatigue test
		  ➢ Stress-controlled cyclic fatigue test
		  ➢ Run, hold, continue, and stop buttons for controlling the test.
		  ➢ On line instantaneous adjustment of frequency, amplitude and mean of the cyclic waveform tests.
		  ➢ Online visual indication of limit settings and status.
			automatic mode changing to any transducer connected to the machine.
			• Minimum 3 digital I/O and 4 analogue outputs of ±10V per channel of controller. The user should be able to configure any of the following parameters for analogue outputs load, stroke, command, servo drive, ground etc.
			• Minimum two analogue inputs of ±10V per channel controller for data acquisition of external analog signals.
			• Continuous synchronous data acquisition at user selectable sampling rate with **minimum 5 kHz or better** on all internal and external channels.
			• Specimen protection feature
			• The application software for running static, high cycle fatigue, dynamic tests and data acquisition should have the following features:
			  ➢ Strain-controlled cyclic fatigue test
			  ➢ Stress-controlled cyclic fatigue test
			  ➢ Run, hold, continue, and stop buttons for controlling the test.
			  ➢ On line instantaneous adjustment of frequency, amplitude and mean of the cyclic waveform tests.
			  ➢ Online visual indication of limit settings and status.

"The remaining specifications shall remain unchanged from the original."