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TECHNICAL SPECIFICATION OF STRAIN CONTROLLED MECHANICAL TESTING FIXTURE/ACCESSORIES

There is a need of the following fixture/accessories for an existing High Precision Forming, Micro-Forming and Mechanical Testing (Make: BANGALORE INTEGRATED SYSTEM SOLUTIONS (P) LTD, INDIA) housed at Department of Mechanical Engineering, IIT Madras.

Key Features:

- Capacity to effectively grip and hold miniature flat tensile samples during low cycle fatigue testing under tension-compression and tension-tension modes with total strain control.

- Capacity to test miniature flat samples under stress controlled high cycle fatigue regime under tension – tension modes.

- Capacity to hold specimens for fracture mechanics testing modes of KIC for Compact Tensile specimen.

- Ability to measure the micro strains experienced by the samples and their stress response in both elastic and plastic regimes using an effective contact-based strain measurement technique.

1. ACCESSORIES FOR LOW CYCLE AND HIGH CYCLE FATIGUE EXPERIMENTS

1. Primary Requirements (Grippers and Fixtures):

1.1.1 Operations	Ability to integrate with universal push pull rods of the existing High Precision Forming, Micro forming and mechanical testing machine (Make: BISS Ltd.) Capable to effectively hold the samples without slip under tension – compression and tension – tension low cycle fatigue with total strain control. Capable to effectively hold the samples without slip under tension – tension high cycle fatigue under total stress control.
1.1.2 Loading Condition	Capable of sustaining at least 5kN (or higher) of load in both tension and compression mode of fatigue cycles
1.1.3 Materials to be experimented	Wide variety of metals and alloys such as aluminium, steel, copper, magnesium, titanium and their alloys and composites within the range of loading capacity as per 1.2.
1.1.4 Specimen Geometry	Thickness ranges: 0.5 to 2.5 mm. Grip range (of grip portion): Minimum 15 mm.

	e length: 10 mm. to 12 mm.
1.1.5 Temperature of testing	All tests are to be carried out at room temperature.

1.2 Primary Requirements (Axial extensometers):

1.2.1 Operations	Measuring micro strains as a result of strain-controlled tension compression and tension-tension low cycle fatigue. Providing strain feedback to the fatigue testing setup to carry out low cycle fatigue tests on flat specimens under total strain control in both tension compression and tension-tension regimes. Ability to provide strain output from the experimental fatigue cycles to plot Stress vs Strain hysteresis plots under every stress and/or strain cycle.
1.2.2 Materials to be experimented	Wide variety of metals and alloys such as aluminium, steel, copper, magnesium, titanium and their alloys and composites.
1.2.3 Specimen Geometry	Gage length ranging from 3.5 mm to 6 mm.
1.2.4 Measurement Capabilities	Travel range: ± 0.5 mm Minimum Accuracy: ± 0.5 % Minimum resolution: 1 Micron.
1.2.5 Temperature of testing	Room temperature testing.
1.2.6 Other Requirement	Mechanical over travels at both ends.

2. ACCESSORIES FOR FRACTURE MECHANICS TESTING

2.1 Primary Requirements (Grippers and Fixtures):

2.1.1 Operations	Ability to integrate with universal push pull rods of the existing High Precision Forming, Micro forming and mechanical testing machine (Make: BISS Ltd.). Clevis Grips that can hold flat Compact Tensile specimens with pin holes during various fracture mechanics tests.
2.1.2 Loading Condition	Capable of sustaining up to 20 kN (or higher) of load in both tension and compression mode of fatigue cycles
2.1.3 Materials to be	Wide variety of metals and alloys such as aluminium, steel, copper,

experimented	magnesium, titanium and their alloys and composites within the range of loading capacity as per 1.2.
2.1.4 Specimen Geometry	iameter: 2 mm to 6.5 mm. : 10 mm to 30 mm. hess of samples : 2 mm – 4 mm.
2.1.5 Temperature of testing	All tests are to be carried out at room temperature.

2. Primary Requirements (COD Gauge):

2.2.1 Operations	COD gauge to conduct fracture mechanics testing in compliance with ASTM E647 and E1820.
2.2.2 Measuring Capabilities	Gauge Length: 1 mm to 5 mm Measuring Range: +3 mm./ -1 mm. or better. Measuring accuracy: $\pm 0.5\%$ of readout value or better as per ASTM E83.
2.2.3 Materials to be experimented	Wide variety of metals and alloys such as aluminium, steel, copper, magnesium, titanium and their alloys and composites within the range of loading capacity as per 1.2.
2.2.4 Temperature of testing	All tests are to be carried out at room temperature.

3. Primary Requirements (Fracture Mechanics software):

2.2.1 Operations	Software to perform fracture toughness tests with MTL 32 environment of the fore mentioned BISS make high precision Forming, micro forming and Mechanical Testing Machine with 2370 series controller.
2.2.2 Capabilities	Ability to conduct tests with the given testing and loading parameters. Tests can be done in stroke or COD control.
2.2.3 Output Requirements:	Real time graphs of J vs. Δa and load vs. displacement. Option to save the test profiles. Auto data acquisition settings Auto scaling of graph. Option to see J and Δa value online. Option to select the previous data file and export the data. Data file storage in same settings file. Option to stop the test after specified percentage load drop. Offline post processing program to analyse the results in MS Excel.

1. Other conditions

1. Warranty for 12 months from the date of installation/commissioning.
2. One set of maintenance and operating manuals in English (with a hard copy)

3. The offer should be made @ 5 % GST against a concessional GST certificate.
4. Equipment to be delivered in test ready, factory calibrated condition.
5. Supplier must have supplied any kind of Fatigue testing machine to at least 2 NITs or 2 IITs or 2 government R& D laboratories in India.
6. Supplier must be either OEM or authorized dealer of standard fatigue testing machines..
7. The firm should be equipped with well-trained engineers to offer post warranty maintenance and service support.
8. Compliance statement needs to be provided clearly specifying COMPLY/NON-COMPLY with remarks/reasons of all of the points mentioned above.