

THERMO-MECHANICAL TESTING SYSTEM

Combined Thermal and Mechanical Load Testing BI-7020/40-TMF

Thermo-mechanical fatigue (TMF) testing is a complex and demanding strain controlled testing under programmable temperature variations. Instron offers a comprehensive solution for such testing that requires simulating of synchronised heating and cooling of specimens combined with mechanical loading with real time thermal strain compensation. TMF test systems are useful to test the operational efficiency and reliability of turbine components and structures when subjected to simultaneous changes in temperatures and load under laboratory controlled environment. Our state of the art digital servo used with TMF test system envisages independent induction heating and cooling through compressed air and also allows multi zone temperature tracking¹. MTL32 proprietary algorithms used with our controllers permit precision heating rates up to 20 °C/s and cooling up to 10 °C/s.

FEATURES

- Fully integrated standalone systems rated from 100 kN
- Digital servo-controlled induction heating² and pneumatic air cooling
- Self-aligning, self-locking, zero backlash water cooled hydraulic grips to test threaded and tubular samples
- Thermocouple based/non-contact type temperature measurements available
- Encoder based displacement measurements with 0.1 µm resolution
- 1µm resolution extensometer rated for 1200 °C operations
- Real time thermal strain compensation³
- Digital servo controller for synchronous control and data acquisition
- In compliance with ASTM E2368 and ASTM E606
- User friendly application software
- In phase and out of phase waveform generation
- Graphical representation of graphs and results
- Auto data acquisition settings depending on test frequency to ensure sufficient data points to calculate various parameters
- Option to save test profiles
- Auto stroke and strain limit settings ensuring safety to the gauges and the system
- Offline post processing program to analyze results in MS Excel.
- Easy to handle and light weight spot welding unit for welding thermocouples on to the specimen
- Optional safety enclosures across the test area of the machine



1 Temperature tracking: multi point thermocouple-based temperature tracking with guaranteed uniformity across 25 mm gauge length available at premium pricing

2 Real time thermal strain compensation: mount extensometer on to the specimen and set strain to zero. Vary temperature of the specimen, extensometer readout doesn't change and still reads zero.

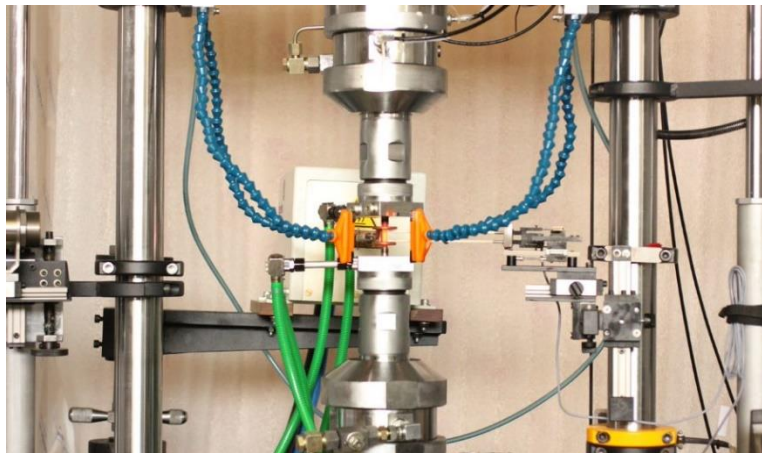
3 Induction heating: delivers superior performance to conventional control schemes where heat control is designated to induction heater

APPLICATIONS

- Axial low cycle fatigue
- Characterization of materials under combined thermal and mechanical loading
- Thermal cycling
- Thermo mechanical cycling with independent phase control
- Optional axial torsion testing
- Testing of solid and tubular specimens of stainless steel, ferritic steels and their welds
- TMF crack initiation in super alloys for gas turbine generators
- TMF life prediction of hot section components in jet engines

WHY CHOOSE INSTRON?

- Instron offers a fully integrated and a comprehensive thermo mechanical fatigue test solution with a high-performance state of the art controller and a dedicated user-friendly application software. The key benefits include
- A multi-coil induction head that allows more complex designs that optimize coupling between coils and specimen to improve heating rates and specimen temperature gradients
- Integrated extensometer with minimal setup time and roller mount for quick and precise adjustment of extensometer position
- Real time thermal strain compensation where the extensometer readout doesn't change even with change in mechanical strain of the specimen due to the variations in temperature
- Optional multi zone temperature tracking: multi point thermocouple-based temperature tracking with guaranteed uniformity across multi zones
- Adjustable induction coil mount that allows easy and precise movement of the induction system to fit specimen size
- Self-aligning, self-locking, zero backlash water cooled hydraulic grips to test threaded and tubular samples.



SPECIFICATIONS

		Servo Hydraulic Drive	Servo Electric Drive
Model		BI-7021-TMF	BI-7041-TMF
Daylight opening (Maximum between table and crosshead)	mm	1200	
Dynamic Load Capacity	kN	±100	±100
Total Actuator Stroke	mm	150	150
Configuration		Two Column High Stiffness Load Frame with Actuator in Bottom Crosshead	
Column Clearance	mm	600	
Displacement Resolution	μ	0.5, optional 0.1	
Loadcell Accuracy		±0.5% of reading down to 1/500th of load cell capacity	
Min. Speed Rating	μm/min		1
Max. Speed Rating	mm/min		Up to 300
Induction Heater Power Rating	kW	2 to 12	
Heating Rates	° C/s	1 to 20 – depends on sample gauge diameter and sample material	
Cooling Rates	° C/s	Up to 20	
Temperature Measurement Options		Contact: K Type Thermocouple Non-Contact: Pyrometer	
Power Requirements		380/400/415 VAC, 3 Ph, 50/60 Hz	
Controller specifications		24-bit analog data acquisition, 32-bit digital encoder inputs and data logging.	

NOTE

Please refer to individual brochures for information on the selected power packs & accessories.
 Custom configurations available
 CE certification on Demand
 Specifications are subject to change without prior notice

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