

## Thermomechanical Fatigue (TMF) Testing Systems



### Complete TMF Solution for Stress-Free Materials Testing

Instron® Thermomechanical Fatigue testing systems provide a fully integrated, turnkey solution for analysis of combined thermal and mechanical loading cycles on high performance materials. Typical applications are component materials for gas turbines and jet engines, which are subjected to fluctuating temperatures and cyclic loads. Expert integration of proven products has resulted in a complete, user-friendly system perfect for simulating these conditions and measuring material performance.

### Sophisticated Testing Made Easy

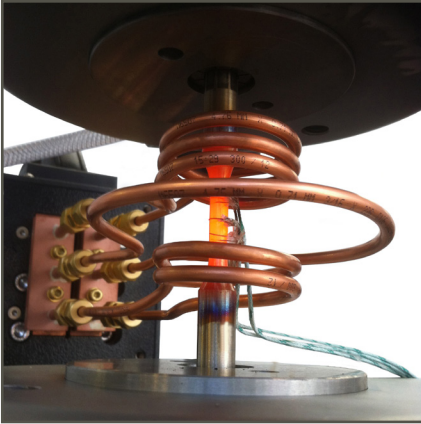
Instron TMF software is designed to be user-friendly and to meet the requirements of ASTM E2368 and ISO 12111. The automated test process reduces the risk of human error caused by manual test configuration. Built-in live graph displays and data post-processing provide effective monitoring and analysis capabilities.

### Increased Data Accuracy and Reliability

Instron offers a range of technologies to increase data accuracy and improve repeatability, so that you can trust your data. An innovative multi-coil induction head enables the temperature gradient across the specimen to be carefully controlled, improving accuracy. A choice of internal or enclosed external specimen cooling improves cooling rates without introducing extensometer disturbances, reducing the noise seen in your data.

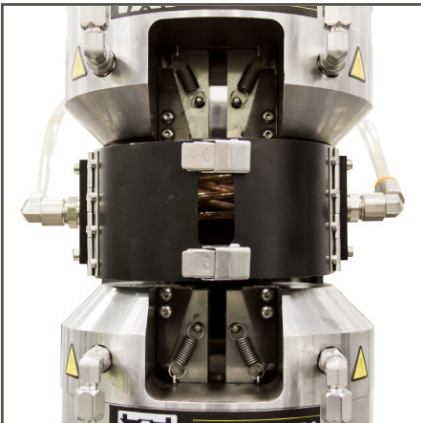
## Functionality and Capability

Instron® TMF systems are designed to guarantee machine performance and test accuracy, ensuring that you can trust your data is of the highest quality. Collaboration with industry and continuous improvement have helped us to develop the following innovative features, creating a truly optimized package for TMF testing.



### Multi-Coil Induction Head

Multiple coils allow more optimized coupling between coil and specimen, in turn increasing heating rates and improving specimen temperature gradients. In addition, multiple simpler coils are easier to manufacture, making the design and your testing more flexible and repeatable. The workspace is less congested as additional workheads are not required.



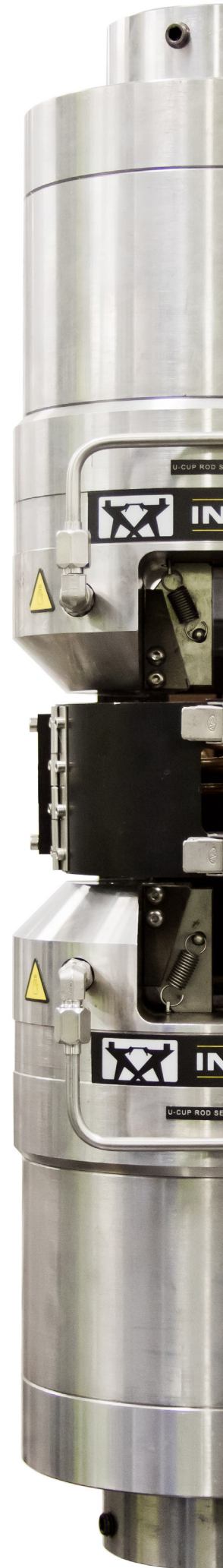
### External Cooling Collar

For external specimen cooling, a cooling collar with multi-directional air jets is available. Helping to improve turbulent airflow, it accelerates cooling rates without introducing extensometer signal noise. This means you can better simulate service conditions on your specimen whilst maintaining excellent data accuracy. It is designed to work with Instron's side entry high-temperature extensometers.



### Internal Specimen Cooling

Collet grips are available as a standard solution for high speed internal air cooling of tubular specimens. Greatly increased cooling rates can be achieved without any interference on extensometer readings - meaning precise, reliable data and control. A modular grip design means interchangeable grip heads can accommodate a range of specimen designs and geometries.

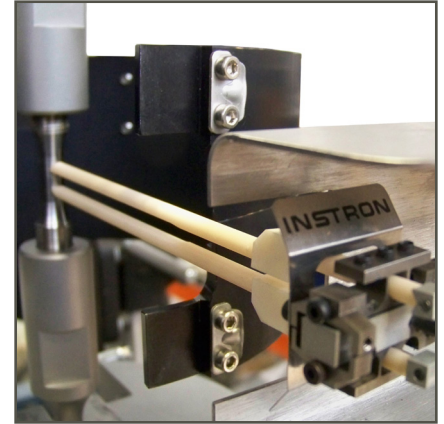


## Usability and Repeatability

Test reproducibility and ease-of-use are key factors to consider when comparing TMF systems and integrated Instron® systems are designed to provide both. Below is a selection of key features that will help to ensure your system is easy to use and produces the most repeatable data.

### Side Entry Extensometer

Proven Instron high temperature extensometers are available with gauge lengths of 5, 12.5 and 25mm. Easy to install, with a low specimen contact force using a stiff, purpose-designed extensometer mount. The mount allows the unit to be easily removed from the test area when access is required and returned to an identical position, improving your test repeatability.



### 8862 Servo-Electric Frame

Ideal for TMF testing, the 8862 load frame features a unique servo-electric actuator providing excellent low speed control, with reduced power consumption and no need for hydraulic infrastructure. Alternatively, for increased flexibility, TMF systems are also available on hydraulic frames including 8801 (100kN) and 8802 (250kN). All frames include an alignment fixture as standard.



### Precision Induction Head Mount

Axial and radial alignment of the induction coil relative to the specimen is critical for induction coupling, and therefore critical for optimum heating. The Instron solution optimizes both by allowing precision adjustment in two axes using hand wheels. Repeatability is improved by allowing you to easily and quickly set up a test for a previously tested specimen.

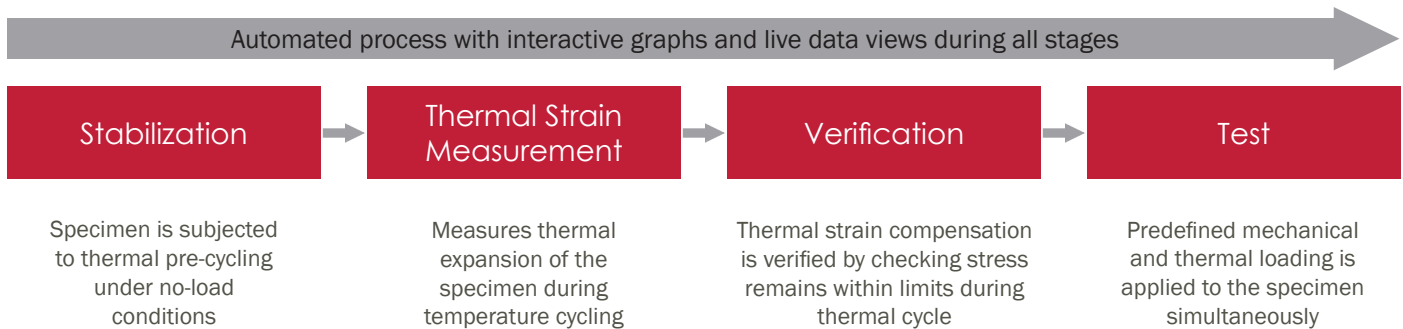


Modular grips shown with wedge heads for flat specimens

## Instron® TMF Software

Throughout many years of collaboration with industry experts, Instron has recognised our customers' desire to simplify the process of setting up and running a TMF test. This complex area of materials testing still requires high levels of knowledge and expertise, but our experience in manufacturing user-friendly systems brings previously unseen levels of usability to this sector.

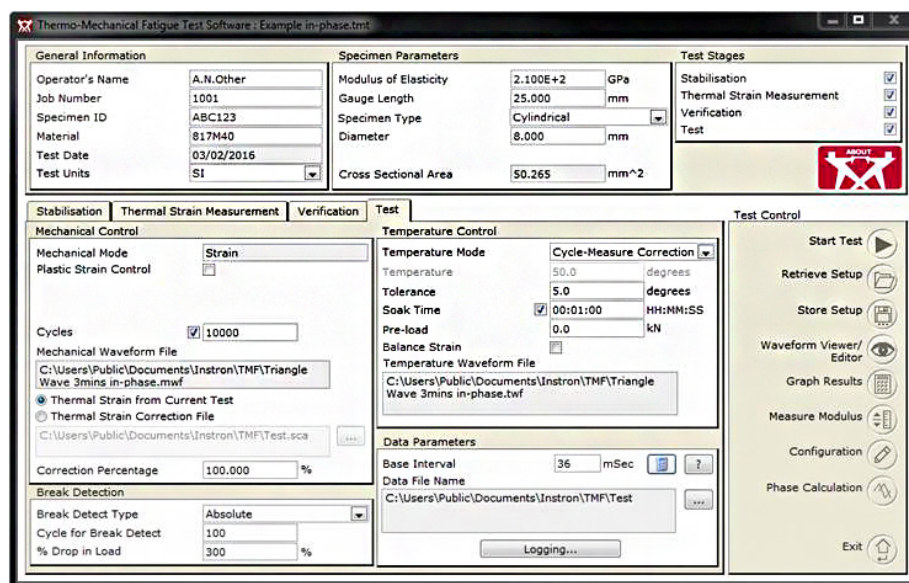
Our purpose-designed TMF software makes it quick and easy for you to conduct tests in accordance with international standards, including ASTM E2368 and ISO 12111. After setting up the test method, an automated process can execute the following four stages of the test with no need for manual calculations or use of third party software.



Carrying out the full test within one piece of dedicated software saves time and reduces the chance of human error. The following are examples of additional features contained within the software: built-in modulus measurement, automated calculations for specimen parameters, visualized test waveform creation and integrated data post-processing.

Instron is constantly developing and improving the system and software. Some examples of recent enhancements and additions are:

- Extended first cycle dwell (hold) period up to 24h, for creep sensitive materials
- Intermittent extended dwell periods at intervals throughout test
- Digital outputs for triggering of external devices, e.g. camera equipment
- Compatibility with DCPD measurement techniques for notched specimen TMF testing



Instron TMF Software - Test Setup Window

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