

# Multi-Specimen Fatigue

Accelerating high cycle fatigue and durability studies by combining many samples of simultaneous loading with industry-leading dynamic performance and instrument reliability.

TA Instruments' Multi-Specimen Fatigue (MSF) Instruments accelerate fatigue studies by simultaneously testing 6 or 16 specimens. Designed to test a variety of materials, subcomponents and complete devices, MSF offers higher statistical confidence in less time.



MSF6 with Oven

MSF16 with Bath

- Durability testing can take a long time, especially when the material or product is expected to last for many years and a high number of cycles. Multi-specimen fatigue shortens durability test time by simultaneously applying cyclic displacement to many samples and detecting each sample's cycles-to-failure for the applied loading level. This allows users to generate many failure datapoints for each loading. When multiple tests are run on similar samples, researchers can quickly build N curves with many data points to improve statistical confidence levels of the resulting fatigue model. Otherwise, these millions, 10s of millions and even 100s of million cycle-long tests can extend product development time and hinder efforts to accelerate time to market of new materials and products.
- Multi-specimen fatigue instruments use a dynamic linear motor and have the capacity to secure many samples into a test fixture and effectively share the loading from that motor. This approach applies a common displacement amplitude to all samples, often using a high frequency sinusoidal loading profile to accelerate the fatigue loading on the many samples. Each specimen has a force sensor to track the applied force; this sensor measures the degradation and/or failure point (number of cycles to failure) for that sample.

## Features and Benefits:

- Simultaneous axial fatigue of 6 or 16 specimens.
- Flexibility to convert to single specimen loading for executing quasi-static strength, fatigue or DMA methods.
- Unparalleled durability and dynamic performance with the patented ElectroForce linear motor technology.
- Accelerated testing frequencies up to 100 Hz with unparalleled displacement amplitudes.
- Nanometer resolution and 5 micron accuracy displacement sensor.

## Two Configurations, quicker insights to develop more reliable products faster.

1. The MSF6 configuration is compatible with an oven to deliver high-throughput fatigue results in temperatures between -20 to 150 °C, and therefore useful for a range of material studies such as polymer and elastomer fatigue.
2. The MSF16 configuration is particularly well-suited for testing in 37 °C fluid environments for medical device durability studies such as stent wire fatigue.



### Built on the versatile 3330 Load Frame

The TA Instruments' MSF solutions leverage the premier high frequency and high durability electrodynamic driven 3330 Load Frame. Its motor design offers a unique combination of best-in-class accelerated fatigue frequencies to deliver more data faster, coupled with premier reliability backed by a 10-year warranty.

The 3300 Load Frame is also available with a DMA Package which delivers High-Force Dynamic Mechanical Analysis to measure the viscoelastic characteristics of materials or products that cannot be miniaturized for testing on smaller conventional DMA instruments.

Waters™



For more information visit  
[tainstruments.com](http://tainstruments.com)

# Fail More Specimens Faster

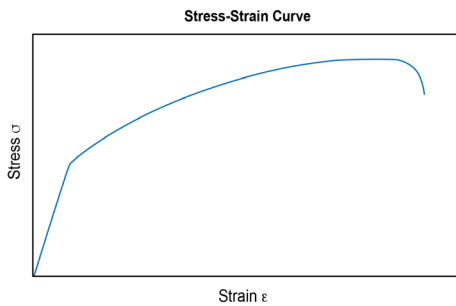
| Instrument Specifications | 3330    | MSF6   | MSF16  |
|---------------------------|---------|--------|--------|
| Number of Samples         | 1       | 6      | 16     |
| Maximum Displacement      | 25 mm   | 25 mm  | 25 mm  |
| Maximum Force per sample  | 3,000 N | 225 N  | 100 N  |
| Maximum Test Frequency    | 100 Hz  | 100 Hz | 100 Hz |

| Environment Options | 3330 | MSF6 | MSF16 |
|---------------------|------|------|-------|
| Ambient             | ●    | ●    | ●     |
| 37 °C Fluid         | ○    | —    | ●     |
| -20 to +150 °C Oven | ○    | ○    | —     |
| -150 to 350 °C Oven | ○    | —    | —     |

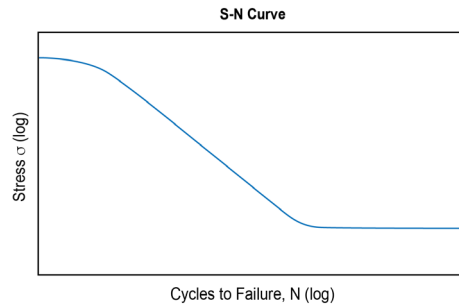
| Test Methods                      | 3330 | MSF6 | MSF16 |
|-----------------------------------|------|------|-------|
| Quasi - Static Strength           | ●    | —    | —     |
| Fatigue Strength                  | ●    | ●    | ○     |
| Dynamic Mechanical Analysis (DMA) | ○    | —    | —     |

● Included, ○ Optional, — Not available

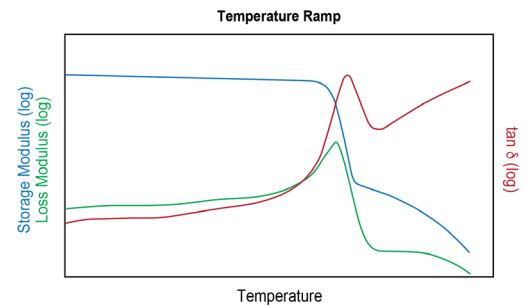
Example Quasi - Static Strength Plot



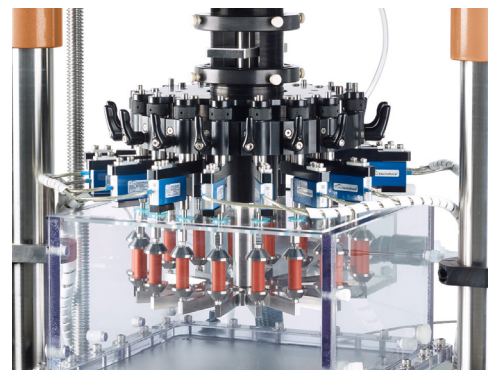
Example Fatigue Strength Plot



Example DMA Plot



MSF6



MSF16