

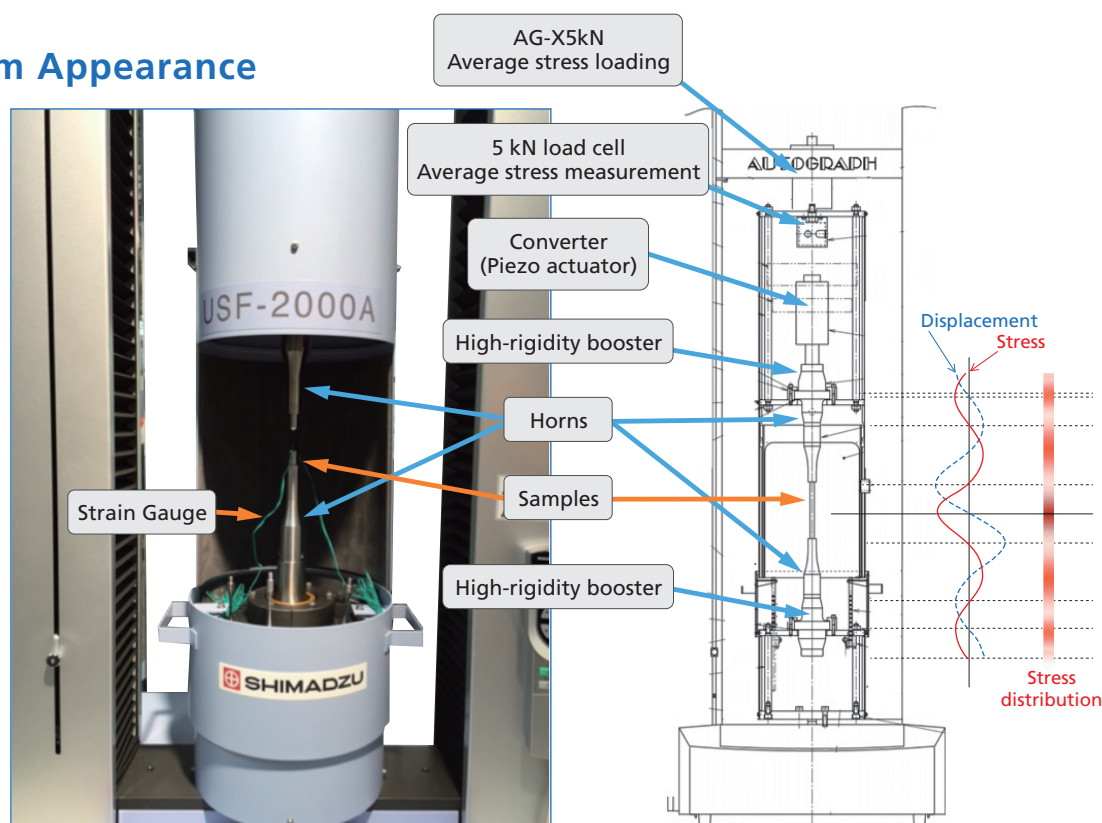
Ultrasonic Fatigue Testing System with an Average Stress Loading Mechanism

For Gigacycle Fatigue Tests with Average Stress Loaded

Actual components are rarely used under conditions in which the average stress is zero. Despite this, the USF-2000A, a standard ultrasonic fatigue testing system, can only perform testing under zero average stress conditions.

Using an ultrasonic fatigue testing system equipped with an average stress loading mechanism, gigacycle fatigue tests can be performed with average tensile stress loaded.

System Appearance



Ultrasonic Fatigue Testing System Effective for Gigacycle Fatigue Tests

With fatigue tests of high-strength steels, it is evident that internal fracture (fish-eye fracture), which is caused by inclusions and other micro defects, occurs at 10⁷ cycles or more, a value considered the conventional fatigue limit.

An ultrasonic fatigue testing system is extremely effective when performing this sort of gigacycle fatigue test. (With a 100 Hz fatigue testing system, this would take 3 years, but if a 20 kHz ultrasonic fatigue testing system is used, testing can be completed in one week.)

Main Specifications

1) Test Frequency: 20 kHz ± 500 Hz

- The recommended test range is 20 kHz ± 30 Hz.
- The test frequency is determined by the resonance frequency of the sample.

2) Horn End Face Amplitude

Min. approx. ±10 μm

Max. approx. ±50 μm

- The minimum and maximum amplitudes are the end face amplitude values at amplitude outputs of 20 % and 100 % respectively. Accordingly, the minimum and maximum amplitude values will change somewhat depending on the shape of the sample.

3) Test Stress

Standard circular tapered sample

Stress Min. 237 MPa

Max. 1186 MPa

- The test stress range can be changed by changing the sample shape.
- The minimum and maximum values are calculated with the end face amplitude values of 10 μm and 50 μm respectively.
- These are the values when the stress is within the elasticity range.

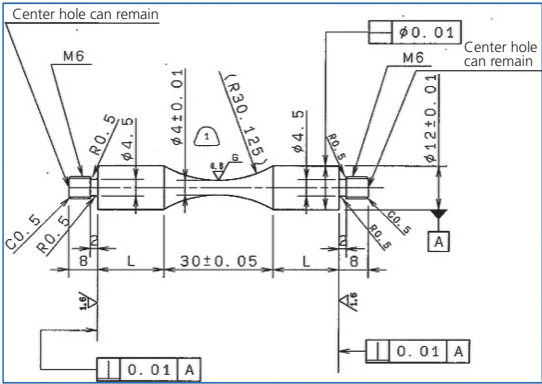
4) Average Stress

Max. 1.5 kN (tensile only)

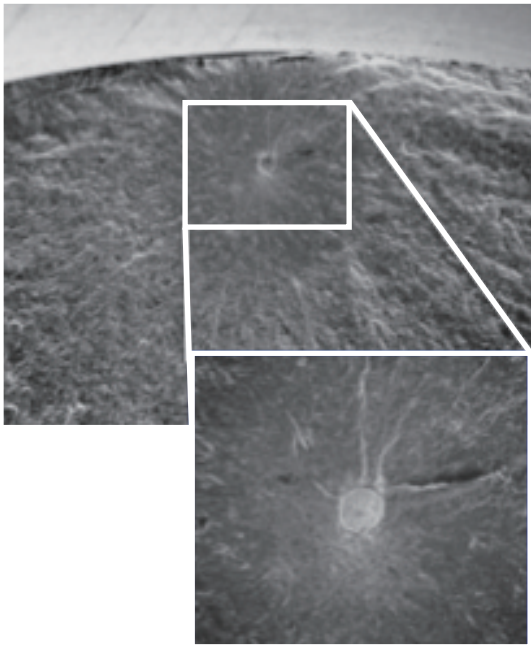
- Average stress loads exceeding 1.5 kN are possible, but will have an impact on the service life of the horn.

Components

1	Ultrasonic resonance system Power supply, converter, booster (1 pair), horn (1 pair)
2	Personal computer (OS Windows 7) ADA/PIO interface board
3	Software Ultrasonic test control measurement software
4	Cooling system Air dryer, air piping • A separate 140 L/min air source is required.
5	Strain meter unit (option)
6	AG-X plus Autograph 5 kN + 250 extension
7	Average stress loading mechanism



Standard Circular Tapered Sample



Surface of the Fatigued Fracture Originating from the Inclusion



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