VERY HIGH CYCLE FATIGUE TESTING MACHINES

MEG 20 & MEG 20 TT

Range Overview

The MEG 20 range is designed for **Very High Cycle Fatigue testing** on metallic alloy specimens at an operating loading frequency of **20 kHz ± 0.5 kHz**.

The range includes:

- **MEG 20**: VHCF tabletop solution for fully reversed stress testing.
- **MEG 20 TT**: VHCF solution for fully reversed and fluctuating tests, integrating a 20 kN SYNTAX testing frame.

MEG 20

Purpose

The MEG 20 is designed to perform very high cycle fatigue tests up to the billion-cycle range in a short testing time, with a tabletop machine requiring no specific civil engineering structure.

It is intended to reduce material development testing time and investigate the endurance limits of technical metallic materials.

Technical Specifications — VHCF Control and Actuator

- Operating loading frequency: **20 kHz ± 0.5 kHz**.
- Specimen material: **metallic alloy**.
- Loading ratio: R -1 fully reversed stress.
- Crack detection or stop criteria:
  - resonance frequency outside **[19.5 ; 20.5 kHz]**;
  - or demanded maximum number of cycles reached.
- Testing environment: laboratory air.
- Air cooling of the specimen by air gun included in the basic package.
- Air pressure manometer and air flow adjustment device included.
- Control system by shuttle fanless computer integrated in the **GreyBox**.
- **MEG20 VibraBoost** series booster with ratio adapted to the application.
- **MEG20 BladeHorn+**: long-life titanium alloy horn with specific geometry.

Power and Air Requirements

- Electric supply: 220 VAC, 50–60 Hz, 16 A.
- Converter cooling: dry air flow at 2 bar maximum.
- Air gun: dry air flow at 7.5 bar maximum.
- Maximum air flow: 60 m^3/h.

Note: dry compressed air without oil must be available in the laboratory. It is not included in the offer.

MEG 20 TT

Purpose

The MEG 20 TT is designed for **fully reversed and fluctuating tests**.

It is presented as a solution to determine a complete Wohler curve on metallic materials, from **R -1 tests** up to **20 kN preloaded fluctuating tests**.

Technical Specifications — VHCF Control and Actuator

- Operating loading frequency: **20 kHz ± 0.5 kHz**.
- Specimen material: **metallic alloy**.
- Loading ratio: R -1 fully reversed stress.
- Crack detection or stop criteria:
  - resonance frequency outside **[19.5 ; 20.5 kHz]**;
  - or demanded maximum number of cycles reached.
- Testing environment: laboratory air.
- Air cooling of the specimen by air gun included in the basic package.
- Air pressure manometer and air flow adjustment device included.
- Control system by shuttle fanless computer integrated in the **GreyBox**.
- 1 pair of **MEG20TT TitanBoost** series boosters with ratio adapted to the application.
- 1 pair of **MEG20TT BladeHorn+**: long-life titanium alloy horns with specific geometry.

SYNTAX Testing Frame and Controller

- Nominal load: **20 kN**.
- High-stiffness twin guiding column frame.
- 2 play-free ball screws.
- Hybrid transmission with high-stiffness reinforced belt and high-performance planetary gearbox.
- Specific preloaded bearings:

- high stiffness;
- high lifetime;
- no maintenance.

- Vertical daylight up to **1230 mm** for testing with temperature chamber, furnaces or corrosion tank.

Drive Unit and Controller

- DC servo motor with resolver.
- Minimum closed-loop speed control: **0.005 µm/s**.
- Crosshead positioning resolution:
  - screen reading resolution: **0.1 µm**;
  - exact resolver step: **0.06 µm**.
- Synchronous measurement channels.
- Adjustable acquisition up to **300 Hz**.
- Closed-loop direct control mode.
- Direct servo torque and speed.
- Control frequency: **1000 Hz**.
- Power supply: 230 V single-phase + T.
- Intuitive remote control with LCD display and adjustable speed drive.
- Cooling fan.

I/O Configuration

- Main load cell channel:
  - force measurement;
  - 10,000,000 steps resolution;
  - HBM U10M 25 kN high-stiffness model;
  - resolution: **0.0025 N**.
- Available slots for connection of 2 cards to secondary inputs.
- Additional input for standard or high-definition force cell.
- Automatic recognition.
- Class 0.5 according to **ISO 7500-1** and **ASTM E4** from 0.2% of maximum load.
- Channels for:
  - sensor gauge;
  - LVDT signal SSI;

- incremental encoder;
- incremental rule;
- TEDDS automatic recognition.

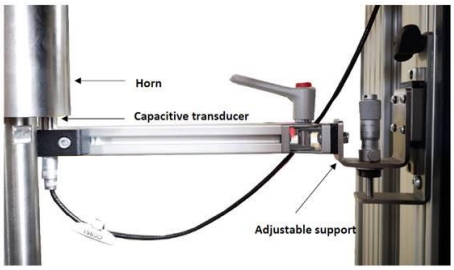
- Serial link for mono or bi-camera video extensometer.
- Possible connection of external multi-channel modules:
  - gauges;
  - LVDT;
  - HBM acquisition modules or equivalent;
  - contactless laser measurement;
  - thermocouples;
  - inputs and outputs -10 V / +10 V.
- SYNTI/O box with 8 analogue input or output channels.

Ergonomics and Protection

- Wide daylight to receive useful testing accessories.
- Easy front-end handling by pallet truck or forklift.
- Ergonomic base, with pedestal modification possible on request.
- Front opening protective door:
  - aluminium frame;
  - polycarbonate window;
  - rear panel.
- Opening sensor.
- Shunt key to use the machine without protective shield.
- Inside LED ring around upper horn.

Displacement and Stress Measurement Kit

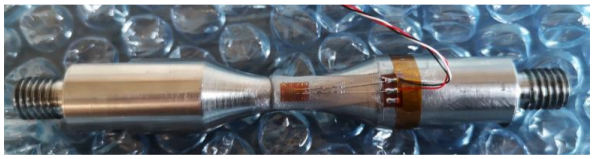
Displacement Sensors



For MEG 20, only one displacement sensor is needed.

- Capacitive sensor with signal conditioning board integrated in the GreyBox.
- Average distance measurement from specimen to sensor.
- Displacement amplitude measurement.
- Real measured frequency from upper or lower sensor.
- Real-time displacement through BNC connector on the GreyBox front panel.

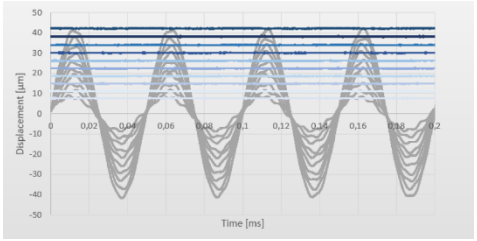
Gauge Data Acquisition



- 2 gauge channels available.
- Mean stress preload from first channel.
- Stress amplitude from first channel.
- Real-time strain for each channel.
- BNC connector on the front of the controller.

Oscilloscope and Real-Time Acquisition

- Integrated oscilloscope in the GreyBox.
- Possibility to connect directly from analogue outputs on the GreyBox front panel or from other devices.
- 4 analogue inputs.
- User-selectable resolution: **12, 14 or 16 bits**.
- Maximum sampling rate:
  - 50 MHz at 12 bit;
  - 3.125 MHz at 14 bit;
  - 195.3 kHz at 16 bit.



- Adjustable full-scale range.
- Trigger function for recording over a predetermined period.

Measurement Pack Content

MEG 20 Measurement Pack

- 3 measurement channels for displacement sensor:
  - distance between sensor and specimen;
  - amplitude measurement;
  - real frequency measurement.
- 1 displacement sensor with positioning swivel.
- 2 gauge instrumentation channels with plugs.
- Real-time strain.
- BNC connector on the GreyBox front panel for analogue real-time outputs.
- Analogue input with integrated oscilloscope and trigger functions for automatic data recording.

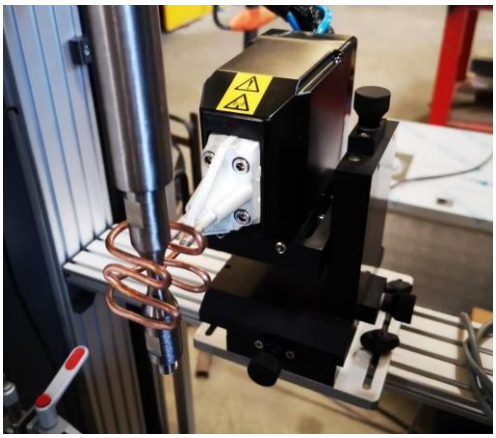
MEG 20 TT Measurement Pack

- 5 measurement channels for displacement sensors:
  - distance between sensors and specimen;
  - amplitude measurement;
  - real frequency measurement.
- 2 displacement sensors with positioning swivels.
- 2 gauge instrumentation channels with plugs.
- Real-time strain.
- BNC connector on the GreyBox front panel for analogue real-time outputs.
- Analogue input with integrated oscilloscope and trigger functions for automatic data recording.

Heating Module

The heating module allows testing from ambient temperature up to **900 °C – 1000 °C**, depending on the environment, specimen dimensions and material.

Heating System



- High-frequency induction generator.
- Power consumption: **5.6 kW**.
- Frequency range: **750 kHz – 1150 kHz**.
- Power supply: **230 Vac mono, 50/60 Hz**.
- Cooling device included on the heating head:
  - pressure: **300 kPa**;
  - flow: **1.5–2.0 l/min**.
- Specific VHCF heating head with cooling.
- Customized for VHCF.

Rods and Grips

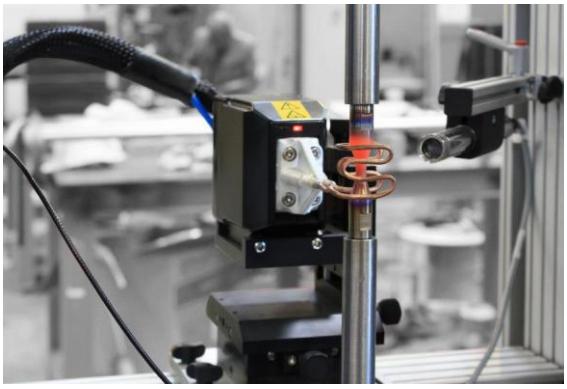
- Titanium specific rods, machined and calibrated for resonance up to **630 °C**.
- Other rods designed with different materials on request for further temperature range.
- Other grips available to match different specimen geometries.

Cooling Group

- Pressure: 3.3 bar.
- Flow rate: 12.9 l/min.
- Power: 2.7 kW.
- Power supply: 230 Vac mono, 50 Hz.
- Central closed-loop control/regulation.
- Power supply: 230 Vac mono, 50/60 Hz.
- Power: 60 W.

Temperature Sensor

- Laser pyrometer with support and lens.
- Direct connection with heating controller.
- Range: **120 °C to 900 °C**.
- Resolution: **0.1 °C**.
- Emissivity setting: **0.1 to 1**.
- Accuracy: **±0.3% of reading in °C**.
- LED pointer for focal length adjustment.
- Calibration certificate included.



Support

- Mechanical support on the machine.
- Vertical positioning device with set-up device for centering on the specimen.
- Swivel mechanism to leave the test position and free the daylight for ambient tests.

VHCF & Synt'X Software for MEG 20 TT

- Easy-to-use ergonomic main control panel.
- Settings by cycling sequences.
- Pulse-stop mode.
- RMS displacement and stress amplitude visualization.
- Mean stress amplitude visualization.
- Cycle counting and real excitation frequency.
- Specimen failure detection.
- VHCF cycle and load step setup.
- Gauge data acquisition setup.
- Multi-curve graph during test.
- Direct data visualization of VHCF frequency, load and actuator power.

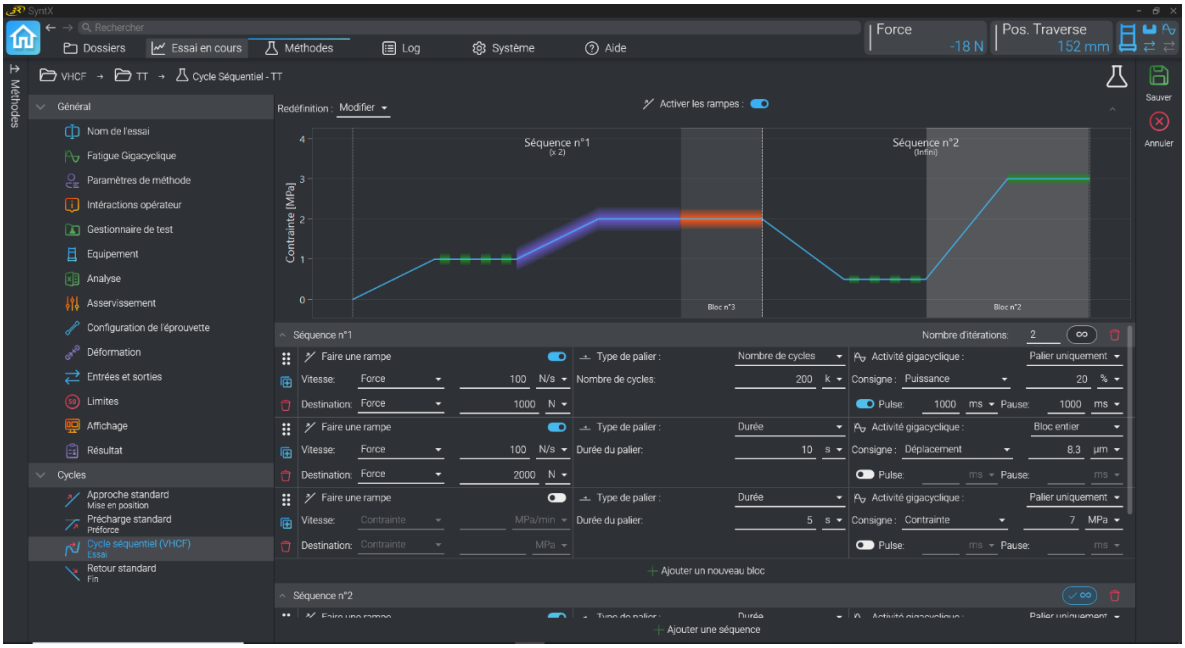


Figure 1 : VHCF cycle and load steps setup

Figure 2 : Multi-curves graph during test (hereunder load and power signal of the actuator)

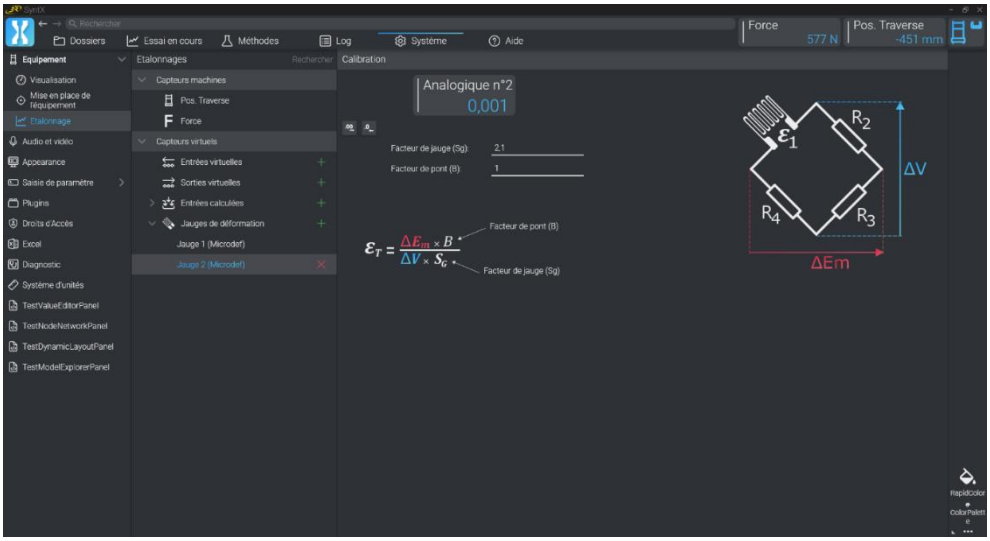


Figure 3 : Gage data acquisition setup

Figure 4 : Direct data visualisation on the upper channels and on the graph (frequency of VHCF, load and power on the actuator)