Universal testing Machines
Fatigue Servo-Hydraulic
EFH Series
Range 300kN

MICROTEST

MICROTEST, S.A.
Instruments and Equipments for Materials Testing
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MICROTEST EFH Series

MICROTEST EH Series are Universal hydraulic servo-controlled machines from 20kN to 2000kN capacity, computer controlled, to perform static tensile tests on metallic materials.

EFH machines basically consist of:

- Strong loading frame with a reading strain gage load cell built into the piston
- Computer Controlled System SCM3000 and software, for the data acquisition, control and processing.
- Hydraulic Power Pack: adapted to the users specific needs: range of force, speed, stroke, type of control, etc. The whole is built in a console.

The frame is designed to carry out tensile tests using the grips placed in the clamping heads. In the upper part, between the head and traverse,

It is possible to carry out flexion, compression, bending, hardness, dishing tests, according to the International Standards by using the suitable (see accessories) devices.

The hydraulic servo-controlled unit regulates the load or the displacement rate by the Computer.

An emergency device stops the machine in any moment as per the International Safety Standards.

A control panel situated on the frame governs the movement of the lower tensile head (typical excursion 0÷300mm with electric end of stroke switches) for an easier positioning of the specimen according to its length.

The machine is supplied complete with loading frame, control system SCM3000 and hydraulic power unit.

The extensometers, the grips and the printer are options and should be ordered separately according to the needs of the user.
The EFH testing machines include one or more force transducers (load cell) that provide better precision measurement of the applied force than pressure transducers or gages used in traditional hydraulic systems. In this way the force measurement is not affected by oil temperature, local disturbances caused by the oil flow, friction in the load cylinder, etc.

The test speed and the position can be digitally controlled and measured by means of a linear displacement transducer in the actuator axis obtaining a high precision controlled movement.

**EFH MACHINES FLEXIBILITY**

The EFH machines flexibility is further extended by a wide array of accessories instrumentation, grips and fixtures to perform all kind of test with the higher efficiency. These accessories include LVDT extensometers, compress-meters, strain gage extensometers, high temperature extensometers, as well as grips, holders, jigs or platens for holding the test specimens. They can also be delivered with special testing equipment as high temperature furnaces, climatic chambers, etc.

MICROTTEST can provide a great variety of grips and accessories, depending on the material or test. Among others:

- Compression platens.
- Pneumatic, hydraulic or manual grips for tensile tests with different jaws.
- Bend fixtures.
- Other test fixtures (shear, friction, tear, peel, etc)
- Extensometers, furnaces, climatic chambers, etc.
This flexibility makes EFH machines very suitable in most of the standardized axial tests, where the force to be applied is under the load capacity of the machine, in tensile test or compression tests in the same single test zone.

Among others, with the suitable fixture, the following tests can be done:

- Tensile tests on metal samples: standard shapes, ribbons, springs, screws, fasteners, washers, wires, cables, elastomeric samples, etc.
- Corrosion under tension tests.
- Tensile tests on standardized steel samples.
- Tensile, shear or bending tests on aluminum samples or profiles.
- Compression tests on concrete, mortars, ceramics, foams, wood, rocks, etc.
- Friction tests, peel tests, shear, etc.
- Bending tests on metals, mortars, concrete, ceramics, wood, paving tiles, etc.

Do not hesitate to contact us to consult any need about your tests.
EFH / 300 LOADING FRAMES

- EFH/300kN is an axial servo-hydraulic precision aligned two column load frame with hydraulic lifting system for the adjustable upper crosshead and hydraulic-mechanical clamping system to lock it on the chromed guiding columns at the desired height. The lower base plate is fixed.
- Hydraulic lifts and locks for adjusting the crosshead height. The position control of the upper crosshead is adjustable by means of two built in hydraulic lifts and commanded electrically. The EFH load frame is floor mounted with a fixed lower base plate and can feature the actuator in either the lower table (base mounted) or the upper crosshead. In this proposal the hydraulic actuator is upper crosshead mounted. For the measurement of the force, the load cell is mounted on the upper crosshead.
- Maximum fatigue rated capacity +/-300kN: The frame is capable of testing in both tensile and compressive modes. The high stiffness, minimum 600kN/mm, of the proposed frame makes it also suitable for higher fatigue forces. In this proposal, the hydraulic fatigue actuator is limited to 300kN forces, but the frame is designed for higher forces.
- Test that can be carried out: Tensile; Compressive; Shear test; Fatigue test; Flexural test; Fracture test, etc.
- The load is applied by means of an integral axial Servo-hydraulic Dynamic System with a hydraulic actuator mounted in the upper crosshead of the loading frame.
- Calibrated for full range.

Figure shows an EFH frame with climatic chamber

The frame has the typical following specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic Capacity</td>
<td>±300 kN</td>
</tr>
<tr>
<td>Typ. Actuator stroke</td>
<td>±75 mm; ±100 mm (other under request)</td>
</tr>
<tr>
<td>No. of columns</td>
<td>2</td>
</tr>
<tr>
<td>Frame stiffness</td>
<td>600 kN/mm</td>
</tr>
<tr>
<td>Maximum vertical test space between crosshead and the base:</td>
<td>Adapted to customer specifications From 700 to 2000 mm</td>
</tr>
<tr>
<td>Minimum space between crosshead and the base:</td>
<td>Typically 50 mm</td>
</tr>
<tr>
<td>Horizontal daylight, width between columns</td>
<td>Adapted to customer specifications From 400 to 800 mm</td>
</tr>
<tr>
<td>Total crosshead travel</td>
<td>Adapted to customer specifications From 700 to 2000 mm</td>
</tr>
<tr>
<td>Height (variable and according to crosshead travel)</td>
<td>2000mm to 3750mm</td>
</tr>
<tr>
<td>Global frame Width</td>
<td>1200mm-1400mm</td>
</tr>
<tr>
<td>Depth</td>
<td>700mm</td>
</tr>
</tbody>
</table>
EFH frame series are ideal for a variety of tests like tension compression flex/bend fatigue (low cycle fatigue / high cycle fatigue / fatigue crack propagation, fracture mechanics, damping properties and vibration testing.

Test area guard to protect the user and an emergency stop to shuts off hydraulics are part of the security elements.
The system is free standing for installation on a standard concrete floor without requiring any special foundations
Isolation mounts are provided for fatigue testing.

SERVO ACTUATOR

CH-9 300kN C-150 .-200 Hydrostatic Bearing Actuator

The axial hydrostatic bearing servo-actuator SERVOSIS CH-9 300kN C-150 or C-200 has a capacity of ±250 kN force with maximum input supply pressure of 207 bar and a maximum capacity of ±300 kN with maximum input supply pressure.

Double action, double piston rod. The typical stroke of the actuator is ±75 mm (total 150mm) or ±100mm (total 200mm). Other under request.
The actuator is a double ended, equal area constructed actuator to generate equal axial force in tension and compression with hydrostatic bearings.

The hydrostatic bearings provide extremely low friction for the most accurate control and longest reliable lifetime at full ratings.
A precision displacement LVDT transducer or a digital position transducer is integrated in the actuator, co-axially mounted. Typically it is a contactless type MTS Temposonics. Resolution: 19 bits.
Power supply: 24 Vdc.

Designed for operation under high dynamic fatigue admitting frequencies up to 100 Hz.
Cylinder and piston are ceramic coated and high fine polished to reduce friction. Hydrodynamics Technology (without seals) with continuous oil flow and double drain front and rear bearings, guaranteeing a very low coefficient of friction and long life with very low maintenance.
- Hollow rear rod and weight lightened moving parts to reduce inertia.
- Frontal flange attachment.
P/T accumulators (to avoid or minimized the hydraulic pressure fluctuations attachment, etc).

Servo Valve

The system has closed loop servo control. The servo valve has a flow rate depending on the required specifications, adapted to the customer requirements.
Typically EFH/300 uses a MOOG 64 L/min servo valve with an operating pressure of 207 bar.
The hydraulic servovalve manifold is coupled to the servo-cylinder body and mounts a high response servovalve MOOG series G761-3005 of 64 l/min rated flow for high cycle fatigue tests and low-cycle fatigue
Universal Testing Machines Servo-hydraulic EFH Series, EFH/300kN

tests. Provision is made to manually shut off the servovalve.
Manifold houses all of piping in the actuator, removing the need for most of the exterior piping.
- 2-stage design with nozzle flapper pilot stage and mechanical feedback offers high dynamics, high resolution and low hysteresis. Control signal ±20mA.
- High spool driving forces, rugged design ensures long-life operation
- Compact design allows applications with limited footprint.

HYDRAULIC POWER UNIT
- The system is provided with suitable hydraulic power supply unit complete with constant pressure control (207 bar) system.
- Typical Flow rating of 67 l/min and operating pressure at 210 bar (3000 psi).
- Output pressure: fully adjustable, user selectable.
- Constant pressure control 207 bar, with pressure gauge.
- A relief valve, factory adjusted, is provided to limit the system pressure
- Reservoir capacity is 400 l.
- Pressure and Return filtration 2 micron.
- 240 bar (3336 psi) maximum output pressure
- Incoming electrical power will be 415 VAC, 3 PH, 50 HZ
- Water cooled system is provided. The HPU will have facility for highly efficient water cooling accommodating water inlet temperatures of up to at least 25°C.
- Remote air-blast cooling unit is available for installation when water cooling is not desirable.

A compatible hydraulic power pack unit CHH/210/67/400, 210 bar (3000psi), 67 l/min provides the pressure and flow rating for the machine. This hydraulic power unit utilizes submerged variable displacement pump unit for maximal electrical efficiency and has protection against different events.
Electric motor to efficiency class 1, Star-Delta starting.
The specifications and capacity are determined by the dynamic requirements of the machine: max. speed of the actuator, forces (300kN), etc. The nominal power for the main motor of this unit is approx. 30kW. The hydraulic power unit has also a heat exchanger system to avoid overheating of the oil. The reservoir tank of the unit has a capacity of about 250 l. The required electrical power for the whole unit is about 40kW, 415Vac, 3 phases, 50Hz+ neutral + ground.
With protection devices for oil temperature, oil pressure, oil level, oil filter condition and motor temperature. Off-line cooling and filtration systems.

System management: A PLC power pack control system with digital display is used to control the hydraulic power unit functions, digital display of oil pressure, oil alarm level and oil temperature, other alarms, controls, etc. The information from the hydraulic unit is also displayed and commanded in the main computer.
This PLC allows the choice of local control (at HPU) or remote control from the machine computer. The maximum pressure can be regulated by the user in order to provide a limit for the applied force, when needed, as security element. The unit disposes of electrical system for command and Pump Start, Pump Stop and Emergency Stop buttons. The unit provides input and output information to the control and measurement unit: state of the input/output signal, activation of electro-valves, alarms, etc. The unit has trip circuits to shut the pump down in the event of high oil temperature and low oil level. It disposes of local or remote Start/Stop functionality
Illuminated trips for:
- Filter blocked.
- Low oil level.
- High oil temperature.
- Abnormal voltage

This information is also displayed in the PC through the SCM4000 software.

Water cooled heat exchanger is used. The integrated cooling water system and hydraulic accumulator (minimum 1 liter) keep hydraulic fluid temperature and pressure uniform for peak system performance. Interlock circuits turn the unit off if the level gets too low or its temperature too high. Easy-to-read gauges let the user monitor fluid pressure, level and temperature.

**HPU Typical Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservoir capacity</td>
<td>400 l</td>
</tr>
<tr>
<td>Flow rate at 210bar (l/min)</td>
<td>67 l/min</td>
</tr>
<tr>
<td>Pump Motor</td>
<td>30W, 1500rpm</td>
</tr>
<tr>
<td>Starter: 3 phase,</td>
<td>Line Voltage required 415Vac,</td>
</tr>
<tr>
<td>(Optional voltages and frequencies)</td>
<td>3 phase, 50Hz+N+G</td>
</tr>
<tr>
<td>Pump Type</td>
<td>Variable displacement</td>
</tr>
<tr>
<td>Cooling system (**)</td>
<td>According to requirements</td>
</tr>
<tr>
<td>Output accumulator</td>
<td>According to requirements</td>
</tr>
<tr>
<td>Dimensions (LxWxH)</td>
<td>Under requirements according the size of the unit (TBD)</td>
</tr>
<tr>
<td>Hydraulic Hose Connection</td>
<td>Pressure, Return and Drain connections. 2 outputs.</td>
</tr>
<tr>
<td>Hydraulic Fluid</td>
<td>Mobil DTE 25, Shell Tellus 46 AW.</td>
</tr>
<tr>
<td>Ambient Operating Temperature</td>
<td>15°C to 40°C</td>
</tr>
</tbody>
</table>

(*)Startup (or surge) current may be as much as 6 time the continuous rating. Electrical circuits should be sized accordingly and must conform to local electrical codes.

**FORCE TRANS_KEYWORDER:** ±300 kN Load Cell

The load cell is completely compatible with the system components and it includes an integral accelerometer for inertial mass effect compensation.

Fatigue rated axial load cell ±300kN capacity with an overload capacity of 300% of the rated load.

- **MICROTEST PB2/500-300** low profile fatigue rated load cell, Tension and compression ±300kN fatigue capacity (rated load). Overload capacity 300% of the rated load.

- Temperature compensated strain gages (-10°C to 80°C), with high signal-to-noise ratio.
- Performance to static error band (nonlinearity, hysteresis): < 0.1% F.E.
- Low moment sensitivity.
- Low deflection: higher fatigue life
- 0.0015%/°C temp. effect on output
- Tension and compression
- Overload capacity: 150% static capacity, 300% dynamic capacity.
- Fatigue life in excess of 10⁶ full stress reversed cycles.
- Calibration error: Calibration to class 0.5 down to 1% of full scale
PB2 load cells for dynamic applications include a miniature accelerometer installed in the centre of the load cell system, in the load axis, to compensate the error due to inertia forces caused by the attached mass. The range of compensation is from 0 to 200Hz, covering the majority of cases in servo-hydraulic testing systems. Amplitude and phase inertial errors can be compensated. A procedure for compensation configuration is included in software SCM4000 when used with MOOG PTC System. Automatic transducer recognition with proposed control system and SCM4000 software.

CONTROL AND DATA ACQUISITION SYSTEM: CONTROL ELECTRONICS

Digital Controller MICROTEST SCM 4000 –MOOG PTC system: control, measurement, acquisition

The Control Unit has a controller and signal conditioning modules for the control of position and load.

Digital controller with computer control Features

UTM Machine will perform in load controlled, strain controlled and displacement controlled mode. The system control is from the PC via the built-in computer interface but the controller disposes also of a frontal operator panel to provide additional and supplementary manual user interface to the controller.

Real time control function like loop closure of data acquisition, command signal generation, and signal conditioning. Emergency stop button, upper lower limit switches included.

Transducer conditioners for stroke control, load control and strain control and be a full range design.

Controller & Interface software have the typical functions associated with setting up limits, sensor selection, valve tuning and set up, error detects, status display and digital displays of sensor output.

Safety features with over travel protection.

Function generation of monotonic ramps and cyclic waveforms using sine, square and triangular shapes, etc. Auto-zero, bump-less start, hydraulics on mode switching, ability to save and restore PID tuning settings.

Adaptive control system with adaptive controls compensation: Peak-valley and null placing and overall accuracy of the test systems better than 1% which is a combination of actuator, controller and servo valve and HPU. The adaptive controller automatically updates the control loop terms to compensate for changes in stiffness during testing. This facility run at 1kHz adaptive control for amplitude and phase. Controller provides adaptive PID gain control, limit and event detectors and system trips. It is possible to generate ramp, triangular, trapezoidal and any other complicated waveforms.

MICROTEST SCM 4000 System with MOOG PTC and MICROTEST SCM4000/m software

- Fully Digital real time control loop 32 bits with synchronized data acquisition and with function generation to drive the actuator with system update rate of 10kHz.
- Includes the necessary transducer conditioning for load (extensometric force transducer), displacement (for LVDT or SSI input), strain channels (extensometric or analog ±10V). 24 bits conditioning units for conducting fatigue tests, in closed loop load and strain control modes with a minimum data acquisition rate of at least 10 kHz.
- Multichannel system: 4 channels x 2 high resolution analog inputs/channel
- PID terms are updated at a rate of at least 1kHz.
- Controller has at least one analogue input for an analogue waveform drive signal and at least six assignable analogue outputs.
- Full reverse-stress dynamic testing capability in tension and compression
- Specimen protection features
- Automatic servo valve null adjustment is provided.
- Servo valve limits are provided with independent settings for low and high pressure modes.

The **MOOG Portable Test Controller** is a 1-4 channel stand-alone digital servo-controller that has been carefully designed based on input from users to meet the demanding needs of automotive testing. It can be used for manual control, constant amplitude tests and high performance handling of complex testing formulas. It incorporates a unique force loop technology for force, displacement and acceleration control to handle general purpose testing with or without a PC. The controller can be operated by PC, hardware panel or both. It is ideal for either replacement or upgrade to digital control, as users can just plug it in and be ready to run without offline external software. PC interface to controller is through Ethernet. Appropriate configuration PC will be supplied. It operates on Windows based OS. The controller is capable of being operated by a personal computer or hardware panel or both. The user is able to select a preferred units system, through software; SI, Metric and US Customary are provided. The selection (configuration) will be persistent through power-down.

The system has necessary safety features & interlocks (see later). The control electronics is able of performing diagnostic tests during power up and report and define any faults found. The controller has a communications watchdog to detect loss of communication with the personal computer and operator panel. In the event of communications loss, the controller reverts to a safe state.

**Advantages**

- High performance operation due to Moog unique force loop technology for faster and more efficient testing and reduced set-up times
- Dual mode, bumpless switching allows test labs to take advantage of the full range of the application. Bumpless transfer from one control mode to another is possible. Test interruption facilities are included, allowing the tests to be intermittently stopped and re-started. This facility allows the test to be paused on completion of the current cycle, the specimen ramped to zero load and the temperature reduced to ambient, while maintaining zero load.
- Matrix Control provides measurement and control flexibility for more efficient testing.
- Flexible features such as ability to run with or without a PC offer user-friendly operation in a range of testing applications
- Proven controller reliability with more than 5,000 control channels installed (MOOG) and used daily in test labs around the world.
**Universal Testing Machines Servo-hydraulic EFH Series, EFH/300kN**

**Features**
- Advanced control that is expandable up to four channels
- A portable and standalone test controller
- Unique control loops (e.g. force, displacement and acceleration) for faster and more efficient testing and reduced set-up time
- Simple operation that allows you to add just the functionality you need for cost-effective integration
- Built-in data-acquisition, integrated oscilloscope display and data storage capability on a local hard-disk, make testing easier and save both lab space and running costs
- Flexibility with any hydraulic, electric or pneumatic actuators
- Plug and play with all connectors for cost-effective, immediate integration.
- Pseudo channels capability allowing the user to create online calculated channels using formulas and other inputs, offering greater flexibility and cost savings for the lab. The controller is able to control any close loop from any concerned, calibrated available transducer, i.e. position, load or strain control, as well as derivatives of these such as stress intensity and plastic strain.
- Matrix control provides measurement and control flexibility for more efficient testing
- Bumpless switching (e.g. Force, Position) to take advantage of the full range of application
- Scripting for digital and analog I/O as well as limits and peak detectors makes set up and running of tests easier
- Online adaptive controls for amplitude and phase saves set-up time
- Calibration and tuning wizard to facilitate and accelerate setup.
- Expandable to 32 channels test controller version, using multiple units.

**Housing**
- Expandable: it can contain up to 4 channels (for 4 axis) in the same housing.
- Desktop or 19” rack mountable 450 x 177 x 280 mm (17.7 x 6.9 x 11.0 in)
- Weight 9.2 kg (20.3 lb)
- Integrated 640 x 480 full VGA color display
- Input voltage: 90-132/180-264 VAC; 47-63 Hz; 10A@115V, 5 A@230V,400VA
- 2 x 2 A @24 V Low/High Solenoid output

**Servo controller**
- Up to 2.5 kHz multi channel or up to 10 kHz single channel control loop (software selectable)
- Moog unique control loop
- Three feedback control possibilities (Force, Position (and strain), Acceleration)
- Bumpless instant mode switching between force (or strain) and position mode.

**Function generation**
- Frequency range (wave form): 0.01 to 500 Hz (1kHz with external input generator) accuracy ≤0.01%
- 32 bit Internal Multi-channel function generation with user defined “mixer” functions (e.g. mix a low frequency offset with a higher frequency load)  
- Waveforms: sine, sawtooth or triangle, block/square, ramp, rounded ramp, Exponential, $\sin^2(\theta/2)$, etc .
- These waveforms are available too on the control panel in absence of a computer  
- Analog input can be used as command
- Complex simulation spectrum support including spectral density (psd frequency definition)
- Constant amplitude and phase matching
- A cycle counter is available and able to display elapsed and total cycles.

**Standard Inputs (per channel)**
- 2x high resolution (0.03 %) with selectable gain and bridge excitation.
- Pot meter input (0.03 %) (± V 5 mA) or LVDT input (0.03 %) with LVDT excitation

**Standard Outputs (per channel)**
- 16 bits ± 100 mA valve driver output, with a limit in software from 0 to 100 % or (hardware selectable) ± 10 V output
- 2x 16 bit D/ A converters, ± 10 V
- Manifold Control Unit with 4 On/Off Low/High pressure valves (24 VDC/2 A each)
- Digital I/O board containing 8 inputs and 8 outputs
- Add on board for 3-stage servovalve
- A servo valve dither facility is provided with a variable frequency and amplitude up to 10% of full scale drive signal. Servo valve automatically adjusted.
HARDWARE OPERATOR PANEL

Via computer touch screen and Handset fully compatible with console software. The console provides manual control and system status for at least one axis of control running tests in position, load or strain control without a computer; with setting of limits, setting of test waveforms and data displays. This touch screen console is provided to adjust actuators, start/stop test, turn hydraulics on/off, etc. at the load frame. This remote hand control unit provides manual control of crosshead positioning including a digital display of static and dynamic load as well as the static and dynamic stroke shall be provided. The operator panel provides system status information when using computer control. A cable connected handset can be provided with push buttons for easy actuator positioning. The hand set includes up/down movements and emergency button. This element is user enable from the console and remains in a non active state when test is running.

The controller has the capability of sample data playback via computer interface with a rate of at least 10kHz. Standard digital filters are available for sampled data playback adjustable by the user.

All the necessary cables for connecting the machine, controller, load frame, PC, transducers etc. with one another are included in the supply.

SIGNAL CONDITIONING NI COMPACTDAQ PLATFORM

The system is typically equipped with low noise, low drift, high accuracy signal conditioning. Separate tapping points are provided for acquiring signals such as load, strain and stroke. Each strain channel will provide for closed-loop control and data acquisition for one transducer, along with enabling transducer excitation. Transducer means or refers to strain gage bridge, LVDT or ± 10V BNC input. The system supports at least 2 main digital conditioning units: for voltage/current signals (up to 4 channels 24 bits) and four strain gage transducers (4 channels 24 bits).

Specifications:
The sampling rate is 50kHz.
Each signal conditioner has a resolution of 24 bits at 100 Hz bandwidth over full range of the transducer. Each signal conditioner have an accuracy of 0.25% of reading or a reading of 0.005 % of full scale (whichever is greater) or better. Position (stroke) accuracy is <± 0.5% of transducer full scale (typically better than 0.1%), or better, with the vendor supplied transducer.
Load cell accuracy will be < ± 0.5% of full scale.
Load cell Calibration will meet ISO7500 -1 class 0.5 &/or ASTM E4.
Strain accuracy is < ± 0.25% of full scale. Calibration will meet ISO9513 class 0.5,1,2; &/or ASTM E83. General calibration certificate will be provided.
The channel provides for automatic transducer recognition and calibration for transducers compatible with the test machine system.
The data logging is fully selectable at up to 10kHz per connected transducer. This logging rate is continuous as measured at the computer regardless of the number of transducers connected. Data acquisition on all channels is fully synchronous to avoid data skew. Logged data include a time and cycle ramp for each logged point. The controller has at least of two peak detectors per connected transducer, for measurement of minimum, maximum, mean and amplitude. The peak detectors updates at 10kHz. A memory of ultimate peak is provided which is user-reset.
ACCESSORIES

The EFH series machines flexibility is further extended by a wide array of accessories instrumentation, grips and fixtures to perform all kind of test with the higher efficiency. These accessories include various fatigue rated sensors, load cells, strain gage extensometers, LVDT extensometers, compressometers, high temperature extensometers, as well as grips, holders, jigs or platens for holding the test specimens. They can also be delivered with special testing equipment as high temperature furnaces, climatic chambers, etc.

MICROTEST can provide a great variety of grips and accessories, depending on the material or test: mechanical, pneumatic or hydraulic tensile grips, compression platens and anvils, bending fixtures, shear fixtures or specific grips or accessories for any type of test or material.