



## High-Pressure Corrosion Testing

### INTEGRATED SOLUTION FOR CORROSION TESTING OF MATERIALS

When selecting metallic or composite materials for transportation, biomedical and civil engineering applications, as well as materials for containing and transporting geothermal or nuclear energy, gas or oil, it is important to test for corrosion resistance. High pressure, high-temperature environments pose threats to metals, and some composites, resulting in increased possibility for corrosion and environment-assisted cracking, such as hydrogen embrittlement or stress corrosion. To meet corrosion testing needs, we offer an integrated solution in which Top Industrie provides the autoclaves and fixtures, and MTS provides the load frame and extensometers. This solution is ideal for gas corrosion testing, mixed flow gas testing, and evaluating the effects of atmospheric exposure to gases such as hydrogen, methane, carbon dioxide and syngas.

### TOP INDUSTRIE TAILOR-MADE AUTOCLAVES

Top Industrie offers a wide range of versatile autoclaves in various force capacities, with high-temperature, high pressure testing capabilities. For gas applications up to 200°C (392°F), an internal force sensor provides the real loading force and compensates for the friction coefficient and pressure effects, increasing measurement accuracy.

#### » CONFIGURATION OPTIONS

- Material options: MOC Stainless steel, 1.4571, 1.4980, alloy C276 and more
- Pressure range: 100 bar (1.5 kpsi) up to 500 bar (7.5 kpsi) for H<sub>2</sub>, and 1000 bar (15 kpsi) for other gases, fluids or liquids
- Temperature range: -20°C (-4°F) up to 400°C (752°F)
- Orientation: Vertical or radial
- Internal volume capacities: 2L / 6L / 14L / larger sizes up to 20L on request

#### » STANDARD FEATURES

- Accommodates gases, fluids or liquids: gas H<sub>2</sub>, CH<sub>4</sub>, CO<sub>2</sub>, mixed gases, syngas and more; corrosive liquids
- Double sealing with leakage collection
- Internal force sensor (gas applications up to 200°C or 392°F)
- External force sensor (liquid and high-temperature applications)
- Adapted fixing clips for many types of specimen
- Gas feeding skids up to 1000 bar (15 kpsi)
- Compatible with a large range of extensometers

#### » OPTIONS

- Oxygen and humidity control
- Heating jacket or electric shell heating source depending on required temperature
- Sapphire window to accommodate DIC camera
- Advanced crack monitoring options, such as DCPD and others
- Complete feeding gas unit including gas booster, vacuum pump, pressure control (The feeding unit can be manufactured in accordance with ATEX 2014/34/UE zone 2. The load frame is not ATEX-certified.)
- Safety equipment with appropriate gas detector
- Refilling tools that reduce gas volume for safety and economy
- Fixtures for standardized and typical specimen



Autoclave with optional optical quality glass window to accommodate non-contacting strain measurement solutions.

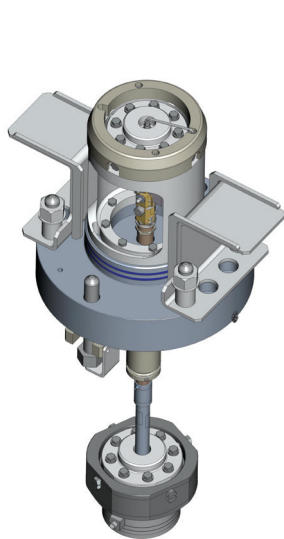
### MTS LANDMARK TEST SYSTEMS

From complex fatigue studies to standard tension and compression tests, MTS Landmark® servohydraulic test systems deliver accurate, repeatable results. Robustly manufactured with SureCoat® technology that extends actuator rod longevity 10x over conventionally chrome-plated rods, these systems will perform reliably for years.

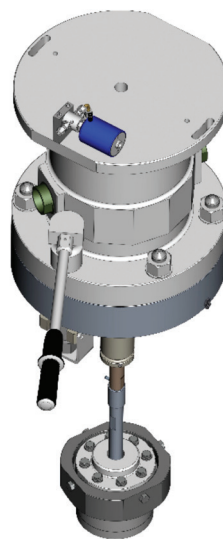
The MTS Landmark Test System provides the power and versatility to conduct the following test types in corrosion testing applications:

- » Fatigue & Fracture
- » Tension
- » Compression
- » Bend

Force range for typical corrosion testing applications: 5 kN to 100 kN (1 kip to 22 kip); more force capacity available on request.



Autoclave, cover up



Autoclave, cover down



Landmark Test System

## MTS EXTENSOMETERS

Many high-pressure corrosion testing applications require accurate strain measurement. MTS has large selection of contacting extensometers that can be used both for cryogenic and gaseous applications and a designated series for testing in high-pressure hydrogen gas environments.

Top Industrie autoclaves can be made with an optical quality glass window to accommodate MTS non-contacting strain measurement and digital image correlation (DIC) solutions if supported by the application.



Axial Tension & Compression Extensometer for Monotonic & Fatigue Applications



Clip-On Displacement Gages for Fracture Mechanics Applications



Non-Contacting Extensometer & DIC Solutions for Static, Fatigue & Fracture Applications

### APPLICABLE INDUSTRIES:

- » Geothermal energy
- » Nuclear energy
- » Gas & Oil
- » Automotive
- » Aerospace
- » Construction
- » Medical device

## SUPERIOR CONTROLS, SOFTWARE & DATA ACQUISITION

### Top Industrie Autoclave Supervision and Data Acquisition:

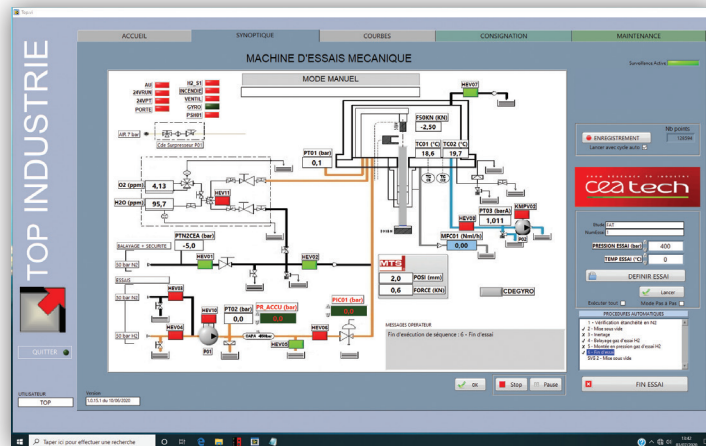
- » Control for pressure, flow, temperature
- » Process sequencer controls all steps for flushing, vacuum, gas filling and safety parameters
- » LabVIEW (National Instruments) data acquisition

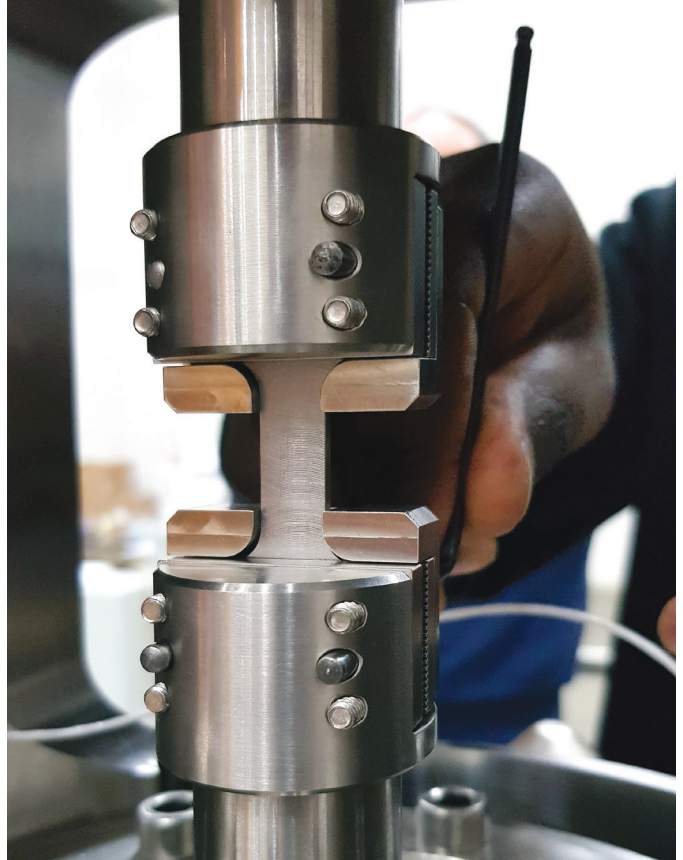
### MTS Landmark System Control:

- » MTS FlexTest® controller
- » MTS TestSuite™ MP software

## SERVICE & SUPPORT

Top Industrie will provide system integration, safety and CE compliance, and MTS can provide testing software training and load frame calibration and alignment.





## LEARN MORE ABOUT SOLUTIONS FOR YOUR APPLICATION

How a material behaves in a corrosive environment will determine whether it is a viable choice for its intended end use, especially in pressure-sensitive applications. Contact Top Industrie or MTS today to discuss options for testing material responses to gases, fluids and liquids in high-pressure, corrosive environments.



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