



HYDROSTEEL® 6500

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Hydrosteel® 6500

The world's first multipoint hydrogen flux corrosion monitor for easy, reliable measurement of flux in extreme environments.



Introduction

Since the year 2000, Hydrosteel® has been recognised as the simplest and most effective way to measure hydrogen flux (HF) through steel. HF measurement can be used to provide direct evidence of corrosion in near-real time. Unlike wall loss measurements, they are not limited by the resolution of pipe wall thickness. Flux also indicates corrosion to the actual service steel non-intrusively, unlike corrosion coupons.

At low temperatures, the flux is generated by corrosion involving hydrogen promoters, such as sour gas and HF. Flux provides a real-time indication of active sour corrosion and the risk of hydrogen induced cracking (HIC). At elevated temperatures, flux is associated with naphthenic acid corrosion.

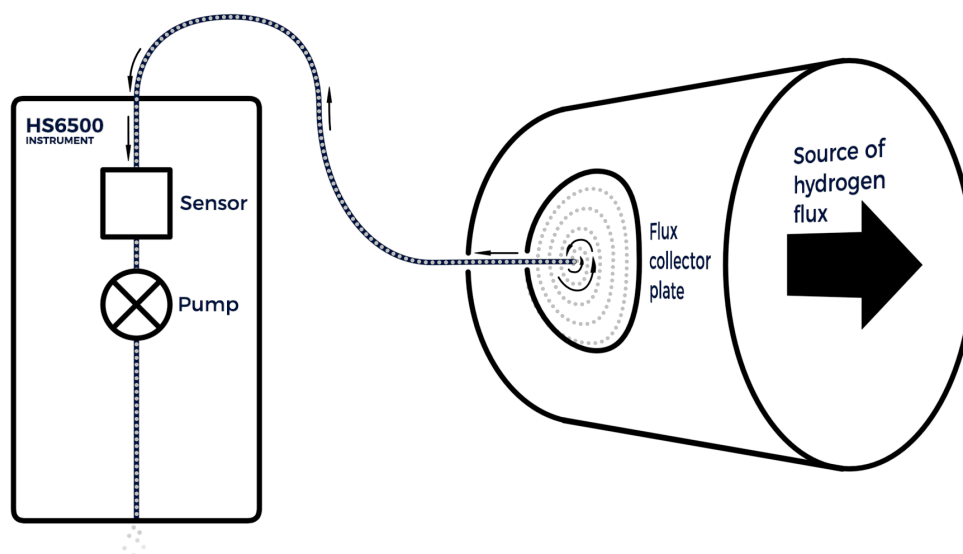
HF measurements determine the rate at which diffusible hydrogen escapes from steel, a factor that can lead to hydrogen damage. These measurements are used to monitor hydrogen outgassing following high-temperature steel processes, and to ensure sufficient hydrogen removal during pre-weld hydrogen bakeouts.

Key Features

- >> Patented Collection Probes**
Small and large patented roaming probes included as standard, suitable for steel of any curvature down to 3.5"
- >> Flexible Monitoring**
Four ports for sequential flux monitoring and multipoint measurements
- >> Long Battery Life**
Up to 70 hours of continuous battery-powered operation, or months at programmed intervals
- >> ATEX Certified and Intrinsically Safe**
Ensures peace of mind for operators in high risk environments



Hydrosteel operates by magnetically attaching a flexible metal plate to a pipe or vessel. Air is drawn between the plate underside and adjoining steel surface, capturing H₂ exiting the steel. The sample stream is passed over a hydrogen sensor. From the sample gas flow, capture surface area, and increased hydrogen gas concentration in the air, the hydrogen flux is calculated and displayed.



Hydrosteel 6500 delivers simplicity of measurement, alongside months of battery-operated monitoring capability. The four independent sample lines provide complete confidence in measurement integrity, enabling a detailed characterisation of the flux signature in a corrosion scenario and a thorough assessment of the effectiveness of corrosion mitigation measures.

The Hydrosteel 6500 comes with a new roaming probe design that delivers more reliable attachment and wider temperature tolerance. The Hydrosteel 6500 is designed to be used to monitor HF in steel across a range of applications and environments.

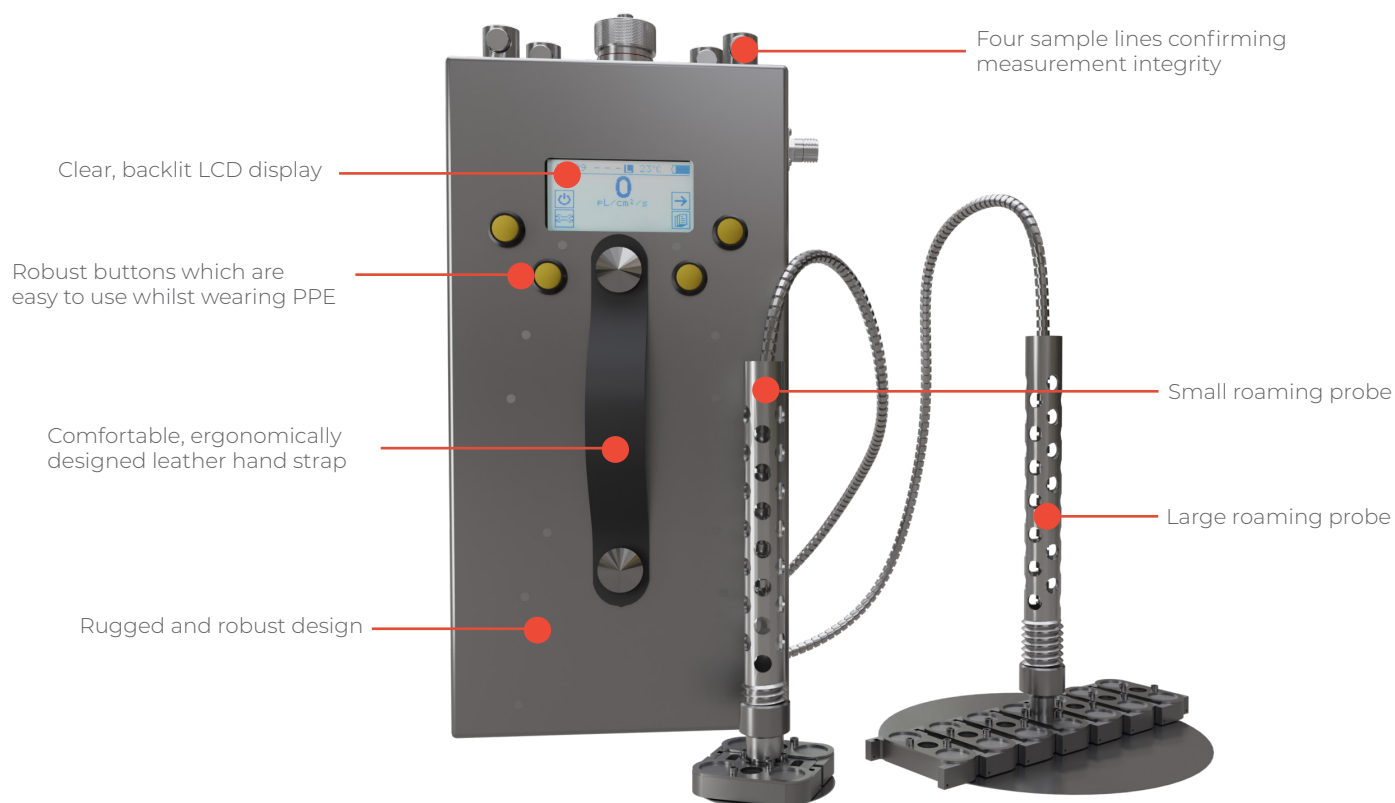
Additional Features

Hydrosteel is a ruggedised field instrument with programmable operation and data monitoring capabilities, ensuring reliable performance in demanding environments. It features a comfortable leather strap-supported carrying case, making it easy to transport and use in the field. The large display with backlight enhances visibility, allowing operators to read measurements clearly, even in low-light conditions. Additionally, robust push-button operation ensures ease of use while wearing PPE, making it suitable for industrial applications.

Designed for seamless integration and ease of maintenance, Hydrosteel offers simple setup, data retrieval, and software upgrades via USB connectivity. The inclusion of Staubli® connectors allows for quick and secure pneumatic fitting to ports, ensuring efficient system connections. A steel-clad flexible sample conduit extends up to 10 meters, enabling extended reach for sampling flux while maintaining durability and flexibility.

Built to withstand harsh conditions, Hydrosteel boasts an IP54 Ingress Protection rating, safeguarding it against dust and water splashes. This level of protection enhances its reliability in various industrial settings, ensuring continued functionality in challenging environments. The sturdy construction and durable materials further reinforce its suitability for field operations, making it a dependable choice for on-site monitoring.

Additionally, the analyser is fully compatible with the use of Hydrosteel stationary probes (HT-S and AT-S), further expanding its versatility and effectiveness in corrosion monitoring applications.



Common Applications

Sour Corrosion Control

Corrosion in sour oil and gas equipment costs billions. Routine flux measurements in pipelines, refineries, and overhead units monitor corrosion, with hydrogen flux aiding corrosion control assessment, especially when scale removal impacts rates. Episodic corrosion from amine units and water washes can be diagnosed with the LR probe.

Hydrogen Induced Crack (HIC) Risk Monitoring

Hydrosteel 6500 measures hydrogen flux through steel while verifying temperature and thickness, allowing quantitative assessment of HIC risk. Flux monitoring helps identify HIC conditions and develop prevention strategies. Unscheduled tests can be conducted using the LR probe.

Napthenic Acid Corrosion Monitoring

As temperatures increase, hydrogen permeates steel, and acid corrosion generates flux. In distillation units, naphthenic acid flux estimates corrosion rates. Flux monitoring provides near real-time corrosivity assessment, complementing corrosion prediction algorithms.

Materials Testing

Corrosion experiments are widely undertaken to identify causes and effects of hydrogen permeation through steel. Hydrosteel is used to measure that hydrogen permeation.

Hydrogen Bakeout Monitoring

Hydrosteel flux measurement confirms hydrogen outgassing during pre-weld bakeout in hydrogen service. Multiple probes monitor bakeout progress, with continuous sampling by Hydrosteel 6500.

HFA Corrosion Monitoring

HF corrosion shows a strong hydrogen flux indication, used to monitor HF alkylation unit corrosion and detect issues like acid runaway. Use at least one probe with a background probe, monitoring three data points per day.

Technical specifications



Range

- 0-2500 pL/cm²/s

Resolution

- < 2 pL/cm²/s hydrogen emanating from steel

Linearity

- Linear over full range

Reproducibility

- 5% or 1 pL/cm²/s, whichever is greater

Rate of Response (%FSD)

- **1% Response Time**
 - 27-inch (70 cm) conduit: 8s
 - 78-inch (200 cm) conduit: 17s
- **50% Response Time**
 - 27-inch (70 cm) conduit: 25s
 - 78-inch (200 cm) conduit: 35s
- **90% Response Time**
 - 27-inch (70 cm) conduit: 60s
 - 78-inch (200 cm) conduit: 75s

Cross Sensitivity (versus Hydrogen @ 100%)

- CO: < 1%
- H₂S: < 20%
- NO: < 30%
- C₂H₄: 80%

Relative Response (versus 100 ppm @ 20°C = 1.00)

- 30°C = 1.03
- 40 °C = 1.11
- 50°C = 1.21

Pre-Set Input Flow Rate

- 30 ± 1 mL/min

Background Signal Drift

- < 50 pL/cm²/s equivalent per year
- < 1 pL/cm²/s per hour
- < 0.5 pL/cm²/s per °C

Operating Lifetime

- **Sensor:** 1 Year
- **Pump:** > 1500 hours

Weight & Dimensions

- 4.1 kg without leather case
- 4.45 kg with leather case
- 320 x 150 x 100 mm

Probe extension

- 150 x 150 mm

Collector

- 200 mm x 150 mm

Power Requirements

- 2 x 4.8 Ahr internal Li-ion batteries construction at 3.8 V nominal to intrinsic safe design

Operational Time

- 70 hr continuous operation

Operating Temperature

- -10°C to +50°C (+14°F to +122°F)

Storage Temperature

- -20°C to +60°C (+4°F to +140°F)

Ingress Protection

- IP54

Calibration

- **Concentration:** 100ppm hydrogen
- **Flow:** Self-calibrating

Measurement Surface (Roaming Probes)

- **Small Probe:** Steel of > 3.5" diameter
- **Large Probe:** Steel of > 5" diameter
- **Temperature Tolerance:** <350°C (660°F)

Gas Fitting

- Stabuli® RBE3 conduit quick fit

Test Gas Pressure Tolerance

- ±10% ambient pressure

Test Gas Humidity Tolerance

- 15% RH to 90% RH non-condensing

Keypad

- Panel mount IP rated buttons

Display

- Backlit LCD display 128 x 64 pixels

Communication

- USB 2.0, enabling data transfer, programming and software updates

Logging

- Data log and monitoring frequency from 1 Hz to 1 reading / day, monitoring statu in sequence

Memory

- 2GB data on internal SD card

Portability

- Leather harness for analyser, spot probes, and conduit

Certification

- ATEX: II 1G Ex ia IIC T4 Ga
- IECEX: Ex ia IIC T4 Ga

Warranty

- 1 year (standard)
- 2 years (extended)

Hydrosteel 6500 V2.0 UK - This publication is not intended to form the basis of a contract and specification can change without notice.

Volumetric specifications are quoted at +20°C and one atmosphere ambient pressure.
Pre-set input flow, deploying 27-inch (70cm) gas sampling conduit and LT-R collector unless otherwise specified.
1 pL = 10⁻¹² litres

Manufactured by:

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