



# FCM-1000

## FRACTURE CONDUCTIVITY METER

Laboratory system for short-term and long-term fracture conductivity testing under realistic in-situ conditions of stress, temperature and flow.

**1,000 psi**

MAX FRACTURE PRESSURE

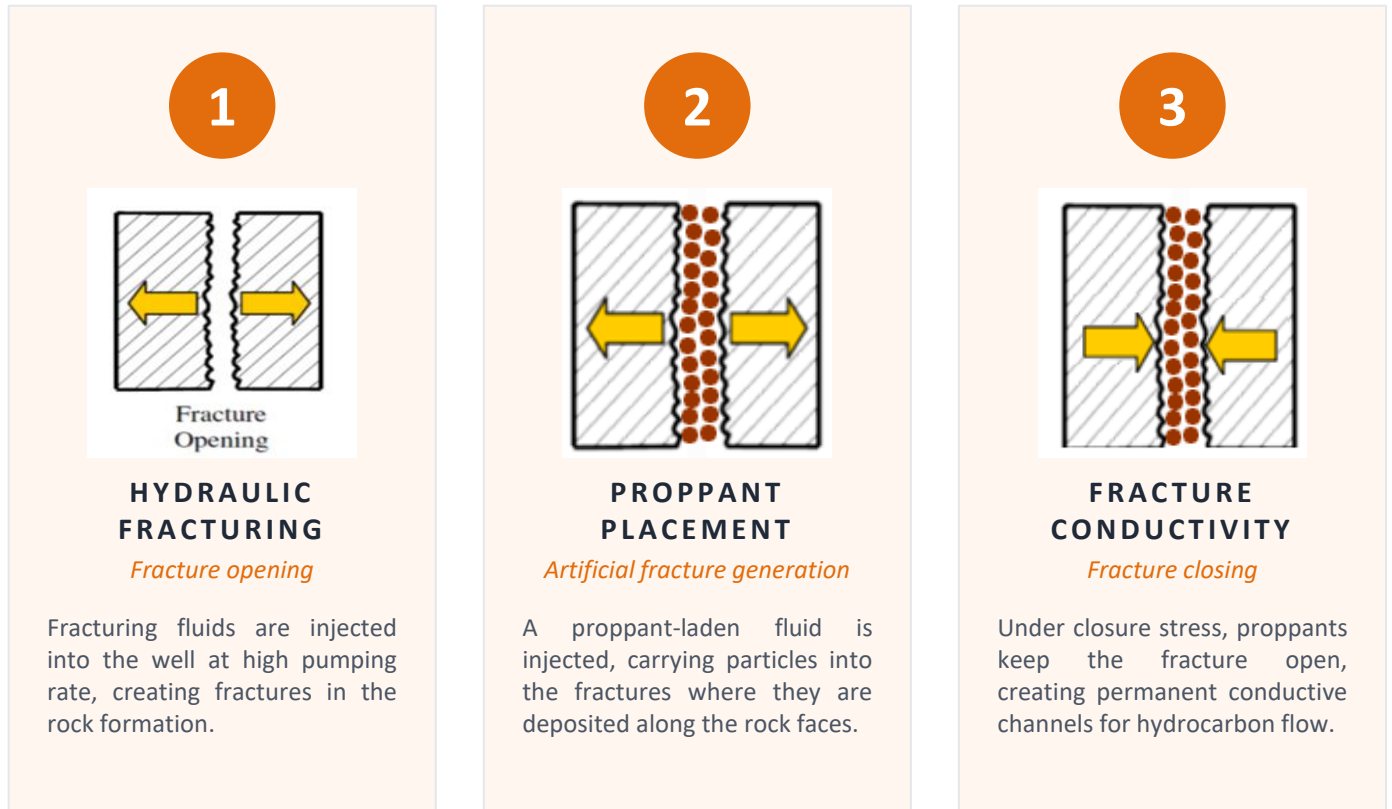
**20,000 psi**

MAX CLOSURE STRESS

**177 °C**

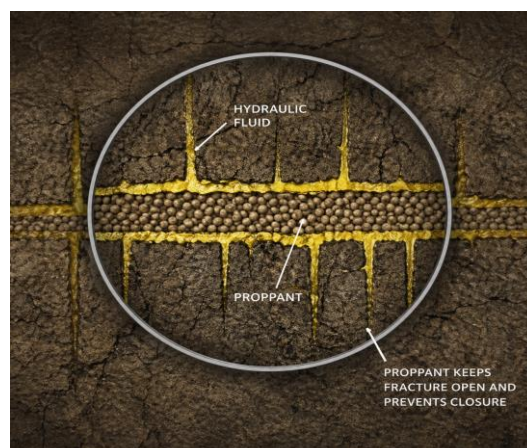
MAX TEMPERATURE

Hydraulic fracturing creates conductive pathways in tight rock formations to enable hydrocarbon extraction. The FCM-1000 reproduces the three sequential phases of this process under realistic in-situ conditions of stress, temperature and flow.



## WHAT THE FCM-1000 REPRODUCES

The FCM-1000 simulates each of the three phases above — fracture opening, proppant placement and fracture closing — at full reservoir conditions, enabling accurate measurement of fracture conductivity for both unpropped and propped configurations.



The FCM-1000 is a fully automated laboratory system designed to evaluate fracture conductivity under realistic down-hole conditions. It supports both unpropped and propped configurations and performs short-term and long-term test sequences with continuous data acquisition.

## KEY CHARACTERISTICS

- ◆ Accurate short-term and long-term conductivity measurements
- ◆ Realistic down-hole conditions — stress, temperature, fluid flow
- ◆ Tests with brine or nitrogen gas as flowing fluid
- ◆ Unpropped and propped fracture configurations
- ◆ Simulates fluid leak-off and fracturing fluid damage
- ◆ Evaluates proppant type, concentration and embedment
- ◆ Assesses creep deformation under high closure stress
- ◆ Fully automated apparatus with data acquisition station
- ◆ Real-time Darcy's law conductivity calculation

## KEY SPECIFICATIONS

Load capacity **1,000 kN (100 tons)**

Max closure stress **20,000 psi**

Max pore pressure **1,000 psi**

Max temperature **up to 177 °C (350 °F)**

Wetted parts **Stainless steel (Hastelloy option)**

### MEASURED & CALCULATED DATA

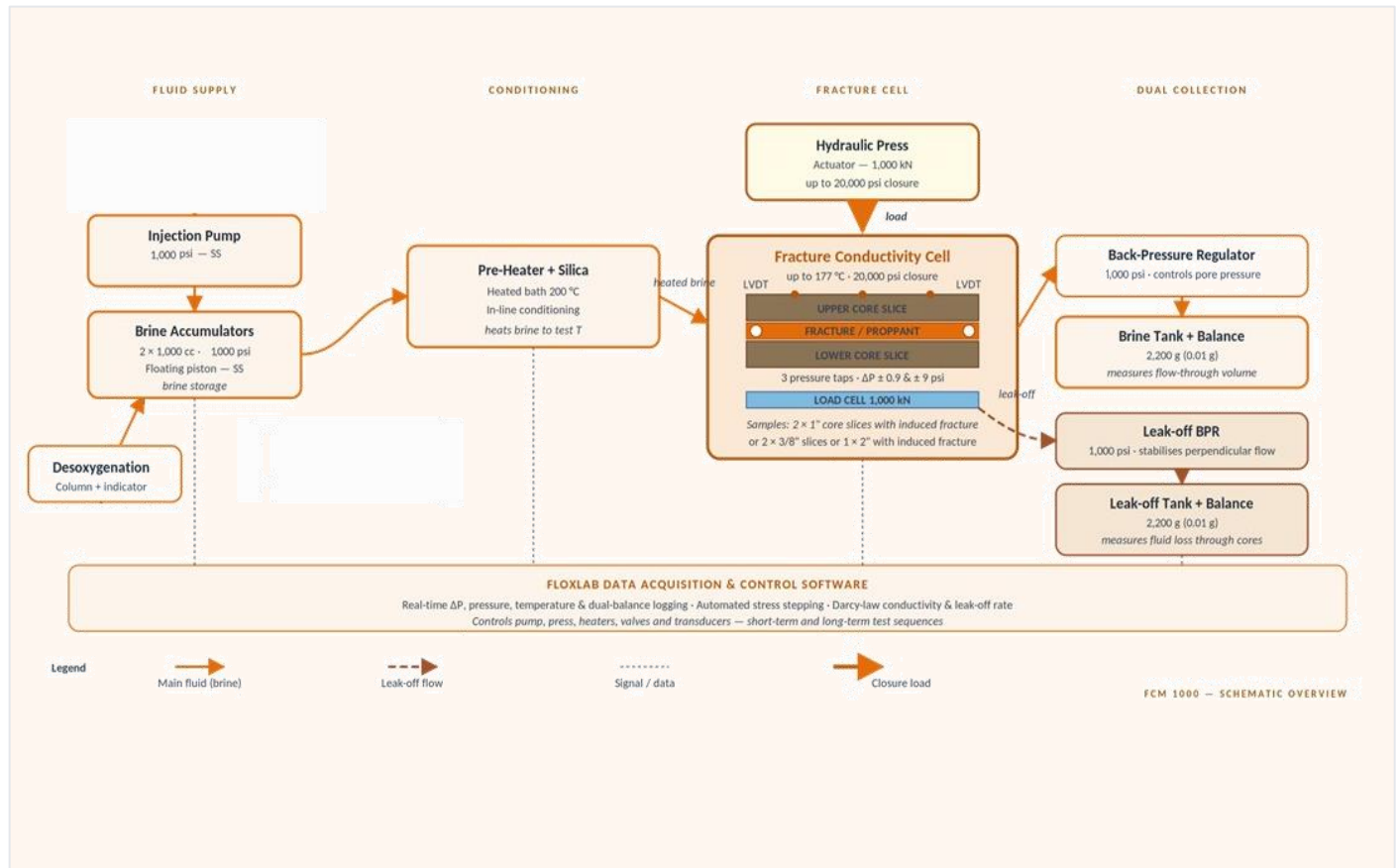
- Closure stress, pore pressure, sample T°
- Pressure drop, liquid & N<sub>2</sub> gas flow rates
- Liquid weight, leak-off weight
- Conductivities & leak-off rate (computed)

## APPLICATIONS

Hydraulic fracturing studies · Proppant qualification & selection · Fracturing fluid damage evaluation · Reservoir characterization · Geothermal & unconventional resources



The FCM-1000 integrates fluid supply, conditioning, fracture cell loading and dual collection in a single automated system, controlled by Floxlab's data acquisition software.

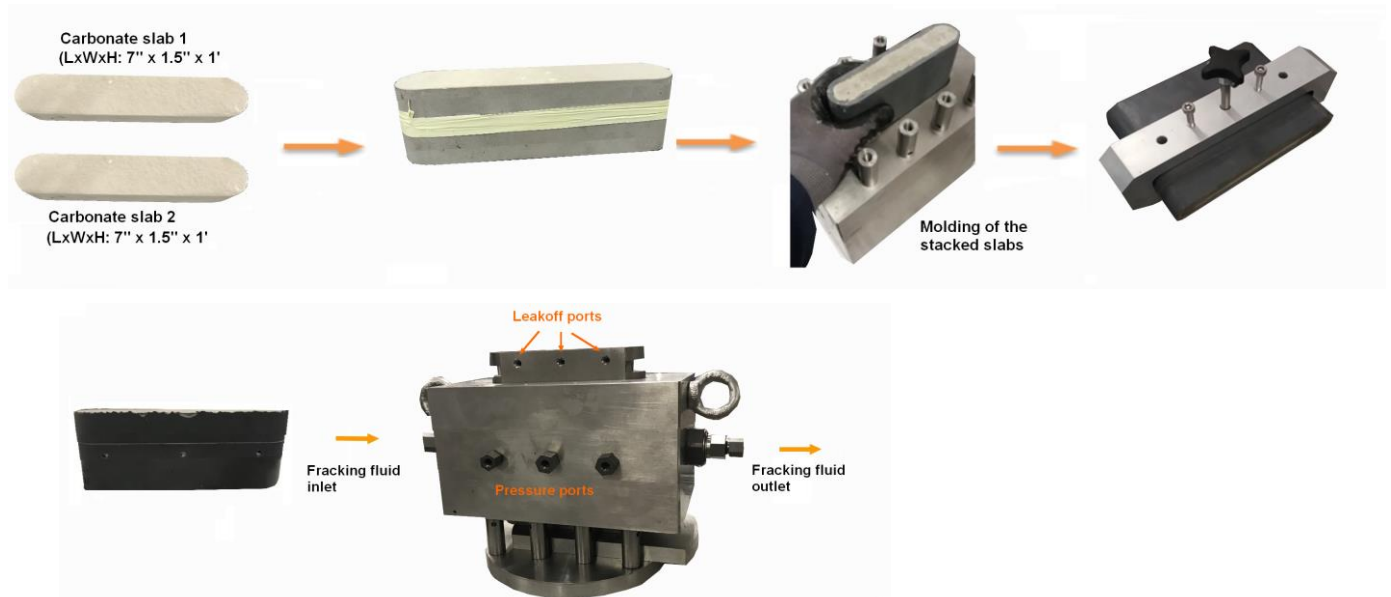


## SYSTEM COMPONENTS

- ◆ Injection pump
- ◆ Two fluid accumulators
- ◆ Brine deoxygenation system
- ◆ Inline heater and silica column
- ◆ Fracture conductivity cell
- ◆ Heating system
- ◆ Hydraulic press (1,000 kN)
- ◆ Instrumentation (P,  $\Delta P$ , T, F-N<sub>2</sub>)
- ◆ Two back-pressure regulators
- ◆ Two electronic balances
- ◆ Valves and plumbing system
- ◆ Data acquisition control station

The FCM-1000 supports two complementary test protocols. Sample preparation is shared across both: two stacked rock slabs are silicone-coated in a mold, then mounted in the conductivity cell.

## SAMPLE PREPARATION



## A

### SHORT-TERM

*Fast conductivity evaluation*

**Evaluates how variables affect fracture conductivity under short exposure.**

#### STEPS

1. Mount silicone-coated stack of slabs inside the cell
2. Install cell on the hydraulic press, set cell & leak-off pressures, set temperature
3. Apply closure stress, ramped up to target (max 20,000 psi)
4. Inject test fluid — brine (2% KCl) or N<sub>2</sub> gas — at controlled rate
5. Record flow rate,  $\Delta P$ , cell pressure, temperature
6. Compute conductivity ( $K \cdot w_f$ ) via Darcy's law at multiple conditions

#### PARAMETERS STUDIED

Conductivity using brine (2% KCl) or nitrogen via Darcy's law.

## B

### LONG-TERM

*Four-stage in-situ simulation*

**Realistic long-term simulation with fluid loss, embedment and flow-back.**

#### STEPS

1. Stage 1 — Static fluid loss: hold at 500 psi initial closure, monitor leak-off
2. Stage 2 — Shut-in: ramp to final stress and temperature, hold ~12 h, valves closed
3. Stage 3 — Flow-back: inject brine at maximum sand-free rate; stop on proppant detection
4. Stage 4 — Conductivity measurement: compute  $K \cdot w_f$  via Darcy's law
5. Record creep deformation and proppant embedment throughout
6. Repeat with different proppant sizes and concentrations

#### PARAMETERS STUDIED

Creep deformation, proppant embedment and proppant size effects.

The conductivity cell is the heart of the FCM-1000 — a heated stainless-steel chamber housing the rock sample, equipped with leak-off ports, pressure taps, LVDTs and flow inserts.



Conductivity cell — front view

## KEY ELEMENTS

- ◆ Heated cell body for precise temperature control
- ◆ Thermocouple monitoring
- ◆ 3 pressure taps for pressure monitoring
- ◆ 2 loading platens with 3 leak-off ports
- ◆ 2 stands for etching tests
- ◆ 4 LVDTs measuring fracture width at various stresses
- ◆ 2 flow inserts for conductivity
- ◆ Sample: Two 1-inch-thick rock slabs stacked on top of each other.

## SPECIFICATIONS

Max temperature	<b>177 °C (350 °F)</b>	Fluid pressure	<b>up to 1,000 psi</b>
Closure stress	<b>up to 20,000 psi</b>	Sample length	<b>7 inches</b>
Sample width	<b>1.5 inches</b>	Sample height	<b>2 × 1 inch</b>
Wetted parts	<b>Stainless steel (HC option)</b>	Configuration	<b>2-slab fracture cell</b>

Precise loading and metering are essential for repeatable measurements. The FCM-1000 combines a stiff hydraulic press, high-pressure servo pumps, floating-piston accumulators and high-resolution instrumentation, all coordinated by Floxlab's control software.

## HYDRAULIC PRESS



Applies precise closure stress in a stiff, compact frame with automated ramping and constant-pressure cycles.

- ◆ Compression: 1,000 kN (100 t)
- ◆ Closure: up to 20,000 psi
- ◆ Weight: 500 kg

### AXIAL PRESSURE PUMP

Max pressure 10,000 psi · Volume 250 cc · Flow 0.001–50 cc/min · SS wetted parts · 40 kg · 110–220 VAC

## INJECTION PUMP — CF MODEL



Dual-cylinder servo pump for ultra-precise metering of brine or test fluids during conductivity measurement.

- ◆ Pressure: 1,000 psi
- ◆ Volume: 2 × 40 cc
- ◆ Flow: 0.0001–80 cc/min

### FLOATING-PISTON ACCUMULATORS

Max pressure 1,000 psi · Volume 1,000 cc · SS wetted parts · 20 kg · Back-pressure regulator: 1,000 psi

## INSTRUMENTATION & DATA ACQUISITION

- Cell pressure transducer: 0–1,000 psi (0.15%)
- Low  $\Delta P$  transducer: 0–0.9 psi (0.025%)
- Mid  $\Delta P$  transducer: 0–9 psi (0.025%)
- Gas  $\Delta P$  transducer: 0–150 psi
- N<sub>2</sub> mass flow controller: 0–2,000 cc/min
- Temperature probe on conductivity cell
- Two electronic balances: 0–2,500 g (0.01 g)
- Floxlab data acquisition & control software



## CONTACT US

*Thank you for your interest in the FCM-1000 Fracture Conductivity Meter.*

Get in touch — our engineers will be glad to discuss your testing needs.

### FLOXLAB

*Geomechanics & reservoir testing equipment*

#### ADDRESS

23 rue du Port, 92000 Nanterre — France

#### PHONE

+33 (0) 1 81 93 12 85

#### EMAIL

contact@floxlab.com

#### WEB

www.floxlab.com



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