Reservoir Stimulation

Advanced systems for proppant characterisation, hydraulic fracture conductivity and acid-fracture testing — supporting unconventional reservoir research and well stimulation engineering.

TECHNICAL BROCHURE

PCT

Proppant Crush Tester

Compliant with ISO 13503-2 · API RP56 · RP58 · RP60

20,000	300	2,000	100
psi	kN	psi/min	kg
Max pressure	*Press stress*	*Loading rate*	*Total weight*

OVERVIEW

Key Points

- **Dedicated to proppant crush-resistance analysis**
- Fully automated — rapid, accurate and reproducible
- ISO 13503-2 & API RP56/58/60 compliant
- Max crush pressure 20,000 psi (300 kN press stress)
- Controlled piston displacement up to 2,000 psi/min
- Servo-controlled load frame with real-time feedback
- Precision control for improved test consistency
- **Compact benchtop design — total weight 100 kg**

TEST PRINCIPLE

How the PCT Works

The crush test evaluates proppant strength at different closure stresses. Crushed material is the weight percentage of particles smaller than the specified range.

01

SAMPLE PREP

Proppant sieved at target mesh (12/18, 18/30, 30/50) and filled at 1.22 cm^3/cm^2 in the crush cell.

02

LOADING

Uniform loading rate up to 2,000 psi/min until the target stress level is reached.

03

HOLD

Target closure stress maintained for 2 minutes under servo-controlled pressure.

04

ANALYSIS

Sample re-sieved for 15 minutes; percentage of crushed fines calculated and reported.

MAIN COMPONENTS

Scope of Supply

The PCT system is delivered complete and ready to operate.

1. **Proppant Crush Cell**
2. **Laboratory Press**
3. **Data Acquisition Station**
4. **Electronic Balance**
5. **Sieve Shaker**

SPECIFICATIONS

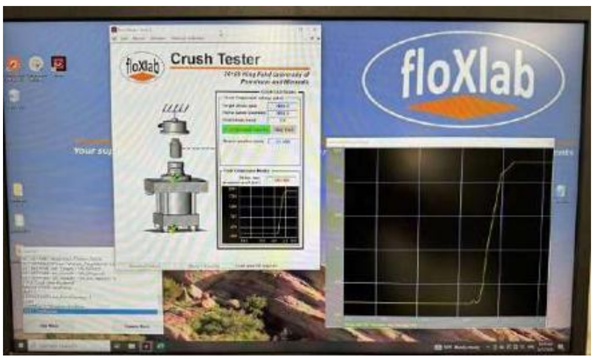
Press & Crush Cell

Complete technical data for the PCT proppant crush tester.

SPECIFICATION	VALUE
Applicable standards	**ISO 13503-2 · API RP56/58/60 · IEC 61010-1**
Max. crush pressure	**20,000 psi**
Press stress	**300 kN**
Loading rate	**Up to 2,000 psi/min**
Crush cell inside diameter	**2.0 in (50.8 mm)**
Crush cell outside diameter	**3.5 in (89 mm)**
Piston height	**3.5 in (89 mm)**
Wetted parts material	**Stainless steel**
Operating temperature	**Ambient (5 °C to 40 °C)**
Power supply	**110–230 VAC · 50/60 Hz · 1000 W**
Total weight	**100 kg**

SOFTWARE & OPERATION

Applilab — Intuitive Control



SOFTWARE CAPABILITIES

- System initialization with fault check
- Real-time pressure display and plotting
- Selectable units: psi, bar or MPa
- Automated pressure ramp-up (2,000 psi/min)
- 2-minute hold phase (per ISO 13503-2)
- Automatic unloading phase
- Emergency stop and reset controls
- Error code reporting and diagnostics

OPTIONAL ACCESSORIES

Complement Your PCT

Dedicated laboratory equipment essential for ISO 13503-2 compliance.

SIEVE SHAKER

Required to assess proppant particle size distribution before and after the crush test — allows retrieval of particles of a defined size.

Simultaneous ops	**Up to 5**
Mesh sizes	**4 to 200 US**
Sieve height	**50 mm (2 in)**
Sieve diameter	**200 mm (8 in)**
Stack capacity	**7 levels**
Power	**110 / 220 VAC · 50/60 Hz**

ELECTRONIC BALANCE

High-precision digital balance required to weigh proppant samples before and after the crush test.

Weighing range	**600 g**
Accuracy	**0.001 g**
Display	**Digital**
Format	**Compact benchtop**
Power	**110–220 VAC · 50/60 Hz**
Compliance	**ISO 13503-2 ready**

PROPPANT CONDUCTIVITY SYSTEM

PCM 1000

Automated fracture conductivity measurement
under high closure stress

ISO 13503-5

API RP 56

API RP 58

◆ Overview

The PCM 1000 measures proppant pack and fracture conductivities under reservoir-representative pressures and temperatures. Its automated test sequences deliver rapid, accurate and reproducible data — fully compliant with ISO 13503-5 and API RP 56 & 58.

PURPOSE

- Measures proppant pack and fracture conductivities
- Operates under high closure stress and high temperature
- Compatible with brine or gas (N_2) as test fluid

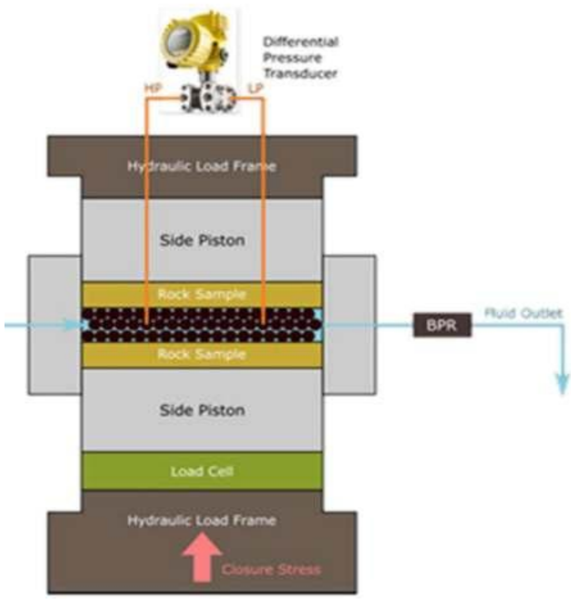
KEY BENEFITS

- Fully automated test sequences
- Rapid, accurate, reproducible data
- Closure stress up to 20,000 psi
- ISO 13503-5 / API RP 56 & 58 compliant

MEASURED PARAMETERS

- Closure pressure
- Flow pressure & temperature
- Pressure drop (ΔP)
- Brine flow & gas flow
- Pack width

HOW IT WORKS — TEST CELL SCHEMATIC



Operating principle

A proppant pack is placed between two Ohio sandstone slabs and held in an API conductivity cell under controlled closure stress. Pre-heated, degassed brine — or nitrogen for compressible-fluid tests — is injected through the pack. Permeability and conductivity are derived from the differential pressure (ΔP) measured across the pack via Darcy's law.

◆ Test Protocol

Proppant pack conductivity measurement procedure

1. Place two Ohio sandstone slabs between the steel platens of the API conductivity cell.
2. Position the proppant pack between the sandstone slabs.
3. Install the cell in the hydraulic compression frame and apply closure stress (1,000 – 20,000 psi).
4. Heat the cell to target reservoir temperature (up to 177 °C / 350 °F).
5. Pre-heat and degas the brine before injection.
6. Inject brine through the pack at controlled flow rate (up to 1,000 psi).
7. Monitor differential pressure (ΔP) across the proppant pack in real time.
8. Compute permeability and conductivity using Darcy's law.
9. Repeat at increasing closure pressures — conductivity decreases with stress due to proppant crushing and embedment.

TEST CONDITIONS

Closure pressure	Temperature	Injection pressure	Test fluid
1,000 – 20,000 psi	**ambient – 177 °C**	**up to 1,000 psi**	**Pre-heated degassed brine / N_2**

PARAMETERS ASSESSED

Proppant concentration ◆ Proppant geometry ◆ Proppant uniformity ◆ Proppant transportability ◆ Proppant strength

Sample Preparation

Proppant Conductivity Cell — sample assembly for API conductivity testing

ASSEMBLY

The sample consists of a proppant bed placed between two Ohio sandstone slabs and covered by a metal shim. The assembled stack is then inserted into the API conductivity cell between two loading pistons. The shim ensures a uniform fracture face and protects the platens during compression.

STACK COMPONENTS

Metal shim

L × W × H : 7" × 1.5" × 1 mm

Ohio sandstone slab

L × W × H : 7" × 1.5" × 3/8"

Proppant bed

Test specimen — placed between slabs

Ohio sandstone slab

L × W × H : 7" × 1.5" × 3/8"

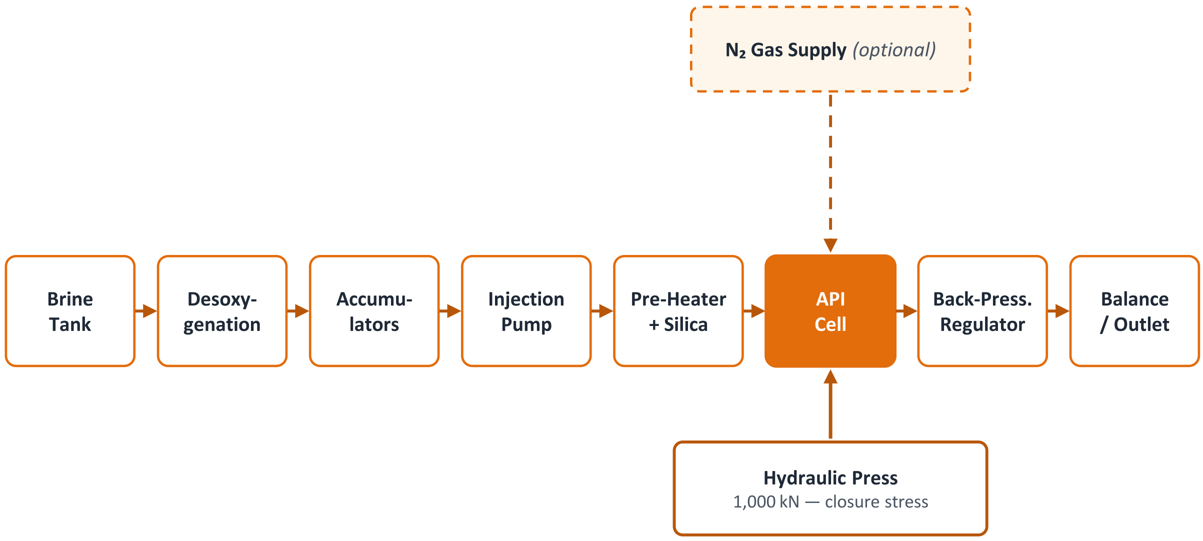
Metal shim

L × W × H : 7" × 1.5" × 1 mm

System Architecture

Main components and process flow diagram

SYSTEM BLOCK DIAGRAM



SENSORS AT API CELL · ΔP transducer · 4 LVDTs (fracture width) · Temperature probe · Cell-pressure transducer

MAIN COMPONENTS

- Injection pump
- Brine accumulators with desoxygenation
- Inline heater with silica column
- API conductivity cell with heating system
- Proppant pack width LVDT meter
- Hydraulic press (1,000 kN / 100 T)
- Back-pressure regulator
- Electronic balance
- P and ΔP transducers
- Gas flow line (optional, N_2)

PROCESS OVERVIEW

End-to-end view of the brine and gas circuits: from desoxygenation and accumulation, through the heater and silica column, to the API conductivity cell instrumented with LVDTs and pressure transducers, and on to the back-pressure regulator and electronic balance for accurate flow measurement.

20,000 psi

Max closure stress

177 °C

Max temperature

◆ Conductivity Cells

PCC and SAC series — single and stacked cell configurations

PCC SERIES

Single-cell conductivity

SPECIFICATIONS

Standard	**ISO 13503-5**
Load capacity	**1,000 kN (100 T)**
Max closure stress	**20,000 psi**
Max pore pressure	**1,000 psi**
Temperature	**ambient – 177 °C**
Pack thickness	**± 0.001 in**
Specimen	**7 × 1.5 × 3/8 in**
Wetted parts	**Stainless steel**
N_2 / Air	**2,000 / 100 psi**

KEY ELEMENTS

- Heated steel platens — precise temperature
- Thermocouple monitoring
- Two 3/8-inch Ohio sandstone slabs
- Metal shim
- 3 pressure taps for monitoring
- 4 LVDTs measuring fracture width

SAC SERIES

Stacked multi-cell assembly

SPECIFICATIONS

Standard	**ISO 13503-5**
Load capacity	**1,000 kN (100 T)**
Max closure stress	**20,000 psi**
Max pore pressure	**1,000 psi**
Temperature	**ambient – 177 °C**
Pack thickness	**± 0.001 in**
Specimen	**5 × 1.5 × 3/8 in**
Stacking	**Up to 2 or 3 cells**
N_2 / Air	**2,000 / 100 psi**

KEY ELEMENTS

- Heated steel platens (per cell)
- Dedicated thermocouple per cell
- Two 3/8-inch Ohio sandstone slabs
- Metal shim
- 3 pressure taps per cell
- Shared piston — simultaneous testing

Press, Pump & Instrumentation

Hydraulic press, axial pump, accumulators, BPR and full sensor suite

Hydraulic Press

Max compression
1,000 kN (100 T)
Closure pressure
up to 20,000 psi
Horizontal clear.
325 mm
Vertical clear.
315 mm
Weight
750 kg

Injection Pump (CF3)

Max pressure
1,000 psi
Volume
2 × 40 cc
Flow rate
0.0001 – 80 cc/min
Wetted parts
Stainless steel
Power
110-220 VAC, 50/60 Hz

Back-Pressure Regulator

Working pressure
1,000 psi
Wetted parts
Stainless steel
Function
Outlet pressure control
Integration
In-line on brine return
Maintenance
Field-serviceable

INSTRUMENTATION

- Cell pressure transducer: 0–1,000 psi (0.15%)
- Low ΔP transducer: 0–0.9 psi (0.025%)
- Mid ΔP transducer: 0–9 psi (0.025%)
- Gas ΔP transducer: 0–150 psi
- N_2 mass flow controller: 0–2,000 cc/min
- Temperature probe on conductivity cell
- Electronic balance: 0–2,500 g (0.01 g)
- Floxlab data acquisition & control software

ACCESSORIES

Electronic balance

Precision weighing for proppant sample preparation.

Vacuum pump

Air evacuation from fluid lines prior to test start.

Sleeve shaker

Mechanical sieving for particle-size distribution.

Floating piston accumulators

3,000 psi · 1,000 cc · stainless steel

H I G H - P R E S S U R E   L A B O R A T O R Y   I N S T R U M E N T S

Reservoir Stimulation & Carbonate Testing Equipment

ACID FRACTURE CONDUCTIVITY METER

ACM 3000

Laboratory system for carbonate formation acid fracturing simulation

20,000 psi *Max closure stress*	**3,000 psi** *Max fracture pressure*	**1,000 psi** *Max acid pressure*	**177°C** *temperature*

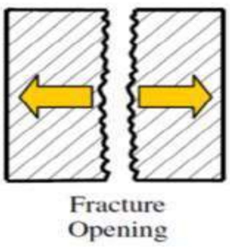
ACM 3000 — Complete acid fracturing laboratory system

How Acid Fracturing Works

In carbonate reservoirs, acid fracturing is used in place of conventional propped fracturing to create permanent conductive flow paths. The ACM 3000 reproduces the three phases of the process under realistic in-situ conditions of stress, temperature and flow.

1 HYDRAULIC FRACTURING

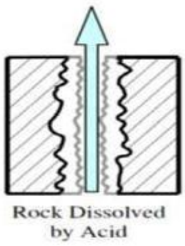
Fracture opening



High-pressure fluid creates a fracture in the carbonate rock formation, opening a pathway for acid injection.

2 ACID ETCHING

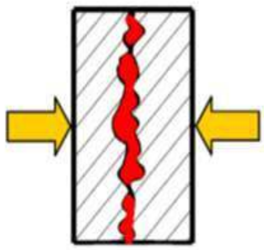
Rock dissolved by acid



Acid is injected through the fracture and reacts with the carbonate rock, creating irregular etched surfaces along the fracture walls.

3 FRACTURE CONDUCTIVITY

Fracture closing



Under closure stress, the etched asperities keep the fracture open, creating permanent conductive channels for hydrocarbon flow.

The ACM 3000 reproduces all three phases under realistic in-situ conditions.

THE SYSTEM CAN BE CONFIGURED FOR

Acid etching experiments — hot-acid circulation through coated carbonate slabs to generate realistic etched patterns.
Short-term & long-term conductivity experiments — measure K·wf via Darcy's law, study creep and proppant embedment over time.

Why Choose the ACM 3000

Carbonate stimulation requires more than a generic conductivity rig. The ACM 3000 is purpose-built to reproduce every phase of acid fracturing on real rock — from hot-acid etching with realistic leak-off to long-duration conductivity testing under closure stress.

Faithful Simulation

Acid fracturing reproduced on real carbonate samples under in-situ conditions.

Acid Etching

Realistic etched fracture surfaces generated by hot-acid circulation.

Short & Long Term

Both rapid evaluations and four-stage in-situ duration tests supported.

Realistic Conditions

Stress, temperature and flow all controlled to match downhole environments.

Propped or Unpropped

Flexible — test acid-etched fractures with or without proppant placement.

Leak-off Monitoring

Fluid loss measured continuously during the etching phase via dedicated balance.

REAL RESULTS — CARBONATE SLAB FACE

Comparison of a carbonate slab face before and after acid etching in the ACM 3000. The system produces irregular, realistic etched patterns — not idealised channels — matching the geometry of a real downhole etched fracture.

Slab face before acid etching

Slab face after acid etching

Three Test Protocols

The ACM 3000 supports a full acid-fracturing workflow — from generating realistic etched surfaces to evaluating fracture conductivity over short and long durations under closure stress.

A — ACID ETCHING

Hot-acid circulation

Generate realistic acid-etched fracture surfaces.

STEPS

1. Prepare two coated carbonate slabs (1.5" × 3.5")
2. Mount the silicone-sleeved slabs in the cell, spaced by a 3 mm gap (no axial load)
3. Fill acid tank; set pre-heater to target temperature (up to 175 °C)
4. Start membrane pump — circulate acid through the fracture (up to 1 L/min at 1,000 psi)
5. Monitor fluid leak-off and cell temperature during the etching phase
6. Collect spent acid; disassemble and record the etching pattern

DURATION
variable

B — SHORT-TERM

Fast conductivity evaluation

Evaluate how variables affect conductivity of an acid-etched fracture under short exposure.

STEPS

1. Mount the silicone-coated stack of acid-etched slabs inside the cell
2. Install cell on the hydraulic press; set cell & leak-off pressures and temperature
3. Apply closure stress (ramped up to target, max 20,000 psi)
4. Inject test fluid — brine (2% KCl) or N_2 gas — at controlled rate
5. Record flow rate, ΔP, cell pressure and temperature
6. Compute K·wf via Darcy's law at several conditions

PARAMETERS
fracture conductivity via Darcy's law using brine (2% KCl) or N_2

C — LONG-TERM

Four-stage in-situ simulation

Realistic long-term simulation: fluid loss, embedment and flow-back in four stages.

STEPS

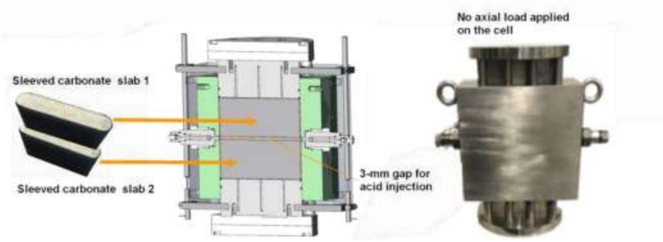
1. Stage 1 — Static fluid loss: hold at 500 psi initial closure, monitor leak-off
2. Stage 2 — Shut-in: ramp to final stress and temperature, hold ~12 h
3. Stage 3 — Flow-back: inject brine at the maximum sand-free flow rate
4. Stage 4 — Conductivity measurement: compute K·wf via Darcy's law
5. Record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

PARAMETERS
creep, embedment, proppant size & concentration

Specimen Preparation

The ACM 3000 uses real carbonate slabs sleeved in silicone to enforce one-dimensional acid attack. Once etched, the same slabs are stacked and re-mounted for conductivity testing — preserving the etched geometry from the first phase to the second.

STEP 1 · ACID ETCHING



Process

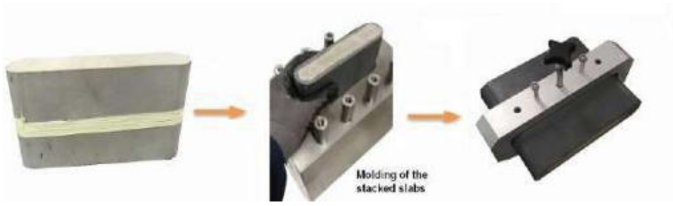
Two carbonate slabs (7" × 1.5" × 3") are silicone-sleeved in a dedicated mold

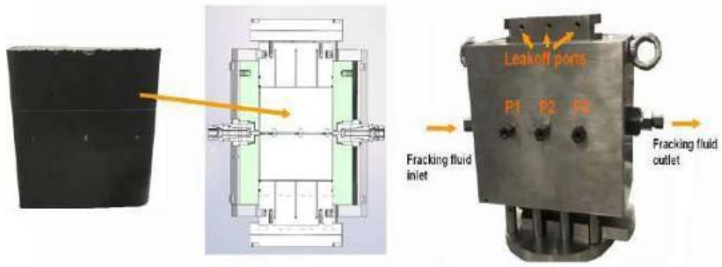
The sleeve confines acid attack to a controlled face area — replicating the geometry of a real fracture wall.

Specimen dimensions
Length: 7 in · Width: 1.5 in · Height: 2×3.5 in

Etching gap: 3 mm between sleeved slabs (no axial load applied during etching).

STEP 2 · FRACTURE CONDUCTIVITY





Process

Two carbonate slabs are stacked with or without proppants between the acid-etched faces, then silicone-coated in a mold.

Holes are precisely created in the sleeve at exact dimensions using a dedicated tool to allow controlled fluid flow. The specimen is then mounted in the cell.

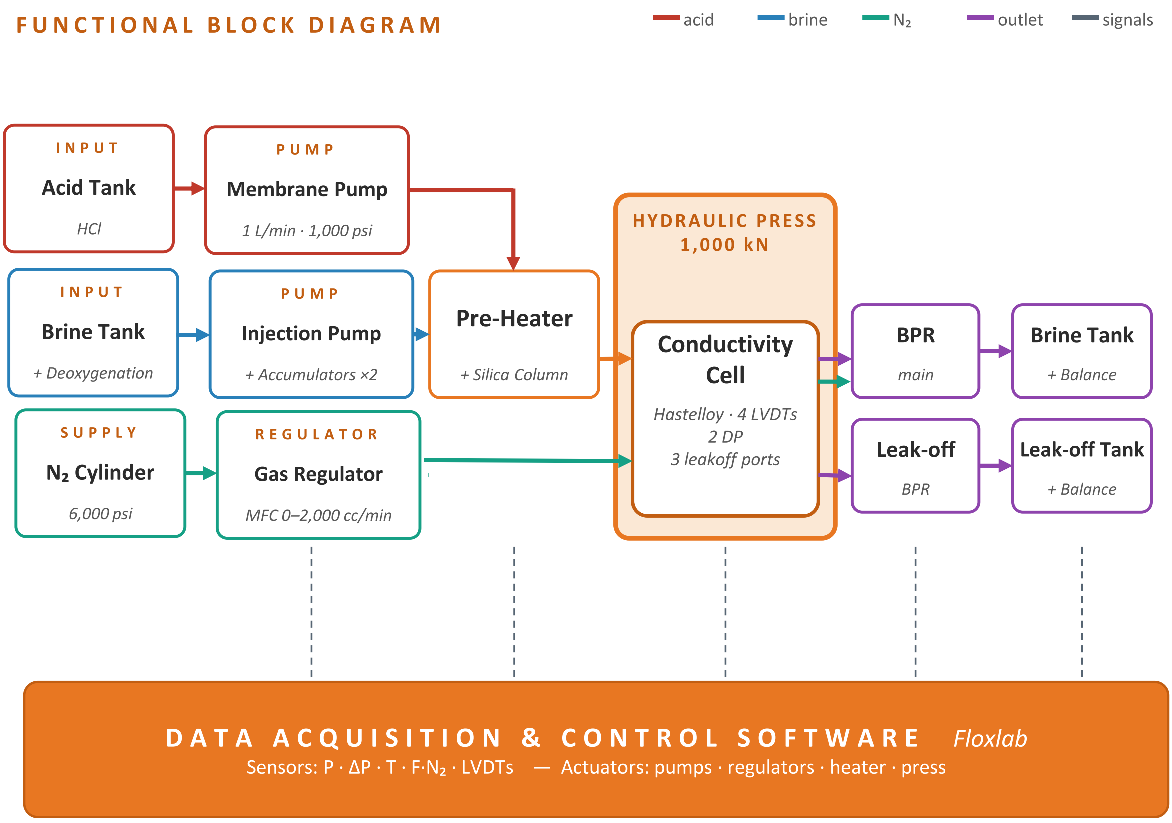
After applying closure stress and setting temperature and fluid pressure, fluids such as brine (2% KCl) or nitrogen are injected at constant pressure while the pressure drop across the specimen is measured. Fracture conductivity is determined using Darcy’s law during short exposure.

Specimen dimensions
Length: 7 in · Width: 1.5 in · Height: 7.5 in

System Architecture

Functional block diagram showing how fluids, gas and signals flow through the ACM 3000. Three input lines (acid, brine, N_2) converge on the heated Hastelloy conductivity cell mounted in the hydraulic press; two outlet paths return to weighed collection tanks for mass-balance accounting.

FUNCTIONAL BLOCK DIAGRAM



MAIN COMPONENTS

FLUIDS & PUMPS

- Brine injection pump + accumulators ×2
- Brine deoxygenation column
- Acid membrane pump (1 L/min · 1,000 psi)
- N_2 regulator + mass flow controller

CORE TEST SECTION

- Inline pre-heater + silica column
- Heated fracture conductivity cell
- Hydraulic press (1,000 kN)
- 4 LVDTs + 3 P-taps + thermocouple

OUTLETS & CONTROL

- Main back-pressure regulator
- Leak-off back-pressure regulator
- Two electronic balances (0.01 g)
- Floxlab DAQ & control software

Technical Specifications

Engineered for laboratories simulating acid fracturing in carbonate formations under realistic in-situ conditions — Hastelloy wetted parts ensure full chemical compatibility with reservoir acids.

20,000 psi
Max closure stress

3,000 psi
Max fracture pressure

1,000 psi
Max acid pressure

177 °C
Max temperature

ACC Series — Acid Fracture Cell

Designed for carbonate acid-frac simulation

Max temperature	**177 °C (350 °F)**
Fluid pressure	**up to 3,000 psi**
Closure stress	**up to 20,000 psi**
Sample length	**7 in**
Sample width	**1.5 in**
Sample height	**2 × 3.5 in**
Wetted parts	**Hastelloy**
Cell features	**4 LVDTs · 3 P-taps · heated**

Hydraulic Press & Servo Pump

1,000 kN compression frame · stiff & compact

Compression	**1,000 kN**
Closure pressure	**20,000 psi**
Press weight	**500 kg**
Pump pressure	**10,000 psi**
Pump volume	**250 cc**
Pump flow	**0.0001–50 cc/min**

ACCUMULATORS, INJECTION PUMP & BPR

Floating piston accumulators: 10,000 psi · 1,000 cc · stainless steel · 20 kg.
Injection pump (CF model): 3,000 psi · 2 × 40 cc · 0.0001–80 cc/min · stainless steel.
Back-pressure regulator: 3,000 psi · stainless steel.

INSTRUMENTATION

- Cell pressure transducer: 0–3,000 psi (0.15%)
- ΔP transducers: 0–0.9 psi & 0–9 psi (0.025%)
- Gas ΔP transducer: 0–150 psi
- N_2 mass flow controller: 0–2,000 cc/min
- Two electronic balances: 0–2,500 g (0.01 g)
- Floxlab data acquisition & control software

PRODUCT BROCHURE

Geomechanics & Reservoir Testing Equipment

02 RESERVOIR STIMULATION

FCM-1000

FRACTURE CONDUCTIVITY METER

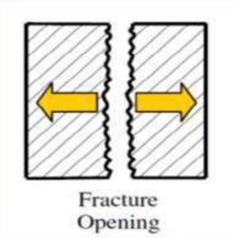
Laboratory system for short-term and long-term fracture conductivity testing under realistic in-situ conditions of stress, temperature and flow.

1,000 psi	20,000 psi	177 °C
MAX FRACTURE PRESSURE	MAX CLOSURE STRESS	MAX TEMPERATURE

Hydraulic fracturing principle

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.

1

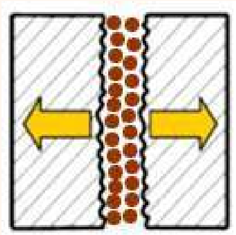


HYDRAULIC FRACTURING

Fracture opening

Fracturing fluids are injected into the well at high pumping rate, creating fractures in the rock formation.

2

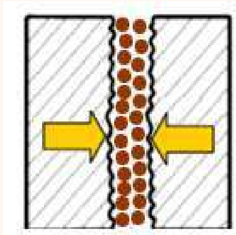


PROPPANT PLACEMENT

Artificial fracture generation

A proppant-laden fluid is injected, carrying particles into the fractures where they are deposited along the rock faces.

3



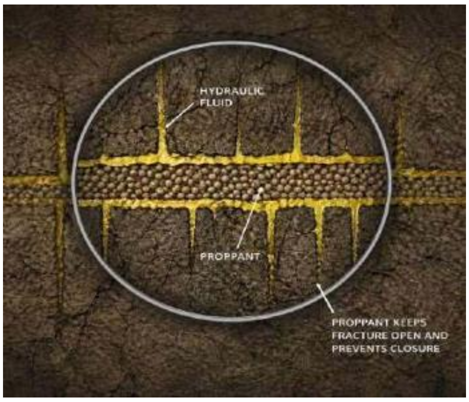
FRACTURE CONDUCTIVITY

Fracture closing

Under closure stress, proppants keep the fracture open, creating permanent conductive channels for hydrocarbon 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.



Overview & key features

FCM-1000 | Fracture Conductivity Meter

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_2 gas flow rates
- Liquid weight, leak-off weight
- Conductivities & leak-off rate (computed)

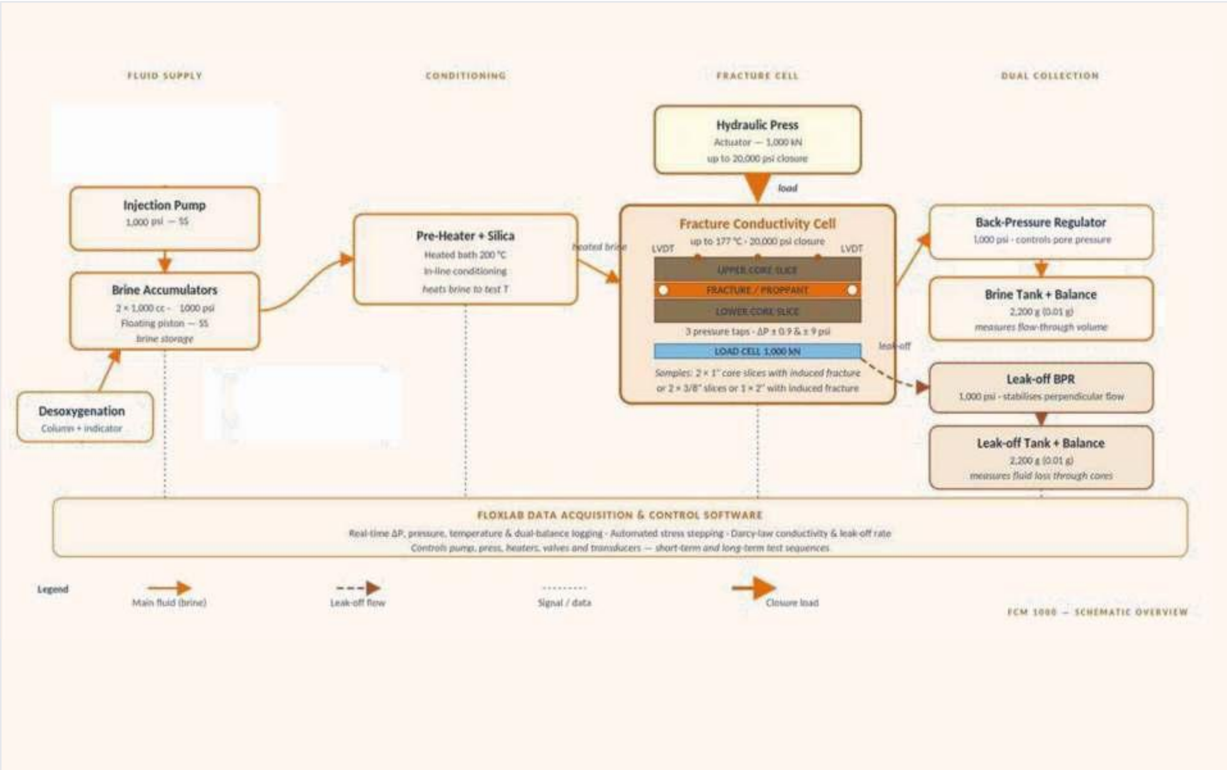
APPLICATIONS

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

Schematic overview

FCM-1000 | Fracture Conductivity Meter

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

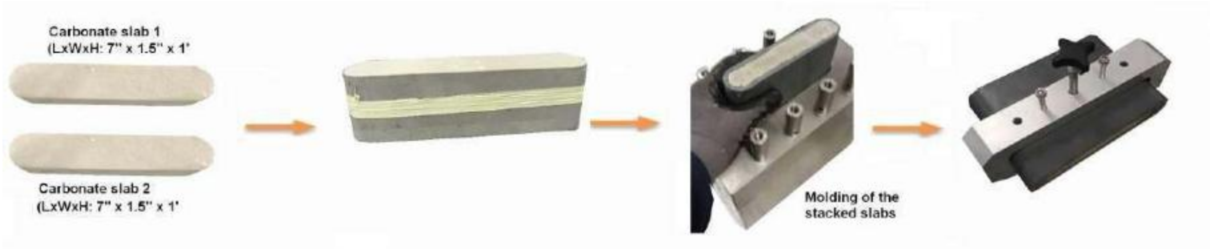
- Injection pump
- Two fluid accumulators
- Brine deoxygenation system
- Inline heater and silica column
- Fracture conductivity cell
- Heating system
- Hydraulic press (1,000 kN)
- Instrumentation (P, ΔP, T, F-N_2)
- Two back-pressure regulators
- Two electronic balances
- Valves and plumbing system
- Data acquisition control station

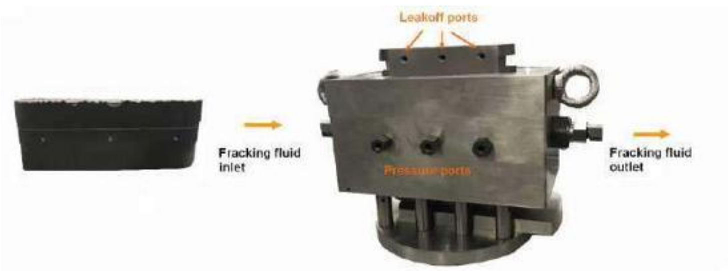
Fracture conductivity protocols

FCM-1000 | Fracture Conductivity Meter

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_2 gas — at controlled rate
5. Record flow rate, ΔP, cell pressure, temperature
6. Compute conductivity (K·wf) 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·wf 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.

Fracture conductivity cell

FCM-1000 | Fracture Conductivity Meter

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

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 ΔP transducer: 0–0.9 psi (0.025%)
- Mid ΔP transducer: 0–9 psi (0.025%)
- Gas ΔP transducer: 0–150 psi
- N_2 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

FRACLAB

Hydraulic Fracture Test System

Rock-mechanics testing platform for hydraulic fracturing, triaxial compression and acoustic emission monitoring under high pressure and elevated temperature.

ROCK MECHANICS | HYDRAULIC FRACTURING | AE MONITORING

AT A GLANCE

Confining pressure	70 MPa
Axial stress	424 MPa
Pore / fracturing	70 MPa
Temperature	150 °C
Specimen ø	54.7 mm
AE channels	6 lateral, 16-bit
Pumps	4 servo-controlled
Standards	ASTM-compliant

System Overview

A complete platform for rock-mechanics and hydraulic-fracture testing

The FRACLAB system performs hydraulic fracture experiments with microseismic activity monitoring under various triaxial stress states and elevated temperatures. The unified platform combines a high-pressure triaxial cell, four servo-controlled syringe pumps, an 8-channel acoustic emission monitoring module and a real-time supervision station — delivering full mechanical, hydraulic and microseismic characterization of rock specimens in a single, automated experiment.

KEY CAPABILITIES

- Hydraulic fracturing under triaxial stress
- Breakdown pressure & tensile-strength measurement
- Rock triaxial compression test (UCS / CTC)
- Rock compressibility & permeability tests
- Pore-pressure regulation (drained & undrained)
- Axial & radial strain monitoring (LVDTs + extensometer)
- Acoustic Emission (AE) event localization
- Real-time fracture morphology reconstruction
- Fully automated, servo-controlled testing
- Standardized report generation

70	424	150
MPa	MPa	°C
Confining	Axial	Temperature

ENGINEERED FOR PRECISION

A pressure-balanced triaxial design isolates the deviatoric piston from confining pressure, delivering parasitic-free axial-stress measurement and ASTM-compliant stress paths — essential for accurate strength, compressibility and fracture-initiation results.

Three Possible Tests

One platform — three complementary measurement modes

FRACLAB combines three coordinated test modes that share the same triaxial cell, instrumentation and control software. Tests can be run independently or sequenced in a single experiment to extract a complete mechanical, hydraulic and microseismic dataset from one specimen.

01

BREAKDOWN PRESSURE

Hydraulic fracturing experiment on a specimen drilled with an axial borehole. Fracturing fluid is injected at constant flow rate until breakdown occurs; tensile strength and frac-coefficient are then computed from the pressure–time curve.

MEASUREMENTS

Fracturing-fluid pressure • Fracturing-fluid flow rate • Pore pressure • Axial & radial stress • Temperature

02

AE MONITORING

Detection and localization of microcracking and fracture events under triaxial loading using six lateral acoustic-emission sensors. Real-time 3D event localization reconstructs the fracture morphology as damage accumulates.

MEASUREMENTS

AE activity & hit counts • AE energy & amplitude • Event duration • Hypocenter localization (≈ 2 mm) • Fracture morphology

03

STRESS-STRAIN

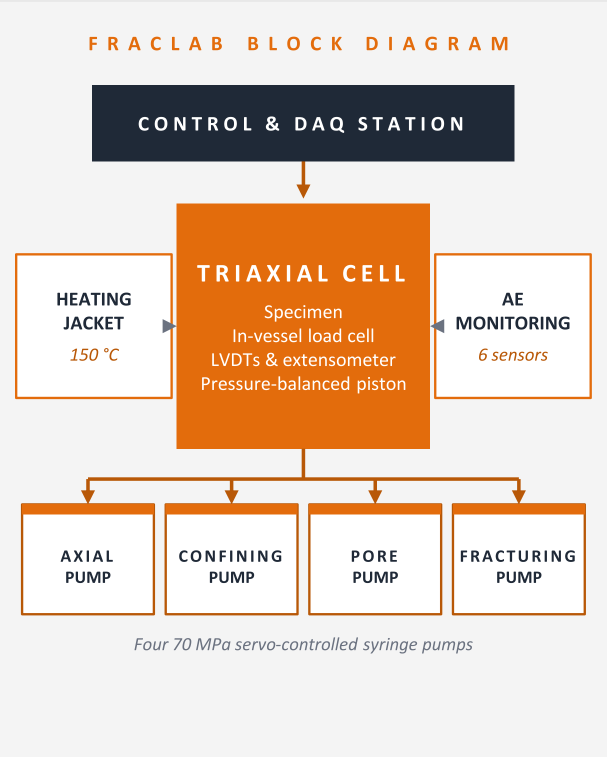
Triaxial compression test with precise measurement of axial and radial strain under controlled confining and pore pressure. Delivers full mechanical characterization including elastic moduli, strength envelope and post-peak behaviour.

MEASUREMENTS

Axial strain (3 LVDTs) • Radial strain (2 extensometers) • Axial load (in-vessel cell) • Confining pressure • Temperature

Main Components

Ten core modules forming the FRACLAB platform



System block diagram — main signal & fluid paths

1. Triaxial cell
2. In-vessel load cell
3. Axial & diametral strain sensors
4. Acoustic Emission monitoring system
5. Heating jacket
6. Triaxial cell hydraulic lift
7. Axial pressure pump
8. Confining pressure pump
9. Pore pressure pump
10. Fracturing fluid pump

\+ *Computer control & data-acquisition station*

INTEGRATED ARCHITECTURE

MECHANICAL LOADING

A hydraulically powered loading frame applies axial stress through an in-vessel piston, while the cell base supports the triaxial chamber. A motorized hydraulic lift opens and closes the cell for rapid specimen change.

FLUID CONTROL

Four independent BT-series syringe pumps regulate confining, axial, pore and fracturing-fluid pressures up to 70 MPa with sub-mL/min resolution, supporting drained, undrained and reactive-fluid protocols.

INSTRUMENTATION

Axial LVDTs, a diametral extensometer, an in-vessel load cell, six AE sensors and dual feedthrough connectors deliver simultaneous mechanical, hydraulic and microseismic data acquisition.

Pressure-Balanced Deviatoric Piston

Independent control of axial and confining stress, free of parasitic forces

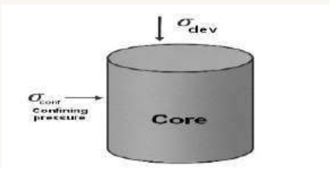
FRACLAB uses a pressure-balanced deviatoric triaxial cell engineered to apply axial stress (σ_{axial}) and confining stress ($\sigma_{confining}$) independently — while preventing the confining pressure from influencing the measured axial load. This design is the cornerstone of accurate stress-path testing.

HOW IT WORKS

The cell incorporates a pressure-balanced piston, where the confining pressure acts on equal and opposing surface areas. As a result, no parasitic force is transmitted to the load train.

Only the applied axial stress contributes to the deviatoric stress (σ_{dev}), allowing precise and independent control of σdev and σconfining throughout the experiment — even at high confining pressure.

$$\text{Axial stress} = \sigma = \underbrace{\sigma_{dev}}_{\text{Deviatoric stress}}$$



Cell components — assembled & cross-section views

BENEFITS OF THE PRESSURE-BALANCED DESIGN

ASTM-COMPLIANT

Stress paths follow ASTM-recognized triaxial-test protocols, ensuring traceable, comparable results.

ACCURATE STRENGTH

Strength measurements are free of confining-pressure bias, giving true peak and residual values.

CLEAN RESPONSE

Residual-stress response is uncontaminated by parasitic loading — essential for fracture-mechanics studies.

Hydraulic Fracturing & Acoustic Emission

High-frequency monitoring of fracture initiation and propagation

FRACLAB couples a high-pressure hydraulic-fracture injection circuit with a high-sensitivity AE module to detect and locate microcracking and fracture events during triaxial testing. Real-time, high-frequency data acquisition delivers a complete picture of damage evolution — from the first microcrack to full breakdown.

HYDRAULIC FRACTURING SYSTEM

Specimen with axial borehole

PURPOSE

Hydraulic-fracturing and wellbore-stability tests under triaxial stress; measures breakdown pressure and fracture-initiation behaviour.

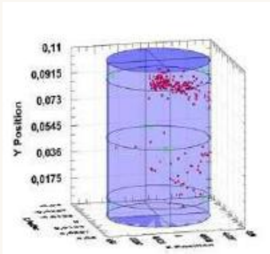
PRINCIPLE

Fluid pressure rises inside the borehole until tensile strength is exceeded — peak pressure equals breakdown pressure. After propagation, pressure decays toward pore pressure.

INJECTION CONFIGURATION

- Integrated injection platen connected to a pre-drilled axial borehole
- Dedicated fracturing-fluid pump (70 MPa, servo-controlled)
- Fluid delivered at constant rate until tensile fracture initiates
- Compatible with the Acoustic Emission (AE) monitoring system

AE MONITORING SYSTEM



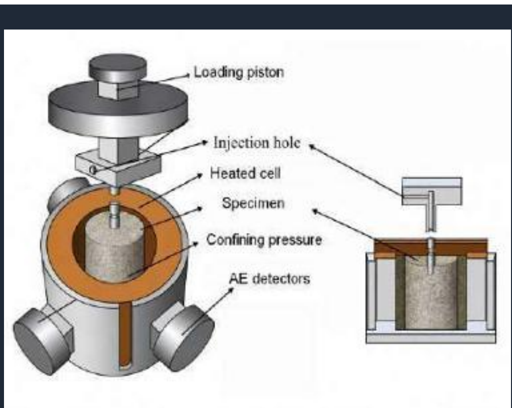
Real-time 3D event localization

KEY SPECIFICATIONS

Sensors	**6 lateral, full radial**
Sensitivity	**62 dB ref V/(m/s)**
Frequency	**125 – 750 kHz**
Resonant	**140 kHz**
Acquisition	**16-bit, 10 MHz, 8 ch**
Location	**≈ 2 mm accuracy**

CAPABILITIES

- Signal amplification: 40 dB (32 – 1000 kHz filters)
- Operating temperature range: −65 to 177 °C
- Real-time fracture-morphology reconstruction
- 2D & 3D event-localization software included



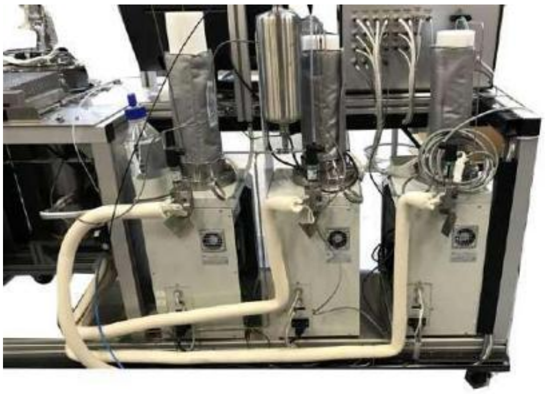
AE TRANSDUCERS — FULL RADIAL COVERAGE

Six AE detectors are mounted laterally around the heated cell, providing full radial coverage of the specimen. The pressure-balanced cell design and an injection channel through the loading piston allow simultaneous fluid injection and microseismic monitoring during the fracture experiment — an essential combination for characterizing crack initiation, propagation paths and post-breakdown behaviour.

Four High-Pressure Syringe Pumps

BT-series, servo-controlled, 70 MPa rated

Four servo-controlled syringe pumps regulate confining, axial, pore and fracturing-fluid pressures with high accuracy in closed-loop control. Each pump is independently programmable and shares a common Ethernet-based data-logging architecture, enabling synchronized control of all four fluid lines from the supervision station.



BT-series syringe pumps installed on the FRACLAB platform

COMMON FEATURES

- Working pressure: 70 MPa (10,000 psi)
- Volume: 250 cc per pump
- Flow rate: 0.0001 to 60 cc/min
- Stainless-steel wetted parts
- Integrated touch-screen panel
- Ethernet data logging
- Ambient & high-temperature operation
- Closed-loop servo control

AXIAL PRESSURE PUMP

Constant-force mode

Controls the axial load applied on the specimen via the in-vessel piston, enabling load-controlled or strain-controlled compression tests.

CONFINING PRESSURE PUMP

Constant-pressure mode

Applies confining pressure on the jacketed specimen up to 70 MPa, with closed-loop regulation independent from axial loading.

PORE PRESSURE PUMP

Drained / undrained tests

Regulates pore pressure and pore-fluid flow rate, supporting drained, undrained and constant-flow Darcy permeability protocols.

FRACTURING FLUID PUMP

Constant-flow injection

Injects fracturing fluid at a precise constant flow rate into the specimen borehole until tensile breakdown — the heart of the hydro-frac test.

Supervision, Control & Reporting Station

A unified workstation for the complete FRACLAB experiment

The FRACLAB control station integrates pump regulation, heating control, instrumentation acquisition and report generation into a single touch-friendly software environment. Operators monitor every parameter on a synoptic display, trigger automated test sequences and obtain a standardized report at the end of each experiment.

Dual-screen control station — synoptic + acquisition

CONTROL

- Synoptic display with live component status
- Independent pump control & sequencing
- Heating control (ambient to 150 °C)
- Programmable test sequences & safety interlocks

REAL-TIME ACQUISITION

- Radial & axial strains (LVDTs, extensometer)
- Axial stress & confining pressure
- Pore / back pressure & differential pressure
- Pore flow rate, temperature, AE signals

PROCESSING & REPORTING

- Automatic property calculation (E, ν, UCS, strength)
- Standardized PDF report generation
- Full data archiving with metadata
- CSV / TDMS export for further analysis

AUTOMATED EXPERIMENT WORKFLOW

1 — MOUNT
Specimen jacketed and instrumented

2 — CONDITION
Pore pressure & temperature stabilized

3 — LOAD
Confining + axial stress applied

4 — FRACTURE / TEST
Injection or compression sequence

5 — REPORT
Auto data processing & PDF report

Typical Applications

Where FRACLAB delivers value

FRACLAB is the ideal platform for advanced rock-mechanics research in academic, energy and geotechnical sectors. Its combination of triaxial loading, hydraulic-fracture injection and acoustic-emission monitoring makes it equally well suited to fundamental research and applied engineering studies.

Oil & Gas

UNCONVENTIONAL RESERVOIRS

Characterization of shale, tight sandstone and carbonate formations: breakdown pressure, fracture propagation and proppant effectiveness.

CO_2 / H_2

GEOLOGICAL STORAGE

CO_2 and hydrogen underground storage studies: caprock integrity, fracturing under reactive fluids, long-term containment assessment.

EGS

GEOTHERMAL ENERGY

Enhanced Geothermal Systems: fracture-network generation, thermo-hydro-mechanical coupling, reservoir-stimulation studies.

Fundamental

ROCK MECHANICS RESEARCH

Studies of damage evolution, fracture toughness, acoustic-emission signatures and failure mechanisms in intact and fractured rock.

Infrastructure

CIVIL & MINING ENGINEERING

Rock-strength characterization for tunnelling, dam foundations, deep excavations and rock-slope stability analyses.

Long-term storage

NUCLEAR WASTE DISPOSAL

Evaluation of host-rock fracture behaviour, sealing capacity and long-term integrity for deep geological repositories.

FROM LABORATORY RESEARCH TO INDUSTRIAL DEPLOYMENT

Whether you are a university group studying fracture initiation, an energy operator screening reservoir candidates, or an engineering firm validating rock-strength assumptions for a major project, FRACLAB delivers laboratory-grade data with the speed and traceability required for modern geomechanical decision-making.

PRODUCT BROCHURE

RCP
TESTER

Resin-Coated Proppant Testing System

High-pressure laboratory instruments
& advanced geotechnical testing equipment

250 kN AXIAL LOAD	**70 MPa** CONFINING
175 °C TEMP. MAX	**Ø 50 mm** SPECIMEN

OVERVIEW

RCP Tester at a glance

The Floxlab RCP Tester is an integrated bench for resin-coated proppant qualification. It cures specimens under realistic closure stress and temperature, then characterises their mechanical strength under unconfined and triaxial compression — all on the same load frame.

01

Curing under stress

Cures resin-coated proppant (RCP) samples under varying axial loads and temperatures, using a dedicated flow-through curing cell.

02

Strength assessment

Measures unconfined and triaxial compression strengths of cured RCP specimens using a purpose-built proppant triaxial cell.

KEY SPECIFICATIONS

SPECIMEN DIAMETER

up to 2" (50 mm)

L = 2 × diameter

AXIAL LOAD CAPACITY

250 kN compression

load or displacement control

CONFINING PRESSURE

70 MPa 10,000 psi

servo-valve regulated

TEMPERATURE RANGE

up to 175 °C

ambient to 175 °C

APPLICATIONS

- Hydraulic fracturing R&D
- Proppant qualification & batch control
- Resin coating performance studies
- UCS and triaxial strength characterisation

Resin-coated proppant specimen

ARCHITECTURE

System components

The RCP Tester is delivered as a complete, integrated system. The eight subsystems below work together to take a proppant specimen from curing to mechanical characterisation under controlled stress and temperature.

1. **Hydraulic Power Pack**
2. **Load Frame**
3. **Axial Actuator (servo-valve)**
4. **Load Cell (up to 250 kN)**
5. **Flow-Through Curing Cell**
6. **Proppant Triaxial Cell**
7. **Confining Pressure Intensifier**
8. **Computer / Data Acquisition Station**

Integrated RCP Tester unit

FULLY INTEGRATED

Single load frame, two test cells

Curing and triaxial testing share the same hydraulic supply and acquisition chain — for repeatable, traceable workflows from prep to report.

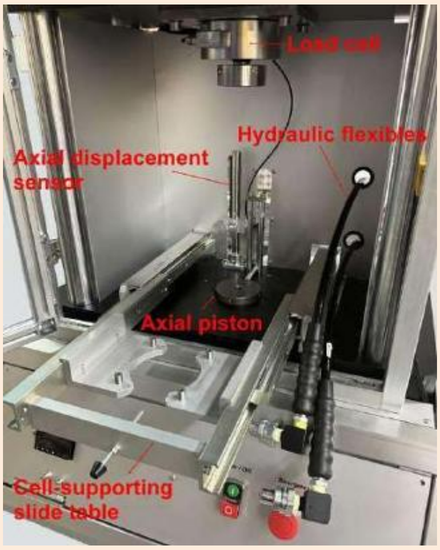
MECHANICS & POWER

Load frame & hydraulic supply

01 · LOAD FRAME

Function

- Applies accurate axial stress during compressive strength tests
- Operates in load-control or axial-displacement mode
- Compatible with both triaxial and curing cells
- Stationary crosshead fixed to the base plate by four columns
- Hydraulic actuator integrated in the lower section of the frame
- Rapid piston displacement with precise loading capacity



Load frame cell work area (annotated)

Cell Work Area

- Sliding table to support the test cell
- Load cell up to 250 kN
- Axial displacement sensor
- Two hydraulic hoses for confining pressure

02 · HYDRAULIC POWER PACK

Functions

- Supplies hydraulic fluid to the axial and confining actuators via servo-valves
- Built around a variable-speed, constant-pressure gear pump
- Low-noise, stable hydraulic operation
- Supports load-control and displacement-control modes

PUMP FLOW	MAX PRESSURE
0.1–1 LPM	20 MPa

PUMP TYPE	OIL TANK
Gear pump	10 L

STAGE 1 · CURING

Flow-through curing cell

Cures resin-coated proppant packs at high temperature and variable closure stress, before unconfined compressive strength testing. The cell allows fracturing-fluid leak-off monitoring during closure application.

KEY FEATURES

- Chamber with upper and lower hardened steel platens
- Applies axial compression to simulate closure pressure on the proppant pack
- Monitors fracturing-fluid leak-off during closure application
- Fluid ports in the platens enable fluids to flow from the specimen
- Heating mantle delivers a uniform temperature from ambient up to 177 °C
- Includes a specimen extractor for easy removal of the cured sample

Curing cell

Sample extractor

Curing cell with heater

WORKFLOW

From raw RCP to test specimen

1 Load RCP – 2 Apply closure stress – 3 Cure at temperature – 4 Extract specimen

STAGE 2 · STRENGTH

Proppant triaxial cell

An enclosure for testing cylindrical resin-coated proppant specimens under combined axial and radial compression. The triaxial cell applies circumferential confining pressure simultaneously with axial load to reproduce realistic stress states.

DESIGN HIGHLIGHTS

- Specimen encased in a Viton sleeve between hardened steel endcaps
- Complete assembly submerged in oil under confining pressure
- Top pore-fluid port at the upper platen for fracturing-fluid expulsion during compression
- Low-friction loading piston designed specifically for triaxial testing
- Heating mantle for controlled temperature conditions during testing

Proppant triaxial cell

Proppant triaxial cell with heater

SPECIFICATIONS

AXIAL LOAD	CONFINING	TEMPERATURE	SPECIMEN
250 kN	70 MPa	175 °C	Ø50 mm

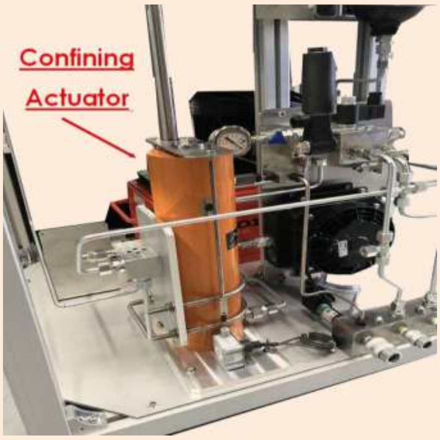
PRESSURE & CONTROL

Confining intensifier · software

01 · CONFINING INTENSIFIER

Function

- Provides pressurised fluid to the confining chamber of the triaxial cell
- Fills, pressurises, regulates and drains the confining fluid
- Servo-valve-controlled hydraulic actuator
- Linear transducer measures confining-oil volume in the actuator
- Housed in a metal cabinet on casters for easy mobility
- Operates in pressure-control or constant-displacement mode



Confining pressure intensifier

02 · COMPUTER STATION & SOFTWARE

Visualisation

Synoptic view, component status, real-time measurements & trend graphs.

Acquisition

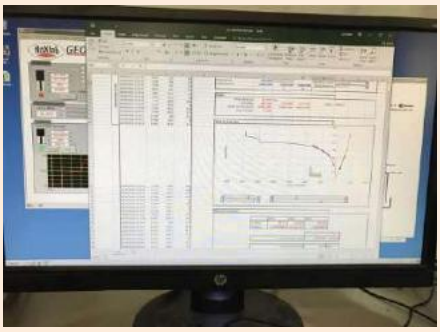
Continuous data logging with high temporal resolution for downstream analysis.

Test setup

Set-points entered manually or via macro commands for automated test runs.

Reporting

Automated report generation, ready to share with QC teams and customers.



Synoptic & trend monitoring

PRODUCT BROCHURE

Rotating Disk Reactor

RDR-350

High-pressure, high-temperature study of reaction kinetics and mass transfer between a fluid and a solid surface.

RDR-350 | Floxlab geotechnical & laboratory testing equipment

01 • OVERVIEW

How the rotating disk reactor works

Reaction kinetics & mass transfer under HP / HT conditions

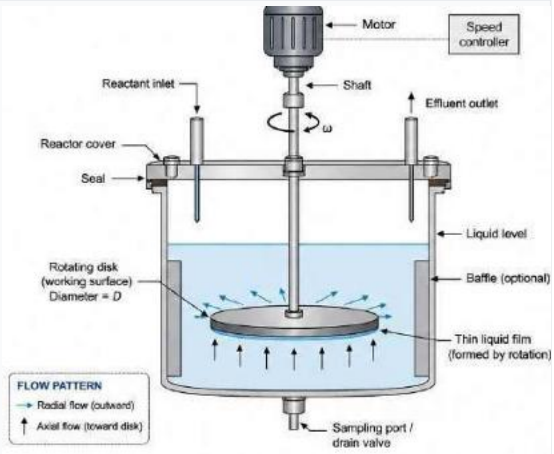
The RDR-350 investigates reaction kinetics and mass transfer between a fluid (acid solution) and a solid surface (carbonate disk) under high-pressure and high-temperature conditions. Carbonate disks are placed inside a reaction vessel and rotated while the mineral dissolution rate in the acid is monitored.

KEY CAPABILITIES

- Acid–rock reactions
- Controllable mass-transfer rate
- Up to 5,000 psi & 250 °C
- Hastelloy wetted parts
- Semi-automated apparatus

WORKING PRINCIPLE

Operating sequence



Working principle of the rotating disk reactor

Carbonate disks ready for the RDR test

1. The motor rotates the disk at a controlled angular speed (ω, rpm).
2. Liquid is fed into the reactor through the reactant inlet.
3. Centrifugal force spreads the liquid across the disk into a thin film.
4. Fluid flows radially outward along the disk surface.
5. Bulk fluid moves axially toward the disk, renewing the film.
6. Reaction occurs at the solid–liquid interface on the disk.
7. Reacted fluid leaves the reactor through the effluent outlet.

02 • PURPOSE

What the apparatus is designed for

Critical parameters for modeling acidizing processes in petroleum reservoirs

The RDR-350 is designed to study reactions between fluid and solid surface under high-pressure, high-temperature operating conditions. It is used to determine:

1. **Mineral dissolution rate**

   Dissolution rate of minerals contained in carbonate rock in acid (calcite or dolomite).

2. **Mass-transfer coefficient**

   Determination of the mass-transfer coefficient k_m between the bulk fluid and the disk surface.

3. **Mass flux rate**

   Mass flux rate J — diffusion coefficient describing transport of reactant to the surface.

4. **Reaction rate**

   Reaction rate r representing the surface kinetics between acid and rock.

5. **Operating-condition effects**

   Effects of temperature, rotation speed, and fluid properties on overall reaction behaviour.

03 • KINETICS & MASS TRANSFER

What controls the dissolution rate

The phenomena governing the rotating disk reactor

OVERALL REACTION RATE 01

$$r = J \cdot A = k_m \cdot A \cdot (Cb - Cs)$$

r represents how fast the rock dissolves or reacts with the acid. The reaction rate increases with higher mass transfer k_m, larger surface area A and a larger concentration gradient.

MASS FLUX TO THE DISK SURFACE 02

$$J = k_m \cdot (Cb - Cs)$$

J is the number of reactant molecules arriving at the disk surface per unit time. Cb is the bulk concentration, Cs the surface concentration. A greater concentration difference means more molecules reach the surface.

MASS-TRANSFER COEFFICIENT 03

$$k_m = 0.62 \cdot D^{2/3} \cdot \nu^{-1/6} \cdot \omega^{1/2}$$

Levich equation. k_m describes how easily molecules move from the liquid to the rock surface. Rotation improves the mass-transfer rate, scaling with the square root of rotation speed ω ($k_m \propto \omega^{1/2}$).

ACID DISSOLUTION OF CARBONATE 04

$$Ca^{2+} / Mg^{2+} \rightarrow \text{measured vs. time}$$

The dissolution rate is measured by analysing dissolved Ca^{2+} or Mg^{2+} ions in the fluid over time using atomic spectroscopy. Concentration evolution gives the reaction rate directly.

04 • MAIN COMPONENTS

Subsystems delivered with the RDR-350

An integrated, ready-to-use HP / HT testing system

01

Reaction Vessel

Hastelloy HP/HT vessel where the acid–rock reaction occurs. Holds the rotating spindle, embedded heating cartridges, cooling jacket, gas and acid inlets, sample outlet, burst disc, pressure transducer and temperature probe.

02

Transfer Vessel

Hastelloy HP/HT reservoir storing the test fluid before injection. Embedded heating and cooling jacket maintain isothermal conditions. Connected to the reaction vessel via the N_2 pressurisation circuit.

03

Chiller

Provides cold water to the reaction and transfer vessels for rapid heat transfer. Temperature range −15 to 40 °C with stability ±0.2 °C. 230 VAC / 50 Hz.

04

Fraction Collector

Model 2110, 80 polypropylene tubes; time- or drop-based collection. Programmable from front panel or remotely. 24 × 33 × 25 cm footprint.

05

N_2 Gas Booster

Compresses and transfers low-pressure N_2 up to 5,000 psi into the HP vessels. Manual valves, air regulator, filter, high-pressure tubing and fittings.

06

Data Acquisition

PC workstation with Floxlab supervision software controlling test duration, rotation speed, temperature, pressure and automatic sampling at user-defined intervals.

05 • SPECIFICATIONS

Technical data & typical applications

Performance envelope and where the RDR-350 is used

KEY FEATURES & BENEFITS

Maximum pressure	5,000 psi
Maximum temperature	Ambient → 250 °C
Reaction vessel volume	500 cc
Transfer vessel volume	500 cc
Sample disk diameter	1.5 in (3.81 cm)
Sample disk thickness	1 in (2.54 cm)
Disk rotational speed	100 – 2,000 rpm
Wetted-part material	Hastelloy
Required N_2 pressure	2,000 psi
Required air pressure	150 psi, dry
Power supply	110 – 220 VAC, 50/60 Hz
Internal vessel diameter	75 mm

TYPICAL APPLICATIONS

Petroleum Engineering

Acid–rock reactions for well-stimulation and carbonate dissolution studies.

Reaction Kinetics

Rate constants and reaction-rate measurements for fluid–solid systems.

Mass-Transfer Studies

Mass-transfer coefficient and boundary-layer quantification.

Corrosion & Dissolution

Corrosion of metals; dissolution of rocks and minerals.

Scale & Precipitation

Precipitation, scale formation and inhibitor effectiveness.

Electrochemistry & Biofilms

Electrodeposition; biomass and biofilm growth on surfaces.

Rapid, accurate and reproducible data — small test-fluid volume, semi-automated apparatus.

TEST PROCEDURE

- Mount 1.5 in carbonate disk on rotating spindle
- Seal reaction vessel; heat to test temperature
- Load test fluid into transfer vessel; preheat
- Pressurise system with N_2 to working pressure
- Push fluid into reaction vessel using N_2
- Start disk rotation at preset speed
- Collect fluid samples at preset intervals
- Measure Ca^{2+} / Mg^{2+} by atomic absorption
- Plot reaction rate vs ω → identify regime
- Repeat at varying ω, T, concentration → rate law

FLOXLAB CELLS

FOR RESERVOIR STIMULATION EXPERIMENTS

Conductivity · Curing · Crush · Triaxial

Laboratory testing cells for proppant evaluation and fracture conductivity studies

STANDARDS	PRESSURE	TEMPERATURE
API RP 56/58/60	**20,000 psi**	**177 °C**
ISO 13503	*max closure*	*max operating*

PRODUCT PORTFOLIO

A complete range of laboratory cells for hydraulic fracturing studies

CONDUCTIVITY & CURING CELLS

AC-series
API Conductivity Cell — single, API RP 56/58

SAC-series
Multi-Stack API Conductivity — 2 or 3 cells, shared pump

FCC-series
Fracture Conductivity Cell — large slab, short & long-term

ACC-series
Acid Fracture Conductivity — Hastelloy, carbonate formations

FTC-series
Flow-Through Curing Cell — resin-coated proppant curing

FLC-series
Fluid Loss Curing Cell — RCP conditioning, parallel cells

CRUSH & TRIAXIAL CELLS

CC-series
Proppant Crush Cell — ISO 13503-2, API RP 60

PTC-series
Proppant Triaxial Cell — UCS & confined compression

COMMON FEATURES

- Fully API / ISO compliant
- Stainless steel or Hastelloy wetted parts
- High-pressure & high-temperature operation
- Compatible with brine, nitrogen, acid, fracturing fluids
- Modular accessories (heaters, jackets, extruders)

THE FAMILY AT A GLANCE


AC


FCC


FTC

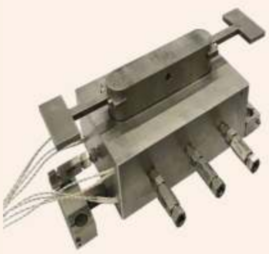

CC


PTC

FLC

AC-SERIES — API CONDUCTIVITY CELL

Single API conductivity cell for proppant pack permeability and conductivity



KEY FEATURES

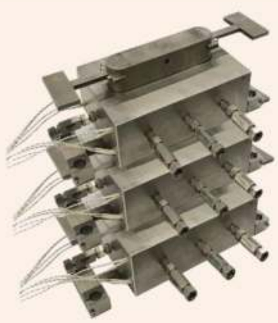
- API RP 56 & RP 58 compliant
- Reservoir-representative pressure & temperature
- Heated end-plates with thermocouple monitoring
- Three-port pressure-tap design for ΔP measurement
- Compatible with brine, gas (N_2) and other fluids
- Stainless steel construction (Hastelloy option)
- Designed for use with the PCM-1000 system

KEY SPECIFICATIONS

Standard	API RP 56 & 58
Closure pressure	up to 20,000 psi
Temperature	ambient to 175 °C
Pore pressure	up to 1,000 psi
Sample size	7" × 1.5" × 1"
Wetted parts	Stainless steel
Pressure taps	3 (ΔP)
Sand screen	Integrated

SAC-SERIES — MULTI-STACK API CELL

Stacked API conductivity cells sharing a single hydraulic pump and pressure source



KEY FEATURES

- Stacked configuration: 2 or 3 cells in one column
- Single hydraulic pump drives all cells simultaneously
- Reduces footprint and accelerates testing throughput
- Identical closure conditions across all cells
- ISO 13503-5 & API RP 56/58 compliant
- Independent flow paths for each cell
- Stainless steel — Hastelloy option for corrosive fluids

KEY SPECIFICATIONS

Standard	ISO 13503-5
Capacity	2 or 3 cells
Closure pressure	up to 20,000 psi
Temperature	ambient to 175 °C
Pore pressure	up to 1,000 psi
Sample / cell	7" × 1.5" × 1"
Wetted parts	Stainless steel
Pump	Shared, indep. flow

FRACTURE CONDUCTIVITY CELLS

Long-term and acid fracture conductivity testing on rock slabs

FCC-SERIES — FRACTURE CONDUCTIVITY CELL

Short-term and long-term tests on large rock slabs

KEY FEATURES

- Designed for use with the FCM-1000 system
- Heated end-plates with precise temperature control
- Two loading pistons with leakoff ports
- Two inlets/outlets for fluid flow
- 4 LVDTs measure fracture width at multiple positions
- 3 inline pressure taps for ΔP measurement
- Sample: two stacked rock slabs (1.5" × 7" x 1” each)

KEY SPECIFICATIONS

Standard	API methods
Max temperature	175 °C
Closure stress	up to 20,000 psi
Pore pressure	up to 1,000 psi
Sample type	Two stacked slabs
Sample size	7" × 1.5" × 2"
LVDTs	4 (fracture width)
Wetted parts	SS / Hastelloy

ACC-SERIES — ACID FRACTURE CELL

Hastelloy cell for simulating acid fracturing in carbonate formations

KEY FEATURES

- Designed for use with the ACM-3000 acid fracture system
- Acid etching and conductivity in a single cell
- Hastelloy construction — resistant to hot acid environments
- Two loading pistons with leakoff ports
- Two inlets/outlets for acid and brine circulation
- 4 LVDTs measure fracture width at multiple positions
- 3 inline pressure taps for ΔP measurement
- Sample: two stacked rock slabs (1.5" × 7" x 3.5” each)

KEY SPECIFICATIONS

Application	Carbonate acid frac
Max temperature	175 °C
Closure stress	up to 20,000 psi
Acid pressure	up to 1,000 psi
Frac. pressure	up to 3,000 psi
Sample size	7" × 1.5" × 7"
Wetted parts	Hastelloy
LVDTs	4 (fracture width)

CURING CELLS

Resin-coated proppant curing under elevated temperature and closure stress

FTC-SERIES — FLOW-THROUGH CURING CELL

Cures RCP plugs at high temperature and variable closure stress

KEY FEATURES

- Designed for use with the RCP tester
- Cures resin-coated proppant plugs at high temperatures
- Bonded steel platens for variable closure stress
- Sample chamber with hardened upper and lower platens
- Fluid ports in platens enable leak-off monitoring
- Heating mantle maintains temperature up to 175 °C
- Extension connector for sample removal after curing

KEY SPECIFICATIONS

Sample diameter	up to 2" (L=2×Ø)
Closure pressure	up to 10,000 psi
Temperature	up to 175 °C
Wetted parts	Stainless steel
Heating	External mantle
Application	RCP curing
Output	Plug for UCS test
Compatibility	RCP Tester

FLC-SERIES — FLUID LOSS CURING CELL

RCP conditioning under closure stress and temperature (API RP 60)

KEY FEATURES

- Engineered to precondition resin-coated proppant packs
- Operates under elevated temperature and closure stress
- Prepares plugs prior to UCS testing
- Floating piston accumulator — N_2-charged closure
- Removable cap with leak-off port and sand screen
- Run 3 to 6 cells concurrently in oven or with mantle
- Compliant with API RP 60

KEY SPECIFICATIONS

Standard	API RP 60
Closure pressure	up to 10,000 psi
Temperature	up to 175 °C
Pack diameters	1" / 1.5" / 2"
Pack length	up to 4"
Models	FLC 25 / 38 / 50
Wetted parts	Stainless steel
Operation	3–6 cells in parallel

CC-SERIES — PROPPANT CRUSH CELL

Crush-resistance evaluation per ISO 13503-2 and API RP 56/58/60

KEY FEATURES

- Designed for use with the PCT apparatus
- ISO 13503-2 and API RP 56 / 58 / 60 compliant
- Cylindrical chamber with upper and lower platens
- Filled at 1.22 cm^3/cm^2 with sieved proppant
- Withstands crush pressures up to 20,000 psi
- Compatible with mesh sizes 12/18, 18/30, 30/50
- Stainless steel — fast loading/unloading

KEY SPECIFICATIONS

Standard	ISO 13503-2 / RP 60
Max crush press.	20,000 psi
Press stress	300 kN
Inside diameter	2.5" (64 mm)
Outside diameter	3.5" (89 mm)
Piston height	3.5" (89 mm)
Loading rate	≤ 2,000 psi/min
Wetted parts	Stainless steel

PTC-SERIES — PROPPANT TRIAXIAL CELL

Unconfined and confined compression on resin-coated proppant plugs

KEY FEATURES

- Designed for use with the RCP tester
- Sample assembly submerged in oil under confining pressure
- Low-friction loading piston for triaxial testing
- Heating mantle for controlled temperature
- Specimen up to 2" Ø (length = 2 × Ø)

KEY SPECIFICATIONS

Application	UCS & triaxial
Specimen Ø	up to 2" (50 mm)
Specimen length	2 × Ø
Axial load	up to 250 kN
Confining press.	up to 10,000 psi
Temperature	ambient to 175 °C
Heating	External mantle
Compatibility	RCP Tester

PRODUCT RANGE — SUMMARY

Comparison of the eight Floxlab cell families at a glance

Cell	Application	Standard	Max stress	Max temp.	Wetted parts
AC-series	API conductivity (single)	API RP 56/58	20,000 psi	175 °C	Stainless steel
SAC-series	API conductivity (stack)	ISO 13503-5	20,000 psi	175 °C	Stainless steel
FCC-series	Fracture conductivity	API methods	20,000 psi	175 °C	SS / Hastelloy
ACC-series	Acid fracture conductivity	API methods	20,000 psi	175 °C	Hastelloy
FTC-series	RCP curing under stress	Internal	10,000 psi	175 °C	Stainless steel
CC-series	Proppant crush resistance	ISO 13503-2 / RP 60	20,000 psi	ambient	Stainless steel
FLC-series	RCP fluid loss & curing	API RP 60	10,000 psi	175 °C	Stainless steel
PTC-series	Proppant triaxial / UCS	Internal	10,000 psi	175 °C	Stainless steel

ENGINEERED IN FRANCE · USED WORLDWIDE

- All cells are operated with Floxlab's matching test apparatus (PCM-1000, FCM-1000, ACM-3000, RCP Tester, PCT press).
- Optional accessories include heating mantles, ovens, hydraulic pumps, LVDTs, thermocouples and pressure sensors.
- Custom configurations and OEM versions available on request — contact our engineering team for a tailored quote.