



PRODUCT BROCHURE

AE MONITORING SYSTEM

Acoustic Emission Sensors & Software



How sensors reveal cracks, direction and fracture shape — inside solid rock

ROCK MECHANICS

HYDRAULIC FRACTURING

DAMAGE MONITORING

Rocks speak — and we listen.

Acoustic Emission (AE) monitoring captures the bursts of sound released by every microcrack inside a stressed rock — and pinpoints exactly where each one forms.

1 Squeeze a rock — and it cracks.

Long before the rock breaks in two, thousands of tiny cracks open inside it. Each is invisible to the eye — but each releases a tiny burst of sound.

2 Tiny sensors hear every click.

Highly sensitive sensors are mounted around the rock surface. They pick up these micro-bursts — called Acoustic Emissions — like a stethoscope hears a heartbeat.

Every "click" tells us a microcrack just formed — and where it formed.

Pinpointing each crack

How do we know exactly WHERE each crack is?

A

Many sensors, one click

An array of sensors is placed around the rock. When a crack opens, each sensor hears the click at a slightly different moment.

B

Time tells distance

Sound travels at a known speed in rock. A small time difference between sensors means the source is closer to one than the other.

C

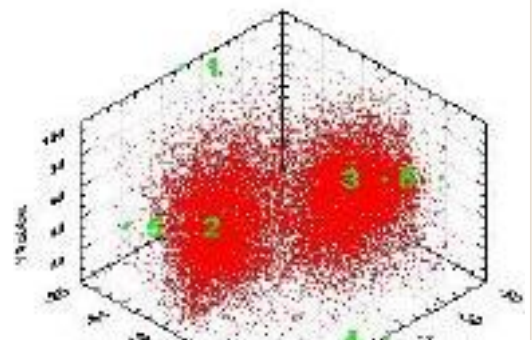
Triangulation

By comparing arrival times across all sensors, the computer pinpoints the crack — accurate to about 2 millimetres.

THE RESULT

A 3D map of every crack, as it happens.

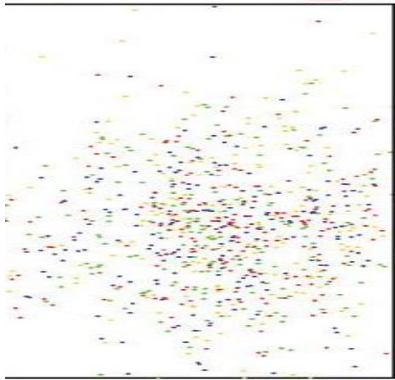
A 3D map showing every crack — its location, timing and strength — as the test unfolds. Like watching a thunderstorm form, but inside a solid rock.



Watching a fracture form — in three stages

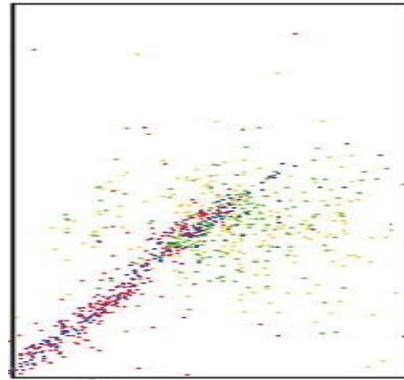
As the load increases, the AE pattern tells the story of the fracture.

1 Scattered



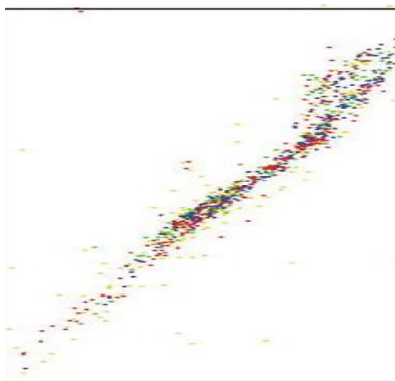
Random microcracks appear throughout the rock. No clear pattern yet — early damage.

2 Lining up



Cracks begin clustering along a diagonal plane. A fault is being born.

3 Fault formed



Cracks now align tightly along a single plane — the fault has cut through the rock.

✓ Confirmed



Cut the rock open: the real fracture matches exactly where the sensors said it was.

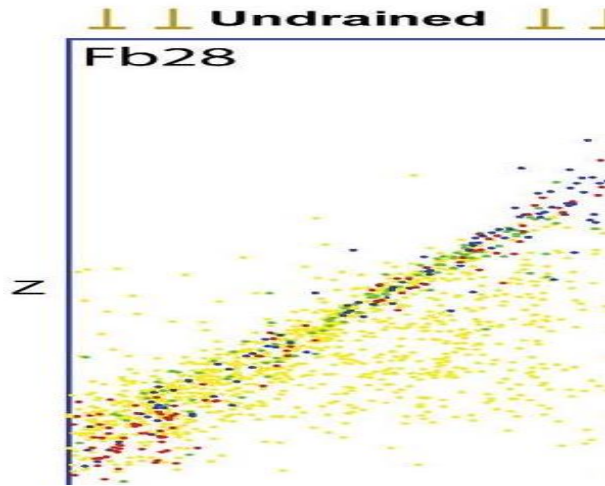
The AE map predicts the fracture before the rock breaks — and matches it perfectly afterwards.

Reading fracture direction & shape

Each fracture has its own signature — and the AE pattern reveals it.

CASE 1

A simple diagonal fault



AE map

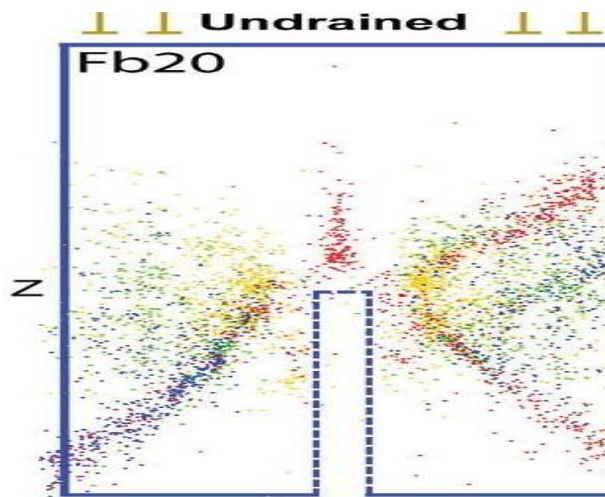


Real fracture

Cracks line up along one straight plane — telling us a single, clean fault formed at a specific angle.

CASE 2

A complex branching fracture



AE map



Real fracture

Cracks fan out from the centre — multiple branches form a network. The AE map captures the whole shape.

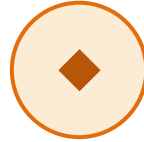
Why this matters

From the laboratory to real-world energy and earth-science applications.



PREDICT before it breaks

AE activity ramps up sharply just before a rock fails — giving an early warning of catastrophic failure.



UNDERSTAND fracture mechanics

Direction, shape and timing of cracks reveal HOW a rock breaks — vital for designing safer tunnels, dams and wells.



DESIGN energy resources

Used in oil & gas, geothermal, CO₂ storage and mining — wherever fluids are injected into rock or stress is applied underground.



VALIDATE engineering models

Real lab data on fracture initiation and growth lets engineers calibrate computer simulations of real rock formations.

AE turns the inside of a rock into a window —
making the invisible visible.

Inside the Floxlab AE Monitoring System

An array of high-sensitivity AE sensors and a dedicated software suite — designed to detect and locate microcracking in real time during rock testing.

HARDWARE • Array of AE sensors

- Lateral high-sensitivity AE sensor array
- Full radial coverage around the rock specimen
- Resonant response at 300 kHz, range 125–750 kHz
- Compact miniature design (8 mm OD × 8 mm H)
- Stainless-steel case, ceramic face, BNC connector
- Operating temperature up to 177 °C
- Mounts around cylindrical or cubic samples

FLOXLAB AE SOFTWARE

- Real-time acquisition and post-processing
- 16-bit · 10 MHz · 8-channel high-resolution acquisition
- 1D / 2D / 3D source localization (~2 mm accuracy)
- Live fracture morphology mapping
- Waveform & time-frequency analysis (FFT, wavelets)
- Automatic / manual filtering with alarms & triggers
- Direct export to Word & Excel · remote monitoring

AE SENSORS — KEY SPECIFICATIONS

Medium-frequency resonant miniature sensors



OPERATING FREQUENCY RANGE

125 – 750 kHz

RESONANT FREQUENCY

300 kHz (V/μbar) / 140 kHz (V/m/s)

PEAK SENSITIVITY

62 dB Ref V/(m/s) · -72 dB Ref V/μbar

DIRECTIONALITY

± 1.5 dB

DIMENSIONS

8 mm OD × 8 mm H

WEIGHT

2 g (8 g with cable & connector)

TEMPERATURE RANGE

-65 °C to +177 °C

MATERIALS

Stainless steel · ceramic face · BNC

Additional features: 40 dB amplification · 32–1000 kHz programmable filters · 500 g shock limit · Enclosed crystal for RFI/EMI immunity · NIST calibration certificate

HIGH-RESOLUTION ACQUISITION • 16-bit • 10 MHz sampling • 8 channels • 40 dB amplification • 32–1000 kHz filters

Compatible Floxlab test systems

The AE Monitoring System is fully integrated with Floxlab rock-mechanics platforms — for triaxial compression and hydraulic fracturing tests.

FRACLAB

Hydraulic Fracture Test System



Triaxial compression with integrated hydraulic fracturing — for cylindrical specimens under high pressure and elevated temperature.

GEOTEST

Rock Triaxial Compression Test



Load-frame triaxial system with cell pressures up to 210 MPa and load capacity up to 2,000 kN, for cylindrical rock specimens.

TRUATEST

True-Triaxial Test System



True-triaxial platform applying independent stresses on three axes — for cubic rock specimens and complex stress paths.

GET IN TOUCH

ADDRESS

Floxlab SAS
23 rue du Port
92000 Nanterre
France

CONTACT

Email
contact@floxlab.com

Phone
+33 (0)1 81 93 12 85

Web
www.floxlab.com

SCAN ME



Visit our website

THANK YOU FOR YOUR INTEREST • ROCK MECHANICS • AE MONITORING • FRACTURE ANALYSIS