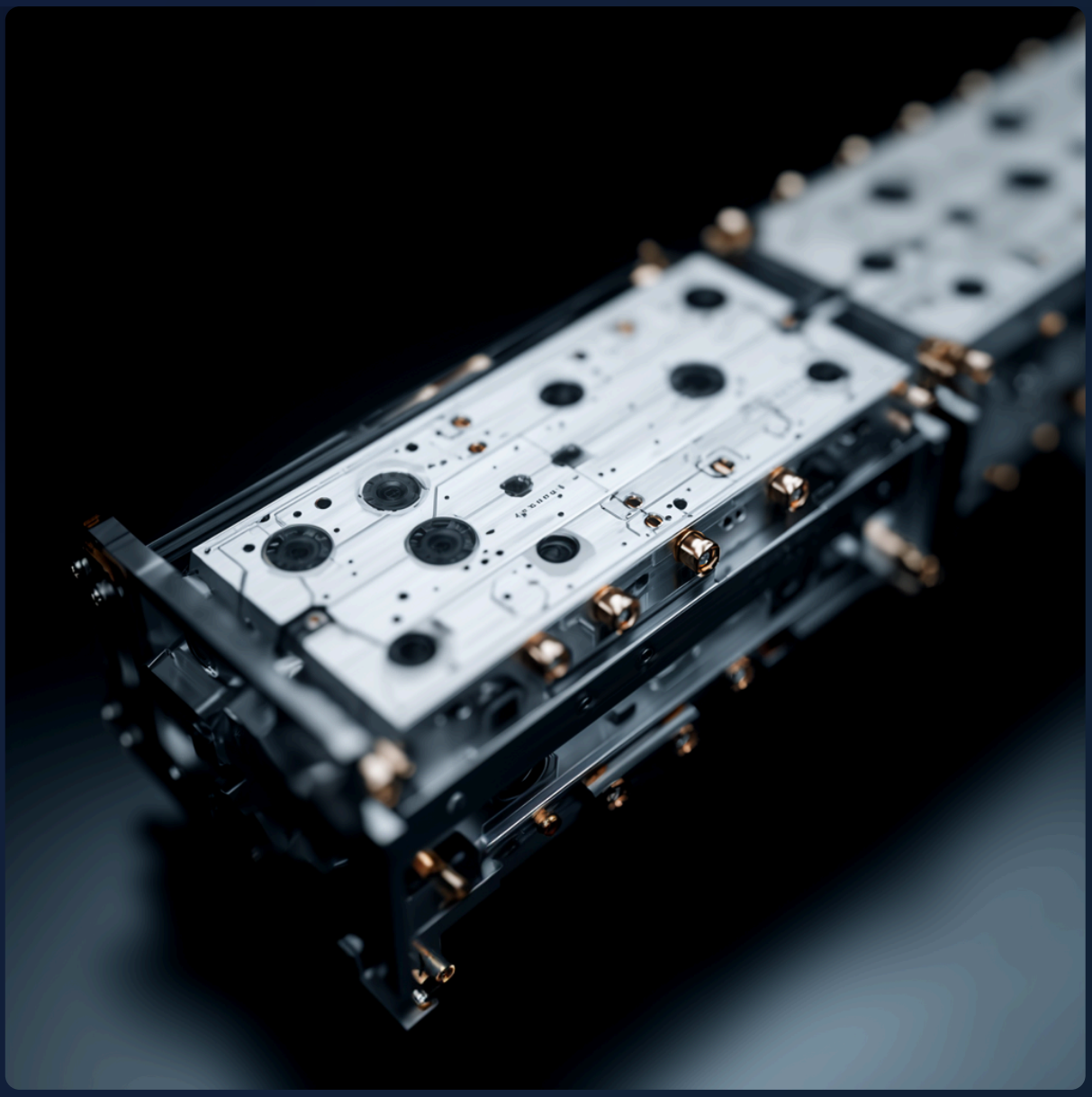
eXoTerra
Extreme Precision

Modular Instrument Rail

ExoTerra's flagship "laboratory-on-rail": a rigid 3U/6U-compatible frame that snaps together multiple TerraCube-class blocks into a single, self-contained analytics chain. Built for deep-space cubesats, cryo-volcanic landers, polar observatories and subsea monitoring stations.



Why ExoSense Pro?

1

Rack-&-Slide™ Architecture

Each 40 mm "slide" houses a sealed instrument cartridge; add, remove or reorder modules with four captive bolts —no board rework.

2

True Autonomous Science

Integrated robotic micro-pumps, sample wheels and adaptive AI decide what to test next while conserving reagents.

3

Harsh-Environment Rated

Carbon-fiber / Ti-6Al-4V skeleton, aerogel insulation and triple-layer radshield survive >25 krad TID, 70 g shocks and cryo-vac cycles.

4

Service-Free Lifespan

Self-healing firmware images, redundant watchdogs and reagent-usage prediction yield ≥ 6 years unattended operation.

Integrated Instrument Deck

Laboratory Function	On-Rail Payload Modules	Performance Highlights
Spectroscopy	Dual-beam VIS-NIR spectrometer • Laser-Induced Breakdown Spectroscopy (LIBS) head	200 – 2 500 nm • 0.25 nm FWHM • ppm elemental resolution
Micro-Fluidics / Bio	Lab-on-chip electrophoresis cartridge • Flow-cytometer with 3-colour fluorescence	< 50 nL sample size • 1 µm particle resolution
Atmospheric / Volatile	Quartz-crystal microbalance • Nano-GC/MS tube array	< 1 ng sensitivity • 10 ppb gas detection
Particle & Dust	MEMS impact sensor • Laser dust interferometer	0.2 – 100 µm sizing • 1 kHz sampling
Thermo-Mechanical	12-point PID thermal bed • Strain/creep rig	–170 … +180 °C • 2 µε precision
Edge Compute	Quad-core RISC-V + 32-TOPS TPU	On-rail chemometrics & AI-driven experiment scheduling

Technical Specifications

Physical

Frame Size:	228 × 100 × 96 mm
Mass:	1.6 kg (loaded)

Power

Draw:	4.5 W nominal
Sleep:	<150 mW

Environmental

Temp Range:	–170 to +180 °C
Pressure:	10^{-6} mbar to 100 bar

Reliability

MTBF:	> 110,000 h
Calibration:	Auto every 72 h

Mission Profiles

CubeSat Molecular Foundry

Fly in a 6U bus to assay atmospheric trace gases over volcanic plumes and urban heat islands.

Europa Cryovolcano Probe

Drop-tube samples meltwater, performs bio-signature GC/MS and transmits results through an ice-penetrator tether.

Lunar Regolith ISRU Testbed

Heat, sieve and spectrally characterise regolith to optimise in-situ oxygen extraction.

Subsea Methane Observatory

Log methane seep chemistry at 3,500 m while the rail's dust interferometer measures turbidity shifts after tremors.

Ready to Deploy ExoSense Pro?

Deploy ExoSense Pro when your mission demands real laboratory results, not just raw telemetry. From orbit-scale chemistry to abyssal biology, ExoTerra Instruments delivers the autonomous science edge that pushes exploration farther and faster.

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