



GeoWave® II

SlimWave®

MaxiWave®



DOWNHOLE SEISMIC TOOLS

# A FULL RANGE OF PRODUCT



Today's major challenges for downhole seismic acquisition include 3D and 4D imaging around deeper wells and permanent reservoir monitoring in production/injection areas. Current major constraints include dramatic reduction in acquisition time for cost effective operation in increasingly complex and harsh environments.

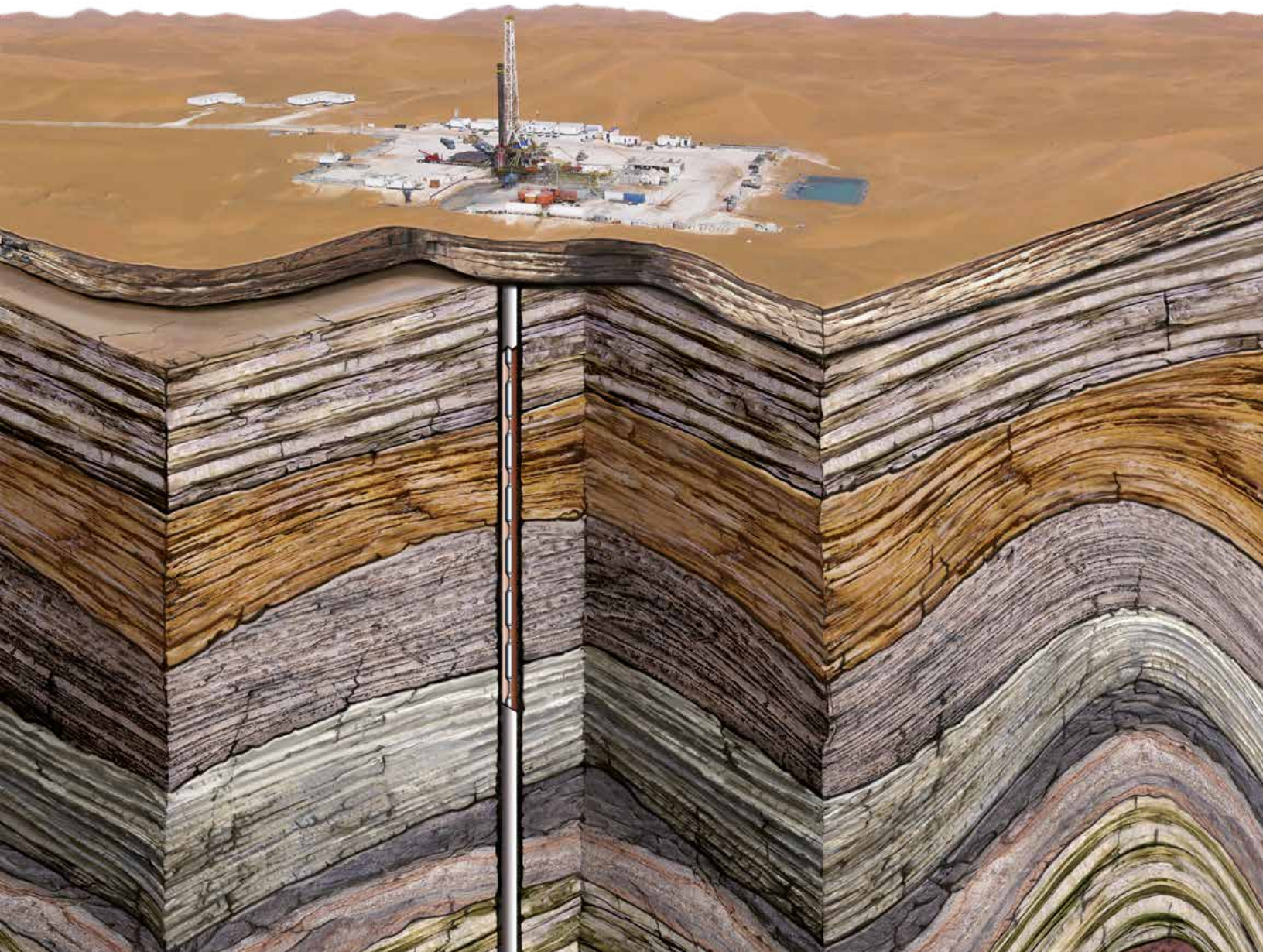
Since the 1970's, SERCEL has accumulated considerable experience with VSP tools based on proven and successful technologies.

**GeoWave® II**, **SlimWave®** and **MaxiWave®** systems, all offering real time telemetry, have been designed to address the needs of large VSP, cross-well and microseismic downhole arrays. Such surveys include challenging requirements ranging from cost efficiency, time saving, reliability, large simultaneous channels count, high quality signals and broad frequency range.

Furthermore, the SERCEL downhole tools offer the major advantage of being operated using a single surface acquisition and monitoring system, WaveLab with WaveControl and Tools Pilot software, providing full testing capabilities during deployment and acquisition to accompany the success of its customers operation.

With unrivaled variety of product lines, Sercel is the best choice for supply of integrated solutions and turn-key projects, including complete range of sources, source controllers, wireline logging units and auxiliary equipment. Sercel Downhole Seismic tools are optimized for synchronized acquisition with Land and Marine seismic providing additional value.





# GeoWave® II

Extending your frontiers

- **High Temperature & High Pressure resistant**

- Designed with specifically built for purpose hermetic components for reliable performance
- 30,000 psi / 2,070 bar pressure housing

- **High productivity**

- Industry best telemetry rate on standard wirelines ( up to 4,2 Mbits/s)
- Up to 120 levels (3 components) and up to 3000 m antenna aperture on standard wireline

- **Faster & Safer operations**

- Safe and efficient deployment (less than 2 minutes per tool) due to a new revolutionary method (patent pending)
- Continuous monitoring of the system performance during the deployment
- Quick “screw on” arm extensions of different sizes

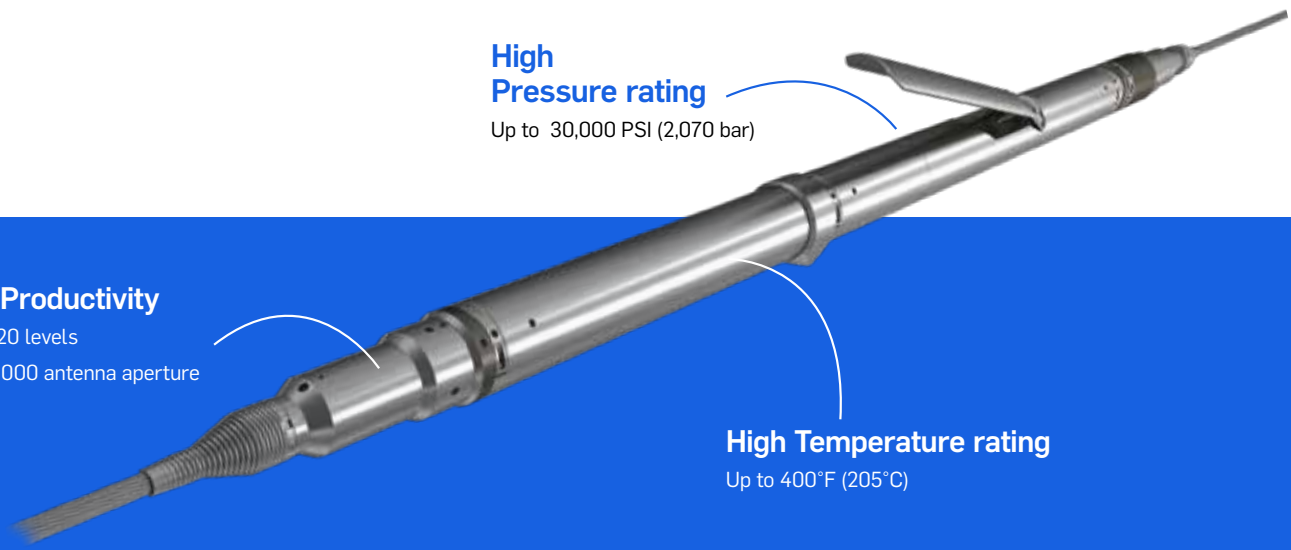
- **High flexibility**






- Tractor Compatible for deployment in horizontal and highly deviated well
- Compatible with Sercel GRC pressure & temperature gauges for real time combined seismic and P&T acquisition
- Each electronics board tracks exposure to temperature, with real time user interface, allowing proactive preventive maintenance management
- Optional additional dual geophone sub to achieve quad geophone package

**High Pressure rating**  
Up to 30,000 PSI (2,070 bar)

**High Productivity**  
Up to 120 levels  
Up to 3,000 antenna aperture

**High Temperature rating**  
Up to 400°F (205°C)

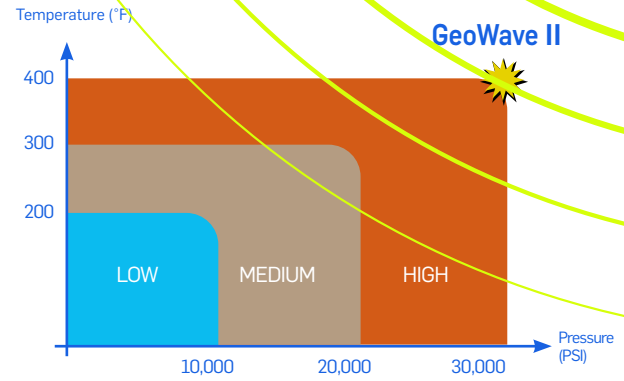


<b>Max. Number of levels</b>	 120
<b>Temperature Rating</b>	 400°F / 205°C
<b>Pressure Rating</b>	 30,000 PSI / 2,070 bar
<b>Min / max Well Diameter</b>	3"  22"
<b>Weight</b>	 18,9 kg / 41,6 lbs



# HIGH PRESSURE AND HIGH TEMPERATURE RESERVOIRS

GeoWave II is the only digital tool on the market capable of continuous acquisition of up to 400°F (205°C) and up to 30,000 psi (2,070 bar)



## ANY SURVEY TYPE

Capable of simultaneous synchronized acquisition with surface spread and multi-well acquisition

- Active strong anchoring (with safe retrieval feature) and Dual Sensor for no compromise on data quality and optimum sensitivity
- Fully compatible with Sercel "MultiWellLink" software

## ANY WELL TYPE

- From 3" to 22" well diameter both in open and cased hole
- Deviated well compliant – compatible with downhole tractors for deviated & horizontal wells
- Works on any wireline from 3 to 7 conductors



# SlimWave®

The monitoring & slimhole access tools

- **High Productivity** - Up to 24 levels
- **Ultra slim** 1 11/16" (43 mm) design allows access to slim holes, live pressurized wells, restrictions within downhole completion strings and deployment through tubing
- **High sensitivity , low noise and excellent vector fidelity**
- **Enhanced flexibility**
  - Available with standard single or quad geophone configuration for higher sensitivity
  - Tractor compatible
  - Compatible with Sercel GRC Pressure and Temperature Gauge

**Wide choice of conveyance**

Heptacable, 3 or 4 conductors, coax or monocable or wireline tractor

**Ultra Slim design**  
1" 11/16

**Ultra light**  
6,5 kg

<b>Max. Number of levels</b>	→ 24
<b>Temperature Rating</b>	→ 302°F / 150°C peak
<b>Pressure Rating</b>	→ 14 500 psi / 1000 bar
<b>Min / max Well Diameter</b>	← 2 1/4" → 13"
<b>Weight</b>	● 6,5 kg / 14,3 lbs

## WIRELINE

- The standard solution for open and cased holes, for both Monitoring and VSP surveys
- Field proven for long term monitoring projects (with hermetically sealed electronics option)
- On any type and length of wireline
- Compatible with tractor and coiled tubing deployment

## CEMENTED ①

- For cost-effective long term monitoring
- On any type and length of wireline

## ON TUBING ②

- Field proven solution for long-term monitoring and 4D VSP
- Can be used for monitoring in the treatment well
- Hermetically sealed option for electronics
- 3C geophone package, acoustically decoupled from the tubing
- Reliability increased by use of standard TEC (Tubing Encased Cable) and standard P&T gauge cable heads
- Does not require hydraulically, mechanically or electrically activated intervention to ensure the sensor coupling to the wellbore
- Deployable at any well deviation
- Pressure sealing at surface achieved by standard wellhead penetrators

## BEHIND CASING ③

- Cemented behind the casing for long term monitoring
- Cost effective solution for shallow and medium depth applications

## UNDER TUBING ON WIRELINE ④

- Can be installed under pressure using standard pressure equipment
- Can be run through the tubing to be installed below the tubing to avoid costly well preparation
- Maintained safety for under tubing installation

## REAL-TIME PRESSURE & TEMPERATURE

- Real time P&T measurement using Sercel GRC gauges
- P&T measurement performed simultaneously with the seismic measurement
- P&T gauge installed at the bottom of the toolstring
- Compatible with deployment on 3 and more conductor wirelines
- Compatible with all SlimWave and GeoWave II tools





# MaxiWave®

## Large seismic survey tools

- **High Productivity** - Up to 100 levels can be run at 2 ms sampling rate real time with the short cycle times required by offshore surveys
- **High channel count** with standard wireline conveyance
- Use of the **proprietary deployment system** allows rapid system rig up and full system testing during deployment
- **Unique bypass function** allows continuous operation in case of a satellite failure
- **Fail safe spring** loaded locking arm design allows safe operation and retrieval both in cased and open hole
- MaxiWave system uses **standard GeoWaves auxiliary tools** such as Gamma Ray, CCL and Tension/Compression meter.



**High channel count**






Connection up to 100 tools in 3-C

**High resolution acquisition**

2ms sampling rate /  
Real time 100 levels

**Very Compact design**

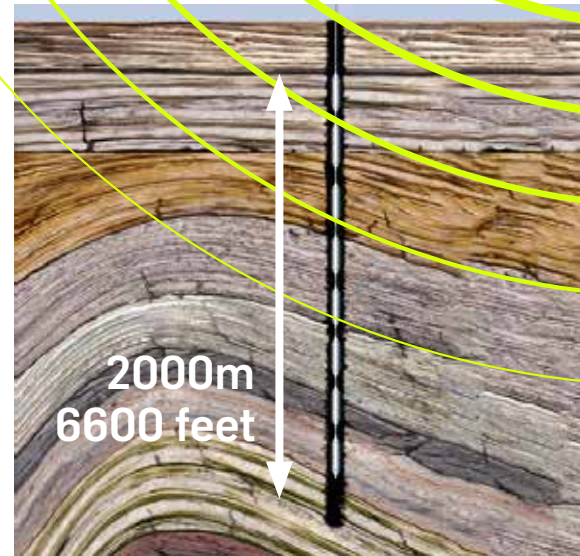
440 mm length (17")

<b>Max. Number of levels</b>	 100
<b>Temperature Rating</b>	 302°F / 150°C peak
<b>Pressure Rating</b>	 17 400 psi / 1200 bar
<b>Min / max Well Diameter</b>	 4" ↔ 13"
<b>Weight</b>	 8 kg / 17,6 lbs



## LARGE DOWNHOLE SURVEY (3D VSP & WALKAWAY)

- Large antenna aperture.
- Improved reservoir delineation.
- Faults & pinch-out detection.
- Possible simultaneous 3D VSP and 3D surface seismic acquisition.
- Application to geological contexts such as overhangs, salt bodies, gas clouds.



## 4D SURVEY

- Improved reservoir imaging resolution, statically and dynamically.
- Improved S/N ratio and optimized repeatability to quantify time-lapse changes in the reservoir.
- Monitoring of fluid interfaces variation.
- Application to water-flooding, gas injection, CO2 sequestration.



Base Survey

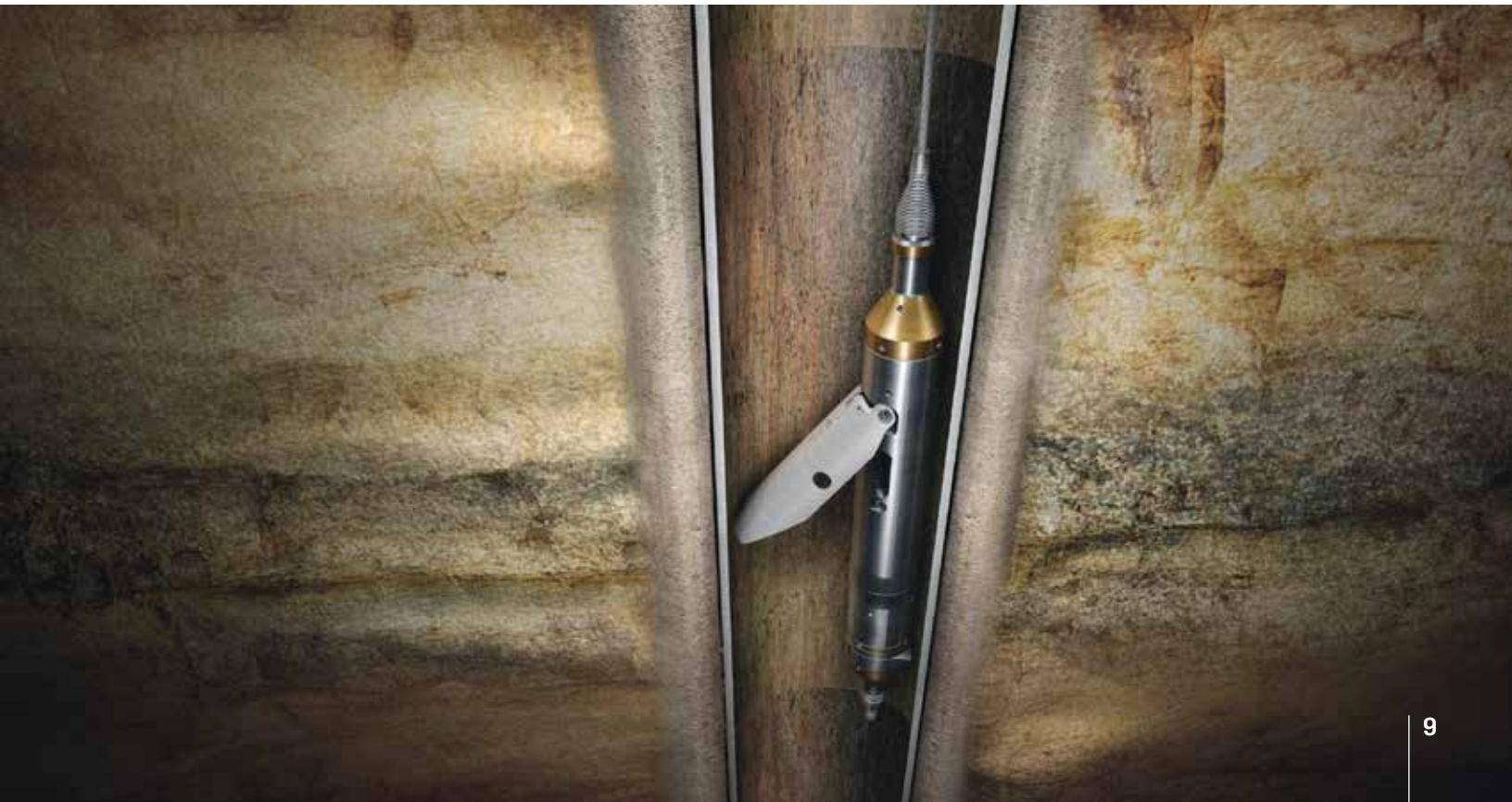


Time-lapse Survey



Difference

**MaxiWave** is the most cost effective digital multi-level downhole seismic array available on the market for very large sized downhole seismic surveys. With 100 digital 3-components levels, MaxiWave benefits from the most advanced developments in terms of real time telemetry and mechanical reliability, that make the system the optimal solution to address today's challenges for cost effective acquisitions with high volumes and high quality data.



# SOFTWARE

Unique and complete WaveControl Software package provides all necessary functions for system management, data acquisition, quality control, report generation and field processing

## WaveControl Data acquisition and quality control

WaveControl software is a complete software package for acquiring VSP and monitoring data with all Sercel digital and analog downhole equipment

- System Configuration
- Data Acquisition
- Basic and Advanced Quality Control
- Report Generation



## ToolsPilot System control

ToolsPilot software is a comprehensive software package for controlling the downhole hardware

- Downhole Tool and Telemetry Control
- Arm Motoring
- Auxiliary Logs
- Instrument Tests



## Navigation QC Software Navigation control

- Source navigation tracking
- Shot gathering for 3D and walkaway



## WaveStack Field QuickLook Processing

- Step by step user-friendly data QC and processing for Zero Offset VSP
- Generation of Corridor Stack



## MultiWellLink Multiple system management for VSP and monitoring

- Real-time multiple system management from single position
- Real-time or post job data concatenation into one single file





# RECORDER

## WaveLab II

Common to all Sercel downhole strings, WaveLab acquisition panel includes:

- Power Supply Module.
- Telemetry interface.
- Interconnecting box (sources and surface channels control).
- GPS Synchronization.

Acquisition PCS include:

- One laptop for the system control.
- One laptop for the data acquisition & QC.
- Software to be installed on the logging unit PCs (if hardware/software compatible).
- Single PC acquisition is possible.
- Industrial rackable PC can be supplied instead of laptops.



## Compatible with any source



VIBRATOR



IMPULSIVE



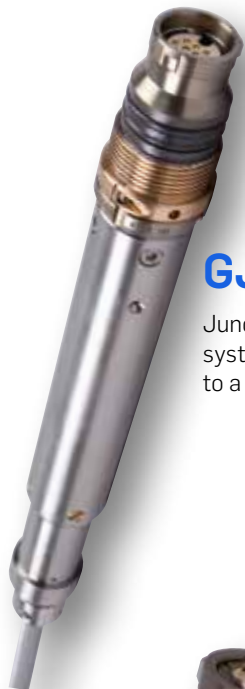
IMPULSIVE SOURCE



# PRODUCTS

**G** Stands for GeoWaves®

**II** Stands for GeoWave II



## **GJC / SJC / GJC II**

Junction Cable allows system connection to a 7 conductor cable.



## **GTCU / STCU**

Tension Compression Unit allows precise tension measurement for safe downhole operation, and reliable compression measurement for drill pipe or coiled tubing deployment.



## **GGRU / SGRU / GGRU II**

Gamma Ray Unit allows exact depth correlation using natural gamma ray reading.



## **GCLU / SCLU**

Casing Collar Locator Unit allows exact depth correlation in cased hole environment.



Stands for SlimWave®



Stands for MaxiWave®

### GHTU / SHTU / XHTU / GHTU II

High Speed Telemetry Unit transmits downhole digital data to surface and controls downhole tools.

### GBU / SHBU

The High Speed telemetry Booster Unit increases the sampling rate and the level capacity.

### GIC / SIC / XIC / GIC II

Intertool cable (available at various lengths) allow quick connection between downhole tools. Use of coaxial cable increases the overall reliability of the system by decreasing the number of connections.

### GAU / SAU / XAU / GAU II

Acquisition Unit is comprised of geophone package, anchoring mechanism and a digitizer.

### GWUS / SWU / XWU / GWU II

Weight Unit is designed to guide the system in the well and to give an early warning of the system hangup.



# Sensor SGHT-15



**GeoWave® II**

- **EXTREME WORKING CONDITIONS**  
Temperature range up to 205°C
- **HIGH PERFORMANCE**  
High sensitivity geophone : 52.0 V/m/s
- **HIGH RELIABILITY**  
Strict validation process : 500h@205°C

The SGHT-15 is a new high temperature omni-tilt geophone. Qualified up to 205°C, it is compatible with all vsp tools in the market.

Its high sensitivity specifications make it also well adapted to microseismic and hydraulic fracturing monitoring surveys.

	Nominal	Horizontal	0° to 180°
Natural frequency	15 Hz	± 5%	-5% to +15%
Coil resistance	2350 Ω	± 5%	± 5%
Sensitivity	52.0 V/m/s (1.32 V/in/s)	-15% to +5%	-15% to +5%
Open circuit damping (without damping resistance)	0.50	-15% to +15%	-20% to +15%
Distortion (@ 15 hz & 1.8 cm/s pk-pk) (@ 15 hz & 0.7 in/s pk-pk)		≤ 0.2%	≤ 0.9%
Spurious frequency		≥ 365 Hz	≥ 280 Hz
Coil excursion pk-pk		<3.0 mm (<0.118 in)	<0.6 mm (<0.024 in)
Moving mass	7.4 g		

Note: Sercel reserves the right to change its specifications without prior notice.  
All specifications are typical at 20°C



# Option

## WaveTest Box

- Full preventive diagnostics and troubleshooting of XAU, SAU and GAU.
- Replaces WaveLab and telemetry module for testing purposes.



WTB

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