

CERTIMUS

NEXT GENERATION MEDIUM MOTION SEISMIC STATION WITH
ULTRA-LOW-POWER MODE FOR REMOTE SITES



All-in-one portable, digital, broadband triaxial seismometer with state-of-the-art communication capabilities suitable for direct burial, surface and vault deployment.

KEY FEATURES

- > 120 s to 100 Hz
- > Remote, user-selectable high-pass frequency corner from 1 to 120 s
- > Operational at $\pm 90^\circ$
- > Ultra-low-power mode < 300 mW
- > Industry standard digitiser with advanced data communication features

APPLICATIONS

- > Local, regional and global monitoring
- > Microseismic and induced seismicity monitoring
- > Permanent and rapid deployment for volcanic unrest monitoring

Certimus

A complete seismic station in a single package for easy, rapid deployment that really is plug and play.

Certimus is a triaxial, broadband, digital seismometer with sophisticated data timing, triggering, storage and communication capabilities in a single compact instrument.

Suitable for the remotest of sites.

Unlike any other medium motion sensors, the plug-and-play Certimus offers maximum flexibility for installation in challenging conditions. The state-of-the-art digital sensor can operate at a tilt range of $\pm 90^\circ$ and has a wide frequency response of 120 s to 100 Hz with selectable gain options of 1000 V/ms^{-1} or 2000 V/ms^{-1} .

For scenarios such as hazardous installations and aftershock monitoring where stations need to be up and running in the shortest timeframe, the Certimus benefits from an adjustable high-frequency corner. The 1 and 10 second modes can be adjusted pre- or post-deployment and significantly reduce the settling time of the sensor.

Data are recorded on dual-redundant microSD cards. Users can elect to house the removable card within the instrument or, for instances of direct burial, in a Surface Storage Module in line with the GNSS at the surface. Data can be shared via Wi-Fi, Ethernet and Bluetooth connections.

An ultra-low-power mode allows for operation at less than 300 mW utilising our Portable Power Module which is re-chargable using solar panels.

For added confidence during deployments, the GüVü, Bluetooth App, displays waveforms, orientation, temperature and humidity data.

Encased in an environmentally sealed, hard anodised aluminum casing to withstand the harshest environments, Certimus has an internal thermometer and a humidity sensor to alert you to any moisture ingress.

Advanced communication and control.

Integrated network connectivity allows the Certimus to be controlled remotely using Güralp Discovery, our software platform, or via a standard web browser.

Discovery allows the user to identify the instrument IP address via a Cloud registry server or data centre, eliminating the need for static IP addresses.

Discovery also allows for simpler instrument and data management with access to hardware State-of-Health (SoH); data viewing, streaming and back fill capabilities; advanced data analysis tools; GNSS location; instrument response and calibration values.

Other features include an ultra-low-latency mode*, industry standard triggering algorithms for EEW (STA/LTA, threshold); multi-instrument voting for mitigating false positive alerts; and Common Alert Protocol (CAP) for automated emergency warning.

Users can select sample rates of up to 1000 samples per second with the option to simultaneously stream multiple sample rates in addition to two recording rates.

Data are locally recorded in miniSEED (with metadata stored in Station XML and dataless SEED formats) and can be streamed in realtime using GCF (Scream!), GDI-link and SEEDlink.

Certimus is available with or without a multi-touch sensitive, 2.4 inch, full colour LCD display showing waveforms, instrument state of health, gain settings, network configurations and a virtual instrument level.

* For more information on the ultra-low-latency mode see our [Minimus datasheet](#).

Applications

- > Local, regional and global seismic monitoring
- > Temporary deployment in challenging environments or remote areas
- > Rapid deployment for aftershock monitoring
- > Microseismic and induced seismicity monitoring in the hydrocarbon market, e.g. fracture monitoring
- > Geothermal energy production monitoring
- > Permanent or rapid temporary deployment for volcanic unrest monitoring

Unlike any comparative instrument, Certimus has the flexibility to work at tilt ranges of up to 90 degrees making it simple and cost-effective to deploy for rapid deployments such as aftershock and volcanic unrest monitoring

CERTIMUS



SURFACE BURIAL IS SIMPLIFIED WITH SENSORS THAT ARE FULLY OPERATIONAL AT ±90 DEGREES



SURFACE STORAGE MODULE CONNECTS IN-LINE WITH THE GNSS AT THE SURFACE



PORTABLE POWER MODULE COMPACT RE-CHARGABLE BATTERY PACK SUITABLE FOR DIRECT CONNECTION TO SOLAR PANELS



RUGGED BACK-PACK PROTECTS CERTIMUS DURING FIELD DEPLOYMENTS WITH ADDITIONAL SPACE FOR ACCESSORIES AND PAPERWORK

Key features

State-of-the-art seismic sensor allows full operation over a wide tilt range of $\pm 90^\circ$ by automatically centring the mass

Triaxial orthogonal (ZNE) instrument with high cross-axis rejection (> 65 dB)

Remote, user-selectable high-pass frequency corner up to 120 s and adjustable gain of 1000 V/ms^{-1} or 2000 V/ms^{-1} .

Low latency outputs available (approx. 0.04 s data packets)

Streaming and storage of instrument response and calibration parameters dramatically simplifies data management (RESP, Station XML and Dataless SEED formats)

Free Android and iOS GüVü Bluetooth App for instant assessment of installation integrity

Dual-redundant 64 GB microSD cards (1 fixed, 1 hot-swappable)

Ultra-low-power mode < 300 mW suitable for remote or temporary deployments using batteries and solar panels

Accurate time-base provided by either surface GNSS, Precision Time Protocol (PTP), or internally trained clock (< 1 ms drift per day without GNSS)

Powerful real-time data Transforms: mathematical operations applied to real-time and recorded data e.g. integration; differentiation; high and low-pass filters

Quick Seismic Characteristic Data (QSCD) protocol and Maximum, Minimus and Average (MMA) calculated on selected time window

On-demand event-specific or time-window data transmission

SPECIFICATIONS

BROADBAND SEISMOMETER SYSTEM	
Configuration / Topology	Triaxial orthogonal (ZNE)
PERFORMANCE: BROADBAND SEISMOMETER	
Maximum frequency response bandwidth	120 s (0.0083 Hz) to 100 Hz User selectable high-pass frequency corner from 120 s to 1 s.
Output sensitivity	1000 V/ms ⁻¹ or 2000 V/ms ⁻¹ (User-selectable via instrument webpage)
Sensor dynamic range	149 dB
Self-noise	173 dB at 10 seconds
Operational tilt range	±90°
Cross axis rejection	> 65 dB
Linearity	> 95 dB
Lowest spurious resonance	> 450 Hz
Centring	Automatic / can be disabled
Transfer function	Measured sensitivity, frequency response and instrument poles and zeros are stored within the instrument and accessible via web interface
ENVIRONMENTAL CHANNELS	
Sensor mass positions	Three independent sensor mass position outputs (integrator)
Orientation sensors	MEMS based accelerometer (three component) Magnetometer (three component)
Other sensors	Temperature, humidity, pressure, input voltage
DIGITISER PERFORMANCE	
ADC converter type	Delta-sigma
Output format	32-bit
Dynamic range	>136.5 dB at 100 samples per second
Decimation filter rejection	170 dB
DATA PROCESSING	
Output rates available	1 sample per hour up to 1000 samples per second for primary channels, user-selectable* *In ultra-low-power mode, output rate is set to 250 samples per second for primary channels Up to 5 samples per second for environmental channels
Decimation filters	÷2, ÷3, ÷4, ÷5 (Causal / Acausal)
Data transmission modes	Continuous
Trigger modes	STA/LTA, Threshold (level)
TIMING AND CALIBRATION	
Timing source precision	Accuracy when GNSS locked ±50 ns. Typical drift when unsynchronised (without GNSS) <1 ms per day
Timing sources	GNSS (GPS, GLONASS, BeiDou), PTP (Precision Time Protocol)
Calibration signal generator	Triangle, step, 1 Hz sinewave, white noise with selectable amplitude
USER INTERFACE	
Configuration and control	(Ethernet) Güralp Discovery - free download, web browser interface. GüVü app (Bluetooth) available for both Android and iOS devices

DATA COMMUNICATION	
Data recording formats	miniSEED (metadata stored in Station XML and dataless SEED formats)
Data streaming protocols (via Ethernet)	Data streaming protocols: GCF (Scream!) GDI-link* and SEEDlink* (*metadata sent in RESP, Station XML and dataless SEED file formats)
ON-BOARD DATA STORAGE	
Flash memory and storage	Dual-redundant 64 GB microSD cards (1 fixed, 1 hot-swappable)
SOFTWARE	
Operating system	Windows, Linux and macOS compatible
Communication technologies supported	Ethernet (10/100/1000BASE-T) with Power over Ethernet (PoE), Wi-Fi
OPERATION AND POWER USAGE	
Operating temperature	-20 to +60 °C
Relative humidity range	zero to 100 %
Power supply	10 - 36 V DC* or Power over Ethernet (PoE)
Power consumption at 12 V DC	2.2 W (with GNSS and Ethernet)
Ultra-low-power-mode	300 mW (GNSS and Ethernet are disabled, output rate is fixed at 250 samples per second)
<i>*Power voltage for operation of this unit only. Connection to additional instrumentation or use of longer cables may result in a higher input voltage requirement</i>	
PHYSICAL	
Casing type	Environmentally sealed, hard anodised aluminium
Environmental sensor	Humidity and temperature
Weight	3 kg (disconnected)
Diameter	165 mm
Height with feet	84 mm
Height (sensor only)	72.5 mm
Connector type	MIL-DTL-26482 Series 1: Ethernet - 8P8C (RJ45) Power - 4 pin LEMO: GNSS/serial - 14 pin
Environmental protection	IP68 - protection against effects of prolonged immersion at 3 m depth for 72 hours
Certimus package includes	Power cable, Ethernet cable, GNSS (GPS/GLONASS/BeiDou) receiver and console cable, Wi-Fi antenna
OPTIONAL ACCESSORIES	
Surface storage module	Connects in-line with the GNSS to allow for data retrieval without instrument disturbance
Portable Power module	Compact re-chargeable battery pack, compatible with solar panel
Rugged back-pack	Protects Certimus during field deployments