CERTIMUS

Next Generation Medium Motion Seismic Station with Ultra-Low-Power Mode for Remote Sites

Key Features

- 120 s to 100 Hz
- Remote, user-selectable high-pass frequency corner from 1 to 120 s
- Operational at ± 90°
- 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

All-in-one portable, digital, broadband triaxial seismometer with state-of-the-art communication capabilities suitable for direct burial, surface and vault deployment.
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 ±90° 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-pass 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 rechargeable 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.

Key features

- State-of-the-art seismic sensor allows full operation over a wide tilt range of ±90° 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 150 s to 1 s.
- **Output sensitivity**: 1000 V/µm⁻¹ or 2000 V/µm⁻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

#### ANOTHER 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
  - Up to 6 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 sine wave, white noise with selectable amplitude

#### USER INTERFACE

- **Configuration and control**: Ethernet/Guralp Discovery - free download, web browser interface. GuVu app (Bluetooth) available for both Android and iOS devices

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#### DATA COMMUNICATION

- **Data recording formats**: miniSEED (metadata stored in Station XML and dataless SEED formats)
- **Data streaming protocols (via Ethernet)**: Data streaming protocol: GCF (Scream!)/GDI-link* and SEEDlink* (metadata sent in RESP, Station XML and dataless SEE 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)
- **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

#### 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  
  - 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

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Güralp Systems Limited  
Midas House  
Calleva Park  
Aldermaston  
Reading  
RG7 8EA  
United Kingdom  
www.guralp.com

T +44 118 981 9056  
F +44 118 981 9943  
E sales@guralp.com

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DAS-CER-0001 Issue A