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 long-period corner of 1 s, 10 s or 120 s
> Operational at ± 90°
> Ultra-low-power mode < 300 mW
> Industry standard digitiser with advanced data communication features

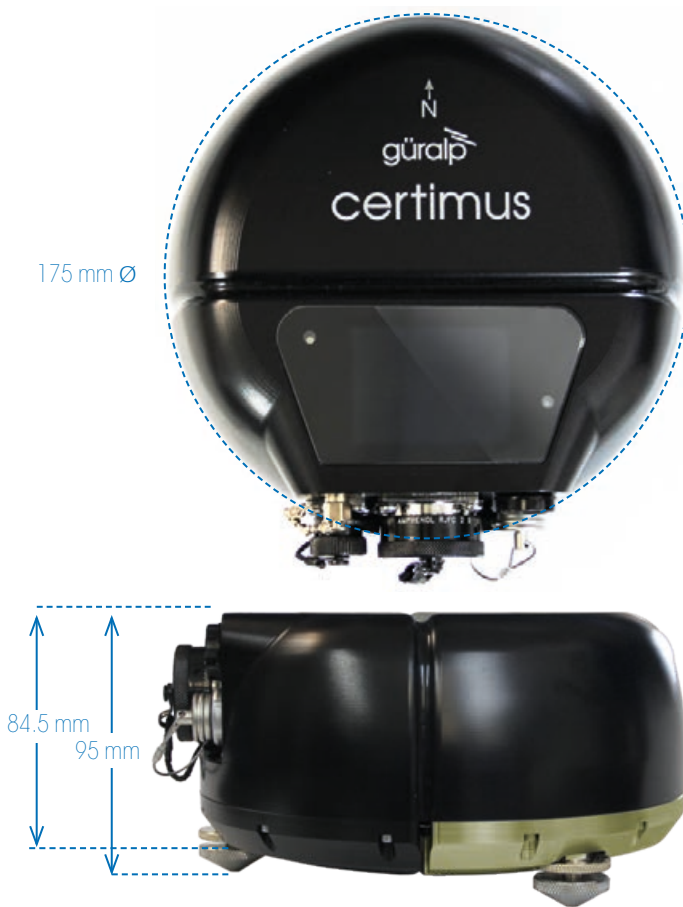### APPLICATIONS

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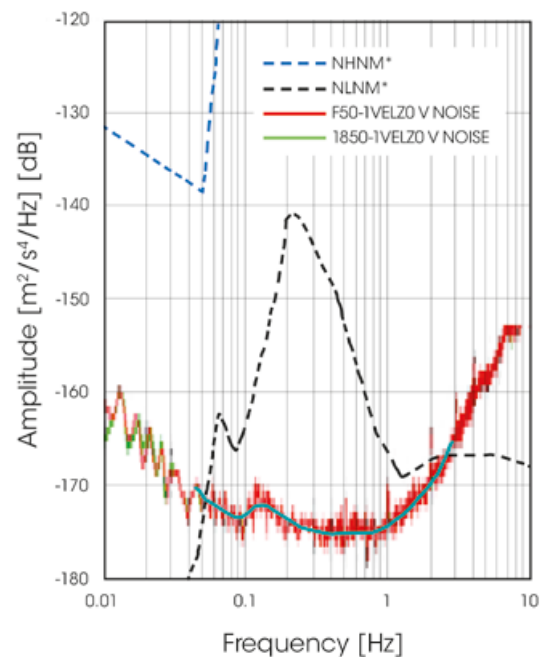> Permanent and rapid deployment for volcanic unrest monitoring

Certimus

A complete seismic station suitable for the remotest of sites, for quick-and-easy, plug-and-play deployment.

CERTIMUS DIMENSIONS:

SELF NOISE PLOT:

175 mm Ø

84.5 mm
95 mm

(Peterson, 1993)

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 moniluring

> Geothermal energy production monitoring

> Permanent or rapid temporary deployment for volcanic unrest monitoring

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

Certimus offers maximum flexibility for installation in challenging conditions. Unlike any other medium motion instrument, 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.

For scenarios such as aftershock monitoring where speed is paramount, the Certimus benefits from an adjustable long-period corner. The 1 and 10 second modes can be adujsted pre- or post-deployment and significantly reduce the settling time of the sensor.

Data are recorded on dual-redundant 128 GB 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.

An ultra-low-power mode allows for operation at less than 300 mW. When used with our 250 Wh Portable Power Module (PPM) which is re-chargable using solar panels, the expected life and power usage are reported and recorded.

An optional 2.4 inch, full colour LCD display shows waveforms, instrument state-of-health and settings, network configuration and a virtual instrument level.

The hard anodised aluminium casing is environmentally sealed to withstand the harshest environments. An internal thermometer and a humidity sensor alert you to any moisture ingress.

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

Data can be shared via Ethernet and Bluetooth connections.

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.

Other features include an ultra-low-latency mode[1] with 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.

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.

Enhanced instrument and data management

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

Discovery's powerful tools include:

> Instrument IP address identification on LAN or internet, eliminating the need for static IP addresses
> Access to hardware State-of-Health (SoH), GNSS location, instrument response and calibration values
> View and stream data with back-fill capabilities plus selectable date-and-time-window data transmission
> Advanced data analysis including spectral density graphs, spectograms, discrete Fourier transforms and histograms
> Remotely and simultaneously apply configuration files to multiple units within a network

[1] For more information on the ultra-low-latency mode see our Minimus datasheet.

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 long-period corner 1 s, 10 s and 120 s

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 GüVü Bluetooth app for instant assessment of installation integrity

Dual-redundant 128 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, Minimum and Average (MMA) calculated on selected time window

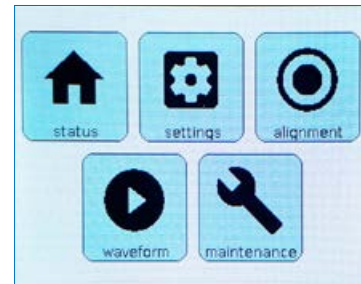On-demand event-specific or time-window data transmission

OPTIONS AND ACCESSORIES 1

OPTIONAL 2.4 INCH FULL COLOUR
LCD SCREEN DISPLAY SHOWING:

- WAVEFORMS
- INSTRUMENT STATE-OF-HEALTH
- INSTRUMENT SETTINGS
- NETWORK CONFIGURATION
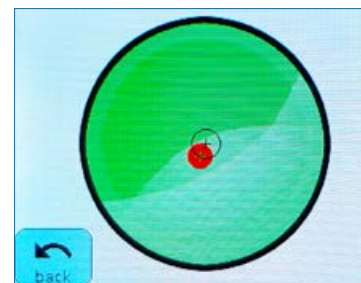- VIRTUAL INSTRUMENT LEVEL

MAIN MENU

WAVEFORMS

ALIGNMENT

FOR DIRECT BURIAL THE CERTIMUS IS
AVAILABLE WITHOUT A SCREEN:

IN THESE INSTANCES AN OPTIONAL
IN-LINE SURFACE STORAGE MODULE
(SSM) PROVIDES EASY ACCESS TO DATA
STORAGE AT THE SURFACE.

FURTHER SSM OPTIONS INCLUDE
BLUETOOTH CONNECTIVITY FOR
INSTRUMENT INTEGRITY CHECKING

OPTIONS AND ACCESSORIES 2

PORTABLE POWER MODULE (PPM)
COMPACT RE-CHARGEABLE 250 Wh BATTERY PACK SUITABLE FOR DIRECT CONNECTION TO SOLAR PANELS

SURFACE STORAGE MODULE (SSM)
CONNECTS IN-LINE WITH THE GNSS AT THE SURFACE FOR EASY ACCESS TO DATA STORAGE AND OPTIONAL BLUETOOTH CONNECTIVITY

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

Certimus

güralp

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 long-period corner of 1 s, 10 s and 120 s.
Output sensitivity	2000 V/ms^{-1}
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	>142 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 and GLONASS, BeiDou optional), PTP (Precision Time Protocol)
Calibration signal generator	Step, white noise with selectable amplitude

USER INTERFACE	
Configuration and control	(Ethernet) Güralp Discovery - free download (Windows, macOS and Linux), web browser interface. GüVü Bluetooth app (Android)

DATA COMMUNICATION	
Data recording formats	miniSEED (metadata stored in Station XML and dataless SEED formats)
Data streaming protocols (via Ethernet)	GCF (Scream!), GDI-link[1] and SEEDlink[1] ([1]metadata sent in RESP, StationXML and dataless SEED file formats)

ON-BOARD DATA STORAGE	
Flash memory and storage	Dual-redundant 128 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	1 W standard operation without GNSS or Ethernet 2.2 W (with GNSS and Ethernet)
Ultra-low-power-mode	300 mW (GNSS sync. once per day, Ethernet is 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	3.5 kg (disconnected)
Diameter	175 mm
Height with feet	95 mm
Height (sensor only)	84.5 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 or GLONASS, BeiDou optional) receiver and console cable, Wi-Fi antenna

OPTIONAL ACCESSORIES	
Surface storage module (SSM)	Connects in-line with the GNSS to allow for data retrieval without instrument disturbance
Power pack module (PPM)	Compact re-chargeable battery pack, compatible with solar panel
Rugged back-pack	Protects Certimus during field deployments

In the interests of continual improvement with respect to design, reliability, function or otherwise, all product specifications and data are subject to change without prior notice.

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