güralp

FORTIMUS

SMART STRONG MOTION TRIAXIAL FORCE-FEEDBACK DIGITAL ACCELEROMETER

Ideal for earthquake early warning and structural health monitoring, the digital Fortimus accelerometer delivers ultra-low-latency strong motion data direct to your network.

KEY FEATURES

> DC to 315 Hz
> Advanced software communications for rapid installation with easy instrument and data management
> Versatile variable gain, controllable remotely
> Ultra low-latency capability for earthquake early warning networks

NEW

> Enhanced features with firmware release 2.0 see page 3

APPLICATIONS

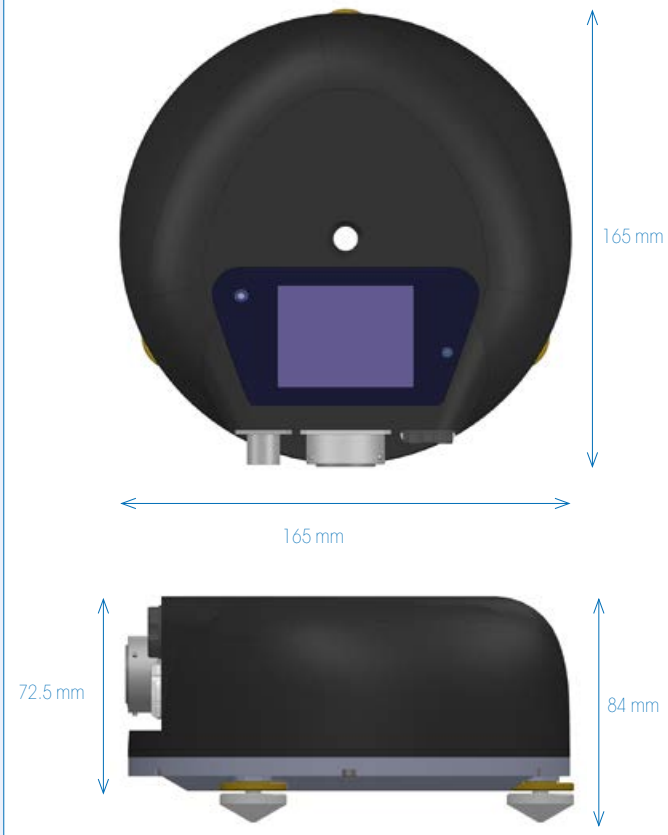
> Earthquake early warning
> Structural health monitoring
> Shake intensity research

Fortimus

The Fortimus is a smart digital broadband accelerometer. simple to use, quick to install and featuring advanced data recording and software communications for instant instrument and data management.

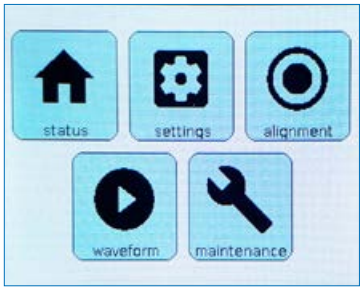
The variable gain optimises performance for a wide range of shaking scenarios and, when used in ultra-low-latency mode, the Fortimus is the ideal instrument for earthquake early warning and infrastructure monitoring applications.

FORTIMUS DIMENSIONS

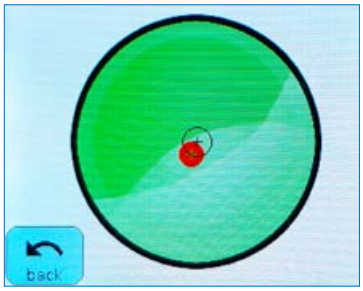


SIMPLE, RAPID INSTALLATION WITH A SINGLE M8 FIXING BOLT

2.4 INCH TOUCH SENSITIVE LCD



MAIN MENU



ALIGNMENT

WAVEFORMS

The Güralp Fortimus is a very low-noise, triaxial, force-feedback digital accelerometer with a large dynamic range, ideal for earthquake early warning, seismic hazard mitigation and civil engineering applications.

Featuring variable gain options from 0.5 g to 4 g, the Fortimus will perform optimally in a wide variety of earthquake shaking scenarios.

The integrated Minimus digitiser delivers a wealth of additional features that make the Fortimus the perfect instrument for earthquake early warning (EEW) and structural health monitoring applications:

> Ultra-low-latency mode for EEW, when used with GDI protocol, transmission can be achieved in 40 ms (sample rate and network dependent)
> Industry standard triggering algorithms for EEW (STA/LTA, Threshold)
> Multi-instrument voting for mitigating false positive alerts
> Common Alert Protocol (CAP) enabled for automated emergency warning
> Advanced network connectivity - full controls can be accessed on the instrument, via Güralp Discovery, our software platform, or via a standard web browser

NEW

> Latest Minimus firmware update now delivers enhanced real-time data manipulation tools such as Quick Seismic Characteristic Data (QSCD); Maximum, Minimum and Average (MMA) calculations and transforms such as integration, differentiation and low and high pass filters

The Fortimus also features 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.

Key features

Low-noise components for high precision and enhanced dynamic range

Variable gain options: ±4 g, ±2 g, ±1 g or ±0.5 g

Ultra-low-latency mode for EEW - when used with GDI protocol, transmission can be achieved in 40 ms*

Industry standard triggering algorithms for EEW (STA/LTA and Threshold)*

Compatible with industry standard software such as Earthworm, SeisComp and supports SEEDlink data interface for seamless integration*

Multi-instrument voting for mitigating false positive alerts*

Common Alert Protocol (CAP) enabled for automated emergency warning*

Slimline shape, robust and waterproof to IP68 - submerged to 3 m for 72 hours

Integrated touch sensitive 2.4 inch LCD for viewing waveforms, state of health, the virtual instrument level and access to full instrument and network controls

Advanced network connectivity - full controls can be accessed on the instrument, via Güralp Discovery, our software platform, or via a standard web browser*

Ethernet (10/100/1000BASE-T) with active Power over Ethernet (PoE). Option to include Wi-Fi

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

Identification of IP address via Discovery and Cloud registry server*

Select from GNSS (GPS, GLONASS or BeiDou) or PTP (Precision Time Protocol) timing sources

Scream!™ compatible

Compatible with GüVü Bluetooth App (Android/iOS)*

*See Minimus datasheet for more detailed information

Applications

> Earthquake Early Warning systems
> Structural Health Monitoring (e.g. dams, industry, buildings
> Surface and vault installation
> Posthole deployment
> Networked Arrays

Fortimus

SPECIFICATIONS

SENSOR SYSTEM	
Configuration / Topology	Triaxial orthogonal
SENSOR PERFORMANCE	
Acceleration output band	DC – 315 Hz Other frequency response options are available please ask for more information.
Variable gain options	±4 g, ±2 g, ±1 g or ±0.5 g
Peak / Full scale output	Differential: ±20 V (40 V peak-to-peak)
Clip level	4 g
Sensor Dynamic Range	> 165 dB
Self-noise below NHNM	> 0.07 Hz (< 14 seconds)
Self-noise below AHNM	DC to 100 Hz
Self-noise below ALNM	0.8 to 45 Hz
Cross axis rejection	0.001 g/g
Linearity	0.1% full scale
Lowest spurious resonance	> 450 Hz
Damping	0.7 critical or 70% critical
Offset zeroing	Automatic on start up and on user command
DIGITISER PERFORMANCE	
ADC converter type	Delta-sigma
Output format	32-bit
Dynamic range	>142 dB at 100 samples per second
Gain drift	3 ppm / °C
Common-mode rejection	>110 dB
DATA PROCESSING	
Output rates available	1 sample per hour up to 5000 samples per second for primary channels, user-selectable Up to 500 samples per second for environmental channels
Decimation filters	÷2, ÷3, ÷4, ÷5 (Causal / Acausal)
Out-of-band rejection	>194 dB
Data transmission modes	Continuous
Trigger modes	STA/LTA and Threshold
Selectable gain	Unity, ×2, ×4, ×8, ×12
TIMING AND CALIBRATION	
Timing source precision	Accuracy when GNSS locked ±50 ns. Typical drift when unsynchronised (without GPS) <1 ms per day
Timing sources	GNSS (GPS or GLONASS, BeiDou optional)
Calibration signal generator	Sine, step or broadband noise, all with adjustable amplitude and frequency
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 dataless SEED format)
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 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 active Power over Ethernet (PoE). Option to include Wi-Fi
OPERATION AND POWER USAGE	
Operating temperature	-20 to +70 °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 W typical (no GPS or Ethernet) 1.5 W (no GNSS or Ethernet) in low power mode

**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 CHARACTERISTICS	
Casing type	Environmentally sealed, hard anodised aluminium
Environmental sensor	Humidity and temperature
Weight	1.9 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
Fortimus package includes	Power cable, Ethernet cable, GNSS (GPS or GLONASS, BeiDou optional) receiver and console cable

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