FORTIMUS

SMART STRONG MOTION TRIAXIAL FORCE-FEEDBACK
DIGITAL ACCELEROMETER

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
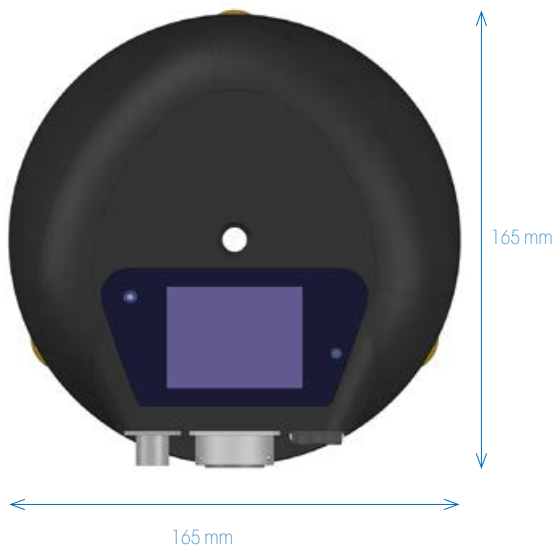> Real-time data manipulation tools

APPLICATIONS

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

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

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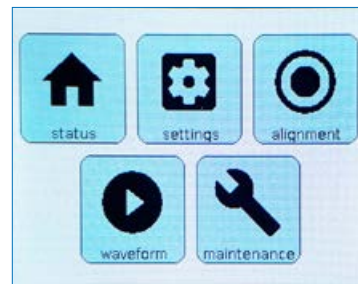
The variable gain optimises performance for a wide range of shaking scenarios and, when used in ultra-low-latency mode, the Fortimus is the ideal instrument for earthquake early warning and infrastructure monitoring applications.
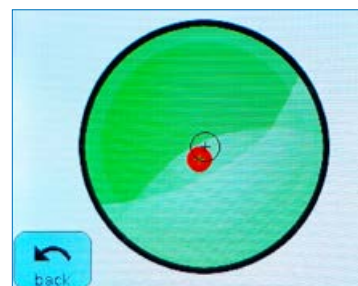
FORTIMUS DIMENSIONS

165 mm

165 mm

72.5 mm

84 mm

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 browse

> 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), Wi-Fi

Dual redundant 16 GB microSD cards (1 fixed, 1 hot-swappable) with options of 64 GB or 128 GB

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)*

*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

güralp

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 Bluetooth app (Android)

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 16 GB microSD cards (1 fixed, 1 hot-swappable) Option for 64 GB or 128 GB

SOFTWARE	
Operating system	Windows, Linux and macOS compatible
Communication technologies supported	Ethernet (10/100/1000BASE-T) with active Power over Ethernet (PoE), 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
Feet †	Three adjustable feet
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

† These specifications are available with some customisation. Please discuss your requirements with one of our sales team who will be able to explain the options available.

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