

# 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
- > Real-time data manipulation tools

## 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



165 mm



72.5 mm

84 mm

165 mm

SIMPLE, RAPID INSTALLATION WITH A SINGLE M8 FIXING BOLT

### 2.4 INCH TOUCH SENSITIVE LCD

MAIN MENU

ALIGNMENT

WAVEFORMS

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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)
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## Key features

Low-noise components for high precision and enhanced dynamic range

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Variable gain options:  $\pm 4$  g,  $\pm 2$  g,  $\pm 1$  g or  $\pm 0.5$  g

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

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

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

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Multi-instrument voting for mitigating false positive alerts\*

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

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

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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

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

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Ethernet (10/100/1000BASE-T) with active Power over Ethernet (PoE), Wi-Fi

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

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Identification of IP address via Discovery and Cloud registry server\*

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

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Scream!™ compatible

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Compatible with GüVü Bluetooth App (Android)\*

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\*See Minimus datasheet for more detailed information

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- > 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
  - > 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.

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## Applications

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

## 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 NHHM	> 0.07 Hz (< 14 seconds)
Self-noise below AHHM	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 <sup>1</sup> and SEEDlink <sup>1</sup> (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), 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
<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 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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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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