

MINIMUS₂

PORTABLE SMART SEISMIC DIGITISER WITH ADVANCED COMMUNICATIONS AND STATE OF HEALTH



Compact and portable four-channel, ultra-low-power smart seismic digitiser.

KEY FEATURES

- > Ultra-low-power < 0.8 W
- > 24-bit, 4-channel ADC
- > 142 dB dynamic range
- > Compact and lightweight
- > Bluetooth and Power-over-Ethernet
- > Dual-redundant microSD storage
- > Advanced State-of-Health capabilities
- > Utilises Güralp Discovery software interface providing access to a range of instrument and data management tools
- > Güralp Data Centre compatible

Minimus₂

The portable, ultra-low-power Güralp Minimus₂ offers advanced communication capabilities with rapid GNSS lock, making it ideal for rapid deployments.

ENCASED IN AN ENVIRONMENTALLY SEALED, HARD ANODISED ALUMINIUM CASING TO WITHSTAND THE HARSHTEST OF ENVIRONMENTS, THE MINIMUS₂ HAS AN INTERNAL THERMOMETER AND A HUMIDITY SENSOR TO ALERT YOU TO ANY MOISTURE INGRESS.

MINIMUS₂ DIMENSIONS:



Multidisciplinary functionality with simplified streaming and filtering options and advanced communications capabilities.

The four channel Minimus₂ is our lowest power digitiser and can accommodate any triaxial analogue seismic sensor plus an auxillary input (e.g. for infrasound).

The portable and ergonomic Minimus₂ features a rapid GNSS lock making it particularly suited for field applications where speed of deployment is of the utmost importance.

Integrated network connectivity enables the Minimus₂ 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 provides simple and streamlined instrument and data management for arrays of any scale, with access to hardware State-of-Health (SoH); data streaming; GNSS location; instrument response and calibration values.

For added confidence during deployments, GüVü, a Bluetooth app, displays waveforms, orientation, temperature and humidity data, for instant checking of installation integrity.

Key features

24-bit, four channel digitiser

Compatible with any analogue seismic sensor

Rapid GNSS lock with accuracy of ± 50 ns once locked

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

Common Alert Protocol (CAP) enabled for automated emergency warning

Identification of IP address via Discovery and Cloud registry server

Remote instrument and data management via easy-to-use Discovery software

Scream!TM compatible

GüVü Bluetooth app for installation integrity checking available (Android)

Dual redundant 128 GB microSD cards

Select from GNSS (GPS and GLONASS, BeiDou optional)

Versatile streaming options.

Users can select sample rates of up to 4000 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 dataless SEED format) and can be streamed in realtime using GCF (Scream!), GDI-link and SEEDlink. Whilst traditional 'Nominal Response' files are supported, the system also provides 'machine generated Response files' to faithfully represent the exact configuration of the station and sensors.

Applications

- > Temporary seismic stations
- > Earthquake Early Warning
- > Rapid deployment arrays
- > Volcanology
- > Multi-discipline seismic observatories
- > Structural health monitoring
- > Induced seismicity detection

Minimus₂ Tools:

GüVü Bluetooth App

Check the integrity of your installation instantaneously

GüVü displays a range of instrument data such as waveforms, orientation, temperature and humidity data. Additionally you can lock/unlock and centre the masses of analogue sensors, reboot Minimus₂ and alter sample rates without instrument disturbance. GüVü can also format replacement SD cards. A deployment status report can then be emailed for a detailed record of the installation.

Connected to:
MIN-C555
DC:49:25:8E:2B:CC

Instrument 1 of 2

- 35.24°C
- 24%
- 12.0V/1.0V(PoE)
- SD memory card used: 5.64 GB size: 58.0 GB 90% free
- Recording
- Latitude: 51.3608° Longitude: -1.16306° Altitude: 117m
- Horizontal dilution of precision: 0.86
- Last GPS update time: 2017/12/04 15:35:54
- GPS time lock quality: 100%
- Last lock time: 2017/12/04 13:39:35

Mass positions

Velocity channels

Z

N

E

1000
750
500
250
0
-250

UNIQUE INSTRUMENT SERIAL NUMBER

MEDIA ACCESS CONTROL (MAC) ADDRESS

INSTRUMENT TEMPERATURE

INSTRUMENT INTERNAL HUMIDITY

POWER SUPPLY

MICROSD CARD STATUS

DATA RECORDING STATUS

GNSS RECEIVER LOCATION

GNSS TIME-LOCK STATUS

SENSOR MASS POSITIONS

MAIN SENSOR OUTPUTS

INSTRUMENT ORIENTATION

SPECIFICATIONS

SENSOR INPUTS	
Primary digitisation channels	Four at 24 bits Differential input: 40 V peak-to-peak (± 20 V). Also compatible with single-ended inputs: 20 V peak-to-peak (± 10 V)
Secondary channels	Three analogue channels for sensor mass positions, one internal calibration channel
Internal environmental channels	Humidity Temperature Supply voltage/Power consumption
Input impedance	50 k Ω
PERFORMANCE	
ADC converter type	Delta-sigma
ADC conversion delay	6 μ s
Output format	32-bit
Dynamic Range	>142 dB at 100 samples per second
Gain drift	3 ppm / $^{\circ}$ C
Common-mode rejection	>110 dB
DATA PROCESSING	
Output rates available	1 sample per hour up to 4000 samples per second for primary channels, user-selectable Multiple independent data streams at different sample rates for all channels (transmission and recording) Up to 500 samples per second for environmental channels
Decimation filters	± 2 , ± 3 , ± 4 , ± 5 decimation (Causal / Acausal)
Out-of-band rejection	>167 dB
Data transmission mode	Continuous and trigger modes
Triggered data	Retrievable using event table in digitiser's web page. User selectable pre and post event time.
Trigger modes	STA/LTA, Threshold
Selectable gain	Unity $\times 1$, $\times 2$, $\times 4$, $\times 8$, $\times 12$
TIMING AND CALIBRATION	
Timing source precision	Accuracy when GNSS locked ± 50 ns. Typical drift when unsynchronised (without GNSS) <1 ms per day once temperature trained
Timing sources	GNSS (GPS and GLONASS, BeiDou optional)
Calibration signal generator	Broadband noise and Sinewave
OPERATION AND POWER USAGE	
Operating temperature	-20 to +60 $^{\circ}$ C
Relative humidity range	zero to 100 %
Power supply	5 - 36 V DC* (2S lithium compatible)
Power consumption at 12 V DC	< 0.8 W in power save mode with no GNSS or Ethernet < 1.3 W in standard mode with constant GNSS and 10 Mb/s Ethernet output
<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>	
SOFTWARE	
Operating system	Windows, Linux and macOS compatible
Communication technologies supported	Ethernet (10/100BASE-T) Power over Ethernet (IEEE 802.3af compliant)
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)
Memory and storage	Dual redundant 128 GB microSD cards (1 fixed, 1 hot-swappable)
PHYSICAL CHARACTERISTICS	
Casing type	Environmentally sealed, hard anodised aluminium on a stainless steel base
Environmental sensor	Humidity and temperature
Weight	600 g (disconnected)
Dimensions	98 mm \times 108 mm \times 40 mm
Connector type	MIL-DTL-26482 Series 1: Analogue - 26 way Power - 4 pin SURE-SEAL IPMODM: Waterproof Ethernet LEMO : GNSS/serial - 14 pin
Global navigation satellite system (GNSS)	Compact, encapsulated, waterproof, precision timing GPS/GLONASS (BeiDou optional) receiver
Environmental protection	IP68 - protection against effects of prolonged immersion at 3 m depth for 72 hours