MINIMUS
MINIMUS+

SMART SEISMIC DIGITISER WITH ADVANCED DATA-PROCESSING CAPABILITY AND SOFTWARE COMMUNICATIONS

Compact and low-power smart seismic digitiser with the option of four or eight primary digitisation channels.

KEY FEATURES
> Advanced software communications for quick and easy instrument and data management
> Hot-swappable and dual-redundant microSD storage
> Select from GNSS (GPS, GLONASS, BeiDou) or PTP timing sources

FOR EARLY WARNING APPLICATIONS:
> Ultra low-latency capability
> Multi-instrument voting for mitigating false-positive alerts
> Reduce telemetry load by streaming only derived values at trigger
> Common Alert Protocol (CAP) enabled for automated emergency warning

Minimus

The Güralp Minimus (four channel) and Minimus+ (eight channel) are advanced 'smart' seismic digitisers, packed with a host of features that make them the ideal plug and play solution for rapid deployments and multi-scale networked arrays.

MINIMUS DIMENSIONS:

134 mm

99 mm

45 mm

MINIMUS+ DIMENSIONS:

134 mm

139mm

45 mm

Multidisciplinary functionality with simple instrument and data management.

The four channel Minimus can simultaneously accommodate a triaxial analogue sensor, an auxillary input e.g. for infrasound; a Radian posthole or borehole instrument; plus its own internal MEMS accelerometer (2g).

The eight channel Minimus+ accommodates all of the above plus an additional triaxial analogue seismic sensor and auxilary input.

Integrated network connectivity allows the Minimus 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 allows for simpler instrument and data management 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.

Versatile streaming and filtering options.

Users can select sample rates of up to 5000 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.

For Earthquake Early Warning applications, the Minimus has an ultra-low-latency mode running causal filters alongside traditional acausal filters. When used with our GDI protocol, this low-latency mode means network transmission can be achieved in 40 milliseconds (sample rate and network dependent). Other EEW features include industry standard triggering algorithms for EEW (STA/LTA); multi-instrument voting for mitigating false positive alerts; and Common Alert Protocol (CAP) for automated emergency warning.

Encased in an environmentally sealed, hard anodised aluminum casing to withstand the harshest environments, the Minimus has an internal thermometer and a humidity sensor to alert you to any moisture ingress.

Key features

24-bit, four (Minimus) or eight (Minimus+) channel digitiser

Compatible with any analogue seismic sensor

Ultra-low-latency mode for Earthquake Early Warning - when used with GDI protocol, transmission can be achieved in 40 ms

Industry standard triggering algorithms for EEW (STA/LTA)

Multi-instrument voting for mitigating false positive alerts

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

GüVü Bluetooth Android App for installation integrity checking available for both Android and iOS devices

Hot-swappable data storage and dual-redundant microSD cards

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

Minimus+ supports Power Over Ethernet (POE) which significantly reduces complexity when installing local arrays

Scream!™ compatible

Applications

> Earthquake Early Warning Systems
> Volcanology
> Multi-scale seismic networks
> Structural health monitoring
> Hydrocarbon exploration
> Permanent reservoir monitoring
> Induced seismicity detection
> Explosion monitoring

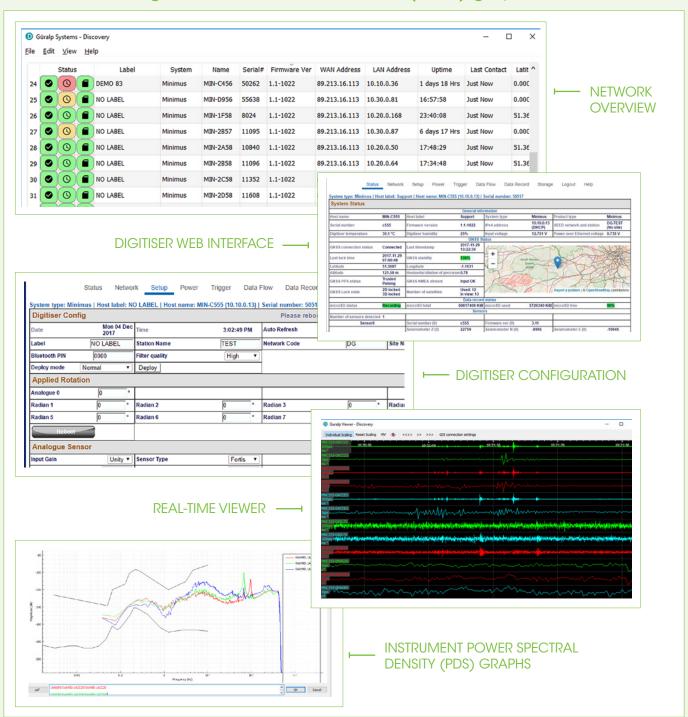# Minimus:
Güralp Discovery Software*

*See Discovery datasheet for more details

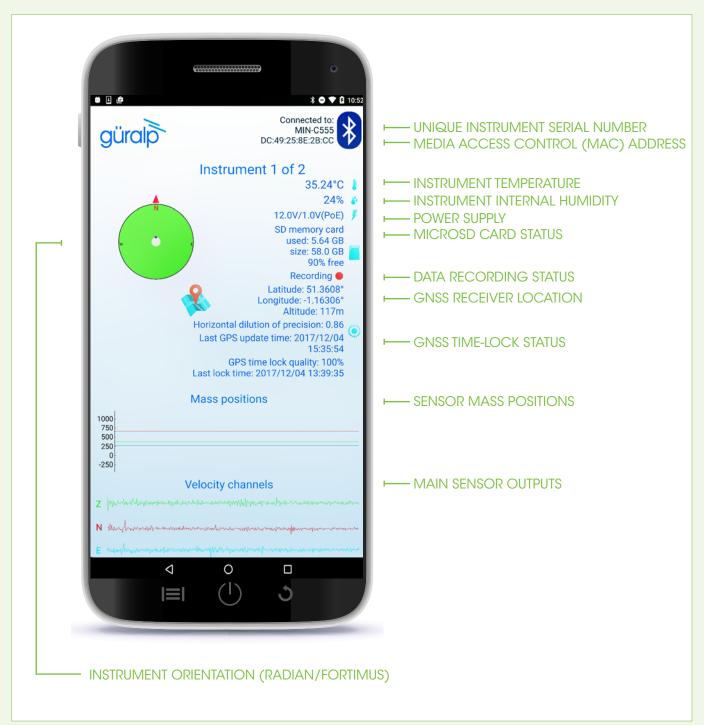Discovery dramatically simplifies instrument and data management and gives users powerful tools via a web interface:

> Identify instrument IP address
> Analysis of hardware State of Health
> Data streaming control
> Access instrument RESP files
> Fully interactive waveform viewer
> PSD (noise) graphs

NETWORK OVERVIEW

DIGITISER WEB INTERFACE

DIGITISER CONFIGURATION

REAL-TIME VIEWER

INSTRUMENT POWER SPECTRAL DENSITY (PDS) GRAPHS

Minimus:
GüVü Bluetooth App

For efficient field deployments, GüVü allows you to check the integrity of your installation instantaneously. GüVü displays waveforms, orientation, temperature and humidity data plus it enables you to alter sample rates without instrument disturbance. All deployment data can then be emailed for a detailed record of the installation.

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 (RADIAN/FORTIMUS)

Minimus
Minimus+

SPECIFICATIONS

SENSOR INPUTS	
Primary digitisation channels	Minimus: four at 24 bits Minimus+: eight 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	Minimus: three analogue channels for sensor mass positions, one internal callibration channel Minimus+: six analogue channels for sensor mass positions, two internal callibration channels
Internal environmental channels	Humidity Temperature Supply voltage MEMS accelerometer (three component - see below) Magnetometer (three component)
Input impedence	50 kΩ

MEMS ACCELEROMETER	
Frequency bandwidth	DC to 100 Hz (0.01 s)
Linear acceleration noise density	150 µg / √Hz at 100 Hz
Clip level	±2 g

PERFORMANCE	
ADC converter type	Delta-sigma
ADC conversion delay	6 µs
Output format	32-bit
Dynamic Range	>136.5 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 and triggered
Trigger modes	STA/LTA
Selectable gain	Unity, ×2, ×4, ×8, ×12

TIMING AND CALIBRATION	
Timing source precision	Accuracy when GPS locked ±50 ns. Typical drift when unsynchronised (without GNSS) <1 ms per day
Timing sources	GNSS (GPS, GLONAS, BeiDou), PTP (Precision Time Protocol)
Calibration signal generator	Sine, step or broadband noise, all with adjustable amplitude and frequency

OPERATION AND POWER USAGE	
Operating temperature	-20 to +60 °C
Relative humidity range	zero to 100 %
Power supply	10 - 36 V DC* Optional 9 V DC available
Power consumption at 12 V DC (Minimus)	< 1 W (no GNSS or Ethernet) 1.8 W (GPS with 10 Mb/s Ethernet output)
Power consumption at 12 V DC (Minimus+)	< 1.1 W (no GNSS or Ethernet) < 1.9 W (GPS with 10 Mb/s Ethernet output)

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.

SOFTWARE	
Operating system	Windows, Linux and macOS compatible
Communication technologies supported Minimus and Minimus+:	Ethernet (10/100/1000BASE-T)
Minimus+ only:	Power over Ethernet (PoE)

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!) and GDI-link (metadata sent in RESP / dataless SEED file formats), SEEDlink
Flash memory and storage	64 GB field-swappable microSD card flash storage (dual-redundant).

PHYSICAL CHARACTERISTICS	
Casing type	Environmentally sealed, hard anodised aluminium
Environmental sensor	Humidity and temperature
Weight	Minimus: 674 g (disconnected) Minimus+: 782 g (disconnected)
Dimensions	Minimus: 134 mm × 99 mm × 45 mm Minimus+: 134 mm × 139 mm × 45 mm

Connector type	MIL-DTL-26482 Series 1:
	   Analogue - 26 way (Minimus ×1; Minimus+ ×2)
	   Ethernet - 8P8C (RJ45)
	   Power - 4 pin
	   Digital - 10 pin
	
	LEMO :
	   GNSS/serial - 14 pin

Global navigation satellite system (GNSS)	Compact, encapsulated, waterproof, precision timing GPS/GLONASS/BeiDou receiver
Environmental protection	IP68 - protection against effects of prolonged immersion at 3 m depth for 72 hours

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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