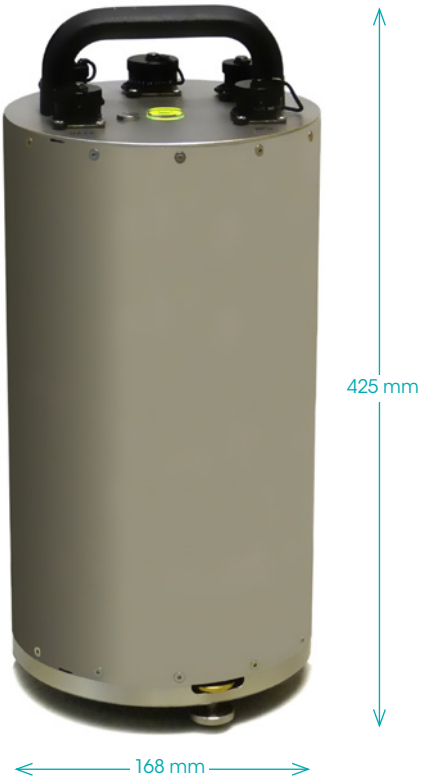
Güralp 3TDE

WEAK MOTION DIGITAL BROADBAND SEISMOMETER



A digital broadband sensor offering unparalleled flexibility.

The Güralp 3TDE is a well proven, established design based on the 3T seismometer and DM24 digitiser. An on-board, Linux-based acquisition module offers remote monitoring and control, with unparalleled flexibility.

The 3TDE combines the well-regarded 3T weak motion sensor, an integrated DM24 digitiser and an EAM embedded acquisition module to form a low noise sensor with on-board and external storage options, a convenient web-based user interface and multi-protocol communications over serial and Ethernet connections. This capability makes the 3TDE ideal for long-term, permanent deployments.

Key features

Self-contained weak-motion broadband triaxial seismometer (3T) with digitiser and data-logger (DM24S3EAM) in a single waterproof stainless steel case

Covers the complete seismic spectrum with a single transfer function

The 3T family offers standard frequency responses of either a 120 s or a 360 s long period corner, other bespoke options are available on request

High sensor linearity: >111 dB (USGS figures)

Over 140 dB dynamic range over a wide frequency band

Cross axis rejection over 65 dB; sensor axes orthogonal to within +/- 0.05 °

Remote, automatic electronic mass locking for transport, unlocking for instllation, and mass centring

Up to 64 GB of on-board Flash memory storage

Fast data download over Ethernet or USB

Communication includes Ethernet, Wi-fi and Serial with many options such as GSM or VSAT

Real-time data streaming protocols include: SEEDlink, CD1.1, GCF (SCREAM!) - fully compatible with SeisComp3, Earthworm, Antelope analysis packages

Configuration, monitoring and control via web interface, terminal based menu systems or the Linux command line

Applications

> Surface and subsurface vault installations
> Monitoring arrrays
> Nuclear test ban treaty monitoring
> Geophysical and petrochemical exploration
> Global and national seismic networks

Images show the 3TDE weak motion digital broadband seismometer

Güralp 3TDE

SPECIFICATIONS

SENSOR: GÜRALP 3T BROADBAND SEISMOMETER

SENSOR SYSTEM	
Technology	Force feedback (force balance) velocity sensor
Configuration / Topology	Triaxial orthogonal (ZNE)
SENSOR PERFORMANCE	
Velocity output band (flat response within -3 dB crossing points)	Standard options: 120 s (0.0083 Hz) to 50 Hz 360 s (0.0028 Hz) to 50 Hz Contact Güralp to discuss other frequency response options
Sensitivity	6,000 V/ms^{-1} (2 x 3000 V/ms^{-1}) differential standard output Contact Güralp to discuss alternative sensitvity (gain) options
Self-noise below NLNM (New Low Noise Model; Peterson; 1993, USGS)	200 s (0.005 Hz) to 20 Hz
Sensor dynamic range (at standard output sensitivity)	140 dB
Cross axis rejection	65 dB
Linearity	>111 dB
Lowest spurious resonance	>140 Hz
Operating tilt range	±2.5°
Lowest spurious resonance	>140 Hz
MASS MONITORING / CONTROL	
Sensor mass positions	Three independent sensor mass position outputs (single-ended)
Mass ;ocking	Remote auto mass lock/unlock for transportation
Mass centring / offset zeroing	Remotely controlled automatic mass centring
CALIBRATION CONTROLS	
Calibration signal types	Sine, step or broadband (adjustable amplitude and frequency)
DIGITISER PERFORMANCE	
Digitiser type	Fourth-order sigma delta
Digitiser resolution	24-bit
Dynamic range	140 dB at 20 sps 138 dB at 40 sps 135 dB at 80 sps 135 dB at 100 sps
Sample rates	1 to 1000 sps (up to four simultaneous streams wih different sample rates available)
Gain options	Unity (1×) only
Digital filter types	FIR (linear phase) and IIR options available
Decimation filters	÷2; ÷4; ÷5; ÷8; ÷10
Anti-aliasing filter at Nyquist	160 dB
Absolute accuracy	<0.15%
Input impedance	117 kΩ
Crosstalk (out of band rejection)	140 dB
Linearity	110 dB at 80 sps
Common-mode rejection ratio	80 dB

DIGITISER / DATA-LOGGER: GÜRALP DM24S3EAM

USER INTERFACE / SOFTWARE	
Digitiser control and configuration	Platinum software (via web browser) Güralp Scream! software (free download) Terminal window over SSH or serial link
Triggering modes	STA/LTA, level, per-channel & network voting
REAL-TIME DATA COMMUNICATION	
Protocols	Scream! (GCF); SEEDlink; CD1.1; GDI-link
Latency	0.38 s digitisation delay at 250 sps 1 s transmission delay at 250 sps (GCF protocol)
ON-BOARD DATA STORAGE	
Data storage file formats	GCF; miniSEED
Internal storage capacity	Flash memory storage options available up to 64 GB
Data retrieval interfaces	Internal flash memory accessible via GPIO connector (appears as USB drive); or via secure file transfer protocols (e.g. sftp)
Expandable storage	Optional hot-swappable USB armoured canister (various sizes available)
TIMING	
Timing system	Internal VCXO clock
Timing sources	GPS; GLONASS; NTP (Network time protocol)
Timing accuracy: GPS unlocked	100 µs per day at 40 samples per second
Timing accuracy: GPS locked	<1 µs
STATE-OF-HEALTH	
Parameters available	Sensor mass positions, digitiser temperature, digitiser voltage and current
CONNECTORS	
Connector types	Power/data: 19-pin mil-spec bayonet GPS: 10-pin mil-spec bayonet USB: 6-pin mil-spec bayonet GPIO: 12-pin mil-spec bayonet Ethernet: 6-pin mil-spec bayonet
POWER	
Power supply voltage	12–32 V DC
Power consumption	With GPS; no Ethernet: 2.0 W
ENVIRONMENTAL / PHYSICAL	
Operating temperature range	-20 to +75 °C
Operating humidity range	0-100% relative humidity
Enclosure ingress protection	IP68 - protection against prolonged effects of immersion under pressure (tested under 3 m of water for 72 hours)
Enclosure material	Stainless steel case; O-ring seals throughout
Height	With feet: 380 mm With feet & handle: 425 mm
Diameter	168 mm
Weight	16.1 kg
Alignment	Bubble level on lid; north arrow on handle and base; adjustable feet
SUPPORTING DOCUMENTATION	
Calibration values	Measured sensor sensitivity, frequency response, instrument poles & zeros, digitiser sensitivity and test results enclosed

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