

THREE COMPONENT

DIGITAL FEEDBACK ACCELEROMETER

SIGMA Σ - TSD4G - ACC

SIGMA Σ - TSD4G - ACC digital force feedback accelerometer is based on a truly rectilinear suspension system, with 8 channel 24 bit high resolution digitiser. Three axis strong motion accelerometer is housed in an 'O' ring sealed Hard Anodised waterproof Aluminium case.

The system is self-contained, except for the power source. Three separate digital data outputs ports are provided, these being Ethernet, USB and serial RS-232.

An isolated dc-dc converter ensures galvanic isolation of the system and operates from 9 to 36 Volts.

The analogue feedback accelerometer has an extremely large dynamic range and 8 channel 24 bit acquisition system is incorporated to exploit the full dynamic range of the sensor as high gain and low gain digital outputs.



Figure 1:

Strong motion Accelerometer with Mil spec connectors

The low and high gain outputs are set digitally using the (PGA) Programmable Gain Amplifiers of the 8 channel Acquisition system.

Nominally the high gain outputs are set to have a 12 times larger output than the low gain outputs.

The sensor analogue differential outputs are interfaced to the differential inputs of the digitiser. The digital part of the circuitry is optically isolated from the front end ADC converter circuitry.

The photo Figure 1 shows the sensor connector turret. The connector turret allows easy connection to the sensor.

The product specifications and the stated data are subject to change without prior notice.

All the connectors are waterproof with O ring seals to a depth of 2 meters of water. The display provides State of health information of the feedback sensor and the digitiser.

Full-scale low and high gain sensitivity is digitally user-adjustable from ± 4.0 g to ± 0.33 g on individual channels of the digitiser.

The standard frequency pass band is flat to acceleration from DC to 350 Hz.

Detailed sensor calibration information is provided with every sensor, including sensor dc calibration levels, frequency response of the instrument and the transfer function in poles/zeros notation. The digitiser calibration values are also provided and the calibration values are stored with in the digitiser.

It is extremely simple to install the digital sensor, Single point slotted base bolt point ensures that the sensor to be fixed firmly to the installation point. Three levelling feet ensure that the sensor to be levelled and locked to the installation bolt.

The North/South ordination pointes are machined on the sensor base and the sensor component fixing crews are fixed with dowel pins to achieve highest possible orientation accuracy. The errors in pointer to the sensor orientation is less than ± 0.1 degrees.

After installation the sensor output offsets are nulled electronically, without exposing the insides of the accelerometer.

The digital sensor noise performance is better than $0.15 \mu \text{ m/s}^2/\sqrt{\text{Hz}}$. The sensor dynamic range exceeds 145 dB.

The digital accelerometer is provided with different connector options. Either with Gaiacode D type water proof connectors or Mil-spec. connectors.



Figure 2:
Feedback accelerometer with Gaiacode -D Type waterproof connectors



Figure 3:
Sealed water proof GPS antenna/receiver



Single fixing point

Figure 4:
Accelerometer base with fixing point and Orientation indicators machined to the base of the sensor

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TECHNICAL SPECIFICATIONS

Standard Frequency Response:

Flat Acceleration response DC to 350 Hz

Analogue sensor sensitivity:

Differential: $\pm 4g \sim 2 \times 0.5V/m/s^2$ for ± 20 Vdc

Configurable, $\pm 2g$, $\pm 1g \pm 0.5g$

The sensor sensitivity is configurable according to customer's requirement.

SENSOR CONTROL LINES:

Centre the sensor mass Positions: Serial (RS 232) and Logic line control.

Offset Adjustment: On demand.

Calibration On/Off: Serial (RS 232) and Logic control line.

Calibration signal: can be applied to each axis. The calibration signal can be any form of signal.

Feedback calibration Constant: Provided in the calibration document for each sensor axis.

Cross axis Rejection: 0.001g/g

Three axis orthogonal Rectilinear suspension system.

Linearity: 0.01%. 90% of full-scale.

Lowest spurious Resonance: 550 Hz for Vertical and Horizontal modules.

DIGITAL RECORDER MODULE:

Operational Performance Independent 8--24 bit Delta Sigma Digitizer with simultaneous sampling.

Dynamic Range:

Sample rate: Sample rate: 1K Hz: -122.2dB, at:100 Hz:-136.3 dB, at: 10 Hz -138.4dB.

(Full scale P-P to RMS Shorted input Noise)

Gain Accuracy: $\pm <0.5\%$, Each channel calibrated.

Configurable Preamplifier (PGA):

Gain settings *1, *2, *4, *8 *12. Each channel independently controlled.

Sample rates:

User selectable sample rates: 1,2,5,10,20,40,50,100, 125,200,250,500,1000. Four separate same rates are available concurrently.

Calibration signal: 24 bit buffered output DAC with adjustable amplitude.

Wave forms: Square, Sine, Step, Pulse with duty cycle and frequency control and Pseudo random signals. Generated with an internal synthesizer.

Digital filters: User selectable, high pass and band pass digital filters.

Decimation Filter Options:

Causal (minimum phase) and a-causal (linear phase) filters, applicable to all the sample rates and concurrently available.

Four separate same rates are available concurrently and can be mixed with Causal and a-causal output options.

DATA STORAGE:

Format: MiniSEED and PCF (Proprietary data Format).

Internal Memory: 2 G Byte

Data Storage: 32 G Byte SD card. Data downloadable via USB or Ethernet.

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TRIGGERS:

Threshold trigger with high-pass filter.

User selectable high pass filter.

STA/LTA: Band passed ratio-metric trigger.

Concurrently available in addition to continuous data streams.

LED Indicators: TCP/IP activity.

Colour display: Displays operational parameters, State of health information.

TIME SYNCHRONIZATION

Time Source: GPS, GNSS, NTP or internal source.

GPS: Maximum 50 meters cabling.

NTP: NTP option software selectable.

USER INTERFACES:

Available interfaces: 10/100 Base-Ethernet, USB, Serial RS232

RS232 Serial input: Control and acquire digital data. Interface to e.g.: Weather stations, digital infrasound sensors, digital strain/stress gauges.

Logic Control Lines: Calibration enable and centre via serial interface.

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IP Addressing: Static, dynamic (DHCP)

Protocols: UDP/IP unicast/multicast

Recording/acquisition Software Options:
SeisGram2K: Swarm: Earthworm: jAmaSeis

Operating temperature: -20 to 75 degrees centigrade

Power Supply: +9 - +36 V DC, Galvanically Isolated Supply input.

Power Consumption: Less than 2.1 Watts

Isolation and transient Protection:
Sensor casing is isolated for the signal ground and sensor input power.

All outputs are transient protected.

PHYSICAL:

Power/signal connector:

- Mil-spec connectors on the connector turret
- GaiaCode D type Connectors GaiaCode D type connector is waterproof connector designed and manufactured for GaiaCode

Case diameter: 165 mm

Case height: 155 mm with Mil-Spec Connector

Case height: 145 mm with GaiaCode "D" Connector

North South Pointer: Machined to the base.
North- Black Pointer. South-white Pointer

Base plate, casing and top cap: Hard Anodised Aluminium. Environmental: IP-68

Weight: 2.45 Kg with GaiaCode "D" Connector

Weight: 2.75 Kg with Mil-Spec Connector



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