GSS GTR

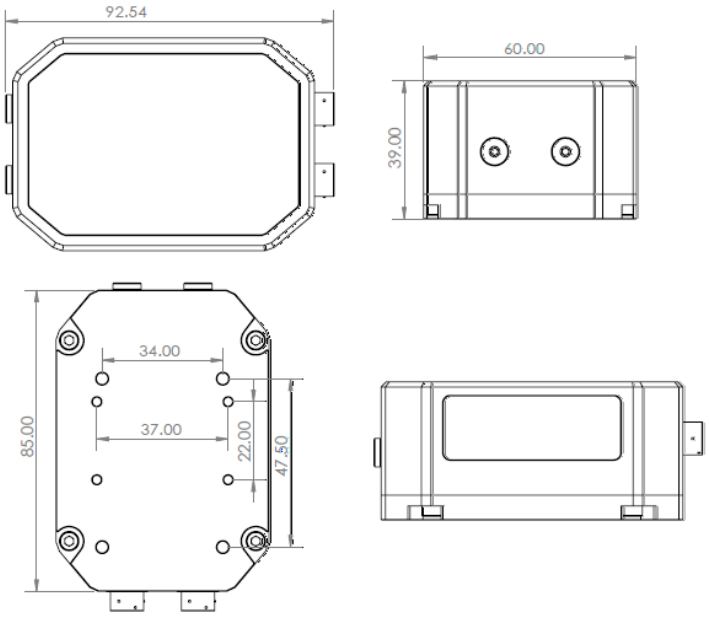
Data you want, when and where you need it…

GTR is a high-precision temperature-compensated, tri-axial tilt sensor offering <10 arc second resolution. Fully compatible with monitoring and positioning systems from Leica Geosystems as a direct replacement for the Leica Nivel2xx Inclinations sensors. The GTR can operate directly with Leica GR/GM GNSS receivers and with Leica GeoMoS Monitor. It emulates all original commands over RS232/485 or USB serial ports for seemly integration into existing systems thus is natively supported by Leica Geosystems solutions.

The device is externally powered (5GV to 18V DC), can provide on-demand readings at up to 1Hz rate and supports mounting in any physical orientation, delivering reliable tilt and temperature data in demanding environments.

Features

- <10 arc second pitch and roll resolution
- Fully temperature compensated for stable performance across wide ranges
- Externally powered (5V to 18V DC)
- Status and diagnostic LEDs for easy monitoring (configurable)
- Selectable RS-232 / RS485 interface (AUX port)
- USB serial interface
- 10-meter UV resistant cable with LEMO connector
- IP67 machined aluminium case (85x60x39mm)
- IP67 sealed protective caps for connectors
- Multiple mounting bracket options
- GTR and cable supplied in protective ABS case



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General Specifications	
Part Number	GTR-X10
Interfaces	1 x USB Port and 1 x AUX port with selectable RS232/RS485
Management Access	Serial via USB Port
Tilt Specifications	
Sensing Range	± 90 degrees on Pitch and Roll
Precision/Repeatability[1]	±1.3 arc-seconds (3σ, 99.7% confidence) 0.42 arc-seconds RMS (1σ)
Accuracy[2]	±18 arc-seconds
Stabilisation Time	~120 secs
Reading Interval	On demand (>=1 sec interval)
Data Format	Angles in Milliradians and Temperature in Celsius
Operating Specifications	
Power & Environmental	
Operating Temperature	-40 °C TO +50 °C
Mechanical Shock Limit	500 G (Calibration Unaffected) 1000 G (Bias Affected) 5000 G (Survivability)
MTBF	1.1 million Hours (Telcordia Method I, GF/30C) 0.4 million Hours (Telcordia Method I, GM/35C)
Base Unit Dimensions	L:94.54mm x W:60mm x H:39mm
Weight (grams)	400g

GTR Connectors	
USB	1 x 6-pin LEMO-type keyed connector with metal cap (IP67) and chain
AUX (Serial Port)	1 x 4-pin LEMO-type keyed connector with metal cap (IP67) and chain
Calibration	
Calibration Certification	Factory calibrated. Supplied with calibration certificate. Calibration may be performed by GSS or GSS certified laboratory
Accessories	
USB to PC Cable	ACC-CAB-USB1: 1 meter cable. USB to 6-pin LEMO-type connector
GTR 232 Cable (10m standard)	ACC-CAB-GTR-10L: 10-meter cable. 4-pin LEMO-type to 8-pin LEMO (FGA-1B-308)
RS485 Expansion Kit Cable (100m)[3]	ACC-EXP-GTR-100-485: 485 expansion nodes + 100m cable + LEMO-type 4-pin to 4-pin and standard ACC-CAB-GTR-10L cable.
Mounting Brackets	Fits on Small Bracket ACC-RZR-M01 and Mounting Kit with Small and Large Bracket ACC-RZR-MK1 (ACC-RZR-M01, ACC-RZR-M02)

Note 1. ±1.3 arc-seconds (3σ, 99.7% confidence) 0.42 arc-seconds RMS (1σ)

- Derived from filtered RMS noise: $\sigma_a \approx 2.05$ µg (after EWMA reduces white noise by $\sqrt{(4\tau)}$ factor).
- Converted via $\Delta\theta$ (rad) $\approx \sigma_a / g$, then to arc-seconds (×206265).
- Static repeatability test: 1000 samples at fixed 0° tilt on vibration-isolated mount; std. dev. computed per ISO 17025.

With τ=30 s, noise floor dominates random error (<0.5 arc-seconds contribution from quantization).

Note 2. ±18 arc-seconds

- Total systematic error after polynomial compensation and Leica-referenced calibration: Includes residual offset (<0.5 mg RMS post-fit), sensitivity error (<0.1%), and nonlinearity.
- Validated via two-point (gain/offset) + multi-temperature poly fit (3rd-order: offset(T) = $aT^3 + bT^2 + cT + d$), reducing temp drifts from ±13 mg to <1 mg peak-to-peak (-40°C to +60°C).
- Sweep tilts against Leica reference; RMSE <0.005° over range. Limited by reference (±0.5–1 arc-second) and residuals;

Analog Devices app notes and peer-reviewed studies (e.g., SFEM calibration) report this as achievable for compensated ADXL355 tilt sensors.

Note 3. Future Product. Contact GSS for further details on the 485 Expansion Kit availability.

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