

# Tersus GNSS

## TS21 GNSS Receiver

### Overview

The TS21 GNSS Receiver is an innovative integration of visual positioning technology, GNSS, IMU and dual cameras. Its front camera enables high-precision, high-efficiency and multi-point measurement, allowing you to measure what you see. Its front and bottom cameras work in tandem to support CAD AR visual stakeout, enabling precise path planning at varying distances.

It can provide high accuracy and stable signal detection with an internal high-performance multi-constellation and multi-frequency GNSS board. The high-performance antenna can speed up the time to first fix (TTFF) and improve anti-jamming performance. The built-in large capacity battery supports long time of fieldwork in 4G/3G/2G network and rover radio mode. The built-in UHF radio module supports long-distance communication. The rugged housing protects the equipment from challenging environments.

The TS21-TAP version features visual positioning, visual stakeout and the satellite-based precise point positioning service developed by Tersus (TAP). With TAP, the GNSS rover receives correction directly from satellites, including ephemeris error and satellite clock errors, eliminating the need for a local RTK base station or CORS. TS21 TAP meets the demand of centimeter-level high-precision positioning in areas worldwide without or with poc network coverage, such as oceans, deserts, mountains, high altitudes, etc.

### Key Features

- ✓ Multiple constellations and frequencies
  - GPS L1C/A, L1C, L2C, L2P, L5C
  - GLONASS L1OF, L2OF, L3OC
  - BeiDou B1I, B2I, B3I, B1C, B2a, B2b
  - Galileo E1, E5a, E5b, E5AltBOC, E6
  - QZSS L1C/A, L1C, L2C, L5C
  - SBAS L1C/A, L5
  - IRNSS L5
  - L-Band
- ✓ 1792 channels
- ✓ Innovative visual positioning technology for precise measurements
- ✓ Measure what you see, save your time
- ✓ Point clouds generation and export from measurement results
- ✓ Dual professional cameras, visual navigation and stakeout in One step
- ✓ 410-470MHz UHF radio, 4G network, Wi-Fi, Bluetooth, NFC
- ✓ Tilt compensation without calibration, immune to magnetic disturbances
- ✓ 32GB internal storage
- ✓ IP68-rated dust- & waterproof enclosure, for reliability in harsh environmental conditions
- ✓ With worldwide coverage, TAP<sup>(1)</sup> enables centimeter-level high-precision positioning
- ✓ No need to use the network to receive corrections with TAP
- ✓ High stability TAP service, which guarantees uninterrupted transmission of 24 hours a day



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### Technical Specifications

#### Performance

Signal Tracking:	
GPS	L1 C/A, L1C, L2C, L2P, L5C
GLONASS	L1OF, L2OF, L3OC
BDS	B1I, B2I, B3I, B1C, B2a, B2b
Galileo	E1, E5a, E5b, E5AltBOC, E6
QZSS	L1 C/A, L1C, L2C, L5C
SBAS	L1 C/A, L5
L-band	
Channels:	1792 <sup>(1)</sup>
Image Sampling Accuracy(Typically):	2cm <sup>(2)</sup>
Image Point Measurement Accuracy: Typically 2cm~4cm(2D), within the distance of 2m to 15m to the object <sup>(2)</sup>	
Single Point Positioning Accuracy (RMS):	
- Horizontal:	1.5m
- Vertical :	2.5m
DGPS Positioning Accuracy (RMS):	
- Horizontal:	0.25m
- Vertical:	0.5m
High-Precision Static (RMS):	
- Horizontal:	2.5mm+0.1ppm
- Vertical:	3.5mm+0.4ppm
Static & Fast Static (RMS):	
- Horizontal:	2.5mm+0.5ppm
- Vertical:	5mm+0.5ppm
Post Processed Kinematic (RMS):	
- Horizontal:	2.5mm+1ppm
- Vertical:	5mm+1ppm
Real Time Kinematic (RMS):	
- Horizontal:	8mm+1ppm
- Vertical:	15mm+1ppm
Initialization (Typical):	4s <sup>(3)</sup>
Initialization Reliability:	>99.99% <sup>(4)</sup>
Network Real Time Kinematic (RMS):	
- Horizontal:	8mm+0.5ppm
- Vertical:	15mm+0.5ppm

Time To First Fix (TTFF):	
- Cold Start:	<30s
- Warm Start:	<5s
Re-acquisition:	<1s
Timing Accuracy (RMS):	20ns
Velocity Accuracy (RMS):	0.03m/s
Tilt Compensation Accuracy (No tilt angle limit ):	
	≤2cm(within 60°)
Observation Accuracy (Zenith Direction):	
- C/A Code:	10cm
- P Code:	10cm
- Carrier Phase:	1mm
TAP <sup>(1)</sup> Positioning Accuracy (RMS):	
- Horizontal:	15mm
- Vertical :	30mm
TAP Convergence Time:	3 minutes
TAP Coverage:	Global
TAP Signal Stability:	99.99%

#### System & Data

Operating System:	Linux
Storage:	Built-in 32GB
Differential Data Format: CMR, CMR+ (GPS only), RTCM2.x/3.x	
Data Output:	RINEX, NMEA-0183, Tersus Binary
Data Update Rate:	20Hz

#### Communication

Cellular:	4G LTE/WCDMA/GSM/EDGE
Cellular Bands <sup>(5)</sup> :	LTE FDD B1, B3, B5, B7, B8, B20, B28
	LTE TDD B38, B40, B41
	WCDMA B1, B5, B8
	GSM/EDGE 900/1800MHz
Network Protocols:	Ntrip Client, Ntrip Server, TCP Tersus Caster Service (TCS)

# Technical Specifications

Wi-Fi:	802.11a/b/g/n/ac
Bluetooth:	5.0
Internal Radio:	
RF Transmit Power:	0.5W/1.0W
Frequency Range:	410MHz ~ 470MHz
Operating Mode:	Half-duplex
Channel Spacing:	12.5KHz / 25KHz / 250KHz
Modulation Type:	CSS, GMSK, 4FSK
Air Baud Rate:	4800 / 9600 / 19200bps
Radio Protocols:	
LORA, TrimTalk450, TrimMark 3, South, Transparent, Satel	
Wired Communication	
USB:	Type-C, OTG

## Camera

Pixel:	bottom camera 2.0MP
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## Electrical

External Power Supply :	Support USB (5~20V)
Fast Charging:	Support, 15W max (5V 3A)
Lithium Battery:	Built-in, 7000mAh/7.4V
Charging Time:	3 hours (20%-90%)
Battery Charging Temperature:	+10°C ~ +45°C
Working Time:	up to 9 hours <sup>(6)</sup>
Smart Battery with Power Display:	Support
Electronic Bubble:	Support

## Physical

Dimension:	φ134x71mm
Weight:	≈ 850g <sup>(7)</sup>
GNSS Antenna:	Integrated
Operating Temperature:	-40°C ~ +70°C
Storage Temperature:	-55°C ~ +85°C
Relative Humidity:	100% not condensed
Dust- & Waterproof:	IP68
Pole Drop onto Concrete:	2m
Vibration:	MIL-STD-810G, FIG 514.6C-1
Warranty Period:	One Year

## Software Support

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## User Interface

Button:	Power Button
LED Indicators:	
Satellite, Correction Data, Static, Solution	
Voice:	Support
Power Display:	Support

Note:

(1) TAP Service is available exclusively on the TS21 TAP version.

(2) The measurement precision may be subject to anomalies such as multi-path, obstructions, satellite geometry , atmospheric conditions, etc.

(3) The initialization time depends on various factors, including the number of satellites, observation time, atmospheric conditions, multi-path, obstructions, satellite geometry, etc.

(4) The initialization reliability may be affected by atmospheric conditions, signal multipath, and satellite geometry.

(5) Optional.

(6) The working time of the battery is related to the working environment, working temperature and battery life.

(7) The actual size/weight may vary depending on the manufacturing process and measurement method.

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