

SURVEYING & ENGINEERING



# TERSUS TS21 & TS20

GNSS  
Receiver

RIGHT TO THE POINT



# TS21 & TS20 GNSS RECEIVER



**TS21** GNSS Receiver  
**WITH DUAL CAMERAS**



**TS20** GNSS Receiver  
**WITH BOTTOM CAMERA**

TS21 GNSS receiver integrates visual positioning, GNSS, IMU and dual cameras into one innovative device. The front camera enables high-precision, high-efficiency and multi-point measurement, allowing surveyors to measure what they see. The combination of front and bottom cameras supports CAD AR visual stakeout for precise path planning at varying distances.

TS20 GNSS receiver integrates visual positioning, GNSS, IMU and a bottom camera into one innovative device. The bottom camera supports CAD AR visual stakeout for precise path planning.

Equipped with a powerful multi-constellation, multi-frequency GNSS board, TS21/TS20 deliver stable, high-accuracy signal detection. With calibration-free IMU tilt compensation, accuracy is maintained without restrictions on tilt angles. The advanced antenna improves time-to-first-fix (TTFF) and enhances anti-jamming capability. A large-capacity battery ensures extended fieldwork in both network and radio rover modes, while the built-in UHF radio enables long-distance communication. Rugged housing with IP68 protection keeps the devices reliable in harsh environments.

TS21-TAP and TS20-TAP versions integrate the Tersus satellite-based Precise Point Positioning service (TAP), enabling centimeter-level accuracy worldwide without relying on local RTK base stations or CORS. By directly receiving satellite-broadcast corrections such as ephemeris and clock errors, Oscar-TAP ensures high-precision positioning even in remote areas with poor or no network coverage, including oceans, deserts, mountains, and high altitudes.

## APPLICATION SCENARIO



Building  
Construction



Road  
Construction



Bridge  
Construction



Pipework



Landscaping



Metro Tunnel

# FEATURES



**Multiple constellations & frequencies**  
GPS, GLONASS, BeiDou, Galileo, QZSS, SBAS.



**Professional cameras**  
visual positioning and stakeout.

**1792** 1792 channels



**32GB** internal storage



**Tilt compensation without calibration**  
immune to magnetic disturbances.



**Rich data transmission options**  
UHF radio, 4G network, Wi-Fi, Bluetooth, NFC.



**Smart battery** with extended working hours and power level display.



**Global satellite-based PPP service<sup>(1)</sup>**

## VISUAL POSITIONING AND STAKEOUT



**TS21**  
GNSS Receiver

### Innovative Visual Positioning

Global shutter with video measurement delivers precise and reliable results.

### Measure What You See

Multi-points a time, accelerate the workflow and improve efficiency.

### On-Site Point Cloud Generation

Generate and export high-precision point clouds in real-time.

### Dual-Camera Visual Stakeout

Front and bottom cameras work in tandem, automatically switching for precise navigation at varying distances.



**TS20**  
GNSS Receiver

### Effortless stakeout

Quick, one step stakeout on NUWA software's 3D view with 50% efficiency gain for less experienced operators.

### 3D visual navigation

Guided by a clear, eye catching directional arrow and real time distance.

### 3D visual stakeout

Immersive 3D stakeout experience with the stakeout point marked directly on the ground.

### Star-level cameras

The stakeout display is clear even at night.

# Technical Specifications

## TS21 & TS20

### Performance

|                                                                                                                                                                                                                                             |                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Signal Tracking:<br>GPS L1 C/A, L1 C, L2C, L2P, L5;<br>GLONASS L1OF, L2OF, L3OC;<br>BeiDou B1I, B2I, B3I, B1C, B2a, B2b;<br>Galileo E1, E5a, E5b, E5AltBOC, E6;<br>QZSS L1 C/A, L1C, L2C, L5C;<br>SBAS L1 C/A, L5;<br>L-band <sup>(1)</sup> |                       |
| Channels:                                                                                                                                                                                                                                   | 1792 <sup>(1)</sup>   |
| Image Sampling Accuracy(Typically):                                                                                                                                                                                                         | 2cm <sup>(2)</sup>    |
| Image Point Measurement Accuracy:<br>Typically 2cm~4cm(2D)<br>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:                                                                                                                                                                                                                 | >99.9% <sup>(4)</sup> |
| Network Real Time Kinematic (RMS):                                                                                                                                                                                                          |                       |
| - Horizontal:                                                                                                                                                                                                                               | 8mm+0.5ppm            |
| - Vertical:                                                                                                                                                                                                                                 | 15mm+0.5ppm           |
| Observation Accuracy (Zenith Direction):                                                                                                                                                                                                    |                       |
| - C/A Code:                                                                                                                                                                                                                                 | 10cm                  |
| - P Code:                                                                                                                                                                                                                                   | 10cm                  |
| - Carrier Phase:                                                                                                                                                                                                                            | 1mm                   |
| Time To First Fix (TTFF):                                                                                                                                                                                                                   |                       |
| - Cold Start:                                                                                                                                                                                                                               | <30s                  |
| - Warm Start:                                                                                                                                                                                                                               | <5s                   |
| Re-acquisition:                                                                                                                                                                                                                             | <1s                   |

### Performance – continued

|                                                    |                  |
|----------------------------------------------------|------------------|
| Tilt Compensation Accuracy (No tilt angle limit) : |                  |
|                                                    | ≤2cm(within 60°) |
| Timing Accuracy (RMS):                             | 20ns             |
| Velocity Accuracy (RMS):                           | 0.03m/s          |

### PPP(TAP)<sup>(1)</sup>

|                             |           |
|-----------------------------|-----------|
| Positioning Accuracy (RMS): |           |
| - Horizontal:               | 15mm      |
| - Vertical:                 | 30mm      |
| Convergence Time:           | 3 minutes |
| Coverage:                   | Global    |
| Signal Stability:           | 99.99%    |

### System & Data

|                   |                                   |
|-------------------|-----------------------------------|
| Operating System: | Linux                             |
| Storage:          | Built-in 32GB                     |
| 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<br>LTE TDD B38,B40,B41<br>WCDMA B1,B5,B8<br>GSM/EDGE 900/1800MHz |
| Network Protocols:              | Ntrip Client, Ntrip Server,<br>TCP, Tersus Caster Service (TCS)                                  |
| 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                                     |
| Air Baud Rate:     | 4800 / 9600 / 19200bps                                   |
| Modulation Type:   | CSS, GMSK, 4FSK                                          |
| Radio Protocols:   | LORA, TrimTalk450,<br>TrimMark3, South,Transparent,Satel |

### Wired Communication

|      |             |
|------|-------------|
| USB: | Type-C, OTG |
|------|-------------|

### Camera

|        |                                           |
|--------|-------------------------------------------|
| Pixel: | Front Camera 2.3MP<br>Bottom Camera 2.0MP |
|--------|-------------------------------------------|

### Electrical

|                                   |                              |
|-----------------------------------|------------------------------|
| External Power Supply:            | Support USB (5~20V)          |
| Fast Charging:                    | Support, 15W max(5V 3A)      |
| Lithium Battery:                  | Built-in, 7000mAh/7.4V       |
| Charing 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

Tersus Nuwa

### User Interface

|                 |                                                 |
|-----------------|-------------------------------------------------|
| Button:         | Power Button                                    |
| LED Indicators: | Satellite, Correction data,<br>Static, Solution |
| Power Display:  | Support                                         |

Note:

- (1) TAP Service is available exclusively on TS21-TAP and TS20-TAP versions.
- (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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To learn more, please visit: [www.tersus-gnss.com](http://www.tersus-gnss.com)  
Sales inquiry: [sales@tersus-gnss.com](mailto:sales@tersus-gnss.com)  
Technical support: [support@tersus-gnss.com](mailto:support@tersus-gnss.com)

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Global Headquarter

Tersus GNSS Australia  
Level 2, 990 Whitehorse Rd, Box Hill,  
VIC 3128, Australia  
+61 3 9018 5598

US Office

Tersus GNSS United States  
809 San Antonio Rd, Suite 10,  
Palo Alto CA 94303-4634,  
United States  
+1 4158 0048 00

China Office

Tersus GNSS China  
18F, Tower 1, No. 235, Yubei  
Road, Pudong New District,  
Shanghai, China  
+86 21-5080 3061