

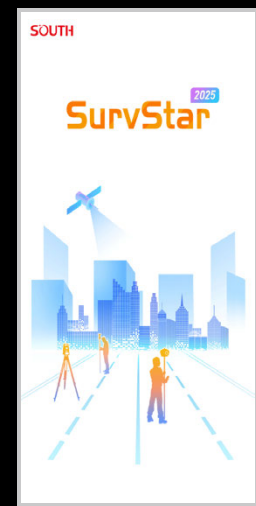
## SPECIFICATION (SOFTWARE)

### SOFTWARE

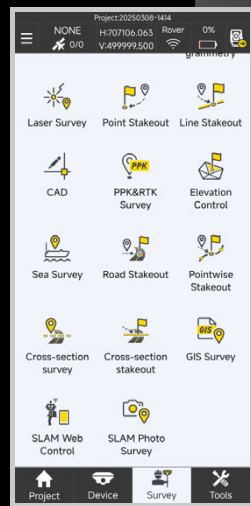
- GNSS Fieldwork
- Fieldwork Partner
- SurvStar
- smartphone recommended (instead of regular data logger)

- SLAM Fieldwork
- SLAM Pre-proces
- SurvStar
- RobotSLAM Engine

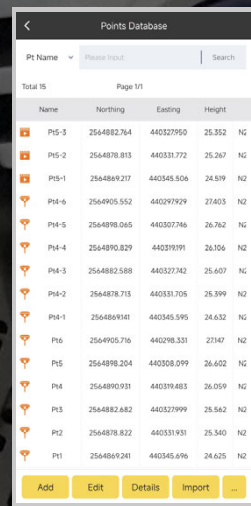
## SOFTWARE



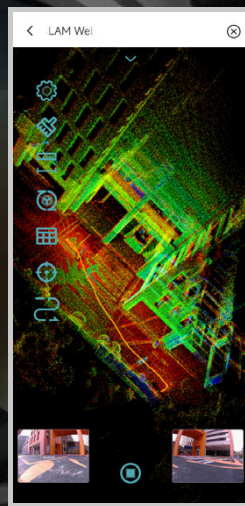
fieldwork software  
SurvStar



newly added merged  
applications

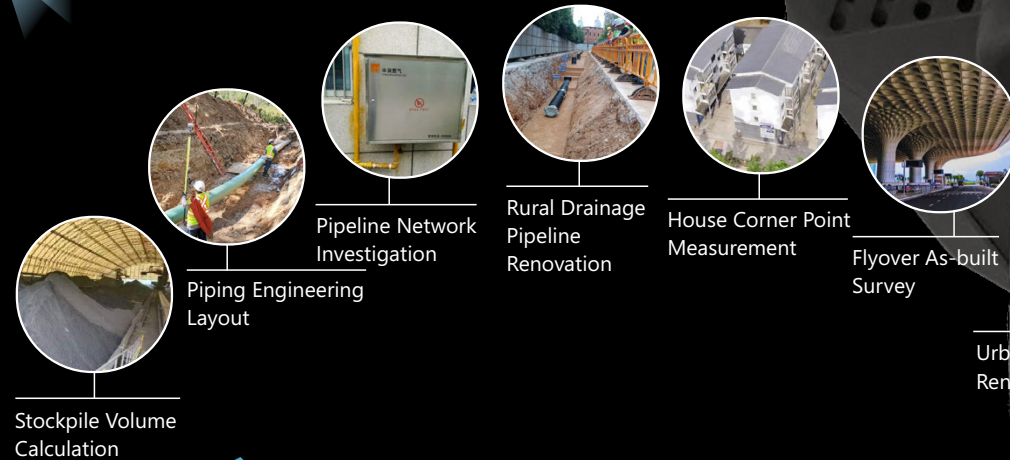


mixed solution  
point library



realtime laser  
point cloud

## APPLICATIONS



The GNSS + SLAM Mixed&Match Combo tends to help this device tackle some tough cases in which conventional RTK survey suffers satellite signal loss and total station measurements come up with low efficiency. With DotLas Plus, it's possible to witness a few changes.

## SPECIFICATION (TECHNICAL)

### TECHNICAL

#### GNSS Feature

full constellation tracking and smart dynamic sensitivity positioning technology, supports all existing and under-planning satellites, reliable carrier tracking capability and quality observational data, adapts to various environments, complex terrains, and long-range challenges

#### GNSS Performance

- Signal Tracking
- Multi-constellation

- 1698 channels
- GPS: L1C/A, L2P, L2C, L5, L1C\*
- GLONASS: G1, G2, G3\*
- BDS-2: B1I, B2I, B3I
- BDS-3: B1I, B3I, B1C, B2a, B2b-PPP
- GALEO: E1, E5b, E5a, E6\*
- QZSS: L1C/A, L1C, L2C, L5
- NavIC/IRNSS: L5
- SBAS: EGNOS L1, L5\*
- L-band
- 1-10 Hz

- Positioning Output
- Frequency
- Initialization Time
- Cold Restart
- Initialization Reliability
- IMU Refresh Rate

#### GNSS Accuracy

- Single Point Positioning
- DGPS
- Real Time
- Kinematic (RTK)
- Post Processed
- Kinematic (PPK)
- Precise Point
- Positioning (PPP)
- High-precision Static

- Static and Rapid Static

- Code Differential
- Positioning Refresh Rate
- Time for First Fixed
- Solution

#### IMU Performance (GNSS)

- Calibration-free

- Tilting Range
- Tilt Compensating
- Accuracy
- Attitude Accuracy
- (post processed)
- Positioning Accuracy
- (post processed)

- < 10 sec
- < 12 sec
- > 99.9%
- 200 Hz

- H. 1.5 m RMS; V. 2.5 m RMS
- H. 0.4 m RMS; V. 0.8 m RMS
- H. 8 mm + 1 ppm RMS;
- V. 15 mm + 1 ppm RMS
- H. 3 mm + 1 ppm RMS;
- V. 5 mm + 1 ppm RMS
- supports PPP-B2b,
- H. 10 cm; V. 20 cm
- H. 2.5 mm + 0.1 ppm RMS;
- V. 3.5 mm + 0.4 ppm RMS
- H. 2.5 mm + 0.5 ppm RMS;
- V. 5 mm + 0.5 ppm RMS
- H. 0.4 m RMS; V. 0.8 m RMS
- 1Hz/5Hz/10Hz
- cold start < 45 sec
- hot start < 10 sec
- single reacquisition < 1 sec

- automatically calibrates coordinates according to tilt direction and tilting angle
- 0°~60°
- RMS RTK+0.7mm/\*tilt angle (in case of 1.8m carbon fiber pole)
- 0.005° RMS pitch/roll, 0.01° RMS heading

- 0.01 m RMS pitch/roll, 0.02 m RMS heading

#### IMU Performance (SLAM)

- Gyro Offset Stability TC
- Gyro Sensitivity/
- Temperature
- Accelerator Offset
- Stability TC
- Accelerator Sensitivity/
- Temperature
- Gyro + Accel Combo
- Current
- Extended Accel
- Full-scale Range
- Improved ODR Latency

#### SLAM Performance

- Scanning Range

- Measurement Rate
- Scanning Rate
- Field Of View (FOV)
- Laser Wavelength
- Laser Safety Class
- Loop Closure Free
- PPK Mode

#### SLAM Accuracy

- Realtime Assessment
- Relative Accuracy
- Range Noise
- Absolute Accuracy (RTK)

- Absolute Accuracy (PPK)

#### Merged Applications

- Positioning Accuracy
- while Satellites Unlocked
- Contactless Measurement
- Accuracy
- Super Stake-out Accuracy

#### AR Stake-out Performance

- Mode
- Visual Stake-out Accuracy

- ±10 mdps/C
- ±0.045%/C
- ±0.15 mg/C
- ±0.007%/C
- 0.77 mA
- 32 g
- 32 kHz
- 0.1-70m (70m@ 80% reflectivity; 40m@ 10% reflectivity)
- 200,000 pts/sec
- 10Hz
- 360° x 59°
- 905 nm
- CLASS 1 (IEC 60825-1:2014), eye-safe
- available when RTK is enabled outdoors
- available
- available
- ≤10 mm
- approx. 5-20 mm (optimized)
- best up to 3-5 cm (powered by onboard RTK positioning)
- best up to 2-4 cm (post processed)
- optimal: H. 8 mm + 1 ppm RMS; V. 15 mm + 1 ppm RMS
- typical: H. 10 mm + 1 ppm RMS; V. 20 mm + 1 ppm RMS
- best up to 3 cm, typical 5-10 cm, known as Magicalc by means of Mixed Solution
- ≤5 cm (@15 m)
- optimal: H. 8 mm + 1 ppm RMS; V. 15 mm + 1 ppm RMS
- typical: H. 10 mm + 1 ppm RMS; V. 20 mm + 1 ppm RMS

Note: all specifications are subject to change without any prior notice.

1. The accuracy performance and reliability might vary due to different factors such as signal obstruction, tilting angle, observation time, multipath model validation, optimal GNSS geometry and atmospheric conditions, etc.
2. The battery endurance might result from the operating environment, operating temperature, and battery life.

# GNSS RTK Hybrid Supreme DotLas Plus

When RTK Meets SLAM ...

**1+1 > 2 IS TRUE**



## Why DotLas Plus?

Literally, DotLas is a highly integrated device capable of point (= dot) measurement and laser scanning. That's how this new compound word DotLas came. And Plus here actually refers to something extra, merged applications. By combining the immense power from the existing 2 core technologies in geo-spatial society, it features amazing versatility, and intends to challenge some complex environments where conventional GNSS RTK cannot satisfy. Therefore, it resets the benchmark of GNSS RTK hybrid models and tops itself as the supreme masterpiece in the industry.

## SPECIFICATION (GENERAL & PHYSICAL)

### GENERAL

Model Series  
Functionality

- DotLas Plus
- RobotSLAM
- SLAM-based RTK, RTK-based SLAM, and merged applications all-round

Type  
Component

- GNSS RTK hybrid supreme
- built in with GNSS mainboard, SLAM scanner, camera lenses, temperature sensor, IMU, smartwatch-like LED screen, etc.

### PHYSICAL

Dimension  
Net Weight

- 120x120x340 mm (LxWxH)
- 1.4 kg (battery handgrip excluded); 1.8 kg (battery handgrip inclusive)
- horizontal and forward, pixel size 2.0 μm, FOV 210°x120°, resolution 10 MP in total (5 MP x2), imaging effect best up to 20 MP
- downward, resolution 2 MP x1, FOV 75°

Temperature Sensor

- built in, intelligent variable frequency temperature control, realtime monitors and regulates device temperature

Camera (for SLAM)

- Livox Mid-360 built in, 3D mixed solid-state sensor, 40 channels
- Type-C and Ethernet interfacing
- LAN1 (7-pin) and LAN2 (9-pin), for debugging and RS232 data transfer, etc.

IMU Module

- built in, intelligent variable frequency temperature control, realtime monitors and regulates device temperature
- built in for GNSS, and supports tilt survey option, Linux OS
- smartwatch-like, round face, 1.39-inch, resolution 454x454

Camera (for GNSS)  
Laser Scanner

LED Screen

Wi-Fi Module

- built in and serves as a Wi-Fi hotspot source, accessible to any smart device for configuration
- SIM card slot built in, Nano SIM
- radio antenna interfacing SMA

Data Download  
LEMO Interfacing

Network Telecom  
Radio Wireless

inbuilt RX radio module  
(to enable its rover use via radio datalink)

inbuilt GNSS mainboard and antenna  
(for RTK rover and RTK-based SLAM purposes)

inbuilt dual-cam facing forward  
(to colorize SLAM point cloud with textures)

smartwatch-like LED screen  
(touch screen, more interactive and informative)

market-proven laser scanner sensor  
(for SLAM use and merged applications)

handgrip battery exclusive  
(highly integrated handgrip with batteries built in)

inbuilt single-cam facing forward  
(for intuitive AR stake-out practice)

RTK rover pole connector interface  
(screw hole underneath handgrip to install pole)

## SPECIFICATION (ELECTRICAL & ENVIRONMENTAL)

### ELECTRICAL

Power Supply

- battery handgrip unit, model: iGrip, 50 Wh, 3500 mAh

Endurance

- ≥ 2 hours

Power Consumption

- 26 W

### ENVIRONMENTAL

Working Temperature

- -20 ~ 50 °C

Storage Temperature

- -20 ~ 60 °C

Charging

- charging time 2 hours, type-C recharge, max. current 3 A
- nominal 14.4 V
- charging 30 W max. current 5 A max.

Input Voltage

Power Output

Operating Humidity

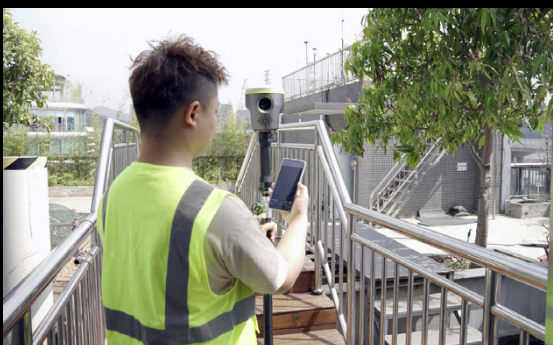
- 80% non-condensing

Ingress Protection

- IP64 rating according to IEC 60529

## How DotLas Plus Works?

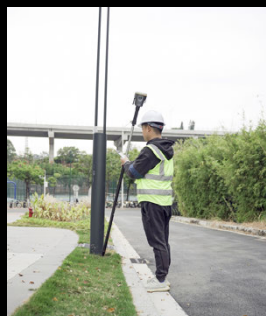
Primarily, when used in RTK work mode (without SLAM enabled), it would be performing as a rover connected to an allocated base station via either UHF or Ntrip.



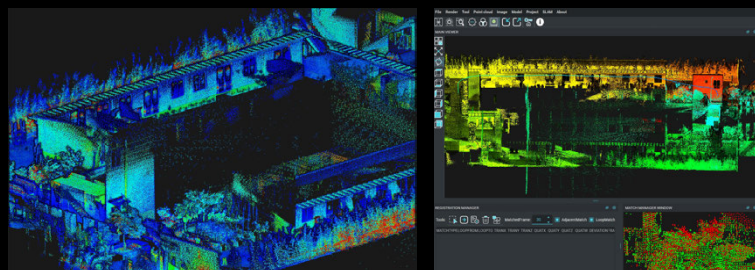
Connected to UHF or Ntrip



Point Survey



Tilt Survey



colorized point cloud

point cloud direct geo-referencing



SLAM data capture (outdoor)



SLAM data capture (indoor)

Secondly, when used in SLAM work mode, it's just quite similar to other SLAM handhelds for indoor purposes. On the other hand, it enjoys much better satellite signals tracking performance compared to other SLAM handheld devices simply equipped with an external black aviation antenna stick. Moreover, PPK standby is good for further improving point cloud accuracy.

## Why 1 + 1 > 2 Is True?

### ① Magicalc = Magic + calculation (Positioning while Satellites Unlocked)

With DotLas Plus, it's possible to obtain coordinate information in the way of Mixed Solution in GNSS-unfriendly or even GNSS-denied areas. The SLAM trajectory will help to reverse compute the positional result and continue point measurements when satellites are unlocked. The Magicalc accuracy mainly depends on the unlocked duration, SLAM trajectory distance, and texture details of the new environment.

### ② AirMeas = Air Measurement (Contactless Measurement)

Have you heard about iPhone AirDrop? AirMeas is somewhat similar to this principle or saying. For some inaccessible zones, DotLas Plus may help to measure in the way of SLAM data capture within scanning range. Just imagine how to measure the center of the manhole cover on the ground, center of a router device installed overhead, etc. Go to the point in pano image overlaid with colorized point cloud, and you will obtain the coordinate automatically instead of reaching there physically.

### ③ Super Stake-out

On the market, AR stake-out has been applied to more and more RTK receiver models. Generally speaking, AR stake-out goes with visual aided methodology. While AirMeas is to measure the unknown point that is inaccessible, Super Stake-out helps to reach the known point in the way of pano image overlaid with colorized point cloud, which is a powerful reverse application of AirMeas.

### About Fixed Solution & Mixed Solution

**Fixed Solution** means that the GNSS RTK rover and its allocated base station can simultaneously track at least five satellites in common, and then the rover keeps receiving differential corrections from the base station, which is already widely acknowledged in the geospatial community.



no satellite signals tracking

GNSS positioning - indoor

**Mixed Solution** refers to a reverse computed result scientifically derived from the time synchronization of SLAM trajectory and earlier positional records, which well interprets the Mix&Match Combo. By unlocking the combined power of GNSS+SLAM, it sets out **A Brand New Concept to the Industry** indeed.



SLAM to enable and deploy

GNSS positioning - indoor

## SPECIFICATION (COMMUNICATION & DATA MANAGEMENT)

### COMMUNICATION

Screen Operation

- touch operation, for mode setting and status display
- device may access to Wi-Fi for transmit and receive differential corrections
- Web UI management platform built in, accessible to device for reltime monitoring device status and device configuration via Wi-Fi and USB
- iVoice smart audio technology on board, for smart status broadcasting and voice instructions

Voice Language

- supports Chinese, English, Korean, Russian, Portuguese, Spanish, Turkish as default
- RX radio module built in, working frequency 410-470 MHz, protocol Farlink, SOUTH, TrimTalk450S, ZHD, HUACE
- BT4.2 (BR/EDR+BLE) standard automatic Bluetooth pairing between device and controller by touch (NFC module on board is needed for controller side)
- 802.11b/g/n standard

### DATA MANAGEMENT

Data Transfer  
Data Storage

- USB, FTP, and HTTP
- SSD 4 GB (for GNSS) and 512 GB (for SLAM) built in, extendable to 1 TB max.

Data Format

- Static: South STH, Rinex2, Rinex3.02, etc.
- Differential: RTCM3.0, RTCM3.2 input and output
- GPS output: NMEA0183, PJK plane coordinate, binary code
- Network module: VRS, FKP, MAC, N-Trip

