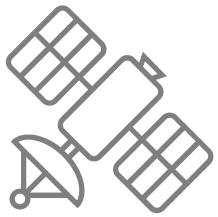
STONEX

S999 Dual Camera GNSS Receiver

October 2024

S999 – Main features

S999, equipped with 1408 multi-constellation channels, guarantees precise and reliable positioning by supporting all GNSS signals, including GPS, GLONASS, BeiDou, IRNSS, Galileo, and QZSS.
It features an integrated 4G modem and a 1-Watt UHF radio operating in the 410-470 MHz and 902.4-928 MHz frequency ranges, ensuring constant connectivity and an extended working range. The advanced IMU technology enables tilted measurements of up to 60° with rapid initialization, enhancing field productivity by as much as 40%.



The S999 receiver is also equipped with two cameras: one for stakeout and one for photogrammetric applications, expanding the system's usage possibilities. Thanks to its innovative features the new S999 represents the ideal solution for high-precision GNSS surveys in every operational context.

S999 – Main features

MULTIPLE CONSTELLATIONS
S999 can track and utilize signals from multiple satellite constellations, such as GPS, GLONASS, Galileo, QZSS, IRNSS, and BeiDou.

IMU TECHNOLOGY
The integrated **IMU** allows the receiver to automatically compensate for pole tilt up to 60 degrees, boosting surveying speed and efficiency.

CAMERAS
S999 receiver is equipped with **two cameras**: one for stakeout and one for photogrammetric applications.

DOUBLE FREQUENCY RADIO
S999 GNSS receiver has integrated UHF **double frequency radio**, 410-470MHz and 902.4-928MHz.

RUGGED RTK GNSS With IP68
S999 is a durable and **IP68** waterproof high-precision positioning solution designed for challenging outdoor environments.

S999 – UM980 GNSS Board

- Unicorecomm
- UM980 Chip
- 1408 channels
- Full GNSS
- Anti-jamming technology
- Dual processor
- Low power consumption

S999 – EG25-G Modem GSM

The new S999 has integrated the new modem GSM, Worldwide LTE, UMTS/HSPA+ and GSM/GPRS/EDGE. Multi-constellation GNSS receiver is available for applications requiring fast and accurate fixes in any environment.

EG25-G is backward-compatible with existing EDGE and GSM/GPRS networks, ensuring that it can be connected even in remote areas without 4G or 3G coverage.

S999– Radio TRM121

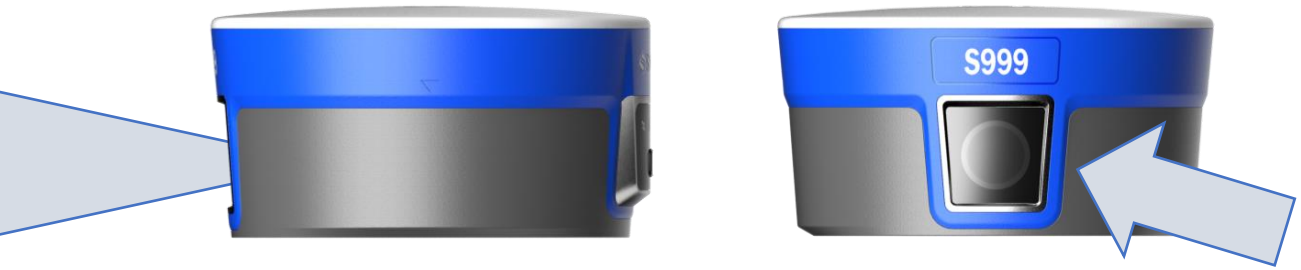
The S999 model includes integrated UHF capabilities, supporting dual frequencies of 410-470MHz and 902.4-928MHz. This allows for the accommodation of different country-specific requirements.

	General Performance	
Frequency Range	Fixed frequency：410~470MHz	
	Hopping frequency：410~470MHz and 902.4~928MHz	
Working mode	Half-duplex	
Band width	Fixed frequency：12.5KHz，25KHz	
	Hopping frequency：280KHz	
Modulation Scheme	Hopping Frequency: GMSK	
	Fixed Frequency: GMSK,4FSK	
	Transmitter	
RF output power	High power(1.0W)	30±0.3dBm@DC 3.3V
	Modem	
Rate	Fixed frequency: 9600bp,19200bps	
	Hopping Frequency：115200bps	
Modulation	GMSK	

Camera Technology

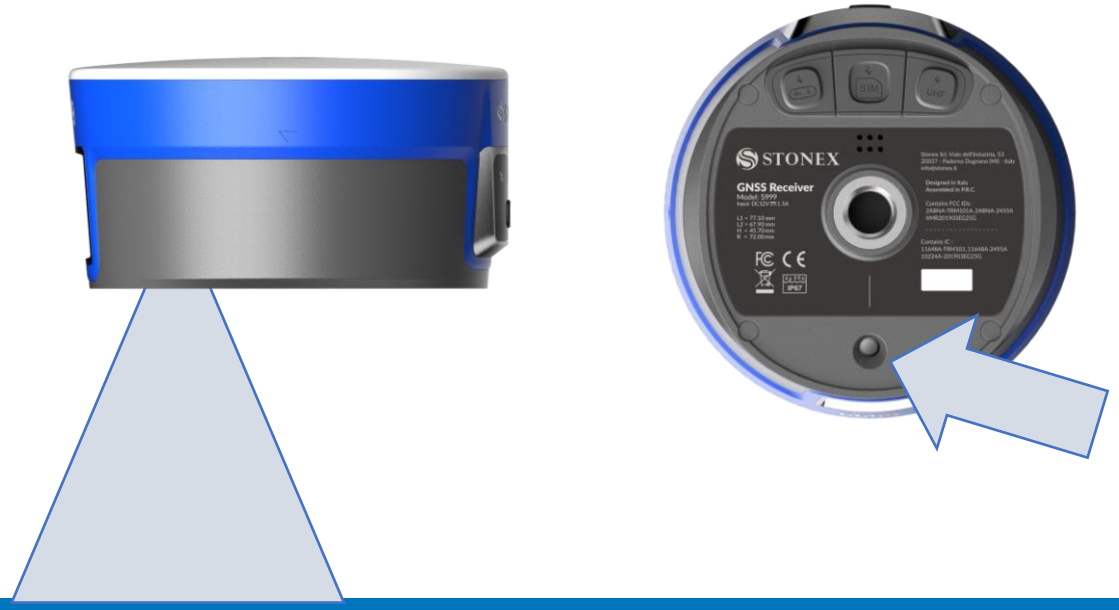
Change the way you **Measure**!

S999 – Cameras

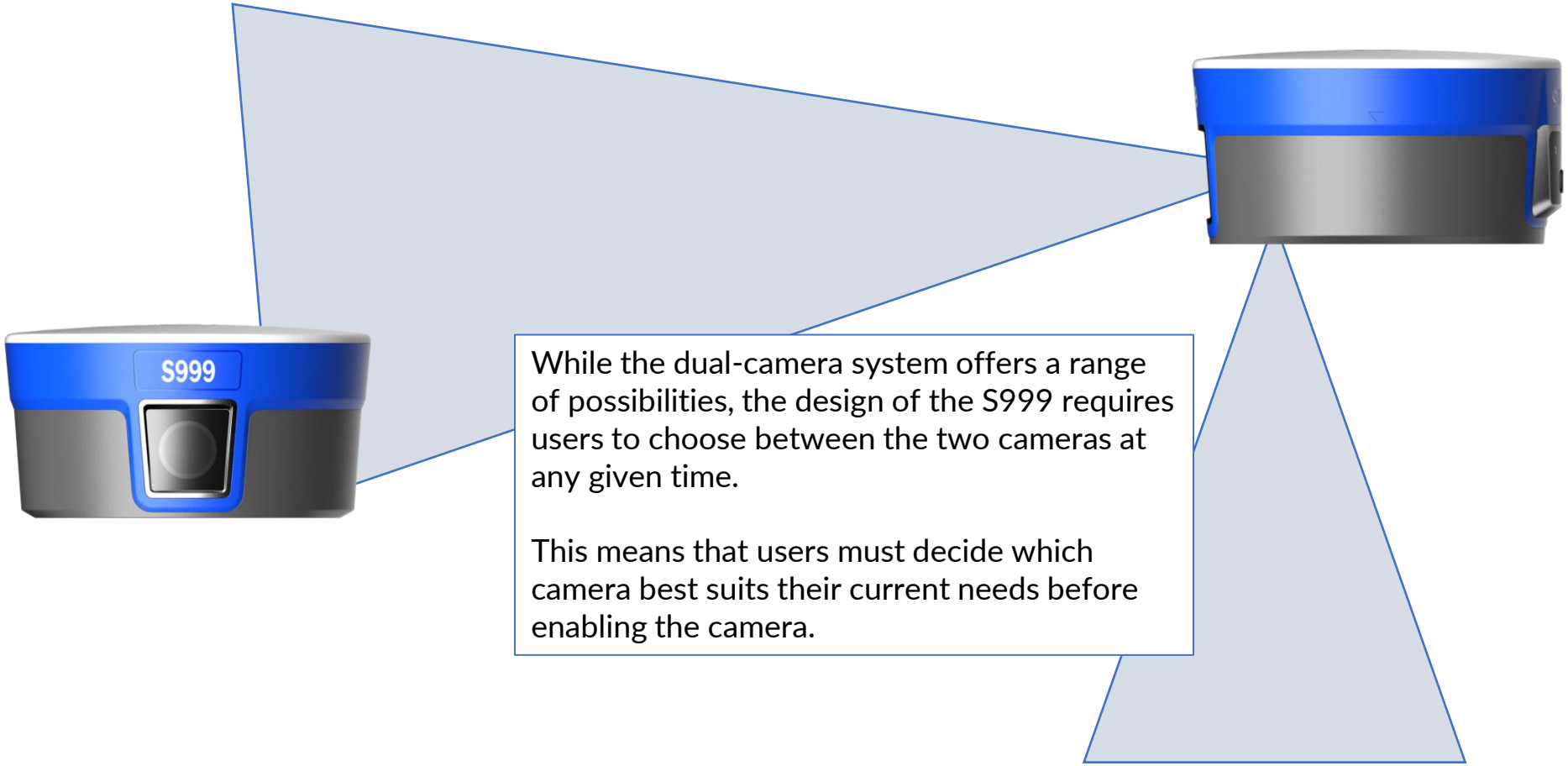


The camera at the bottom of the device is referred to as the stakeout camera. It is positioned parallel to the ground and can be activated by the operator via the Cube-a control interface when necessary.

The frontal camera, referred to as the camera for photogrammetry, plays a crucial role in capturing high-quality images that are essential for creating accurate three-dimensional models and maps. This specialized camera is designed to facilitate a wide range of functions that enhance the overall capabilities of the Cube-a software. The frontal camera is also used for the stakeout.



S999 – Camera technology



While the dual-camera system offers a range of possibilities, the design of the S999 requires users to choose between the two cameras at any given time.

This means that users must decide which camera best suits their current needs before enabling the camera.

S999 – Camera technology advantages

OVERCOMING TRADITIONAL LIMITATIONS

Traditional GNSS receivers often struggle in environments with obstructions, such as urban canyons or dense forests. The integration of visual positioning technology allows GNSS receivers to function effectively in these challenging conditions, capturing detailed imagery and location data that traditional methods cannot achieve.

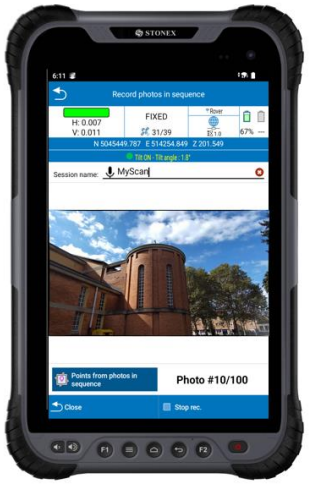
INTEGRATION WITH ADVANCED TECHNOLOGIES

The use of GNSS receivers with cameras facilitates the integration of advanced technologies such as augmented reality (AR) and 3D modeling. These technologies can further improve the visualization of geological data, making it easier to communicate findings and insights.

REAL-TIME DATA FUSION

The ability to fuse GNSS positioning data with visual data in real time is a major advancement. S999 can combine satellite positioning signals with camera imagery, resulting in a comprehensive dataset that enhances accuracy and reduces the potential for errors associated with separate data collection methods.

S999 – Measurement Workflow



Video Storage

Point Measurement

VScloud

cube·3d

3D view

S999 – Visual stakeout

The staking of a point is made significantly easier by the ability to identify its position using the front camera. This feature allows for a clear view of the surrounding area, helping you to accurately locate the point of interest. As you approach the designated area, it switches automatically to the lower camera. This transition enables you to frame the point to be staked with greater precision, ensuring that your measurements are accurate and reliable.

Cube-a's interface employs visual aids to direct the surveyor to the precise staking location. A graphical component displays both the direction of the point and the distance to it. These graphical elements change based on how far the operator is from the point that needs to be staked.

S999 – Measuring inaccessible points

The system allows you to record a video of the area you want to measure. The program will extract several photos that the operator can use to align the points to be measured. Cube-a will immediately provide the calculated coordinates, which can be recorded.

S999 – Online point cloud and mesh

The acquired video of an area can be exported and uploaded to photogrammetry software (Cube-3D) to generate a three-dimensional model (point cloud and mesh).

Alternatively, it can be sent directly from Cube-a to the Stonex VScloud for semi-real-time data processing, resulting in a 3D model (point cloud and mesh). The survey can then be visualized and managed directly on the Android controller within Cube-a (v. 7).

PPP Corrections

S999 – PPP Corrections

- The high-precision positioning services provided by the European satellite navigation system Galileo, known as High Accuracy Service (HAS), and the high-precision services offered by the Beidou system (BDS), known as PPP-B2b, are both available thanks to Cube-a software through a dedicated menu for selecting the desired PPP service.

- The Cube-a software allows users to easily access these high-precision positioning services provided by Galileo and Beidou without additional costs.

S999 – PPP Corrections

The Galileo High Accuracy Service (HAS) and PPP-B2b services offer several advantages, some of which are:

1. **Free and Open Access**: Accessible to a wider range of users.

2. **Improved Accuracy**: This is achieved through the use of highly accurate ephemerides and error models for tropospheric variations.

3. **Multi-Constellation Support**: Improving positioning accuracy and robustness.

4. **Real-Time Availability**: Available in real-time, making them suitable for applications that require immediate and accurate positioning.

5. **Enhanced Integrity**: Ensuring the reliability and integrity of positioning data.

Technical Specification

S999 - Technical Specification

Receiver	
Board	UM980
Channels	1408
Tracking	GPS: L1 C/A, L1C, L2P, L2C, L5 GLONASS: L1, L2, L3 BeiDou: B1I, B2I, B3I, B1C, B2a, B2b Galileo: E1, E5a, E5b, E6 QZSS: L1, L2, L5, L6 IRNSS: L5 SBAS
PPP	B2b PPP, HAS
Update Rate	Up to 50Hz
Memory	32 GB

S999 - Technical Specification

Positioning	
High Precision Static Survey	H 2.5 mm + 0.1 ppm RMS V 3.5 mm + 0.4 ppm RMS
RTK (< 30 Km)	H 8 mm + 1 ppm RMS V 15 mm + 1 ppm RMS
PPP Accuracy	< 20 cm RMS
SBAS Accuracy	< 60 cm RMS

S999 - Technical Specification

Power Supply	
Battery	3.6V, 13.6Ah, 48.96Wh
Voltage	12V DC
Working Time	Up to 10 hours
Charge Time	Typically 4 hours

S999 - Technical Specification

Internal UHF Radio	
Type	Tx – Rx
Frequency Range	410-470 MHz 902.4 – 928 MHz
Channel Spacing	12.5 KHz / 25 KHz
Transmission power	1 W
Range*	3-4 Km in urban environment Up to 10 Km with optimal conditions

*Varies with the operating environment and with electromagnetic pollution

S999 - Technical Specification

Frontal Camera for Photogrammetry

Resolution	2 MP
Image frame rate	5 frame/s
Video frame rate	30 frame/s
Field of view	75°

Below Camera for Stakeout

Resolution	2 MP
Image frame rate	30 frame/s
Field of view	72°

S999 - Technical Specification

Internal GSM Modem	
Band	LTE FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/ B19/B20/B25/B26/B28 LTE TDD: B38/B39/B40/B41 UMTS: B1/B2/B4/B5/B6/B8/B19 GSM: B2/B3/B5/B8 Nano SIM card

S999 - Technical Specification

Physical Specification	
Weight	1065 g
Dimensions	Ø 139 mm x 74 mm
Operating Temperature	-40°C to 65°C (-40°F to 149°F)
Storage Temperature	-40°C to 80°C (-40°F to 176°F)
Protection Class	IP68
Drop	Designed to endure to a 2 m pole drop on hardwood floor with no damage
Humidity	100% non-condensing

S999 - Panel definition

Power key		Switch on/off the receiver; short press to broadcast current operation mode and status.
Indicators	Power indicator	Green: power level is 30%-100% Flashing green: power level is 10%-30% Flashing red: power level is less than 10%, accompanied by a warning beep
	Satellite indicator	Off: no satellite tracked Flashing red: satellites tracked but position not determined Flashing green: satellites positioned but position not fixed Green: position fixed Flashing green and red alternately: GNSS board abnormal
	Datalink indicator	Green: datalink setting succeeded Flashing green: data is being transmitted normally Flashing blue: in static mode, the device is flashing blue according to the static sampling interval
	Bluetooth indicator	On: Bluetooth has connected Off: no connection

S999 - Connector definition

N.	Name	Definition
1	Type-C slot	Receiver power supply and data transfer
2	SIM card slot	Nano SIM card interface
3	UHF slot	TNC port to connect radio antenna

Marketing

S999 - Product pictures

S999 -Brochure

S999 TECHNICAL FEATURES

RECEIVER

Satellite signals tracked	GPS: L1 C/A, L2P, L2C, L5 GLONASS: L1, L2, L3 BEIDOU: B1I, B2I, B3I, B1C, B2a, B2b GALILEO: E1, E5a, E5b, E6 QZSS: L1, L2, L5, L6 IRNSS: L5 SBAS
PPP	B2b PPP, HAS
Channels	1408
Position Rate	Up to 50Hz
Signal Reacquisition	< 1 s
RTK Signal Initialization	< 5 seconds
Hot Start	Typically < 15 s
Initialization Reliability	> 99.9 %
Internal Memory	32 GB
Tilt Sensor	IMU ±60°

POSITIONING[1]

HIGH PRECISION STATIC SURVEYING	
Horizontal	2.5 mm + 0.1 ppm RMS
Vertical	3.5 mm + 0.4 ppm RMS
REAL TIME KINEMATIC (< 30 Km) – NETWORK RTK[2]	
Fixed RTK Horizontal	8 mm + 1 ppm RMS
Fixed RTK Vertical	15 mm + 1 ppm RMS
PPP Accuracy	< 20 cm RMS
SBAS Accuracy[3]	< 60 cm RMS

INTEGRATED GNSS ANTENNA

High accuracy multi-constellation antenna, zero phase center, with internal multipath suppressive board

INTERNAL RADIO (optional)[4]

Type	Tx – Rx 1W
Frequency Range	410 - 470 MHz 902.4 – 928 MHz
Channel Spacing	12.5 KHz / 25 KHz
Range[5]	3-4 Km in urban environment Up to 10 Km with optimal conditions

INTERNAL MODEM

Band	LTE FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/ B19/B20/B25/B26/B28 LTE TDD: B38/B39/B40/B41 UMTS: B1/B2/B4/B5/B6/B8/B19 GSM: B2/B3/B5/B8 Nano SIM card

BELOW CAMERA

Resolution	2 MP
Image frame rate	30 frame/s
Field of view	72°

FRONTAL CAMERA

Resolution	2 MP
Image frame rate	5 frame/s
Video frame rate	30 frame/s
Field of view	75°

COMMUNICATION

I/O Connectors	Type-C for charging and data transfer
Bluetooth	2.1 + EDR, V5.0
Wi-Fi	802.11 a/ac/b/g/n
Web UI	To upgrade the software, manage the status and settings, and download data. Smartphone, tablet, or other electronic device with Wi-Fi capability can be used.
Reference outputs	RTCM 3.x
Navigation outputs	NMEA 0183

POWER SUPPLY

Battery	Built-in battery, 3.6V, 13.6Ah, 48.96Wh, support for PD fast charge
Power	12V DC
Working Time	Up to 10 hours
Charge Time	Typically 4 hours

PHYSICAL SPECIFICATION

Dimensions	Ø 139 mm x 74 mm
Weight	1065 g
Operating Temperature	-40°C to 65°C (-40°F to 149°F)
Storage Temperature	-40°C to 80°C (-40°F to 176°F)
Waterproof/Dustproof	IP68
Shock Resistance	Designed to endure to a 2 m pole drop on hardwood floor with no damage
Humidity	100% non-condensing

Illustrations, descriptions and technical specifications are not binding and may change

1. Accuracy and reliability are generally subject to satellite geometry (PDOP), multipath, atmospheric conditions, and obstructions. In static mode, they are also subject to occupation times: the longer the baseline, the longer the occupation time must be.
2. Network RTK precision depends on the network's performance and is referenced to the closest physical base station.
3. Depends on SBAS system performance.
4. Optional, can be activated via activation code.
5. Varies with the operating environment and with electromagnetic pollution.

STONEX AUTHORIZED DEALER

STONEX®
Viale dell'Industria 53 - 20037 Paderno Dugnano (MI) - Italy
Phone +39 02 78619201
www.stonex.it | info@stonex.it

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STONEX

S999 GNSS Receiver

Dual Camera
GNSS Receiver

suite cube

S999 Dual Cameras

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It features an integrated 4G modem and a 1-Watt UHF radio operating in the 410-470 MHz and 902.4-928 MHz frequency ranges, ensuring constant connectivity and an extended working range. The advanced IMU technology enables tilted measurements of up to 60° with rapid initialization, enhancing field productivity by as much as 40%.

The S999 receiver is also equipped with two cameras: one for stakeout and one for photogrammetric applications, expanding the system's usage possibilities.

STONEX SURVEYING SYSTEMS

MULTIPLE CONSTELLATIONS
S999 can track and utilize signals from multiple satellite constellations, such as GPS, GLONASS, Galileo, QZSS, IRNSS, and BeiDou.

IMU TECHNOLOGY
The integrated IMU allows the receiver to automatically compensate for pole tilt up to 60 degrees, boosting surveying speed and efficiency.

CAMERAS
S999 receiver is equipped with two cameras: one for stakeout and one for photogrammetric applications.

DOUBLE FREQUENCY RADIO
S999 GNSS receiver has integrated UHF double frequency radio, 410-470MHz and 902.4-928MHz.

RUGGED RTK GNSS WITH IP68
S999 is a durable and IP68 waterproof high-precision positioning solution designed for challenging outdoor environments.

Change the way you **Measure**!

VISUAL STAKE OUT
The front camera simplifies point staking by clearly showing the surrounding area, helping you accurately identify the point of interest. As you get closer, it automatically switches to the lower camera for precise framing, ensuring reliable measurements. Cube-a's interface uses visual aids to guide surveyors to the exact staking location. A graphical display indicates both the direction and distance to the point, adjusting as the operator approaches.

MEASURING INACCESSIBLE POINTS
The system allows you to record a video of the area you want to measure. The program extracts several photos that the operator can use toalign the points to be measured. Cube-a then immediately provides the calculated coordinates, which can be easily recorded. Measurements can be taken offline as well.

ONLINE POINT CLOUD AND MESH
The acquired video of an area can be exported and uploaded to photogrammetry software (Cube-3D) to generate a three-dimensional model (point cloud and mesh). Alternatively, it can be sent directly from Cube-a to the Stonex VScloud for semi-real-time data processing, resulting in a 3D model (point cloud and mesh). The survey can then be visualized and managed directly on the Android controller within Cube-a (v. 7).

Configuration

S999 - Standard Configuration

PRODUCT CODE	DESCRIPTION
B10+150221	**S999, GNSS, 1408Ch, IMU, 4G, 2 camera**
	Power Adaptor with 4 plugs (US, UK, EU, AU)
	Charging cable, TypeC-TypeC cable, 1.5m
	Type C-USB cable, 1.5m
	Carrying case
30-350110	AR-100, UHF antenna, 430-470MHz, TNC, 10cm

S999 – Suggested Optional Accessories and Software

PRODUCT CODE	DESCRIPTION
40-450661	**Software Stonex Cube-a GPS v6.x**
40-450227	S999, Firmware activation, UHF Dual
30-350607	PG-260, Pole for GNSS, 2,60m, 2-section, Carbon fiber/allum, Telescopic
50-550731	UT12P, Controller, 6", 4G, Android
30-350391	UT12P, Bracket

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Paderno Dugnano (Milano) - Italy