# AIR TRAFFIC AND NAVIGATION SERVICES SOC. LTD REPUBLIC OF SOUTH AFRICA

# REQUEST FOR QUOTATION

# APPOINTMENT OF A SERVICE PROVIDER FOR SUPPLY AND DELIVERY OF WGS-84 SURVEY EQUIPMENT.

## SPECIFICATION

## DECEMBER 2024

# TABLE OF CONTENTS

# Technical Requirements

## 1. Introduction

The Air Traffic and Navigation Services Company (ATNS) is seeking qualified suppliers to participate in an RFQ process for the supply and delivery of advanced WGS-84 survey equipment and accessories. The primary objective of this tender is to enhance the precision and efficiency of our surveying operations by integrating state-of-the-art technology and tools into our existing systems. This initiative is part of ATNS's commitment to maintaining the highest standards of accuracy and reliability in air traffic management and navigation services.

## 2. Purpose

The purpose of this tender is to invite reputable and experienced suppliers to submit proposals for the provision of WGS-84 survey equipment as outlined herein. The selected supplier(s) will ensure that the equipment meets the specified technical requirements, deliver the equipment to the ATNS Bruma Fead Office, and offer ongoing after-sales support and maintenance.

## 3. Project Overview

The project involves the procurement of advanced WGS-84 survey equipment to support ATNS's surveying and mapping operations. The equipment will by the WGS-84 team to enhance the accuracy and efficiency of our geospatial data collection and analysis. The scope of the project includes the supply and delivery including a mandatory 12-month warranty.

## 4. Scope of Work

The scope of works includes:

### 1. Supply and Delivery

1.1. Supply all equipment to the following address:
1.1.1. Ensure delivery to **Air Traffic & Navigation Services (ATNS) SOC Ltd, Block C, Eastgate Office Park, South Boulevard Road, Bruma, 2198**.

2. Verify and check all equipment upon delivery for compliance with specifications.

### 3. Calibration Services

3.1. Provide initial calibration for all supplied equipment.
3.2. Provide documentation of each calibration service performed.

4. Training and Support

4.1. N/A

## 5. Contract Deliverables

The following bill of materials describes equipment and services to be acquired as a result of this RFQ.

| WGS-84 Equipment | | |
|---|---|---|
| **Item No.** | **Description** | **Qty** |
| **Global Navigation Satellite System Set** | | |
| **1** | Advanced GNSS receiver | 1 |
| **2** | Base and rover configuration level | 1 |
| **3** | Dual battery charger with power supply | 1 |
| **4** | Rugged handheld controller with WWAN connectivity | 1 |
| **5** | Handheld controller mounting bracket | 1 |
| **6** | Adjustable arm and quick release clamp for mounting bracket | 1 |
| **7** | Rod - 2.0m Carbon Fibre Range Pole without Bipod | 1 |
| **8** | Protective carrying bag for a GNSS pole | 1 |
| **9** | 32GB USB Type C Flash Drive | 1 |
| **10** | Precision tribrach with optical plummet | 3 |
| **11** | Rugged transport case (GNSS Receiver) | 1 |
| **12** | Configuration: LT base and rover modes. | 1 |
| **13** | GNSS Receiver: Accessory kit, including pouch, battery, charger, and base station extender. | 1 |
| **14** | Mounting bracket for attaching radio to a tripod | 1 |
| **15** | Radio antenna cable for GNSS Receiver, minimum 5 meters in length | 1 |
| **16** | Unity gain antenna whip for radio, 450-470MHz frequency range. | 1 |
| **17** | Heavy-duty tripod: GNSS Receiver | 1 |
| **18** | Precision tribrach with optical plummet | 1 |
| **19** | Adapter for converting tribrach to 5/8" thread with removable center for various mounting options | 1 |
| **20** | Protective carrying bag for heavy-duty wooden tripod | 1 |
| **2.4 Ghz 3" Total Station Set** | | |
| **1** | Total station with 3" angular accuracy | 1 |
| **2** | Anti-glare screen protectors | 1 |
| **5** | 2.6-meter aluminium telescopic rod | 1 |
| **9** | Medium-duty aluminium tripod | 2 |
| **Additional Accessories** | | |
| **1** | Lithium-ion battery pack designed for industrial use | 4 |
| **2** | Stabilizing bipod | 1 |

## 6. Contract Specific Deliverables

All equipment to be supplied under this tender shall comply with the specifications outlined herein and **have operational licences**.

## 7. GNSS Set

**7.1. Advanced GNSS receiver Description**: Advanced GNSS receiver with precise positioning capabilities.

**7.1.1.** The GNSS receiver shall meet the following requirements:

**7.1.1.1. Key Features**

7.1.1.1.1. Calibration-free, IMU-based tilt compensation.

7.1.1.1.2. GNSS positioning engine for improved accuracy in challenging conditions.

7.1.1.1.3. 672-channel solution 360 satellite tracking technology.

7.1.1.1.4. RTX correction service for fast, RTK level accuracy via satellite/IP.

7.1.1.1.5. Correction outage technology.

7.1.1.1.6. Optimized for field software.

7.1.1.1.7. Support for Android™ and iOS platforms.

7.1.1.1.8. Military-spec rugged design with IP67 rating.

7.1.1.1.9. Ergonomic form factor with all-day battery life and built-in status indicator.

7.1.1.1.10. 6 GB internal memory.

7.1.1.1.111. Supports augmented reality capabilities.

**7.1.1.2. Performance Specifications**:

**7.1.1.2.1. GNSS Measurements**:

**7.1.1.2.1.1.** **Constellations Supported**: GPS, GLONASS, Galileo, BeiDou, QZSS, SBAS (WAAS, EGNOS, GAGAN, MSAS), NavIC (IRNSS), L-band (GNSS Correction).

**7.1.1.2.1.2.** **Signals Tracked**: GPS: L1C, L1C/A, L2C, L2E, L5; GLONASS: L1C/A, L1P, L2C/A, L2P, L3; SBAS: L1C/A, L5; Galileo: E1, E5A, E5B, E5 AltBOC, E6; BeiDou: B1, B1C, B2, B2A, B2B, B3; QZSS: L1C/A, L1S, L1C, L2C, L5, L6.

**7.1.1.2.1.3.** **Positioning Rates**: 1 Hz, 2 Hz, 5 Hz, 10 Hz, 20 Hz.

**7.1.1.3. Positioning Performance**:

**7.1.1.3.1. Static GNSS Surveying**:

7.1.1.3.1.1. High-Precision Static: Horizontal 3 mm + 0.1 ppm RMS; Vertical 3.5 mm + 0.4 ppm RMS.
7.1.1.3.1.2. Static and Fast Static: Horizontal 3 mm + 0.5 ppm RMS; Vertical 5 mm + 0.5 ppm RMS.

**7.1.1.3.2. Real-Time Kinematic (RTK) Surveying**:

7.1.1.3.2.1. Single Baseline <30 km: Horizontal 8 mm + 1 ppm RMS; Vertical 15 mm + 1 ppm RMS.
7.1.1.3.2.2. Network RTK: Horizontal 8 mm + 0.5 ppm RMS; Vertical 15 mm + 0.5 ppm RMS.
7.1.1.3.2.3. RTK Start-Up Time: 2 to 8 seconds.

**7.1.1.3.3. Inertial Technology**:

7.1.1.3.3.1. Compensated Surveying: Horizontal RTK + 5 mm + 0.4 mm/° tilt (up to 30°) RMS; Horizontal RTX + 5 mm + 0.4 mm/° tilt (up to 30°) RMS.

**7.1.1.3.4. RTX Correction Services**:

7.1.1.3.4.1. CenterPoint RTX: Horizontal 2 cm RMS; Vertical 5 cm RMS.
7.1.1.3.4.2. RTX Convergence Time: <1 min (RTX Fast regions), <15 min (non-RTX Fast regions), <1 min (RTX QuickStart).

**7.1.1.3.5. Correction Outage Technology**:

7.1.1.3.5.1. Horizontal RTK + 10 mm/minute RMS; Vertical RTK + 20 mm/minute RMS.

**7.1.1.3.6. Correction Outage Technology Horizontal and Vertical**:

7.1.1.3.6.1. Horizontal 3 cm RMS; Vertical 7 cm RMS.

**7.1.1.3.7. Code Differential GNSS Positioning**:

7.1.1.3.7.1.1. Horizontal 0.25 m + 1 ppm RMS; Vertical 0.50 m + 1 ppm RMS.
7.1.1.3.7.2. SBAS typically <5 m 3DRMS.

**7.1.1.4. Hardware Specifications**

**7.1.1.4.1. Dimensions**: 11.9 cm (W) x 13.6 cm (H).

**7.1.1.4.2. Weight**: 1.12 kg with internal battery, internal radio with UHF antenna.

**7.1.1.4.3. Temperature**: Operating: -40°C to +65°C.Storage: -40°C to +75°C.

**7.1.1.4.4. Humidity**: 100%, condensing.

**7.1.1.4.5. Ingress Protection**: IP67 dustproof, protected from temporary immersion to depth of 1 m.

**7.1.1.4.6. Shock and Vibration**: MIL-STD-810F standards; non-operating shock: 2 m pole drop onto concrete; operating shock: 40 G, 10 msec, sawtooth.

**7.1.1.4.1. Power**:

7.1.1.4.1.1. 11 to 24 V DC external power input with over-voltage protection on Port 1 and Port 2 (7-pin Lemo).

7.1.1.4.1.2. Rechargeable, removable 7.4 V, 3.7 Ah Lithium-ion smart battery with LED status indicators.

7.1.1.4.1.3. Power consumption: 4.2 W in RTK rover mode with internal radio.

7.1.1.4.1.4. Operating times on internal battery: 450 MHz receive only: 6.5 hours; 450 MHz receive/transmit (0.5 W): 6.0 hours; 450 MHz receive/transmit (2.0 W): 5.5 hours; Cellular receive: 6.5 hours.

**7.1.1.4.2. Communications and Data Storage**

**7.1.1.4.2.1. Serial**: 3-wire serial (7-pin Lemo).

**7.1.1.4.2.2. USB**: v2.0, supports data download and high-speed communications.

**7.1.1.4.2.3. Radio Modem**: Integrated 450 MHz wide band receiver/transmitter, frequency range 403-473 MHz, supports Trimble, Pacific Crest, and SATEL radio protocols, transmit power 2 W, range 3-5 km typical / 10 km optimal.

**7.1.1.4.2.4. Cellular**: Integrated 3.5 G modem, HSDPA 7.2 Mbps (download), GPRS multi-slot class 12, EDGE multi-slot class 12, Penta-band UMTS/HSDPA (WCDMA/FDD) 800/850/900/1900/2100 MHz, Quad-band EGSM 850/900/1800/1900 MHz, GSM CSD, 3GPP LTE.

**7.1.1.4.2.5. Bluetooth**: Version 4.1.

**7.1.1.4.2.6. Wi-Fi**: 802.11 b/g, access point and client mode, WPA/WPA2/WEP64/WEP128 encryption.

**7.1.1.4.2.7. I/O Ports**: Serial, USB, TCP/IP, IBSS/NTRIP, Bluetooth.

**7.1.1.4.2.8. Data Storage**: 6 GB internal memory.

**7.1.1.4.2.9. Data Formats**: CMR+, CMRx, RTCM 2.1, RTCM 2.3, RTCM 3.0, RTCM 3.1, RTCM 3.2 input and output; 24 NMEA outputs, GSOF, RT17, and RT27 outputs, 1 PPS output.

**7.1.1.5.** **Web UI**: Offers simple configuration, operation, status, and data transfer, accessible via Wi-Fi, Serial, USB, and Bluetooth.

**7.1.1.6.** **Supported Controllers & Field Software**: Handheld, Android and iOS devices running supported apps.

**7.1.1.7.** **Augmented Reality**: Supports outdoor augmented reality capabilities through applications running on the handheld controller.

**7.1.1.8.** **Certifications**: FCC Part 15 (Class B device), 24, 32; CE Mark; RCM; PTCRB; BT SIG.

**7.2. Base and rover configuration level**

**Description**: Configuration to operate in both base and rover modes.

**7.2.1.** The base and rover configuration level shall meet the following requirements:

**7.2.1.1. Modes**: Base mode for establishing a GNSS base station, rover mode for field data collection.

**7.2.1.2. Compatibility**: GNSS receiver.

**7.2.1.3. Configuration**: Pre-set configurations for easy switching between base and rover modes.

**7.2.1.4. Calibration**: Pre-calibrated for accuracy and performance.

### 7.3. Dual battery charger with power supply

**Description**: Dual battery charger with power supply, designed for South African power standards.

**7.3.1.** The battery charger shall meet the following requirements:

**7.3.1.1. Charging Bays**: 2

**7.3.1.2. Input Voltage**: 100-240 V AC

**7.3.1.3. Output Voltage**: 12 V DC

**7.3.1.4. Charging Time**: Approximately 4 hours for full charge

**7.3.1.5. Compatibility**: Compatible with GNSS Receiver batteries

**7.3.1.6. Indicators**: LED status indicators for charging progress

**7.3.1.7. Plug Type**: European standard plug

### 7.4. Handheld controller with WWAN, Worldwide Region

**Description**: Rugged handheld controller with WWAN connectivity for field data collection.

**7.4.1.** The handheld controller shall meet the following requirements:

**7.4.1.1. Display**: 5-inch sunlight-readable touchscreen

**7.4.1.2. Processor**: 2.2 GHz quad-core processor

**7.4.1.3. Memory**: 4 GB RAM, 64 GB internal storage

**7.4.1.4. Operating System**: Android 10

**7.4.1.5. Connectivity**: WWAN, Wi-Fi, Bluetooth, GNSS, USB-C

**7.4.1.6. Battery Life**: Up to 10 hours

**7.4.1.7. Durability**: IP67-rated for dust and water resistance

### 7.5. Pole Mount Bracket for the Handheld Controller

**Description**: Mounting bracket for attaching the Handheld controller to a survey pole.

**7.5.1.** The mounting bracket shall meet the following requirements:

**7.5.1.1. Material**: High-strength aluminium.

**7.5.1.2. Adjustability**: 360-degree rotation.

**7.5.1.3. Compatibility**: Fits standard survey poles.

**7.5.1.4. Weight**: Approximately 0.5 kg.

**7.5.1.5. Features**: Durable construction, easy to attach and detach, secure grip

### 7.6. Handheld Controller Adjustable Arm and Quick Release Pole Mount Clamp

**Description**: Adjustable arm and quick release clamp for mounting Handheld controllers.

**7.6.1.** The pole clamp shall meet the following requirements:

**7.6.1.1. Material**: High-strength aluminium.

**7.6.1.2. Adjustability**: Fully adjustable arm for optimal positioning.

**7.6.1.3. Quick Release**: Easy to attach and detach the controller.

**7.6.1.4. Compatibility**: Fits standard survey poles.

**7.6.1.5. Features**: Secure grip, durable construction, lightweight design.

### 7.7. Rod - 2.0m Carbon Fibre Range Pole without Bipod

**Description**: Lightweight and durable carbon fibre range pole for precise measurements.

**7.7.1.** The rod shall meet the following requirements:

**7.7.1.1. Material**: Carbon fibre

**7.7.1.2. Height**: 2.0 meters

**7.7.1.3. Weight**: Approximately 0.7 kg

**7.7.1.4. Compatibility**: Fits standard GNSS receivers and accessories

**7.7.1.5. Features**: Durable, lightweight, easy to transport.

### 7.8. Stage Bag for GNSS Pole (Carbon Pole)

**Description**: Protective carrying bag for a GNSS pole made of carbon fibre.

**7.8.1.** The bag shall meet the following requirements:

**7.8.1.1. Material**: Durable, weather-resistant fabric.

**7.8.1.2. Dimensions**: Custom fit for carbon fibre GNSS poles.

**7.8.1.3. Closure**: Heavy-duty zipper.

**7.8.1.4. Handles**: Reinforced handles for easy carrying.

**7.8.1.5. Features**: Padded interior, external pockets, durable construction.

### 7.9. 32GB USB Type C Flash Drive

**Description**: High-speed flash drive for data storage and transfer.

**7.9.1.** The flash drive shall meet the following requirements:

**7.9.1.1. Capacity**: 32 GB

**7.9.1.2. Interface**: USB Type-C

**7.9.1.3. Speed**: Up to 150 MB/s read speed.

**7.9.1.4. Compatibility**: USB-C compatible devices.

**7.9.1.5. Features**: Durable design, fast data transfer, compact size

### 7.10. Accessory - Tribrach 3 Pin Type with Optical Plummet (GDM/GT)

**Description**: Precision tribrach with optical plummet for accurate instrument levelling.

**7.10.1** The tribrach shall meet the following requirements:

**7.10.1.1. Material**: High-strength aluminium.

**7.10.1.2. Plummet**: Optical plummet for precise centering.

**7.10.1.3. Compatibility**: Fits standard GNSS receivers and instruments.

**7.10.1.4. Features**: Durable construction, precise adjustment, easy to use.

### 7.11. Receiver Transport Case

**Description**: Rugged transport case for the GNSS Receiver.

**7.11.1.** The transport case shall meet the following requirements:

**7.11.1.1. Material**: High-impact plastic.

**7.11.1.2. Dimensions**: Custom fit for GNSS receiver.

**7.11.1.3. Weight**: Approximately 2 kg.

**7.11.1.4. Features**: Durable construction, secure latches, padded. interior

## 7.12. Configuration Level - Base and Rover Mode

**Description**: Configuration for to operate in base and rover modes.

**7.12.1.** The base and rover configuration shall meet the following requirements:

**7.12.1.1. Modes**: LT Base mode for establishing a GNSS base station, Rover mode for field data collection.

**7.12.1.2. Compatibility**: GNSS receiver.

**7.12.1.3. Configuration**: Pre-set configurations for easy switching between base and rover modes.

**7.12.1.4. Calibration**: Pre-calibrated for accuracy and performance

### 7.13. Pouch, 6 Ah Battery, Charger, Base Station Extender

**Description**: Accessory kit for GNSS Receiver, including pouch, battery, charger, and base station extender.

7.13.1. The accessory kit shall meet the following requirements:

**7.13.1.1. Battery**: 6 Ah rechargeable battery.

**7.13.1.2. Charger**: Compatible with GNSS Receiver R10 batteries.

**7.13.1.3. Pouch**: Durable carrying pouch.

**7.13.1.4. Base Station Extender**: Enhances base station range and performance.

**7.13.1.5. Features**: Comprehensive kit for field use, durable and reliable components.

### 7.14. Bracket - PDL450 Side Mount on Tripod

**Description**: Mounting bracket for attaching 450 MHz Radio Solution for Base Stations radio to a tripod.

**7.14.1.** The mounting bracket shall meet the following requirements:

**7.14.1.1. Material**: High-strength aluminium

**7.14.1.2. Compatibility**: A 450 MHz Radio Solution for Base Stations radio and standard tripods

**7.14.1.3. Features**: Durable construction, easy to install, secure mounting

### 7.15. R10-NMO to SMA Radio Antenna Cable, 5m

**Description**: Radio antenna cable for GNSS Receiver R10, 5 meters in length.

**7.15.1.** The radio antenna shall meet the following requirements:

**7.15.1.1. Length**: 5 meters.

**7.15.1.2. Connectors**: NMO to SMA.

**7.15.1.3. Compatibility**: GNSS receiver R10 and compatible radios.

**7.15.1.4. Features**: High-quality cable, durable connectors, reliable signal transmission.

### 7.16. Antenna Whip - Unity Gain, 450-470MHz PDL450

**Description**: Unity gain antenna whip for PDL450 radio, 450-470MHz frequency range.

**7.16.1.** The antenna shall meet the following requirements:

**7.16.1.1. Frequency Range**: 450-470 MHz

**7.16.1.2. Gain**: Unity gain (0 dB)

**7.16.1.3. Compatibility**: PDL450 radio

**7.16.1.4. length**: Approximately 45 cm.

**7.16.1.5. Material**: Durable and weather-resistant materials

**7.16.1.6. Features**: High-performance antenna for reliable communication, easy installation.

### 7.17. Accessory - Tripod Heavy Duty

**Description**: A heavy-duty tripod designed to provide stable support for the GNSS receiver.

**7.17.1.** The tripod shall meet the following requirements:

**7.18.1.1. Material**: High-strength aluminium or composite materials.

**7.17.1.2. Height**: Adjustable legs to accommodate various heights.

**7.17.1.3. Leg Locking Mechanism**: Twist locks or lever locks for secure adjustments.

**7.17.1.4. Head**: Flat or dome head compatible with GNSS Receiver.

**7.17.1.5. Weight**: Approximately 5 kg.

**7.17.1.6. Features**: Heavy-duty construction, spiked feet, carrying handle.

### 7.18. Accessory - Tribrach 3 Pin Type with Optical Plummet (GDM/GT)

**Description**: Precision tribrach with optical plummet for accurate instrument levelling.

**7.18.1.** The tribrach shall meet the following requirements:

**7.19.1.1. Material**: High-strength aluminium.

**7.18.1.2. Plummet**: Optical plummet for precise centering.

**7.18.1.3. Compatibility**: Fits standard GNSS receivers and instruments.

**7.18.1.4. Features**: Durable construction, precise adjustment, easy to use

### 7.19. Adapter - Tribrach to 5/8 with Removable Center

**Description**: Adapter for converting tribrach to 5/8" thread with removable center for various mounting options.

**7.19.1.** The adapter shall meet the following requirements:

**7.20.1.1. Material**: High-strength aluminium.

**7.19.1.2. Thread Size**: 5/8".

**7.19.1.3. Removable Centre**: Yes.

**7.19.1.4. Compatibility**: Fits standard tribrachs and survey equipment.

**7.19.1.4. Features**: Durable construction, easy to install and remove, versatile mounting options.

## 8. 2.4 Ghz 3'' Total Station Set

### 8.1. Total station with 3" angular accuracy

**Description**: Reliable total station with 3" angular accuracy.

8.1.1. The 2.4 Ghz 3'' Total Station Set shall meet the following requirements:

**8.1.1.1. Key Features**:
8.1.1.1.1. Powerful, fast EDM for long-range measuring.
8.1.1.1.1. Application software onboard for topographic surveys, staking, and control.
8.1.1.1.1. Fully integrated with application Software.
8.1.1.1.1. Dual colour touchscreen displays.
8.1.1.1.1. L2P security location technology.
8.1.1.1.1. Compact, lightweight, and rugged design.

**8.1.1.2. Distance Measurement**:
**8.1.1.2.1. Range with Specified Prisms**:
8.1.1.2.1.1. Single Prism: 5000 m
8.1.1.2.1.2. Reflector Sheet (5 cm x 5 cm): 300 m

8.1.1.2.2. Reflector less Mode:
8.1.1.2.2.1. Kodak Gray Card (90% Reflectivity): 800 m (Good), 500 m (Normal), 250 m (Difficult)
8.1.1.2.2.2. Kodak Gray Card (18% Reflectivity): 400 m (Good), 300 m (Normal), 235 m (Difficult)

**8.1.1.2.3. Accuracy in Standard Measurement Mode**:
8.1.1.2.3.1. Prism: ±(2 + 2 ppm × D) mm
8.1.1.2.3.2. Reflector less: ±(3 + 2 ppm × D) mm

**8.1.1.2.4. Measuring Interval**:
8.1.1.2.4.1. Standard Mode: Prism Mode: 1.0 s; Reflector less Mode: 1.0 s

8.1.1.2.4.2. Fast Standard Mode: Prism Mode: 0.5 s; Reflector less Mode: 0.5 s
8.1.1.2.4.3. Tracking Mode: Prism Mode: 0.3 s; Reflector less Mode: 0.3 s

**8.1.1.3. Angle Measurement**:
8.1.1.3.1. Accuracy (Standard Deviation based on ISO 17123-3): 1” (0.3 mgon), 2” (0.6 mgon), 3” (1.0 mgon), 5” (1.5 mgon)
8.1.1.3.2. Reading System: Absolute encoder
8.1.1.3.3. Circle Diameter: 62 mm
8.1.1.3.4. Horizontal/Vertical Angle: Diametrical/Single

**8.1.1.4. Telescope**:
8.1.1.4.1. Tube Length: 128 mm
8.1.1.4.2. Image: Erect
8.1.1.4.3. Magnification: 30× (19x/38x with optional eyepieces)
8.1.1.4.4. Effective Diameter of Objective: 45 mm
8.1.1.4.5. Field of View: 1° 25’
8.1.1.4.6. Resolving Power: 3”
8.1.1.4.7. Minimum Focusing Distance: 1.5 m
8.1.1.4.8. Laser Pointer: Coaxial Red Light
8.1.1.4.9. Track light: Yes
8.1.1.4.10. Reticle Illumination: Yes, 4 steps

**8.1.1.5. Tilt Sensor**:
8.1.1.5.1. Type: Dual-axis
8.1.1.5.2. Method: Liquid-electric detection
8.1.1.5.3. Compensation Range: ±3’

**8.1.1.6. Communications**:
8.1.1.6.1. Communication Ports: 1 x serial (RS-232C), 2 x USB (host and client)
8.1.1.6.2. Wireless Communications: Integrated Bluetooth®

**8.1.1.7. Power**:
8.1.1.7.1. Internal Li–ion Battery (x2)
8.1.1.7.2. Output Voltage: 3.6 V
8.1.1.7.3. Operating Time:
8.1.1.7.3.1. Continuous Angle-Only Measurement: 14 h
8.1.1.7.3.1. Distance/Angle Measurement/Autofocus every 30 s: 12 h
8.1.1.7.3.1. Continuous Distance/Angle Measurement: 7 h
8.1.1.7.3.1. Charging Time, Full Charge (Both Batteries): approx. 6 h

**8.1.1.8. General Specifications**:
8.1.1.8.1. Autofocus: Yes
8.1.1.8.2. Level Vials:
8.1.1.8.2.1. Sensitivity of Circular Level Vial on Tribrach: 10’/2 mm
8.1.1.8.3. Tangent Clamps: Yes
8.1.1.8.4. Display Face 1: LCD back-lit (640 x 480 pixel)
8.1.1.8.5. Display Face 2: LCD back-lit (640 x 480 pixel)
8.1.1.8.6. Operating System: Windows® Embedded Compact 7

8.1.1.8.7. Processor: Dual Core 800 MHz
8.1.1.8.8. Point Memory: 512 MB RAM, 4 GB flash memory
8.1.1.8.9. Internal Plummet: Optical or Class 2 Laser
8.1.1.8.10. Optical Plummet:
8.1.1.8.10.1. Magnification: 3x
8.1.1.8.10.2. Field of View: 5°
8.1.1.8.10.3. Minimum Focusing Distance: 0.5 m
8.1.1.8.11. Dimensions (W x D x H): 206 mm x 169 mm x 318 mm
8.1.1.8.12. Weight (approx.):
8.1.1.8.12.1. Main Unit: 4.3 kg
8.1.1.8.12.2. Battery: 0.1 kg
8.1.1.8.12.3. Carrying Case: 3.3 kg

**8.1.1.9. Environmental**:
8.1.1.9.1. Operating Temperature Range: -20 °C to +50 °C
8.1.1.9.2. Winterized Operating Temperature Range: -30 °C to +50 °C
8.1.1.9.3. Storage Temperature Range: -25 °C to +60 °C
8.1.1.9.4. Winterized Storage Temperature Range: -30 °C to +60 °C
8.1.1.9.5. Atmospheric Correction:
8.1.1.9.5.1. Temperature Range: -40 °C to +60 °C
8.1.1.9.5.2. Barometric Pressure: 400 mmHg to 999 mmHg / 533 hPa to 1332 hPa / 15.8 inHg to 39.3 inHg
8.1.1.9.6. Dust and Water Protection: IP66

**8.1.1.10. Certification**:

8.1.1.10.1. Class B Part 15 FCC certification, CE Mark approval, RCM Mark
8.1.1.10.2. IEC60825-1 am 2007, IEC60825-1 am 2014, FDA notice 50
8.1.1.10.3. Prism/Reflector less Mode: Class 1 laser
8.1.1.10.4. Laser Plummet/Laser Pointer: Class 2 laser

## 8.2. Screen Protectors - Anti Glare

**Description**: Anti-glare screen protectors designed to protect the display.

**8.2.1.** The anti-glare screen protector shall meet the following requirements:
**8.2.1.1. Material**: High-quality anti-glare film
**8.2.1.2. Compatibility**: Total Station screen
**8.2.1.3. Features**:

8.2.1.3.1. Reduces glare and reflections for better visibility in bright conditions.
8.2.1.3.1. Protects against scratches, dust, and fingerprints.
8.2.1.3.2. Easy to apply and remove without leaving residue.
8.2.1.3.2. Durable and long-lasting.

## 8.3. Rod - 2.6m Aluminium Telescopic Rod

**Description**: A 2.6-meter aluminium telescopic rod designed for use with the Total Station.

**8.3.1. The telescopic rod shall have the rod shall meet the following:**
**8.3.1.1. Material**: Lightweight aluminium
**8.3.1.2. Height**: Extends up to 2.6 meters
**8.3.1.3. Graduations**: Marked in metric and imperial units for precise measurements
**8.3.1.4. Locking Mechanism**: Twist-lock or snap-lock for secure height adjustments
**8.3.1.5. Weight**: Approximately 1.5 kg.
**8.3.1.1. Features**:

8.3.1.5.1. Durable and lightweight construction
8.3.1.5.1. Easy to extend and collapse
8.3.1.5.1. Clearly marked graduations for accurate readings

## 8.4. Medium Duty Aluminium Tripod

**Description**: A medium-duty aluminium tripod designed to provide stable support for the Total Station and other survey instruments.

**8.4.1.** The tripod shall meet the following requirements:
**8.4.1.1. Material**: Lightweight aluminium

**8.4.1.2. Height**: Adjustable legs to accommodate various heights

**8.4.1.3. Leg Locking Mechanism**: Twist locks or lever locks for secure and quick adjustments

**8.4.1.4. Head**: Flat or dome head compatible with the Total Station

**8.4.1.5. Weight**: Approximately 3 kg.

**8.4.1.6. Features**:

8.4.1.6.1. Lightweight yet durable construction
8.4.1.6.2. Spiked feet for secure placement on different terrains
8.4.1.6.3. Carrying handle for easy transport

## 9. Accessories

### 9.1. Lithium-ion Battery Pack

**Description**: Lithium-ion battery pack designed for industrial use, providing reliable power for survey equipment.

**9.1.1.** The battery packs shall meet the following requirements:
**9.1.1.1. Battery Type**: Lithium-ion (Li-Ion).
**9.1.1.2. Configuration**: 2S2P (2 cells in series, 2 parallel).
**9.1.1.3. Voltage**: 7.4V.
**9.1.1.4. Capacity**: 3700mAh.
**9.1.1.5. Dimensions**: 78.4 mm x 54.3 mm x 25 mm.
**9.1.1.6. Applications**: Suitable for powering various survey. equipment and accessories described in the tender document.
**9.1.1.7. Features**: High energy density, long cycle life, stable performance under various environmental conditions.

### 9.2. Rod - Bipod for Range Pole (GDM/GTR/ATS)

**Description**: Stabilizing bipod designed for use with range poles in geodetic, topographic, and construction surveys.

**9.2.1.** The stabilizing bipod shall meet the following requirements:

**9.2.1.1. Material**: High-strength aluminium alloy.
**9.2.1.2. Compatibility**: Compatible with GDM, GTR, ATS range poles.
**9.2.1.3. Height Adjustment**: Quick-release clamps for easy height adjustments.
**9.2.1.4. Leg Extension**: Telescopic legs with pointed tips for stability on various terrains.
**9.2.1.5. Weight**: Lightweight for easy portability.
**9.2.1.6. Features**: Durable construction, easy to set up and transport, provides stable support for precise measurements.