

TECHNICAL SPECIFICATION

The equipment offered must meet the minimum technical specifications or better.

LOT 1: Weather station

Weather Station comprising components from the same manufacturer:

- Data logger: logging interval of 60 minutes, 6 input ports, 2 MB memory; dimensions: 14.9 cm (length) × 6.3 cm (width) × 25 cm (height).
- Temperature sensor: measurement of temperature (–40°C to 80°C), relative humidity (RH; 0-100%), vapour pressure (0-47 kPa), and barometric pressure (1-120 kPa).
- Rain gauge: double-spoon tipping bucket rain gauge; dimensions: 17 cm (depth), 14.2 cm (width), 16 cm (diameter), 16 cm (height).
- Ultrasonic wind sensor: measurement of horizontal wind speed, wind gusts, wind direction, and tilt; dimensions: 10 cm (diameter) × 16 cm (height).

LOT 2

Soil moisture measuring devices

Data logger, (4 pieces):

- Programming: None (plug-and-play)
- Communications: Cellular / Wi-Fi / Bluetooth
- Power: AA batteries + solar
- Data storage (at least): 80k records
- Integrated sensors: GPS + barometric pressure

Soil moisture sensor, (2 pieces):

- Measurement Specifications
 - Dielectric Measurement Frequency: 70 MHz
 - Measurement Volume: 351 cm³ per segment
 - Temperature Range: –20 to +60 °C
 - Temperature Resolution: 0.03 °C
 - Temperature Accuracy: ±0.5 °C from –20 °C to 0 °C; ±0.25 °C from 0 °C to 60 °C
 - Measurement Depths: 15, 30, 45, and 60 cm
- Communication Specifications
 - Output: DDI Serial and SDI-12 communications protocol (3-wire cable version)
 - Output: RS-485 Modbus RTU and tensioLINK serial communications protocol (4-wire version)
 - Data Logger Compatibility: METER ZL6 and EM60 data loggers or any data acquisition system capable of 4.0- to 24.0-VDC power and serial interface with SDI-12 and/or RS-485 interface, Modbus RTU, or tensioLINK communication
- Physical Specifications

- Diameter (Shaft): 6.0 cm (2.36 in)
- Length: 75.0 cm (29.53 in)
- Width (Head): 11.0 cm (4.33 in)
- Operating Temperature Range: Minimum $-20\text{ }^{\circ}\text{C}$, Maximum $+60\text{ }^{\circ}\text{C}$
- Cable Length (Standard): 5.0 m (stereo plug and stripped and tinned wires)
- Cable Length (M12): 5.0 m and 10 m
- Maximum Custom Cable Length: at least 75.0 m
- Cable Diameter (Stereo Plug): $4.2 \pm 0.2\text{ mm}$ ($0.16 \pm 0.01\text{ in}$) with minimum jacket of 0.8 mm (0.031 in)
- Cable Diameter (M12 Plug): $5.5 \pm 0.2\text{ mm}$ ($0.22 \pm 0.01\text{ in}$) with minimum jacket of 1.0 mm (0.039 in)
- Connector Size (Stereo): 3.50 mm diameter
- Connector Size (M12): 14.4 mm diameter
- Connector Types: Stereo plug connector, 4-pin M12 connector, or stripped and tinned wires
- Conductor Gauge (Stereo Plug): 22-AWG / 24-AWG ground wire
- Conductor Gauge (M12 Plug): 22-AWG
- Electrical and Timing Characteristics
 - Supply Voltage Power to Ground: Minimum 4.0 VDC, Maximum 24.0 VDC
 - Digital Input Voltage (Logic High): Minimum 2.8 V, Typical 3.6 V, Maximum 5.0 V
 - Digital Input Voltage (Logic Low): Minimum -0.3 V , Typical 0.0 V, Maximum 0.8 V
 - Digital Output Voltage (Logic High): Typical 3.6 V
 - Power Line Slew Rate: Minimum 1.0 V/ms
 - Current Drain (During Measurement): Minimum 3 mA, Typical 35 mA, Maximum 50 mA (during 500-ms measurement)
 - Current Drain (While Asleep): Minimum 0.03 mA, Typical 0.1 mA
 - Power Up Time (DDI Serial): Minimum 500 ms, Maximum 800 ms
 - Power Up Time (SDI-12): Typical 1,000 ms
 - Power Up Time (SDI-12, DDI Serial Disabled): Minimum 500 ms, Typical 600 ms, Maximum 800 ms
 - Measurement Duration: Minimum 500 ms, Maximum 800 ms

Cloud platform for storage (6 pieces):

- Storage, visualization, and management of environmental monitoring data
- Data transmission: Automatic upload from field data logger via cellular or Wi-Fi
- Data access: Web-based interface accessible from desktop and mobile devices
- Visualization: Real-time graphs, maps, and time-series data display
- API: REST API for automated data access and integration with external systems
- Threshold alerts: Ability to define threshold values and trigger notifications
- Soil parameters: Input of soil parameters such as field capacity and permanent wilting point
- Environmental models: Built-in options including Growing Degree Days (GDD), Plant Available Water (PAW), ET_0 , ET_r , ...
- Data export: Download of datasets in standard formats (e.g., CSV)
- User management: Multi-user access and data sharing
- Security: Encrypted data transmission and secure cloud storage
- Subscription: Annual cloud service subscription for platform access and data hosting for three years

Weather Station and Sensors

1. Data logger

- Programming: none (plug-and-play)
- Sensor ports: 6 (analog, digital, pulse)
- Communications: cellular / Wi-Fi / Bluetooth
- Power: AA batteries + solar
- Data storage (at least): 80k records
- Integrated sensors: GPS + barometric pressure
- Enclosure: weatherproof (IP55)

2. Soil moisture sensor

- Measured parameters: volumetric water content (VWC), temperature, bulk electrical conductivity (EC)
- VWC range: 0–0.70 m³/m³ (mineral soils), up to 1.0 m³/m³ in soilless media
- Accuracy: ±0.03 m³/m³ (typical)
- Resolution: 0.001 m³/m³
- Temperature range: –40 to +60 °C (±0.5 °C from 0–60 °C)
- EC range: 0–20,000 µS/cm
- Communication: DDI serial or SDI-12
- Connector: 3.5 mm TRS stereo plug
- Power supply: 4–15 V DC

3. Water level sensor (CTD)

- Measured parameters: water depth, temperature, electrical conductivity
- Depth range: 0–10 m, resolution 1 mm
- Barometric compensation: vented sensor (no extra barometer needed)
- EC range: 0–120 dS/m
- Temperature range: –40 to +60 °C (±0.5 °C from 0–60 °C)
- Sensor diameter: max. 3.5 cm
- Communication: DDI serial or SDI-12
- Connector: 3.5 mm TRS stereo plug
- Power supply: 4–15 V DC

4. Soil moisture sensor for saline soils

- Measured parameters: VWC, dielectric permittivity, temperature, bulk EC, pore water EC
- Measurement principle: complex dielectric (accurate VWC in high-salinity soils)
- VWC range: 0–0.72 m³/m³ (mineral soils)
- Accuracy: ±0.03 m³/m³ (typical)
- Temperature range: –40 to +60 °C (±0.3 °C from 0–60 °C)
- EC range: 0–20 dS/m

- Communication: DDI serial or SDI-12
- Connector: 3.5 mm TRS stereo plug
- Power supply: 4–15 V DC

5. Rain gauge

- Type: tipping bucket (double spoon)
- Resolution: 0.2 mm per tip
- Funnel diameter: approx. 16 cm
- Housing: UV- and frost-resistant plastic
- Output: pulse
- Connector: 3.5 mm TRS stereo plug

Net Radiation Sensor

Measurement Specifications

Calibration uncertainty

Pyrgeometer: ± 5 %

Pyranometer: ± 5 %

Measurement range

Pyrgeometer: -200 to 200 W m⁻² (net longwave irradiance)

Pyranometer: -0 to 2000 W m⁻² (net shortwave irradiance)

Measurement repeatability

Pyrgeometer: Less than 1 %

Pyranometer: Less than 1 %

Long-term drift

Pyrgeometer: Less than 2 % change in sensitivity per year

Pyranometer: Less than 2 % per year

Non-linearity

Pyrgeometer: Less than 1 %

Pyranometer: Less than 1 %

Detector response time

Pyrgeometer: Less than 0.5 s

Pyranometer: 0.5 s

Field of view

Pyrgeometer: 150°

Pyranometer: 180° (upward-looking); 150° (downward-looking)

Spectral range

Pyrgeometer: 5 to 30 μ m

Pyranometer: 385 nm to 2105 nm (upward-looking), 295 nm to 2685 nm (downward-looking); (50 % points)

Directional (Cosine) response

Pyranometer: Less than 30 W m⁻² at 80° solar zenith (upward-looking); Less than 20 % for angles between 0 and 60° (downward-looking)

Temperature response

Pyrgometer: Less than 5 % from -15 to $45\text{ }^{\circ}\text{C}$

Pyranometer: Less than 5 % from -15 to $45\text{ }^{\circ}\text{C}$

Window heating offset

Pyrgometer: Less than 10 W m^{-2}

Zero offset A

Pyranometer: Less than 5 W m^{-2} ; Less than 10 W m^{-2} (heated)

Zero offset B

Pyrgometer: Less than 5 W m^{-2}

Pyranometer: Less than 5 W m^{-2}

Tilt error

Pyrgometer: Less than 0.5 %

Uncertainty in daily total

Pyrgometer: $\pm 5\text{ }%$

Pyranometer: Less than 5 %