ALTA® by MONNIT®

Remote Monitoring for Business

ALTA® Wireless Soil Moisture Sensor

General Description

The ALTA® Wireless Soil Moisture Sensor measures soil moisture tension and soil temperature.

Key Features

- Reports matric potential (soil water tension) which is the best indicator of water availability in the soil.
- Moisture Range: 0 to 240 centibar (kPa)
- Moisture Resolution: ~0.3 centibar or kPa
- Temperature Accuracy: +/- 1.0°C (1.8°F)
- Temperature Resolution: 0.1°C
- Configurable thresholds for critical condition monitoring

Principles of Operation

The ALTA Wireless Soil Moisture Sensor uses a resistive granular matrix element to accurately measure the soil's matric water potential (soil moisture tension). It also measures accurate soil temperatures. The sensor takes its measurements based on a user-configurable time interval or Heartbeat. On every Heartbeat, the soil moisture element takes a resistive measurement within a defined and consistent internal matrix material. The sensor also uses a temperature element on the end of the soil moisture lead to make accurate soil temperature measurements. These measurements are then sent to the gateway, making the data available in iMonnit or another approved data service.

Example Applications

- Smart agriculture
- Irrigation scheduling
- Water table monitoring
- Leak detection
- Agronomy research
- Environmental monitoring
- Almost any soil moisture/status application
- Additional applications

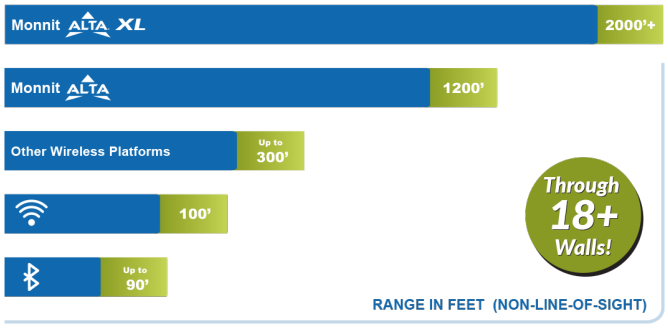
Features of Monnit ALTA Sensors

- Wireless range of 2,000+ feet through 18+ walls[1]
- Frequency-Hopping Spread Spectrum (FHSS)
- Best-in-class interference immunity
- Best-in-class power management for longer battery life[2]
- Encrypt-RF® Security (Diffie-Hellman Key Exchange + Advanced Encryption Standard (AES)-128 Cipher Block Chaining (CBC) for sensor data messages)
- Sensor logs 2000 to 4000 readings if the gateway connection is lost (non-volatile flash, persists through power cycling):
  - 10-minute Heartbeats = ~ 22 days
  - 2-hour Heartbeats = ~ 266 days
- Automatic over-the-air updates to sensor firmware (future-proof)
- Free iMonnit Basic Online Wireless Sensor Monitoring and Notification System to configure sensors, view data, and send alerts via SMS text, email, and voice call

1 Actual range may vary depending on the environment and gateway.

2 Battery life is determined by the sensor reporting frequency and other variables. Other power options are also available.

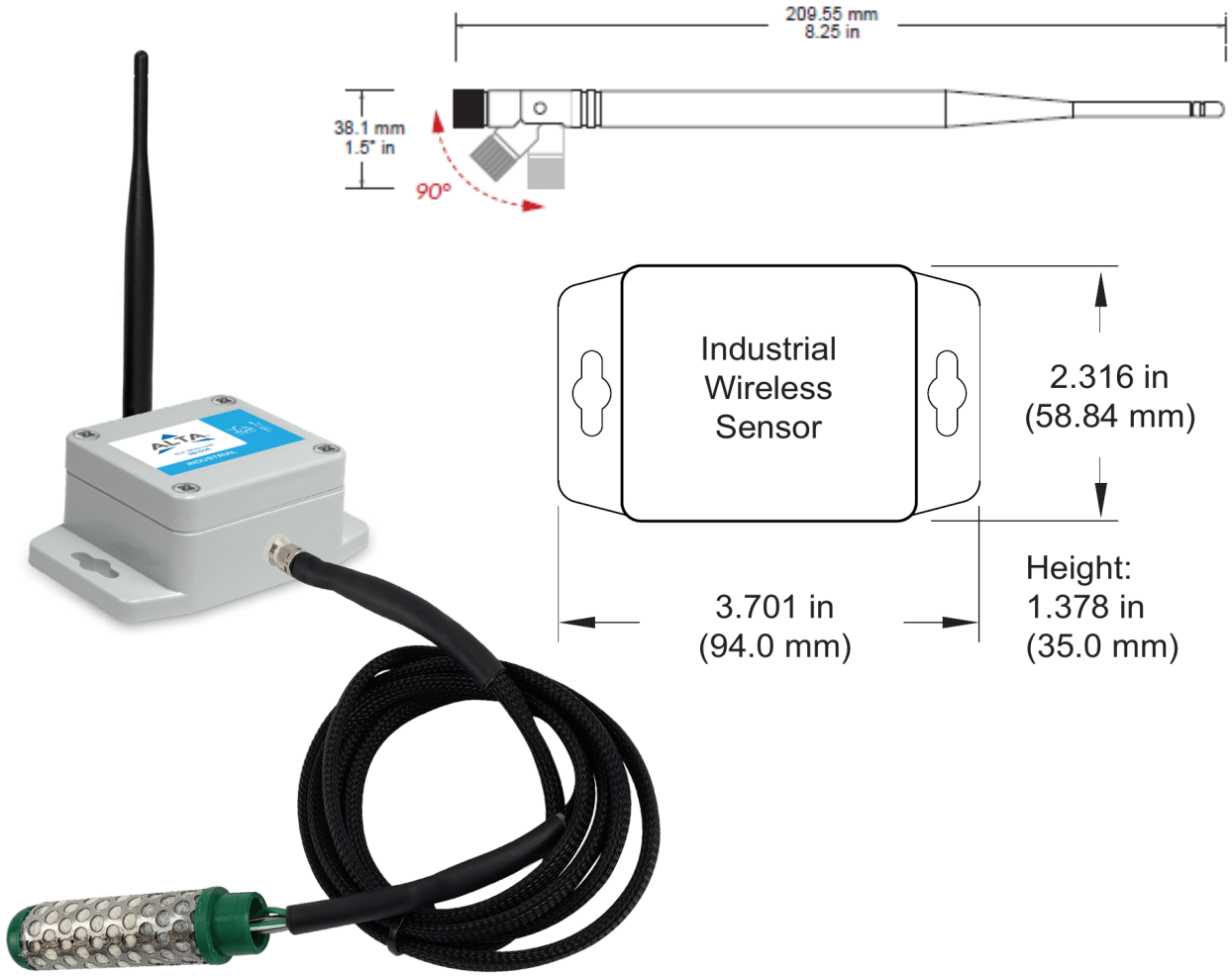
Wireless Range Comparison



Technical Specification | ALTA® Wireless Soil Moisture Sensor		
Moisture Sensing Element	Element Type	Resistive element with granular matrix
	Range	0.0 to 240.0 centibar or kPa (Water Tension)
	Resolution	~0.3 centibar or kPa[1]
	Dimensions	Diameter: 0.875 in. (22 mm)
		Length: 3.25 in. (83 mm)
	Materials	ABS plastic caps with stainless steel body over a hydrophilic fabric covered granular matrix. (Will not dissolve in soil or be compromised by freezing temperatures)
	Response Time	~5 Minutes[2]
Temperature Sensing Element	Element Type	Thermistor embedded in sealed metal bullet
	Accuracy	+/- 1.0 Celsius
	Measurement Range	-40°C to 125°C (-40°F to 257°F)
	Resolution	0.1° C
	Response Time	Typically less than 15 seconds
Cable Physical Specifications	General Composition	Soil moisture and temperature leads coupled together in a single sealed cable wrapped in a braided sleeve. Sleeve ends fixed using adhesive lined heat shrink.
	Length	63 in. (160 cm)
	Cable Sleeve Material	Polyethylene terephthalate (PET)
	Overall Cable Operating Temperature	-40°C to 80°C (-40°F to 176°F)[3,4]
	Weight	4.07 oz. (115 g)
	Connector End	Keyed M8 6-pin female connector, with M8 female coupling collar.
	Sensor Base Connector	Keyed M8 6-pin male connector
ALTA Wireless	Data logging	Sensor logs 2000 to 4000 readings if gateway connection is lost (non-volatile flash, persists through power cycling): 10-minute Heartbeats = ~22 days - 2-hour Heartbeats = ~266 days
	Wireless protocol	ALTA Proprietary Frequency-Hopping Spread Spectrum (FHSS)
	Wireless transmission power (EIRP)	50 mW (900MHz), 25 mW (868 MHz), 10 mW (433 MHz)
	Wireless range	2,000+ ft. through 18+ walls with the ALTA XL® Gateway
	Security	Encrypt-RF® (256-bit key exchange and AES-128 CTR)
General	Battery voltage range	2.0 to 3.8 VDC
	Operating altitude (non-pressurized environments)	-15.2 to 1,982 m (-50 to 6,500 ft)[5]
	Storage altitude (non-pressurized environments)	-15.2 to 3,048 m (-50 to 10,000 ft)[5]
	Operating humidity	5 to 85% RH (non-condensing)
	Certifications	900 MHz sensors: **FCC ID: ZTL-G2SC1** and **IC: 9794A-G2SC1**. 868 and 433 MHz sensors tested and comply with: **EN 55032**: 2015/A11:2020; **EN 55035**:2017/A11:2020; **ETSI EN 300 220** V3.2.1 (2018-06); **ETSI EN 301 489-3** V2.2.0. (2021-11); and **ETSI EN 303 645**. All sensors tested and comply with: **EN 61010-1** and **EN 60950** and meet **RoHS 2015/863** and **REACH 224** (June 2022), according to **IEC 63000**:2016/AMD1:2022.

1. The resolution increases as the centibar readings get lower. Resolution at 0 centibar is ~0.05 centibar, at 240 centibar it is ~0.36 centibar. The sensor is limited to 0.1 centibar by the sensor firmware.
2. The response time is calculated by measuring the time it takes for the sensor to go from fully dry to saturated by placing the moisture element upright in 1" of water. Therefore, actual response times may vary.
3. Heat shrink adhesive melts at ~85° C. Using temperatures at or above this level may compromise the waterproofing of the cable and allow the heat shrink and sleeve to slip and become loose.
4. The soil moisture element will not work properly while frozen, but the sensor readings will return to normal when thawed.
5. Operating and storage altitude without DC power supply is -30.48 to 9144 m (-100 to 30000 ft).

The sensor reports soil water tension on the Heartbeat and Temperature is measured on Heartbeat in °C or °F.



Technical Specifications | ALTA® Industrial Wireless Soil Moisture Sensor	
Battery	1x 3.6V AA Lithium Thionyl Chloride, 1500mAh, pre-installed
Battery Life	10+ years expected
Operating temperature range[1]	-25°C to 80°C (-13°F to 176°F)
Wireless antenna type	1/2-wave waterproof dipole with RP-SMA connector and swivel neck; dBi of 3.0 (900/868MHz) or 2.5 (433 MHz); length of 8.27" (210mm) (900/868MHz) or 7.68" (195mm) (433 MHz); diameter at thickest point of 0.55" (14mm)
Weight	8.3 ounces (235.3g) (senor body and lead)
Enclosure rating	NEMA 1, 2, 4, 4x, 12, and 13 rated, sealed, and weatherproof
UL rating	UL Listed to UL508-4x specifications (File E194432)

1. Operating below 0°C (32°F) degrees will reduce battery life.

Commercial-Grade Sensors

Monnit commercial-grade sensors are designed for applications in ordinary environments (normal room temperature, humidity, and atmospheric pressure). Do not use these sensors under the following conditions, as these factors can deteriorate the product characteristics and cause failures and burnout.

- Corrosive gas or deoxidizing gas: chlorine gas, hydrogen sulfide gas, ammonia gas, sulfuric acid gas, nitric oxide gas, etc.
- Volatile or flammable gas
- Dusty conditions
- Low-pressure or high-pressure environments
- Wet or excessively humid locations
- Places with salt water, oils, chemical liquids, or organic solvents
- Where there are excessively strong vibrations
- Other places where similar hazardous conditions exist

Use these products within the specified temperature range. Higher temperatures may cause deterioration of the characteristics or the material quality.

Industrial-Grade Sensors | Type 1, 2, 4, 4X, 12, and 13 NEMA-Rated Enclosure

Monnit's industrial sensors are enclosed in reliable, weatherproof NEMA-rated enclosures. Our NEMA-rated enclosures are constructed for indoor and outdoor use and protect the sensor circuitry against the ingress of solid foreign objects like dust and the damaging effects of water.

- Safe from falling dirt
- Protects against wind-blown dust
- Protects against rain, sleet, snow, splashing water, and hose-directed water
- Increased level of corrosion resistance
- Will remain undamaged by ice formation on the enclosure

MONNIT

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