



Cost-Effective Network Densification

With an Internet of Things approach

Overview

Wintersense uses smart-sensor technology coupled with IoT communications and a cloud-hosted data solution to enable rapid densification of road-weather networks. The Wintersense smart sensor is a completely integrated smart sensor, available in two forms.

- ▶ R1 provides non-invasive surface-temperature measurement in a compact, self-powered unit with integrated communications.
- ▶ R2 provides the same features as R1 with the addition of air temperature, relative humidity, and dew point measurements.

Wintersense provides consistent data 24/7, which can be easily ingested by forecast agencies to improve route-based forecasting services. Road authorities can minimize expenses through smarter route-based treatment decisions with the additional confidence that Wintersense data provides.

Data from Wintersense smart sensors is delivered wirelessly via IoT networks to a cloud-hosted web application. Via the web application, users can create and manage networks of sensors; set quality-control rules and automatic alerts on incoming data; and export data via FTP, API, or Datex II polling.

Benefits and Features

- ▶ Quick and easy to install; mounts to existing roadside infrastructure
- ▶ Semi-mobile; can easily be moved and redeployed across a network
- ▶ Easily monitor troublesome areas, such as bridge decks
- ▶ Cost-effective method of densifying RWIS networks
- ▶ Open-platform web application with API to easily export data
- ▶ Consistent 24/7 data for integration with route-based forecasting services
- ▶ Ideal for multiple uses, including roads, parking lots, cycleways, and sidewalks
- ▶ Simple to maintain

Technical Description

Wintersense smart sensors use infrared thermopile technology to measure road-surface temperature non-invasively. R2 sensors provide additional air temperature, humidity, and dew point measurements using an advanced digital sensor. A stainless-steel mesh filter on the integrated temperature and humidity sensor minimizes the effects of

dust and dirt on the sensor, allows air exchange around the sensor element, and reduces the likelihood that condensation remains inside the filter cap. A small PTFE membrane filter is bonded to the surface of the element,

which prevents any finer dust or mold from directly influencing the measurement.

Wintersense smart sensors are self powered via a user-replaceable 3.6 V 19 Ah non-rechargeable lithium thionyl chloride D-cell battery. Integrated communications within the smart sensor allow complete end-to-end data delivery to the cloud-hosted Wintersense web application.

Specifications

Operating Temperature Range	-40 to +70°C
Operating Humidity Range	0 to 100%
Power Consumption	< 1 mA (typical)
Sensor Dimensions	350 x 100 x 200 mm (13.8 x 4.0 x 7.9 in.) excluding band clamp
Sensor Weight	1.4 kg (3.1 lb)

Road Surface Temperature

Measurement Range	-40 to +70°C
Accuracy	<ul style="list-style-type: none"> › -40 to +60°C: ±1°C or better › <i>Note: Temperature dependent—quoted accuracy is against a blackbody source within ambient temperature range of -20 to +50°C and object temperature range of -40 to +60°C.</i>
Resolution	0.01°C
Field of View (FOV)	10° with 50% sensitivity cut-off

Power

Replaceable Internal Battery	3.6 V 19 Ah non-rechargeable lithium thionyl chloride D-cell battery
Recommended Replacement Battery	Tadiran SL-2780/TL-5930, available from Campbell Scientific (Any alternative battery must comply with IEC 60086-4 to ensure safe operation.)
Battery Life	1 year minimum

Radio Communication

Transmission Frequency	868.130 MHz
Transmission Power	25 mW ERP
Data Transmission Frequency	15 minutes

Web Application

User Rights	Basic, engineer, and admin levels
Data Export	FTP, web API, and Datex II

R2 Option: Relative Humidity

Measurement Range	0 to 100% RH
Accuracy	<ul style="list-style-type: none"> › <i>-NOTE- The accuracy figures quoted are the 95% confidence limits relative to factory standards.</i> › ±1.5% (at 25°C, over the range 0 to 80% RH) › ±2% (at 25°C, over the range 80 to 100% RH)
Short-Term Hysteresis	< ±1% RH
Additional Errors at Other Temperatures	< ±1% RH (over -40° to +60°C)
Long-Term Stability	±0.5% per year (maximum drift in clean air conditions)
Reported Resolution	0.001% RH
Repeatability	0.05% RH (3σ noise level)
Response Time with Filter	8 s (63% response time in air moving at 1 m/s)

R2 Option: Air Temperature

Measurement Range	-40°C to +70°C
<i>-NOTE-</i>	<i>The accuracy figures quoted are the 95% confidence limits relative to factory standards.</i>
Accuracy	<ul style="list-style-type: none"> › ±0.1°C (over the range -20 to +60°C) › ±0.2°C (over the range -40 to +70°C)
Long-Term Drift	< 0.03°C per year
Reported Resolution	0.001°C
Repeatability	0.04°C (3σ noise level)
Response Time with Filter	< 130 s (63% response time in air moving at 1 m/s)
Calibration Traceability	NIST and NPL standards

For comprehensive details, visit: www.campbellsci.eu/wintersense 



80 Hathern Road, Shephed, LE12 9GX UK | +(0)1509 828888 | sale@campbellsci.co.uk | www.campbellsci.eu
 AUSTRALIA | BRAZIL | CANADA | CHINA | COSTA RICA | FRANCE | GERMANY | INDIA | SOUTH AFRICA | SPAIN | THAILAND | UK | USA