



Wireless Temperature Sensor with Data Backfill

Product Datasheet

Description

The Wireless Temperature Sensor with Data Backfill periodically measures Temperature (°C/°F) and wirelessly transmits the result to nearby Cloud Connectors (gateways) via the SecureDataShot™ protocol. Cloud Connectors relay sensor data to the cloud via cellular or ethernet connectivity. From the cloud, the data can be integrated into other services using REST APIs and webhooks or viewed directly in DT Studio (web application).

Features

- High accuracy ($\pm 0.25^{\circ}\text{C}$ after calibration)
- Can store up to 100,000 measurements
- Software verification level Class III with accuracy class 0.5

Applications

- Refrigerator Temperature Monitoring
- Freezer Temperature Monitoring
- Incubator / Hot-hold monitoring

How it works

Default Operation

The Wireless Temperature Sensor with data backfill periodically measures the temperature in the surrounding environment and wirelessly transmits the results to nearby Cloud Connectors at a predetermined interval. The temperature measurement interval can be configured down to 30 seconds by the user.

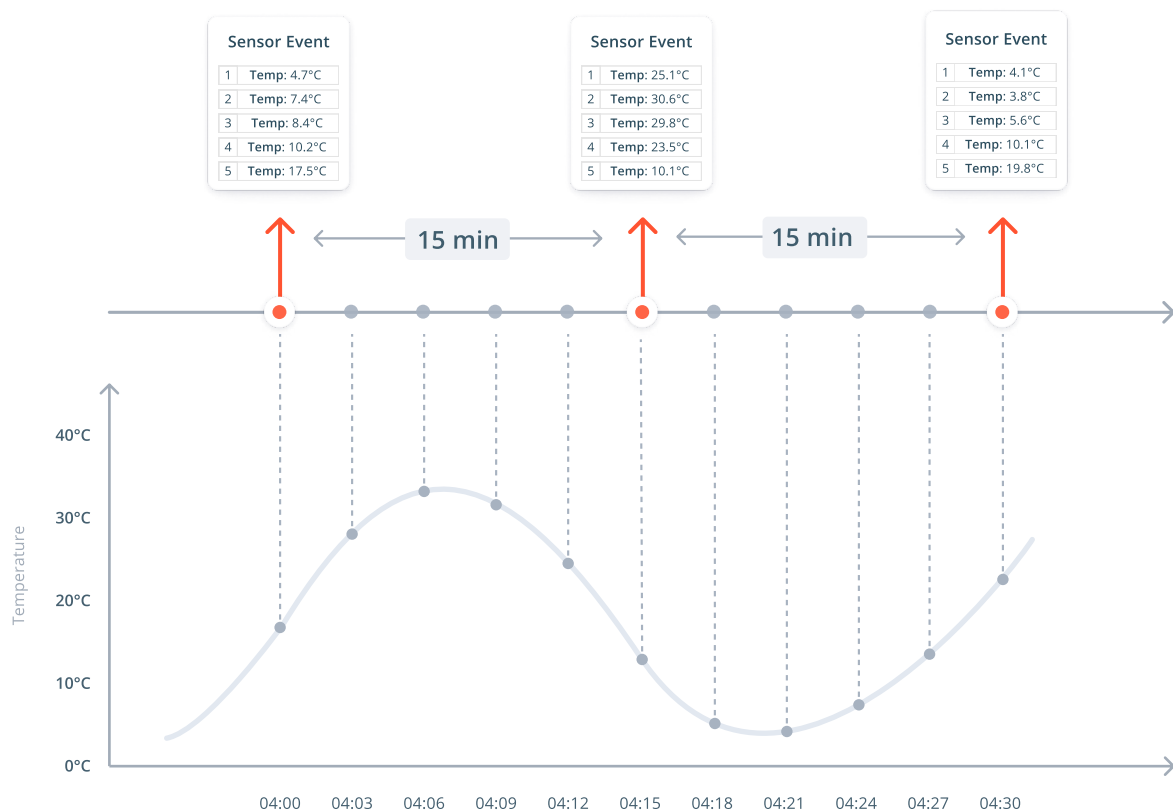
The radio protocol used is SecureDataShot™, and the data is relayed to DT cloud infrastructure using a SecureDataShot™ enabled gateway, also known as a Cloud Connector. From the cloud, the data can be viewed directly in Studio (web application) or sent to external services using webhooks or a REST API.

Measurement Interval

1 to 30 samples per heartbeat (user configurable)

Heartbeat Interval

5 to 60 minutes (order configurable)



Sensor events during default operation with 5 minute sampling interval and 15 minute heartbeat

Technical Specification

Measurement Range -40°C to 85°C (-40°F to 185°F)

Sensor Technology CMOS

Sensor Accuracy The accuracy of the sensor depends on the temperature. See the table underneath for typical accuracy at specific temperatures.

Temperature Range		Typical		Max	
-40°C to -25°C	-40°F to -13°F	±0.6°C	±1.08°F		
-25°C to 0°C	-13°F to 32°F	±0.3°C	±0.54°F		
0°C to 60°C	32°F to 140°F	±0.2°C	±0.36°F	±0.7°C	±1.26°F
15°C to 45°C	59°F to 113°F	±0.2°C	±0.36°F	±0.4°C	±0.72°F
45°C to 85°C	113°F to 185°F	±0.3°C	±0.54°F		

By calibrating the sensors the accuracy can be improved to ±0.25°C, see the "Calibration Service" section for more information.

Measurement Resolution 0.05°C

Temperature Drift 0.04°C per year (max)

Data backfill

If the sensor goes offline, it will start storing temperature measurements locally until the connection to the cloud is restored. The sensor will backfill data, starting with the most recent samples first. The sensor will overwrite the oldest data if the memory becomes full. The number of datapoints that can be stored in an offline period depends on the sampling rate, heartbeat configuration and temperature fluctuations.

Offline storage: Up to 100,000 datapoints

Timestamp accuracy¹: 1%

Practical example: A sensor with 15 minute heartbeat and 30 second sampling rate in a stable temperature environment can store data for 1 month before it starts overwriting data.

Calibration Service (optional)

Wireless Temperature Sensors can be calibrated by DT for improved and documented accuracy. The setup meets the requirements of traceability stated in the ISO 17025:2017 standard. The sensors are calibrated to ±0.25°C in a 5-point calibration routine (-30°C to 50°C) and delivered with a digital downloadable calibration certificate.

Contact sales at sales@disruptive-technologies.com for more information.

(1): The timestamps are sensitive to variations in temperature and the duration of the offline period.
For sensors in a stable temperature environment the typical accuracy is 1%.

Technical Specification

Operating & Storage Conditions

Operating Conditions **Temperature:** -40°C to 85°C (-40°F to 185°F) **Humidity:** 0 to 100% RH (non condensing)

Storage Conditions Cool and dry, near normal room temperature

Wireless Communication

Radio Protocol SecureDataShot™

Radio Frequency EU: 868 MHz ISM band US: 915 MHz ISM band

Radio Range¹ Indoor: 25 m (82 ft) Free Space: 300m (980 ft)

Radio Range with Extender Indoor: 75 m (246 ft) Free Space: 900 m (2952 ft)

Certification & Compliance

Certification EU: CE, UKCA, WEEE US/Canada: FCC, ISED
IC: 25087-100541 FCC ID: 2ATFX-100541

EN12830 Compliance

Accuracy Class 0.5 in the range -30°C to 55°C

Verification Level Class IIIb (according to WELMEC 7.2) ATP-MUC 1132TS_EN12830:2018

Contact sales at sales@disruptive-technologies.com for order information about EN12830 certified sensors.

(1): Based on standard ITU-R P.1238 (indoor) and ITU-R P.525 (free-space).

Battery Specification

Battery

Chemistry: Lithium (Poly-Carbon-Monofluoride)

Lifetime

Standard Mode: Up to 15 years

High Power Mode: Up to 5 years

There are four factors that contribute the most to the battery life of the wireless sensor:

1. Temperature Conditions
2. Radio Transmissions
3. Sampling Interval
4. Operating mode

Temperature Conditions

The battery's ability to hold and deliver energy is affected by its operating temperature. At high temperatures, the battery will have increased self-discharge, and at low temperatures, it has less ability to deliver the total amount of its stored energy.

Radio Transmissions (Heartbeat)


The wireless sensor's most energy-consuming activity is transmitting and receiving radio messages. The average number of radio transmissions per day dramatically impacts the battery life, and the battery life increases by approximately three times by sending data every 15 minutes instead of every 5 minutes.

Sampling Interval

The sampling interval determines how often the temperature is measured, and when compared to the heartbeat interval, it has a negligible impact on the battery life. However, if the sampling rate is set to a very short interval, it can have a noticeable effect at some temperatures over many years of operation.

Operating Mode

The sensor automatically selects and switches between the two following modes to optimise range and battery life:

- **Standard Mode** (default)
- **High Power Boost Mode** (redundancy mode) 

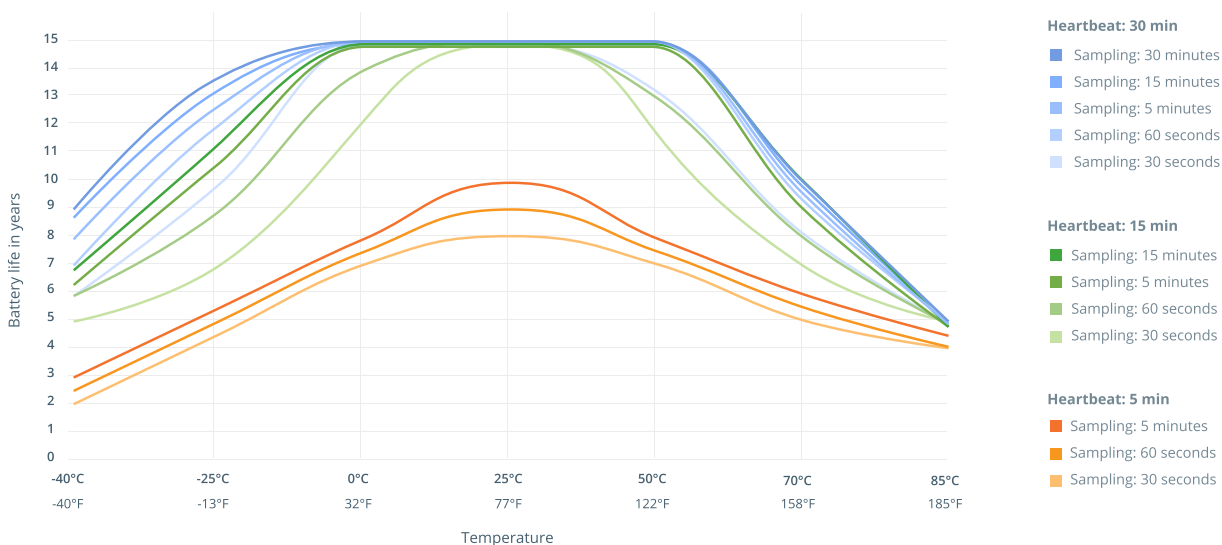
In Standard Mode, when the sensor transmits a message, it expects to receive a message back from the cloud acknowledging that the sensor message has been received.

As a redundancy feature, if there is something preventing the message from reaching the cloud, the sensor will re-transmit the message using more power, in what is called High Power Boost Mode.

High Power Boost Mode gives the sensor increased wireless range, at the expense of battery life. To extend the battery life, sensors should not be permanently operating in High Power Boost Mode. The sensor uses roughly 3x the amount of energy to use the radio in High Power Boost Mode vs Standard Mode.

To make it easy for users to see if a device is currently operating in Standard Mode or High Power Boost Mode, the mode is sent with each sensor event on the API and visible in the Studio user interface.

The graph below shows the expected battery life across multiple temperatures and sampling rates at 5 min, 15 min and 30 minute heartbeat intervals.



Please note: The battery lifetimes listed here are estimates and can vary from sensor to sensor depending on usage pattern, wireless coverage and other environmental variables.

Mechanical Properties

Size	19 x 19 x 3.5 mm (± 0.2 mm) / 0.75 x 0.75 x 0.14 inches
Weight	3.0 g (± 0.5 g) / 0.11 oz
Material	Impact modified acrylic film
Mounting method	Adhesive
IP Rating	IP68



Product Variants

EU Version	Product Number: 102683	Region : Europe
US Version	Product Number: 102685	Region: North America

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Installation Guidelines



Step 1
Clean the surface to ensure good sensor adhesion







Step 2
Peel the protective film from the back of the sensor



Step 3
Attach the sensor to the surface and press gently

Check sensor coverage

  If the sensor is **not reporting data** the sensor is outside the range of the Cloud Connector. Move the Cloud Connector or install a second Cloud Connector to extend the coverage.

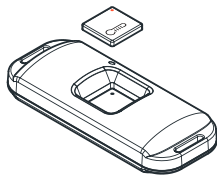
  If a sensor is in **Boost Mode**, the battery life will be reduced because the sensor is using more energy to reach the Cloud Connector. Either move the Cloud Connector or consider using a Range extender accessory to amplify the sensor range.

Please note before attaching the sensor

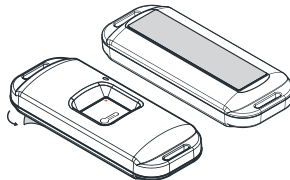
- Installing the sensor directly on a metal surface will reduce the wireless range.
- The sensor should not be placed near a magnet. It can severely affect functionality and battery life.

Installation with Ambient Range Extender

Range Extender accessories can be used to increase the range of the radio signal of the sensor by as much as 4x. The Ambient Range Extender (PN: 101693) allows installation directly on metal surfaces and is designed to work in environments that typically attenuates radio signals a lot, like refrigerators, freezers and ducts.

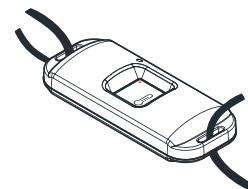


Orientation matters – Make sure the dot on the sensor is aligned with the dot on the range extender



Option 1 – Use the adhesive on the back to attach the range extender in the desired location.

Or



Option 2 – Use zip ties to attach the range extender in the desired location.

Ordering Information

Europe

Product Name	Order Code	Region	Quantity
Wireless Temperature Sensor with Data Backfill EU	-	Europe	1
Wireless Temperature Sensor with Data Backfill EU - 25 kit	102687	Europe	25
Wireless Temperature Sensor with Data Backfill EU - 100 kit	102688	Europe	100

North America

Product Name	Order Code	Region	Quantity
Wireless Temperature Sensor with Data Backfill US	-	North America	1
Wireless Temperature Sensor with Data Backfill US - 25 kit	102690	North America	25
Wireless Temperature Sensor with Data Backfill US - 100 kit	102689	North America	100

Calibration Service (optional)

Product Name	Order Code	Region	Quantity
Calibration Service & Certificate	-	Global	1

Sensor Accessories (optional)

Product Name	Order Code	Region	Quantity
Ambient Range Extender	101693	Global	1
Pipe Range Extender	101702	Global	1

Sensor Subscription (mandatory)

Product Name	Order Code	Region	Quantity
Sensor Subscription - 5 minute heartbeat	-	Global	1
Sensor Subscription - 15 minute heartbeat	-	Global	1
Sensor Subscription - 30 minute heartbeat	-	Global	1
Sensor Subscription - 45 minute heartbeat	-	Global	1
Sensor Subscription - 60 minute heartbeat	-	Global	1

Revision History

Revision 1.0

Change: Initial release.

Date: November 1st, 2022

Revision 1.1

Change:

- Updated document design.
- Corrected product numbers.

Date: February 13th, 2023

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