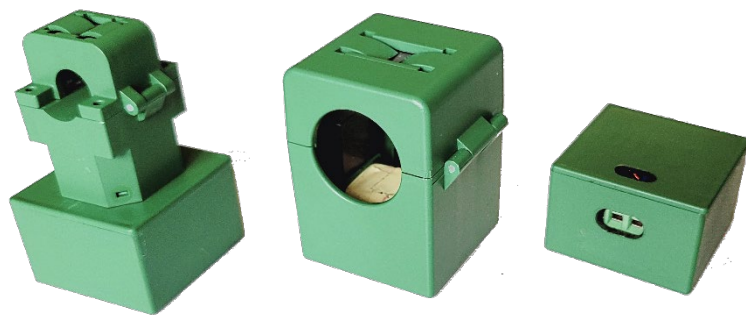




SITEWATCH IOT

SIMPLE | AFFORDABLE | WIRELESS
OPERATIONS & ENERGY MANAGEMENT

Self-Powered, Wireless LoRaWAN Enabled Current Sensors Product and Installation Guide



Contents

Introduction	1
Safety Information	1
Security	1
FCC Compliance	2
General Installation Guidelines	2
Installation of SW-060 and SW-225 Sensors	3
Installation of SW-005 Sensors	3
Power Supply	3
LoRaWAN Specifics	3
Sensor Specifications	4
Sample of LoRaWAN Data Transmission Packet	5

Introduction

SiteWatch wireless, self-powered current transformers (CTs) come in 3 models. A model is selected based on the current range being monitored and the physical dimensions of conductors. SW-060 sensors are designed to monitor circuits up to 60 amps, SW-225 sensors are designed to monitor circuits up to 225 amps, and SW-005 sensors are designed to receive a 5 amp signal from an external CT, with amps based on the capacity of the selected CT (upwards of 4,000 amps).

Safety Information

SW-060 and SW-225 sensors must be installed on an insulated conductor. Check the inside clear dimensions of each sensor versus the outside dimension of conductors to be measured. External CTs used with SW-005 sensors must be deployed in compliance with installation guidelines for those devices.

Refer to local laws and regulations in regarding who is responsible for physical sensor deployment. Generally, electricians or other personnel rated for work on electrical equipment are suitable for sensor deployment.

Security

Sensor data is transmitted to gateways, and then to a cloud-based server. Data is accessed through an AppKey generated by an algorithm known only to the sensor manufacturer. AppKeys are programmed into sensors and can also be recovered by the sensor manufacturer for legitimate owners. Device keys (DevEUI, JoinEUI, and the AppKey) are provided by SiteWatch to the customer or site at the time of purchase.

FCC Compliance

The radio transmitter in the sensor complies with Part 15 of the FCC Rules (47 CFR Part 15 Subpart C §15.247). The device meets the requirements for modular transmitter approval as detailed in FCC public Notice DA00-1407.

The modular transmitter should be used within the limits outlined in Chapter 5 (Specifications) and the according the Design Guidelines (Chapter 7). Transmitter Operation is subject to the following two conditions:

- 1) This device may not cause harmful interference, and
- 2) This device must accept any interference received, including interference that may cause undesired operation.

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If sensors cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna on the equipment or any LoRaWAN connected gateways
- Increase the separation between the equipment and any sensors or gateways
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

CAUTION: The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by the LoRaWAN chip manufacturer may void the user's authority to operate the equipment.

General Installation Guidelines

The CTs can be mounted on any single or group of wires as long as they represent a single phase of electricity. Sensors can be monitored on a single phase of 1 or 3 phase equipment, 3 phases of 3 phase equipment, or 1 or 2 legs of 2-pole equipment.

Conversion of current to electrical energy requires voltage and power factor assumptions on the measured wires. During deployment, the voltage and power factor at the site, panel, and equipment level must be noted to properly configure the conversion factors.

When monitoring a load or machine that changes the characteristics of the supplied electricity (variable speed drives, induction heating power supplies, etc.), sensors should always be mounted on the supply side of the device.

As the sensors are self-powered, there is a minimum current at which each sensor will operate. The minimum required current for each sensor type is noted in the specifications for the devices.

Installation of SW-060 and SW-225 Sensors

Sensors are installed directly on insulated conductors. To install the sensors, release the tab by hand to open the device, position on the wire(s), and close the device. The closure should snap into place securely. Additionally, screws are included with each sensor to ensure devices are secured on the current carrying conductors. The opening of the sensor is designed to fit around the wire with room to dissipate any accumulated heat. Connection keys, including the AppKey and DevEUI, are printed on the label of the sensor. Note these keys during deployment to ensure proper configuration of the data gathering and presentation platform.

Installation of SW-005 Sensors

SW-005 sensors are wired to external CTs prior to CT deployment on wires. Note that if CTs are installed before being wired to sensors, a shorting block is required. Failure to wire CTs to the sensor or shorting block prior to deployment may result in an open circuit voltage that is extremely dangerous to the installer.

Wire the external CT to the sensor using the two wire ports on the sensor. Ensure a secure connection by gently pulling the wires and verifying the wires are not loose. After the CT is secure to the sensor, the CT can be deployed per the manufacturer's instruction on the wire(s) to be monitored. It is advised to secure the sensor to the CT with double-sided tape or a plastic zip-tie, ensuring the sensor is not located within the CT opening itself.

SW-005 sensors require the installer to verify the rating of the CT used (e.g., 400:5, 1200:5) and shared with SiteWatch or the partner responsible for configuring the data collection and presentation platform. The opening of the CT should be designed to fit around the wire with room to dissipate any accumulated heat. Connection keys, including the JoinEUI and DevEUI, are printed on the label of the sensor. Note these keys during deployment to ensure proper configuration of the data gathering and presentation platform.

Power Supply

Sensors are self-powered so do not require an external power supply or battery. Sensors will not transmit if the storage capacitor voltage is below the transmit threshold. The shutdown and startup voltages are significantly lower than the transmit threshold. Note if the sensor is constantly shut down and restarted, it is likely that no measurement will be made or transmitted.

LoRaWAN Specifics

1. **Identification** - Devices are labelled with JoinEUI and DevEUI within the QR code in compliance with LoRa Alliance TR005 format. The AppKey is also shown underneath that code.
2. **Cycling** - The sensors, LoRaWAN Class A devices, transmit data every 12 seconds (2 seconds for the Tx + Rx window, and 10 seconds sleep interval). Sensors deployed in the US are not bound by an enforced duty cycling so optimal placement of gateway(s) should keep duty cycle low.
3. **Transmission Intervals** - The transmission interval can range 15.5 millisecond to 207 milliseconds depending on the spreading factor.

4. **Available Channels** - SiteWatch sensors are suitable for communicate using LoRaWAN 1.0.3, in the US on 902-925 MHz The device will try to join on all eight (8) US915 sub-bands. Once joined, the server will communicate to the device which sub-band to use. The device operates with over-the-air activation and utilizes adaptive data rate for optimizing data rate, airtime and reducing interference.

Sensor Specifications

Overall Outside Dimensions

SW-060	1.50 x 1.50 x 2.57 inch 38.1 x 38.1 x 65.21 mm
SW-225	1.704 x 1.50 x 2.106 inch 43.28 x 38.1 x 53.49 mm
SW-005	1.50 x 1.50 x 1.00 inch 38.1 x 38.1 x 25.4 mm

Maximum Conductor Diameter

SW-060	0.40 inch 10.16 mm
SW-225	0.95 inch 24.13mm
SW-005	External CT

Current Ratings

SW-060	Minimum = 3 amp AC, Maximum = 60 amp AC
SW-225	Minimum = 3 amp AC, Maximum = 225 amp AC
SW-005	Minimum = 0.150 amp AC x CT ratio (external CT), Maximum is dependent on the external CT used

Maximum AC current rating 150 % of sensor capacity

Operating and Storage Temperatures

Operating Temperature	-20 C to +65 C
Storage Temperature	-45 C to + 85 C

Sample of LoRaWAN Data Transmission Packet

```
'payload': [{ 'channel': 500,  
              'name': 'Current',  
              'sensor_id': '1d2d4cb0-1f9c-11ec-8292-0f9cb2fb7dd6',  
              'timestamp': 1651086150533,  
              'type': 'current',  
              'unit': 'a',  
              'value': 0},  
            { 'channel': 100,  
              'name': 'RSSI',  
              'sensor_id': '1d2d4cb0-1f9c-11ec-afe7-45325e766bae',  
              'timestamp': 1651086150533,  
              'type': 'rssi',  
              'unit': 'dbm',  
              'value': -76},  
            { 'channel': 101,  
              'name': 'SNR',  
              'sensor_id': '',  
              'timestamp': 1651086150533,  
              'type': 'snr',  
              'unit': 'db',  
              'value': 7.5}],
```