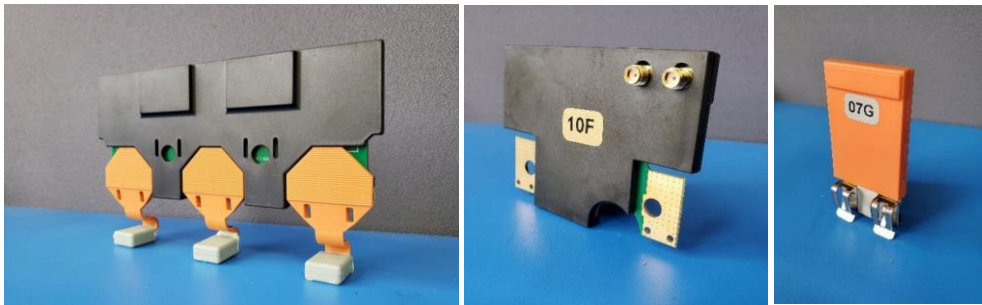


Low Voltage iNFC™ Sensors (CC Series) Installation



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WARRANTY

These products are warranted to be free from functional defects in material and workmanship at time of manufacture and to conform at that time to the specifications set forth in the relevant instruction manuals or data sheets, for such products for a period of one year.

Reference IntelliSAW terms and conditions provided at time of purchase for complete warranty details.

IMPORTANT INFORMATION



This symbol identifies messages in this document related to safety.



DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

Failure to follow the instructions given will result in death or serious injury.



WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.

Failure to follow the instructions given can result in death or serious injury



CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

Failure to follow these instructions can result in personal injury.

NOTICE

NOTICE alerts you to practices unrelated to personal injury, such as those that can cause property damage.

Failure to follow these instructions can result in property damage.

IMPORTANT

IMPORTANT indicates additional information about making effective use of this product.

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1 Overview

The IntelliSAW iNFC™ family of temperature sensors is the ideal method for continuous monitoring of low voltage critical asset hot-spots such as busbars, breaker arms, breaker contacts (Including MCCB), and cables. Each sensor is designed for easy installation in the confined environment of low voltage equipment.



Figure 1: CC-TC single sensors mounting example on Air Circuit Breaker back lugs (right)



Figure 2: CC-E45 sensor module tie-wrap mount example on a MCCB (center) and fuse disconnect (right)

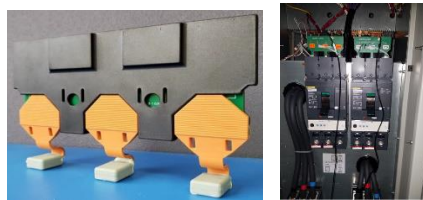


Figure 3: CC-E70 sensor module on MCCB (right)



Figure 4: CC-WC wide-clip mount example

Multiple Mounting formats:

- Individual sensor
 - Single Tall-Clip sensor (CC-TC) and Wide-Clip (CC-WC) mount using mountings clips, high temperature tape, or bolts and nuts.
 - 3- sensor module (E-Frame)
 - (CC-E45, CC-E70) directly connect to 3 phase terminals of Molded Case Circuit Breakers (MCCB)
- Note: High temperature plastic ties wraps are suggested as secondary mounting supports to improve sensor stability to conductor (busbar or cable)

2 Sensor specifications

1. Temp range: -25°C to +125°C continuous, +155 °C intermittent
2. Resolution: $\pm 0.2^\circ\text{C}$
3. Accuracy: $\pm 2^\circ\text{C}$ (at standard 0-80°C range), $\pm 4^\circ\text{C}$ (full range)
4. Number of sensor codes: 12 (non-overlapping bands)
5. Rated Altitude: 5000m
6. Electrical isolation per IEC 61010-1: <600 VAC CAT IV, <1000 VAC CAT III
7. BIL peak voltage: 20kV
8. Exposed materials: stainless steel clips, gold plated SMA connectors,
9. Dimensions:
 - a. Clip-Mount Sensors
 - i. Tall-Clip (CC-TC): 36.5mm W x 85mm L x 12.5mm H
 - ii. Wide-Clip (CC-WC): 81.5mm x 60mm x 12.5mm H
 - b. E-Frame 3-Sensor Module
 - i. 45mm phase-to-phase (CC-E45): 125mm W x 80mm L x 20mm H
 - ii. 70mm phase-to-phase (CC-E70): 170mm W x 80mm L x 20mm H

3 Main Components:

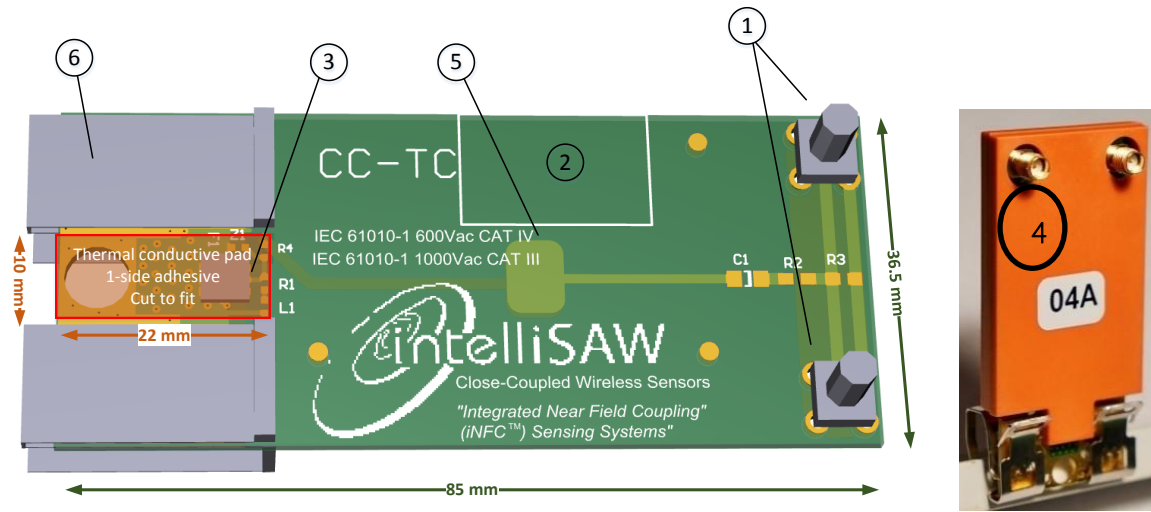
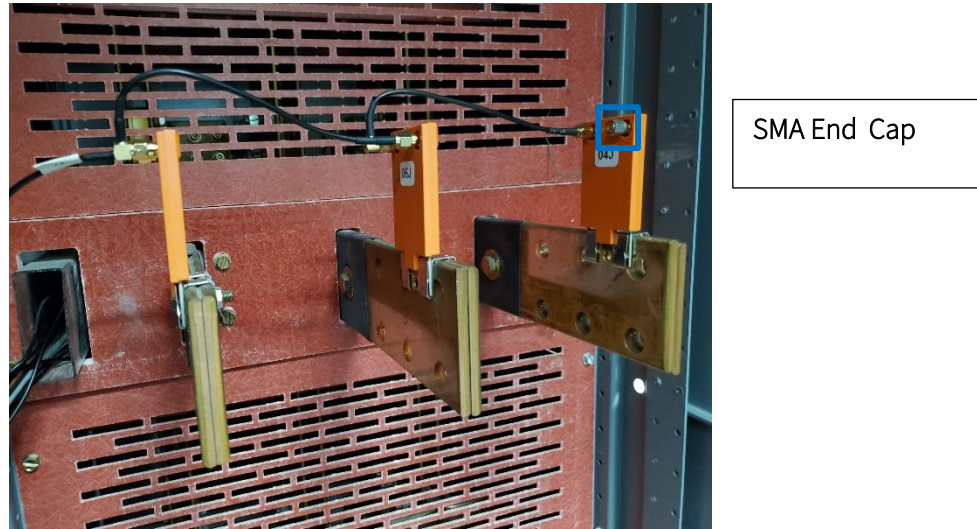


Figure 5: CC-TC sensor main components

1. SMA connectors
2. PCB
3. Sensing element
4. Plastic Housing
5. Internal "Air Interface"
6. Contactor Surface:
 - a. Clips: 1/4", 1/2" (standard), and 3/8"
 - b. Bolt: 1/2" hole for nut, bolt, and washer mount
 - c. Tape: high-temp (>150°C)
 - d. Cable ties: high-temp (150°C) Tefzel to secure to bus

4 System architecture

Each Monitoring Unit, CAM-5 or an IRM Reader, has 4 ports with an SMA connector to monitor up to 12 sensors total, where each sensor uses a different sensor band (no duplicates). Each port may have a daisy-chain of up to 3 sensors with a maximum RF antenna cable of 7m to the first sensor and 25cm extensions two the second and third. The last sensor in the daisy chain should have an SMA plug style 50 Ohm terminal resistor.



SMA End Cap

Figure 6: Three CC-TC sensors daisy-chain connected to SMA port of Monitoring Unit (CAM-5/Reader)

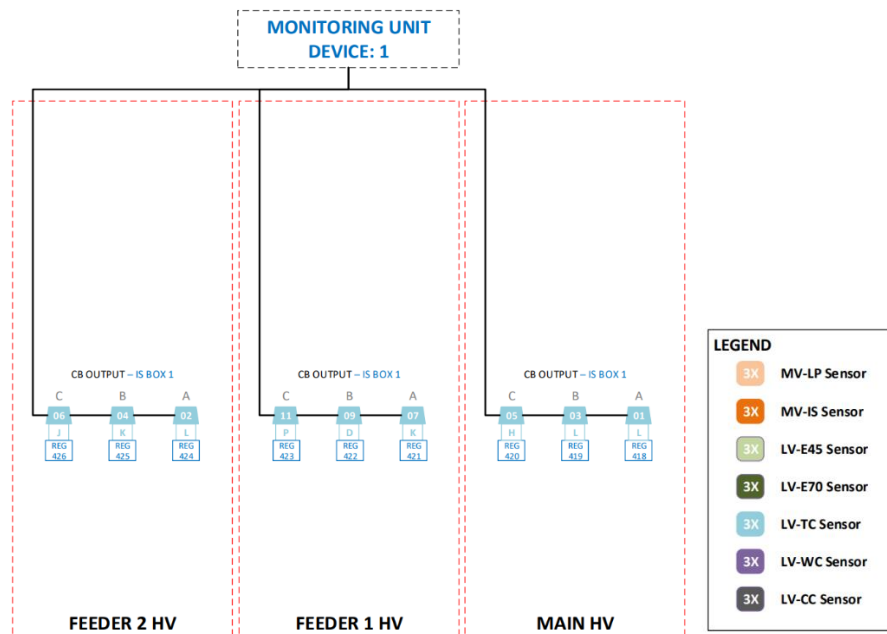


Figure 7: Monitoring Unit (CAM-5/Reader) with 9 unique sensors

5 Sensor Installation

**WARNING**

INSTALLATION ASSUMES THE ASSET IS DE-ENERGIZED AND PROPERLY GROUNDED TO ASSURE A SAFE INSTALLATION. PROPER LOCK-OUT TAG-OUT PROCESSES SHOULD BE FOLLOWED BASED ON CUSTOMER REGULATIONS.

Failure to follow the instructions given can result in death or serious injury

**WARNING**

PROFESSIONAL INSTALLATION REQUIRED.

INSTALLATION AND CONFIGURATION SHOULD BE PERFORMED ONLY BY PERSONNEL WHO ARE TECHNICALLY COMPETENT AND AUTHORIZED TO DO SO. LOCAL REGULATIONS REGARDING ELECTRICAL INSTALLATION AND SAFETY MUST BE OBSERVED.

**WARNING**

ALL BIL LEVELS MUST BE MAINTAINED WHEN INSTALLING THE TEMPERATURE SENSORS. THE SENSOR DIMENSIONS MUST BE TAKEN ACCOUNT WHEN DETERMINING SAFE DISTANCES.

Failure to follow the instructions given can result in death or serious injury

IMPORTANT

IntelliSAW installation best practice recommendations should be followed to ensure system stability and performance. Failure to adhere to IntelliSAW recommendations and/or instructions for system configuration may result in instable system performance and will be the responsibility of the installer.

5.1 RF Cable wiring

RF cables between CAM-5 or Reader and sensors should be planned accordingly to:

- Not exceed 7-meter max cumulative distance
- Long enough cable to avoid tension on the cable between sensors, but short enough to not lag into other bus bar or conflict BIL distances required
- Secure properly cable along its route with ties and sticky backs
- Use SMA End Cap for proper terminating resistance
- Torque all SMA RF connections to 8 lb force

5.2 Mounting

LV sensors are designed to mount on a variety of shapes and surfaces including breaker arms, bus bars, and cable attachment lugs. The different mounting methods are used to create:

- Adequate thermal contact to the monitoring point
- Reliable physical mounting

Attachment materials may include:

- High Temperature Cable ties
 - Tefzel for high temp applications (150°C)
- Steel clips
- Nuts and bolts
- High Temperature Tape
 - 3M 69, high strength glass reinforced electrical tape (180°C)
 - 3M 70, self-fusing silicone splicing tape (also 70HDT is thicker)
 - 3M 130C, linerless self-fusing splicing tape
 - 3M VHB 4646 acrylic foam tape referenced in IS sensor datasheet
- Combinations of the above.

5.2.1 Clip Mounting

CC-TC sensor requires the use of 2 bus mount clips and a thermally conductive self-adhesive pad (size: 10 mm x 22 mm) with a thickness comparable to the clip (1mm). To mount the sensors, first mount the clips to the sensors. The CC-TC sensor has a flush side and node side. Mount the clips, such that when clipping the CC-TC sensor to the bus, the flush side of the sensor is the side that makes contact with the bus.



Figure 8: CC-TC clip insertion at flush side for clip-mount

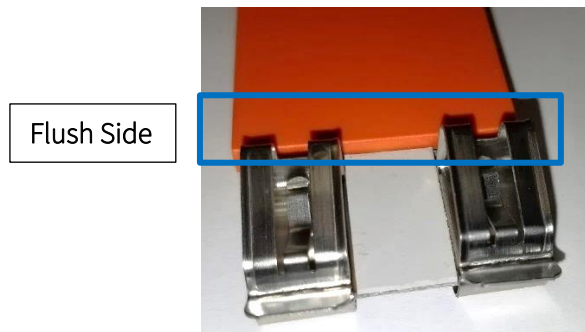


Figure 9: CC-TC Flush side sensor with conductive thermal pad placement for clip-mount

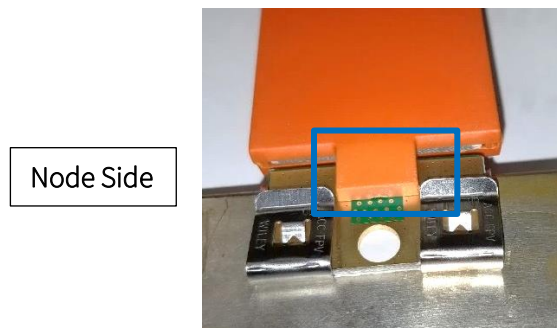


Figure 10: CC-TC Node side sensor with properly mounted clips

To do so, slide the thin side of the mounting clips such that the node separates the mounting clips as shown above in Figure 9. This will leave the large side of the clips, on the flush side of the sensor. Once you have the clips mounted on to the sensor, add thermal conductive adhesive pad as shown on Figure 8.

NOTE: Only the gold-plated flush mount side mounting pad should ever contact live bus!

The combination shown in the figures above is for 1/4" busbar. The tall and narrow TC board will also use cable ties for a more secure mounting.

- Thermal material is 1mm thick and is adhesive on one side. Must be cut to fit as pad sheets are 150mm x 150mm.
- Mounting clips are available for 1/4 inch bus thickness and 1/2 inch bus thickness

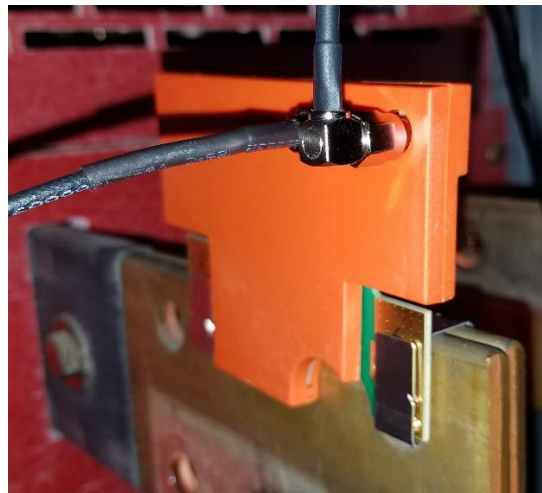


Figure 11: CC-WC sensors clip-mounted to circuit breaker back lug

5.2.2 Bolt mounting:

The figure below shows the standard bolt mounting arrangement for CC-TC and CC-WC sensors. Arrange hardware in the order shown below to properly mount sensors. Making sure to keep flush moutn side of sensors facing the bus being monitored.

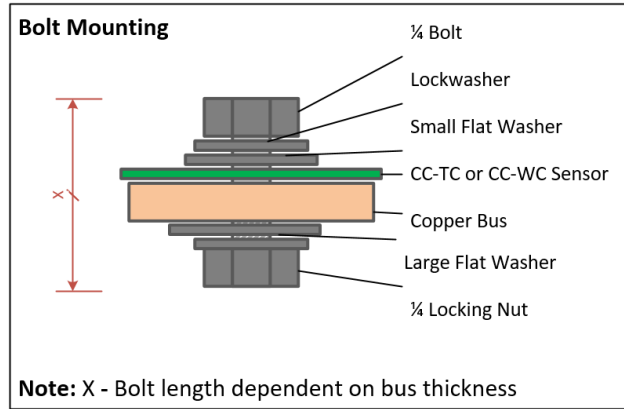


Figure 12: Bolt Mount hardware arrangement

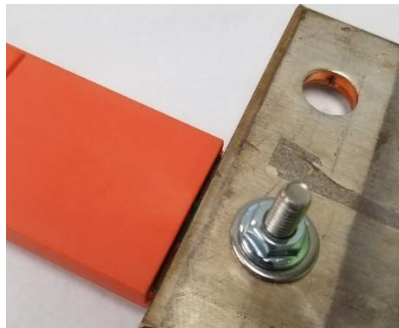


Figure 13: CC-TC sensor with nut and bolt mount



Figure 14: CC-TC sensor with nut and bolt mount cross section view

5.2.3 High-Temperature Plastic Ties to secure sensor fixation

When mounting with high temperature tie wraps, you must:

- Mount sensors securely to the monitoring location
- Make sure thermal contact is made by the sensors to monitoring location

For CC-TC and CC-WC sensor, thermal contact is made by keeping the mounting pad, located on the exposed portions of the sensors, flush with the monitoring location (i.e. bus, cables, breaker).

For E-board sensors, thermal contact must be made by the mounting feet, highlighted below.

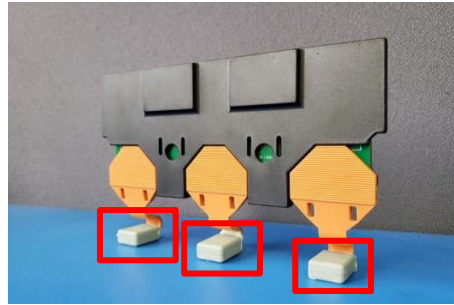


Figure 15: E-board thermal contact points

Using the tie wrap holes available on all LV sensors, securely mount sensors in such a way as to make thermal contact with monitoring locations.

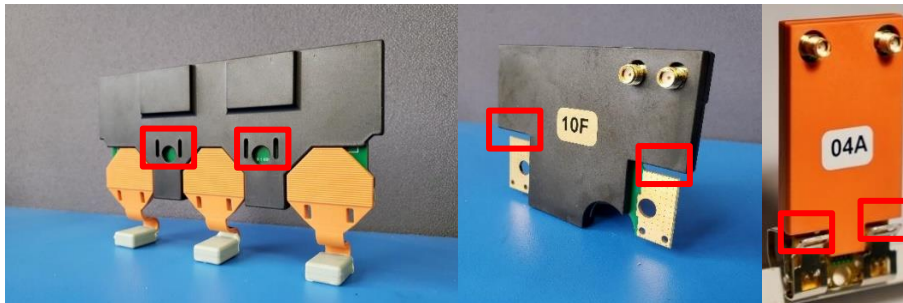


Figure 16: Tie Wrap Holes

Some tie wrap mounting examples shown below:



Figure 17: CC-TC sensor with clip-mount and high-temp plastic ties

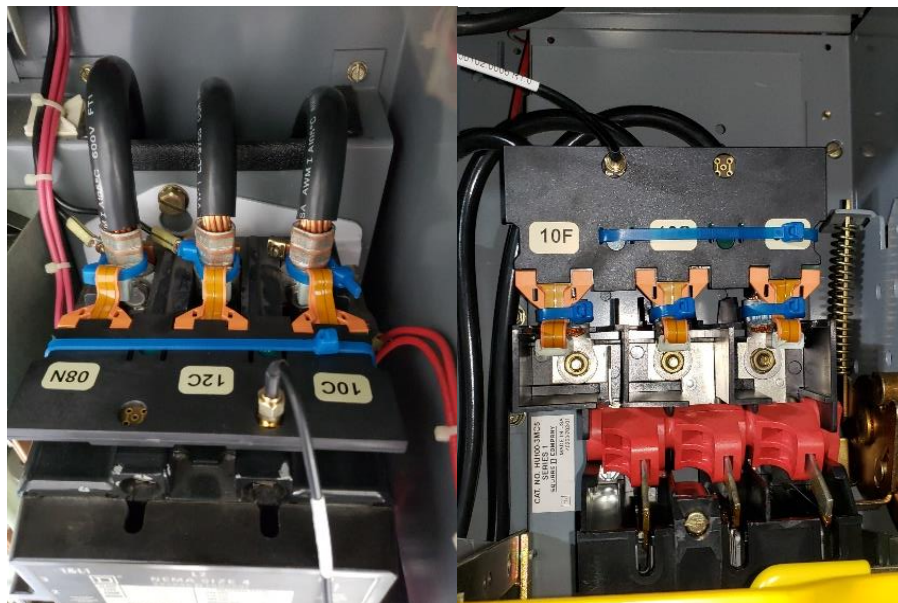


Figure 18: CC-E45 sensor with high-temp plastic ties mounted on contactor (left) and disconnect (right)

Contact

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