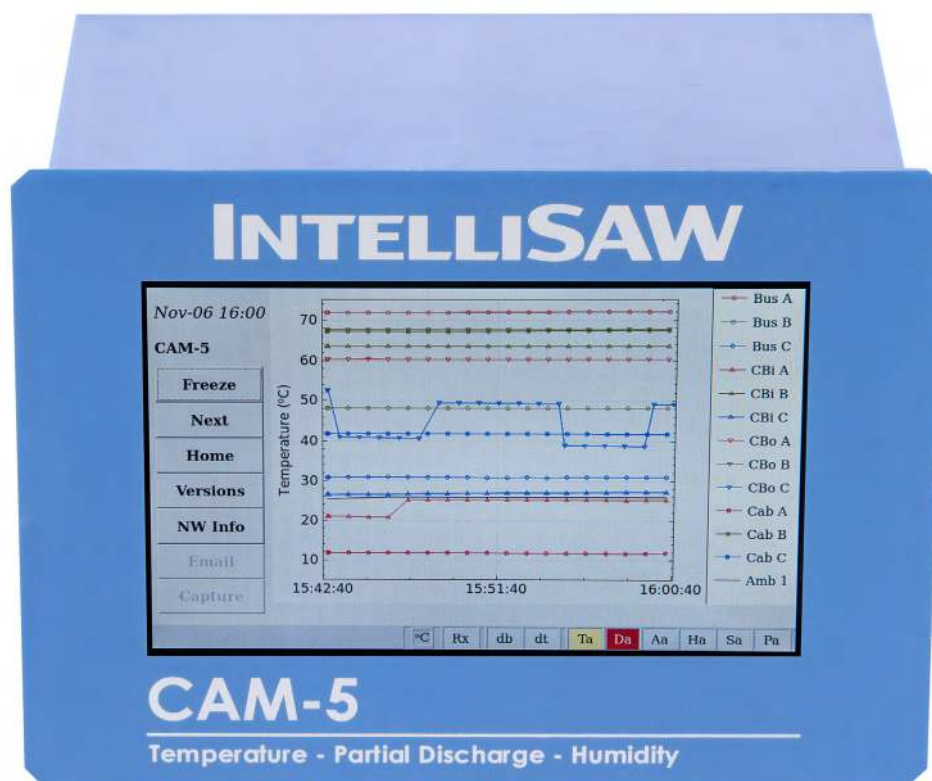


# CAM™-5 HMI

## Critical Asset Management



技术咨询和询价：010-68940148



康高特-TECHiMP CAM-5局部放电监测系统

**ALTANOVA**  
GROUP  
Advanced testing and monitoring solutions

## CAM™-5 HMI Critical Asset Management

The IntelliSAW CAM™-5 unit provides the required measurements (temperature, partial discharge, and humidity) for predictive condition-based monitoring of electrical power critical assets such as switchgear, circuit breakers, and bus ducts. Immediate measurement feedback is available on the local HMI, which extends to support up to 9 connected IntelliSAW Readers. The CAM™-5 unit can easily integrate into substation SCADA systems with industry standard communications.

- 5" touch panel HMI
- Up to 12 SAW (passive) Temperature sensors
- Up to 4 PD air interfaces
- Up to 8 Humidity sensors
- Total up to 10 monitoring units
- 6 configurable alarm outputs
- Industry standard communication interfaces

### Applications

- Switchgear
  - Incomers
  - Feeders
  - Bus Ties
- Bus Ducts
- ISO Phase Bus Ducts
- Ring Main Units
- Transformers
- Generator Circuit Breakers
- Load Tap Changers
- Rectifier Stacks
- Capacitor Banks

### Generation

- Hydroelectric
- Fossil Fuels (Oil, Natural Gas)
- Renewables (Wind, Solar)

### Transmission & Distribution

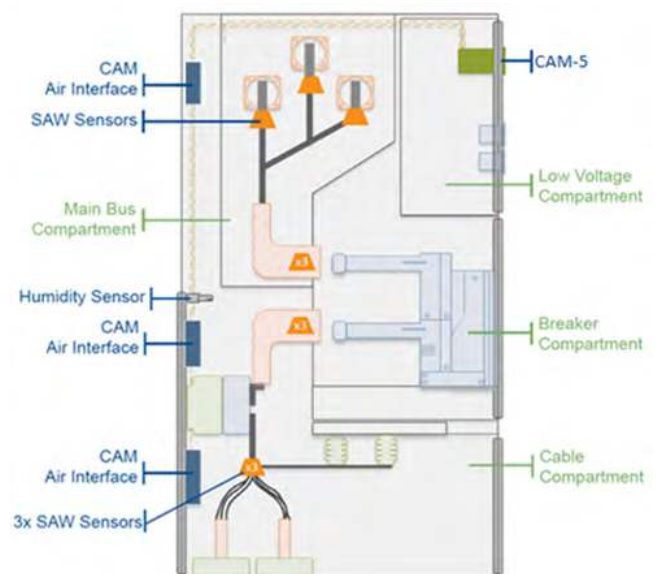
- Step-up Substations
- Step-down Substations
- Collector Substations

### Customers

- Heavy Industrial
- Steel and Aluminum Plants
- Mining
- Petrochemical
- Data Centers

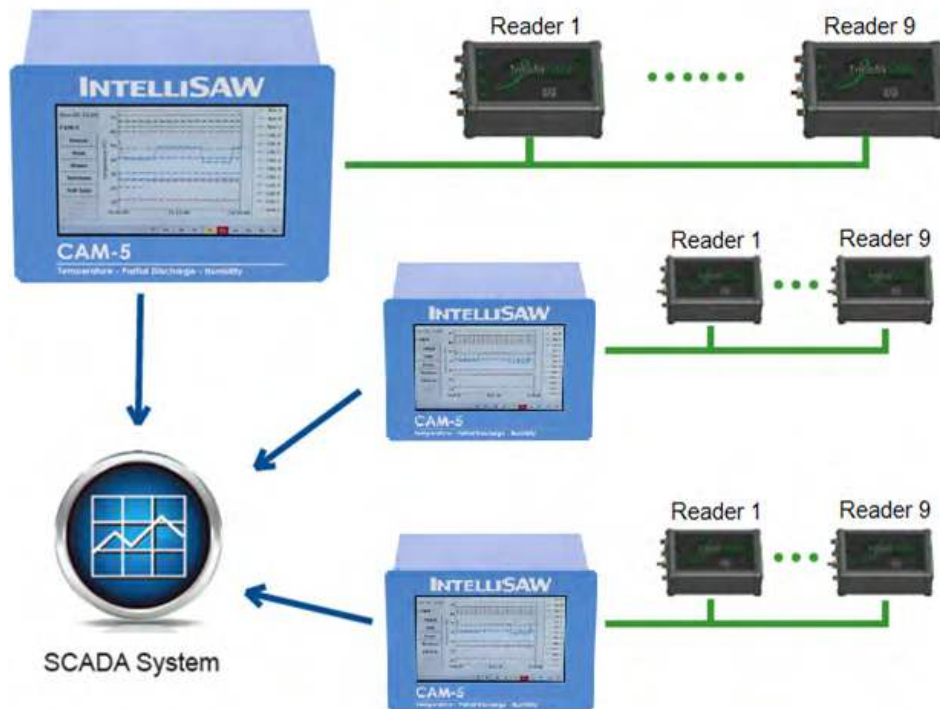
### Typical Installation

A medium voltage switchgear cabinet is a typical application where the CAM™-5 is installed in the low voltage compartment while the sensors and air interfaces are installed in the high potential compartments.

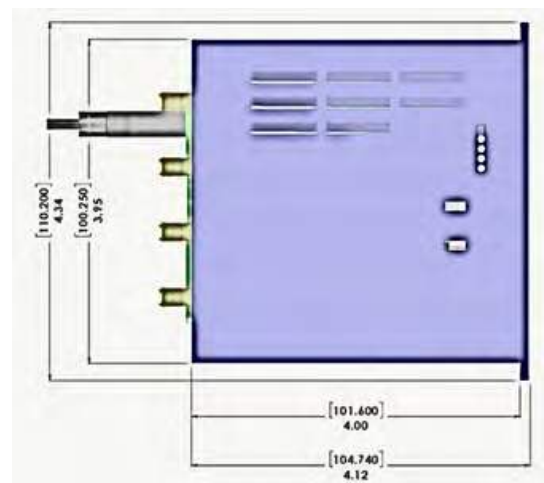
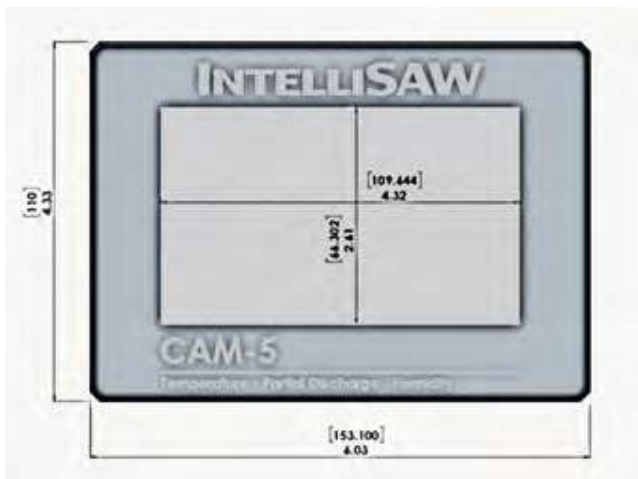


## Multiple Unit Integration

The CAM™-5 supports connectivity for an internal monitoring unit and up to 9 IntelliSAW Readers, allowing each unit (CAM™-5 and Readers) to have unique temperature, partial discharge, and humidity display and alarm configurations. Data from all units can be viewed in real-time, stored to a local USB drive, and transferred to a SCADA system over open industry communication protocols. Multiple CAM™-5 units can be connected to the SCADA system providing a scalable and fully integrated solution.



## Mechanical



## Specifications

### TEMPERATURE

|                                |                                                           |
|--------------------------------|-----------------------------------------------------------|
| Operating Frequency            | 425 to 443 MHz                                            |
| SAW Sensors                    | 0 to 12                                                   |
| Redundancy Model               | Up to 4 air interfaces                                    |
| RF Transmit Power              | Pulsed, -6 to + 10 dBm (compliance mode dependent)        |
| RF Receive Sensitivity         | -86 dBm                                                   |
| RF Receive Frequency Stability | ± 700 Hz                                                  |
| RF Interrogation Distance      | Up to 1.75 m (2.5 m with TPD air interface at full power) |
| RF Interrogation Time          | ≤ 160 mSec                                                |

### PARTIAL DISCHARGE

|                             |                                                                                                                                                                                         |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of Channels          | 4                                                                                                                                                                                       |
| Sensor Type                 | IntelliSAW TPD CAM Air Interfaces                                                                                                                                                       |
| Measurement Method          | Band-pass Ultra-High Frequency (UHF)                                                                                                                                                    |
| Measurement Frequency Bands | <ul style="list-style-type: none"> <li>• 300MHz (270 – 330 MHz)</li> <li>• 600MHz (550 – 650 MHz)</li> <li>• 1200MHz (1050 – 1400 MHz)</li> </ul>                                       |
| Measurement Classification  | <ul style="list-style-type: none"> <li>• Noise Floor</li> <li>• SD – Surface Discharge (Tracking, Treeing, Corona, etc.)</li> <li>• PD – Internal / Partial Discharge</li> </ul>        |
| Measurement Units           | QUHF                                                                                                                                                                                    |
| Measurement Scale           | Nonlinear, capability of normalizing to reference source                                                                                                                                |
| Sensitivity                 | 100pC Qpk demonstrated in 24kV switchgear. Installation dependent                                                                                                                       |
| Response Time               | 200 mSec                                                                                                                                                                                |
| Calculated Data             | <ul style="list-style-type: none"> <li>• Max SD</li> <li>• Max PD</li> </ul> <p><small>Calculated based on Signal to Noise Ratio (SNR)</small></p>                                      |
| Trending Algorithms         | <ul style="list-style-type: none"> <li>• Fast averaging function (α)</li> <li>• Long averaging function (β) – used as baseline</li> <li>• PD acceleration trend function (Φ)</li> </ul> |

### HUMIDITY / AMBIENT TEMPERATURE

|                    |                                        |
|--------------------|----------------------------------------|
| Number of Channels | Up to 8                                |
| Sensor Types       | IntelliSAW IH-10 sensors               |
| Measurement Types  | Relative Humidity, Ambient Temperature |
| Response Time      | 500 mSec                               |

### ALARM OUTPUT CHANNELS

|                                  |                                                 |
|----------------------------------|-------------------------------------------------|
| Contact Type                     | Dry Contact, Form C relays                      |
| Number of Channels               | 6 output pairs (NO/NC pairs with shared common) |
| Rated Voltage                    | 250 V AC/DC                                     |
| Continuous Withstand Capacity    | 10A                                             |
| Make and Carry for 4s            | 15A                                             |
| Breaking Capacity (AC)           | 2500VA                                          |
| Breaking Capacity (DC)           | 24V, 5A / 125V, 0.45A DC                        |
| Contact Material                 | AgNi 90/10                                      |
| Mechanical Operations (40°C)     |                                                 |
| Full Load                        | 30 X 103                                        |
| No Load                          | > 30 X 106                                      |
| Open Contact Dielectric Strength | 1000VRMS; 5000V contacts to coil isolation      |

### COMMUNICATION INTERFACES

#### RS485 (Device)

|                    |                                                                |
|--------------------|----------------------------------------------------------------|
| Port               | 2-Wire (half-duplex) plus common (optional)                    |
| Data Bus Baud Rate | 1200 to 38400 baud (9600 default)                              |
| Data Protocol      | Modbus RTU Master                                              |
| Response Time      | 500 ms (typ.), 1 second polling intervals (typ)                |
| Supported Devices  | IntelliSAW IRM readers (up to 10 devices; baud rate dependent) |

#### Optional RS485 (SCADA)

|                    |                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------|
| Port               | 2-Wire (half-duplex) plus common (optional)                                                      |
| Data Bus Baud Rate | 1200 to 38400 baud (9600 default)                                                                |
| Data Protocols     | <ul style="list-style-type: none"> <li>• Modbus RTU Slave</li> <li>• DNP 3 Outstation</li> </ul> |
| Response Time      | 500 ms                                                                                           |

#### Ethernet (ETH-1 & optional ETH-2)

|                |                                                                                                                                                          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port           | 10/100 BASE-T copper (RJ45 connector)                                                                                                                    |
| Data Protocols | <ul style="list-style-type: none"> <li>• Modbus TCP</li> <li>• DNP3 Outstation*</li> <li>• IEC 61850*</li> <li>• SFTP, SSH</li> <li>• OPC UA*</li> </ul> |
| Isolation      | 5kVpk                                                                                                                                                    |

#### Ethernet (optional ETH-2 FIBER)

|                          |                                                                                                                                                           |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port                     | 100 BASE-FX of IEEE802.3u                                                                                                                                 |
| Wavelength               | 1300 nm                                                                                                                                                   |
| Optical Connector        | LC duplex connector                                                                                                                                       |
| Type                     | Multimode                                                                                                                                                 |
| Fiber Size               | 62.5/125 μm                                                                                                                                               |
| Output (TX) Power        | Min: -19 dBm avg<br>Typical: -15.7 dBm avg<br>Max: -14 dBm avg                                                                                            |
| Receive (RX) Sensitivity | Min: -30 dBm avg<br>Max: -31 dBm avg                                                                                                                      |
| Data Protocols           | <ul style="list-style-type: none"> <li>• Modbus TCP</li> <li>• DNP3 Outstation*</li> <li>• IEC 61850*</li> <li>• wSFTP, SSH</li> <li>• OPC UA*</li> </ul> |

\* License fee applies per device

**Measurement Configuration (CNFG)**

|                              |                                                                          |
|------------------------------|--------------------------------------------------------------------------|
| Port                         | USB 2.0 Mini; Windows COM port with FTDI drivers, 115200 baud.           |
| Data Protocols               | IntelliSAW Native Protocol                                               |
| Protection                   | Type 1 (protected area); light industrial protection, configuration only |
| <b>Extended Memory (USB)</b> |                                                                          |
| Port                         | USB 2.0 Type A host                                                      |
| Use                          | Extended Memory – Required for Trending                                  |
| Data Storage                 | CSV file format extension                                                |
| Protection                   | Type 1 (protected area); light industrial protection, memory only        |
| <b>Micro SD</b>              |                                                                          |
|                              | <b>Factory only</b>                                                      |
|                              | Type 1 (protected area); light industrial protection, configuration only |

**OPERATING POWER**

|                   |                                                       |
|-------------------|-------------------------------------------------------|
| AC input          | 100 to 250V AC<br>50 / 60 Hz                          |
| DC input          | 120 to 250V DC (functional, no FCC, UL, or IEC tests) |
| Power Consumption | 20W                                                   |

**PHYSICAL**

|                                     |                                                                                           |
|-------------------------------------|-------------------------------------------------------------------------------------------|
| HMI                                 | Resistive Touch Panel (5" / 800 x 480 resolution)                                         |
| Dimensions:                         | Body: 143.6 mm W x 100.25 mm H x 101.6 mm D<br>Panel: 153.4 mm W x 110.2 mm H x 3.14 mm D |
| Weight                              | Typical: 0.98 kg (2.16 lbs.)                                                              |
| <small>Will vary with model</small> |                                                                                           |
| Mounting Style                      | Panel Mount, Cutout: 144.9 mm W x 101.65 mm H                                             |

**ENVIRONMENTAL**

|                                |                                              |
|--------------------------------|----------------------------------------------|
| Operating Environment          |                                              |
| Pollution Degree               | 2                                            |
| Overvoltage Category           | Cat III Mains < 300V                         |
| Ingress Protection (IEC 60529) | Panel (IP 62), Body (IP 20)                  |
| Temperature                    | -20°C to +70°C @ 120VAC+55°C @ 250VAC        |
| Indoor Use                     | Max altitude: 5000 m<br>Max humidity: 95% RH |

**Product Certifications****Compliance Testing****COMPLIANCE TESTING**

|                                             |                                                                                                                                                                                     |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Radiated Emissions                          | Radiated Emissions<br>Transmitter<br>Digital Device<br>FCC Part 15.231<br>FCC Part B<br>IEC 61000-6-4                                                                               |
| Conducted Emissions                         | AC Mains Conducted Emissions<br>(FCC Part 15 Subpart B: 09/2017, FCC 15.231: 09/2017, IEC 61000-6-4: 02/2011)                                                                       |
| UL / cUL / IEC 61010-1 Registered Component | Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use<br>Part 1<br>Cat III MAINS < 300V to 5000m altitude (Unless otherwise specified)          |
| IEC 61000-6-5                               | Immunity for Power Station and Substation Environments<br><b>Type 4</b> (All ports, unless otherwise specified)                                                                     |
| IEC 61000-4-2                               | <b>ESD immunity</b><br>Severity Level:<br>• Front (LCD): ±8kV contact & ±15kV air discharge (level 4)<br>• Back (Connectors): ±6kV contact & ±8kV air discharge (level 3)           |
| IEC 61000-4-3                               | <b>Radiated Field Immunity (rEMI)</b><br>Severity Level: 10V/m (class A)<br>30V/m (class B)                                                                                         |
| IEC 61000-4-4                               | <b>Electrical Fast Transient immunity (EFT)</b><br>Severity Level: 4kV                                                                                                              |
| IEC 61000-4-5                               | <b>Surge Immunity</b><br>Severity Level:<br>• 250VAC: ±2kV line-line (A), ±4kV line-Earth<br>• 120VAC: ±2kV line-line (A), ±4kV line-Earth (A)<br>• IO modules: ±4kV line-Earth (A) |
| IEC 61000-4-6                               | <b>CRFI - Immunity to conducted RF disturbances</b><br>Severity Level: 10Vrms (class A)                                                                                             |
| IEC 61000-4-8                               | <b>Power frequency magnetic field immunity</b><br>Relevant modules: 100A/m cont. 1kA/m 1s. (class A)                                                                                |
| IEC 61000-4-11                              | <b>Voltage dips and interrupts</b><br>input current not exceeding 16 A<br>• 70%/1 cycle Pass (class A)<br>• 40%/50 cycles Pass (class A)                                            |
| IEC 61000-4-16                              | <b>Immunity to conducted, common mode 0 to 150 kHz</b><br>• 300 Vrms 1 second (class A)<br>• 30 Vrms Continuous (class A)<br>• Level 3 Sweep (class A)                              |
| IEC 61000-4-18                              | <b>Damped oscillatory wave immunity</b><br>• Slow wave 1MHz 2.5kV (class A)<br>• Fast Wave 10MHz 1.0kV (class A)                                                                    |

## Safety

IntelliSAW systems are installed in close proximity to the energized compartments of medium and high voltage electric power equipment. Qualified personnel need to observe industry standard safety practices that will protect the systems and operators from harm due to induced voltages. Proper antenna installation and system safety grounding is crucial to operator safety and system reliability.

## Homologation

System Integrators and installers are responsible for adhering to all regional regulations concerning the import, installation and operation of IntelliSAW Critical Asset Monitoring systems.

## Model Numbers

Not all model combinations are stocked, please contact sales before ordering.

### CAM5B-TPH-XDCW

| Model (B)                           |                                               |
|-------------------------------------|-----------------------------------------------|
| B                                   | BASE                                          |
| Temperature (T)                     |                                               |
| 0                                   | No Temp                                       |
| T                                   | Temp Monitoring                               |
| Partial Discharge (P)               |                                               |
| 0                                   | No PD                                         |
| P                                   | PD Monitoring                                 |
| Humidity (H)                        |                                               |
| 0                                   | No Humidity                                   |
| H                                   | Humidity Monitoring                           |
| Auxiliary (X)                       |                                               |
| 0                                   | No Auxiliary                                  |
| A                                   | 6 Alarm Relays (NO/NC)                        |
| Device Interface - RS485 Master (D) |                                               |
| 0                                   | No Multiunit interface                        |
| M                                   | IntelliSAW Multiunit Device interface (RS485) |
| Communication Interface (C)         |                                               |
| 0                                   | No Interface                                  |
| E                                   | Ethernet Port (TCP/IP) – (4kV)                |
| F                                   | Fiber (100base FX)                            |
| S                                   | RS485 Slave Device interface (Modbus RTU)     |
| Input Power (W)                     |                                               |
| U                                   | Universal - 100 to 250 VAC; 120 to 250VDC     |

## CAM™-5 Standard Units

| Model Number   | Description                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CAM5B-000-AMFU | <b>CAM5 Base:</b> <ul style="list-style-type: none"> <li>- No Monitoring</li> <li>- Alarm outputs – 6 ch. (NO/NC)</li> <li>- Multiunit Device Interface (RS485)</li> <li>- Communication interface: Fiber Optic (100 base FX)</li> <li>- Standard communication: Modbus TCP</li> <li>- Universal Input Power (100 to 250 VAC; 120 to 250VDC)</li> </ul>                                        |
| CAM5B-TPH-AMSU | <b>CAM5 Base:</b> <ul style="list-style-type: none"> <li>- Monitoring: Temperature, PD, Ambient Temp &amp; Humidity</li> <li>- Alarm outputs – 6 ch. (NO/NC)</li> <li>- Multiunit Device Interface (RS485)</li> <li>- Communication interface: RS485 SCADA</li> <li>- Standard communication: Modbus TCP</li> <li>- Universal Input Power (100 to 250 VAC; 120 to 250VDC)</li> </ul>           |
| CAM5B-TPH-AMEU | <b>CAM5 Base:</b> <ul style="list-style-type: none"> <li>- Monitoring: Temperature, PD, Ambient Temp &amp; Humidity</li> <li>- Alarm outputs – 6 ch. (NO/NC)</li> <li>- Multiunit Device Interface (RS485)</li> <li>- Communication interface: Ethernet</li> <li>- Standard communication: Modbus TCP</li> <li>- Universal Input Power (100 to 250 VAC; 120 to 250VDC)</li> </ul>              |
| CAM5B-TPH-AMFU | <b>CAM5 Base:</b> <ul style="list-style-type: none"> <li>- Monitoring: Temperature, PD, Ambient Temp &amp; Humidity</li> <li>- Alarm outputs – 6 ch. (NO/NC)</li> <li>- Multiunit Device Interface (RS485)</li> <li>- Communication Interface: Fiber Optic (100 base FX)</li> <li>- Standard communication: Modbus</li> <li>- Universal Input Power (100 to 250 VAC; 120 to 250VDC)</li> </ul> |

## CAM™-5 Options\*

| Option          | Description                    |
|-----------------|--------------------------------|
| CAM5-INTP-DNP3  | Interface Protocol - DNP3      |
| CAM5-INTP-61850 | Interface Protocol - IEC 61850 |

\* License fee applies per device

# ALTANOVA

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