Franklin Electric
GRID SOLUTIONS

OPTIMIZER3 CIRCUIT BREAKER MONITOR

The INCON® Optimizer3 Circuit Breaker Monitor delivers advanced automated reporting of all critical circuit breaker diagnostics to ensure uptime and facilitate predictive maintenance. The early small-scale problem detection and automated system performance evaluation capabilities of the Optimizer3 help to improve the efficiency, service life, and reliability of electric utility systems.
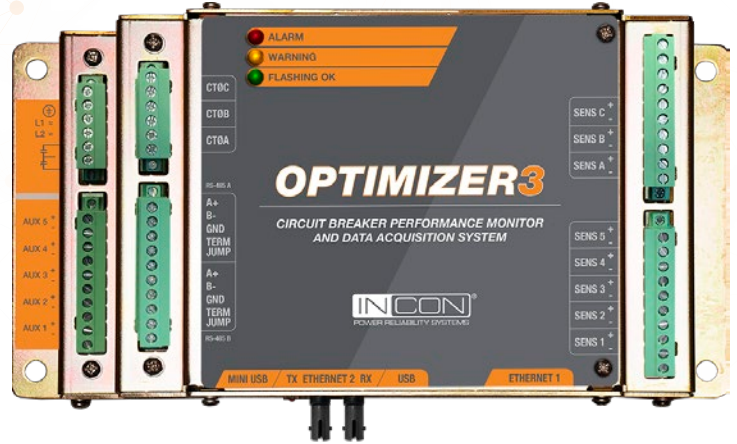
CONDITION-
BASED MAINTENANCE

24/7
MONITORING

EXTEND
BREAKER LIFE

HIGHLIGHTS & TECHNOLOGY

Deploy maintenance with intelligence and only as it's needed, limiting truck rolls, speeding reaction time, and lowering overall maintenance costs — all while reducing on-site exposure.

Targeted maintenance enables utility technicians to repair a small issue before it causes a substantial failure that may require equipment replacement or an entire overhaul of a high-cost asset.

Along with its array of sensors, the Optimizer3 monitors both the mechanical and electrical performance of the circuit breaker to perform trending analysis that predicts the date of future service.

Performance measurements including opening (trip) and closing times, arc duration, clearing time, and open/close travel times and velocities are automatically analyzed to provide a full assessment of the circuit breaker's health.

Provides automated SF6 loss data for regulatory reporting

8 sensor inputs, 20V excitation provided

5 timing inputs (trip/close coils, 52a/52b)

Onboard ambient temperature sensor

Onboard supply voltage monitor

Web server user interface — no special software required

Circuit breaker & gas monitor reports in CSV format

USB port for data downloads

Mini-USB port for local communication

Dual RS-485 full duplex ports for DNP3 communication

Ethernet over copper & fiber optic for DNP3, networking, and firmware upgrades

APPLICATIONS

TRANSMISSION/ DISTRIBUTION

The Optimizer3 is ideal for high-voltage, live or dead-tank, oil, vacuum or gas circuit breakers.

SPECIFICATIONS

Circuit Breaker Monitoring Capabilities	• Breaker State (Open/Closed)
	• Breaker Timing:
	  – Opening & Closing Time (Latch Time)
	  – Opening & Closing Travel Time
	  – Arc Time
	  – Interrupting Time
	• Opening & Closing Travel Velocity
	• Operations Count:
	  – Fault-Interrupt Count
	  – Non-Fault-Interrupt Count
	• Days Since Last Operation
	• Trip & Close Coil Circuit Integrity
	• Charging Motor Current Draw & Run Time
	• Contact Wear & Restrike Detection

Circuit Breaker Monitoring Reporting	• 2-Hour Current Log (5000 Records – FIFO)
	  – Min., Max., & Average Current
	• Event History (5000 Records – FIFO)
	  – Opening Coil (1 or 2)
	  – Timing Measurements
	  – Opening & Closing Velocity
	  – Peak Fault Current
	  – Alarm Status for Each Operation
	  – Contact Wear for Each Operation
	  – Accumulated Contact Wear

SF6 Gas Monitoring Capabilities	• Gas Density • Gas Pressure • Gas Temperature • Leakage Trend & Confidence Level • Forecasts Days until Low Gas Alarm

SF6 Gas Monitoring Reporting	• Daily Average (750 Records – FIFO)
	  – Pressure, density, temperature & SF6 mass
	• 2-Hour History Log (5000 Records – FIFO)
	  – Pressure, density, temperature

Power Supply Input Voltage	110-250 VDC / 90-264 VAC, 50 / 60 Hz
Power Consumption	60VA Maximum
Power Supply Input Fuses	3.15 A Slow-Blow
CT Pickup Coil Input Signal	0 to 5 VAC

Sensor Types Supported	• SF6 Gas Density, Temperature, Pressure • SF6 Gas Dew Point • Generic AC/DC Voltage & Current • Generic (Hydraulic, Air) Pressure • Generic Temperature • Tank Heaters (UPSM-241) • Analog: 4-20mA (Loop-Powered) • Digital: Frequency/Pulse-Width Modulated
Environmental	• Operating Temperature: -40 to 65° C • Storage Temperature: -40 to 65° C • Humidity: 0 to 95% Non-condensing
Communications	• RS-485 Full/Half Duplex • Ethernet • Fiber-optic
Protocols	• DNP3
Relay Output	Dry Contact; 1 ea. Form C
Relay Contact Rating	• N.O.: 5 Amps @ 250 VAC or 3 Amps @ 30 VDC • N.C.: 2 Amps @ 250 VAC or 1 Amp @ 30 VDC
Relay Contact Fuses	3.15 A Slow-Blow
Aux Input Voltage	0 to 48 - 250 VDC
Aux Input Fuses	¼ A Fast-Blow
Aux Input Impedance	540K Ohms
Input Sampling Rate	32 Samples per line cycle
Sensor Signal	• Analog: 4 to 20 mA • Digital: Frequency & Pulse-Width Modulated
Sensor Power	20 VDC @ 25mA Max
Analog Sensor Accuracy	+/-1% of Full-Scale Max, +/-0.5% Typ.
Dimensions	• 280 mm L x 70 mm W x 143 mm H • 11" L x 2¾" W x 5 ⅝" H
Shipping Weight	6 lbs. (2.25Kg)
Immunity and Emissions Certification	CISPR 16-2-1 (Conducted Emissions), CISPR 16-2-3 (Radiated Emissions), IEC61000-4-2 (ESD), IEC61000-4-3 (Radiated RF), IEC61000-4-4 (EFT), IEC61000-4-5 (Surge), IEC61000-4-6 (Conducted RF), IEC 61000-4-11 (Voltage Dips & Interrupts), IEC 61000-4-12 (Damped Osc. Wave, Power Ports), FCC Part 15, Subpart B; ICES-003 (Emissions)

COMPONENTS & DIMENSIONS

11 in
(280 mm)

5 5/8 in
(143 mm)

2 3/4 in
(70 mm)
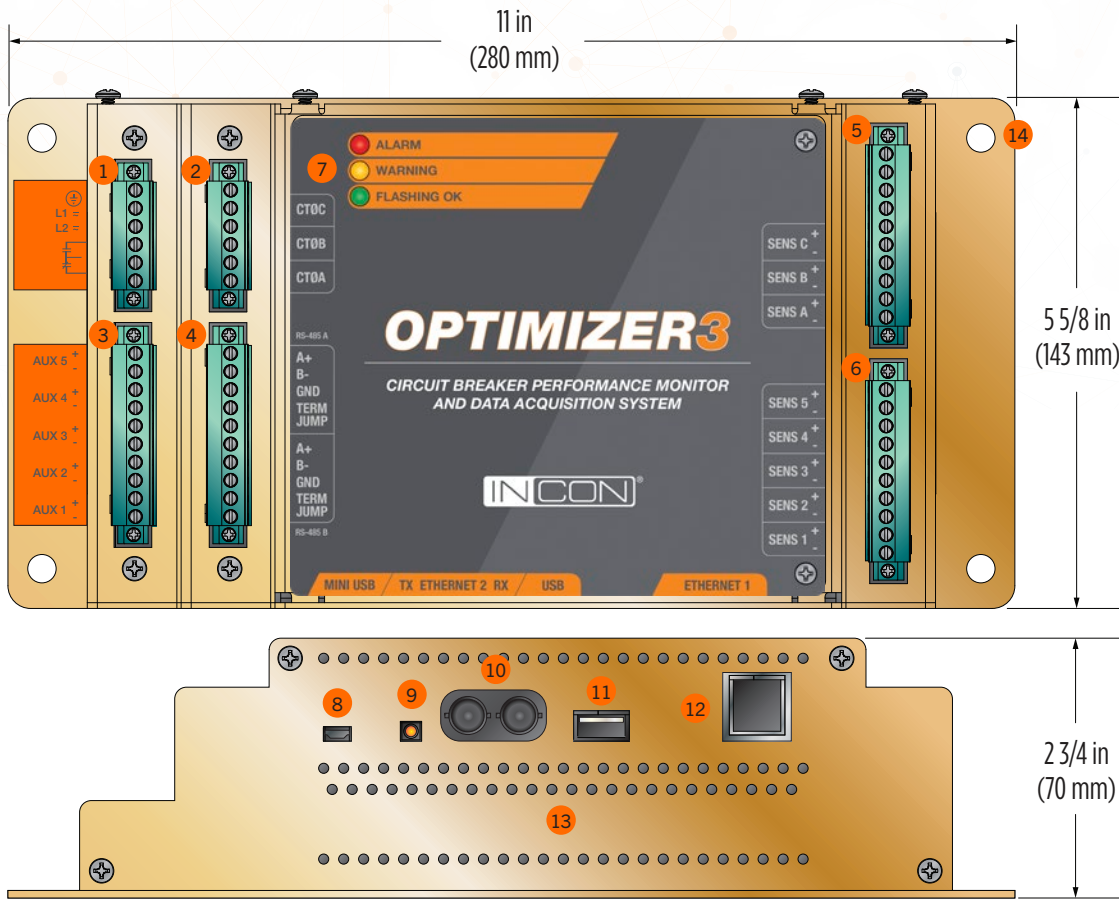
Components

1. Power input & relay output
2. CT inputs
3. Timing inputs
4. RS-485 ports
5. Digital/analog sensor inputs
6. Analog sensor inputs
7. Status LEDs
8. Mini USB port
9. Ambient temperature sensor
10. Fiber-optic port (optional)
11. USB 2.0 port
12. Ethernet port
13. Vents
14. Mounting holes

COMMUNICATION

The Optimizer3 functions as a web server itself, with no additional software required to communicate with it. It is connected to a network via either a fiber optic, Ethernet, or RS-485 connection to facilitate the transfer of data. The web-based interface allows users to securely connect directly to the Optimizer3 data from any web-enabled device without having to host anything on a server.
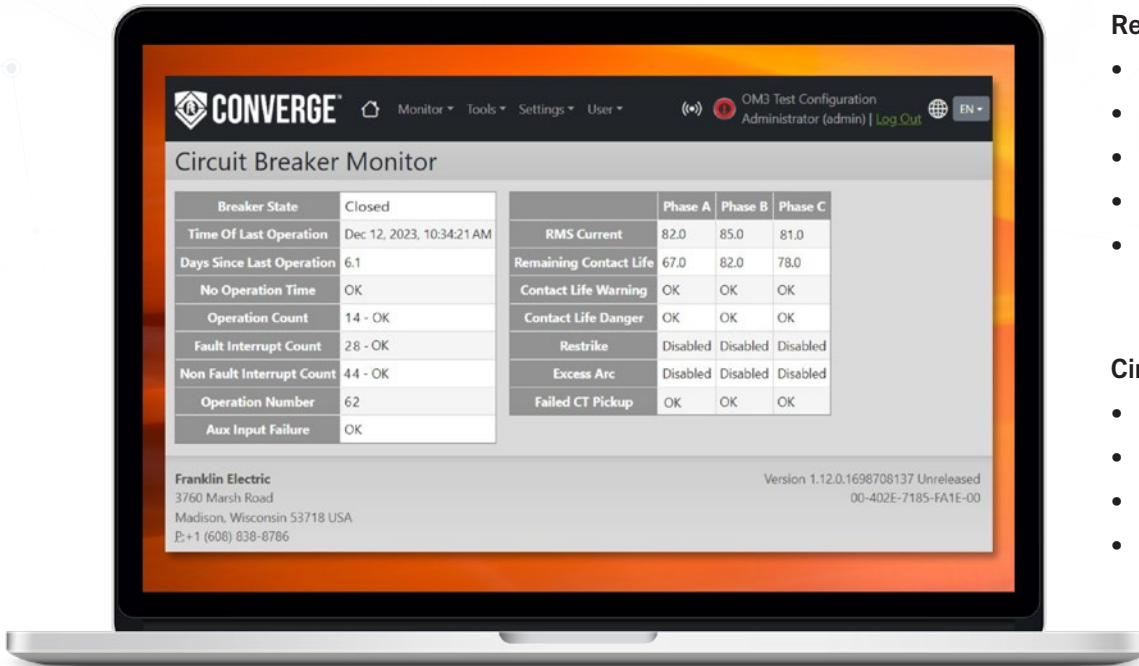
Remote Functions

- Setup
- Programming
- Alarm clearing
- Alarm resetting
- Firmware upgrades

Circuit Breaker Status

- Alarm status
- Date/time of last operation
- Operation number
- Real-time RMS current

Sensor Status

- SF6 gas compliance info
- Ambient temperature
- Supply voltage
- Sensor information

Setup & Configuration

- The completed configuration can be downloaded and saved as an XML file.
- The configuration file can be edited with a word processor and uploaded to other Optimizer 3 units, enabling them to be quickly configured for breakers of the same type.

Data Security

To accommodate the high level of importance power utilities place on security, the Optimizer3 employs a multitude of contemporary security methods to prevent unauthorized access to data including:

- Secure access via HTTPS port only
- Encrypted USB flash drive access
- 10-minute inactivity timeout

- No default passwords
- Generic feedback from failed logins
- Hidden password characters

- Successful third party vulnerability threat testing:
  - Security Posture Level: MATURE

ORDERING INFORMATION

OPTIMIZER3 CIRCUIT BREAKER MONITORS
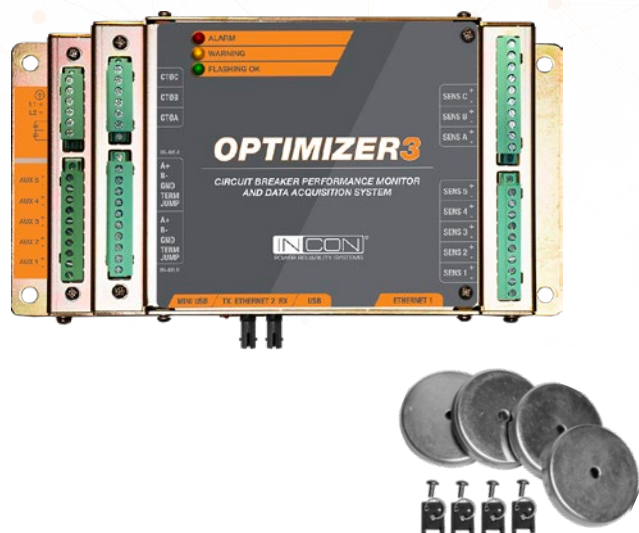
Model	Description
OM3D-F	Optimizer3 circuit breaker monitor, density measurement ready with fiber-optic communication port
OM-MMK	Optimizer3 magnetic mounting kit

Magnetic Mounting Kit

- Non-drill, easy mounting to ferrous metal panels and enclosures
- NEMA cabinet rating is not compromised by having to drill
- All hardware included: (4) clip nuts, (4) Screws, and (4) magnets

CURRENT TRANSFORMER PICKUP COIL

Current transformer pickup coils enable the Optimizer3 to measure real-time current flow in the bushing current transformer secondaries. The split-core design allows the pickup coils to be applied to secondaries of bushing current transformers without disassembling or disconnecting the cabling for fast and convenient installation. They are available in eight current ranges to accommodate all applications.

Model	Description
CT-20	Current transformer pickup coil, 20 Amps
CT-30	Current transformer pickup coil, 30 Amps
CT-50	Current transformer pickup coil, 50 Amps
CT-100	Current transformer pickup coil, 100 Amps
CT-160	Current transformer pickup coil, 160 Amps
CT-250	Current transformer pickup coil, 250 Amps
CT-400	Current transformer pickup coil, 400 Amps
CT-800	Current transformer pickup coil, 800 Amps

Specifications

Current Sensors	Optimizer CT input circuitry
Includes	• 8' wire lead • 30' leads available upon request
Accuracy	Better than 1%

SF6 GAS MONITORING

The Optimizer3 aids in the mandatory compliance reporting required by the EPA, resources boards, and other regulatory agencies by monitoring for SF6 gas leaks and related indicators and automatically reporting any fugitive emissions.

SF6 GAS DENSITY SENSOR

The SF6 gas density sensor measures the true density of SF6 gas using patented quartz oscillator technology. Temperature and density measurements are digitally transmitted over a two-wire, power-line-carrier interface.

Model	Description
DSAP-20	Digital SF6 gas density sensor, temperature & density, 20 ft cable
DSCC	1/2" NPT conduit fitting adapter

Specifications

Density Range	0 to 60 grams per liter (kg/m^3) SF6	Temperature accuracy	• +/- 1˚ C at ambient temp • +/- 3˚ C at -40 to 85˚ C
Temperature Range	-40 to 85˚ C	Output Signal	Analog (4-20mA)
Mounting thread	Male 3/8" BSP	Supply Voltage	10 to 20 Volts DC
Seal	Neoprene O-Ring	Electrical connections	2-wire
Density	• 1.8% of full scale max. • 1.0% of full scale typ.	Operating temperature	-40 to 70˚ C
		Operating pressure	-1 to 20 Bar

SF6 GAS PRESSURE SENSOR

The SF6 gas pressure sensor measures the temperature-compensated pressure of SF6 gas. The temperature and the compensated pressure measurements are digitally transmitted over a two-wire, power-line-carrier interface.

Model	Description
PSDP	Digital SF6 gas pressure sensor, temperature & pressure, 3 meter cable
OM-SC5	5 meter cable with 90 degree connector

Specifications

Pressure Range	0 to 10 Bar Abs at 20˚C compensated	Temperature accuracy	+/- 3˚C
Temperature Range	-40 to 85˚ C	Output Signal	Digital (frequency & pulse-width modulated)
Mounting thread	Male 3/8" BSP	Supply Voltage	15 to 30 Volts DC
Seal	Neoprene O-Ring	Electrical connections	2-wire
Pressure Accuracy	• +/- 1% of full scale range at 85˚C • +/- 2.2% of full scale range at -40 to 85˚C	Operating temperature	-25 to 80˚C
		Operating pressure	0 to 20 Bar absolute

SF6 GAS DEW POINT TEMPERATURE SENSOR

The SF6 gas dew point sensor measures the moisture content of SF6 gas. This solid-state sensor converts the measured dew point temperature to a milliamp analog signal.

Model	Description
OM-DPS	Analog SF6 gas dew point temperature sensor, 3 meter cable
OM-SC5	5 meter cable with 90 degree connector

Specifications

Dew point	-60 to 20°C	Output Signal	4-20 milliamp DC
Mounting thread	Male 3/8" BSP	Supply Voltage	10 to 32 Volts DC
Seal	Neoprene O-Ring	Electrical connections	2-wire
Temperature accuracy	+/- 2° C	Operating temperature	-50 to 60°C

SF6 GAS SENSOR PIPE FITTINGS

SF6 gas sensors can be installed directly into the pipe feeding the circuit breaker's pressure gauge using SF6 gas sensor pipe fittings. All gas connections must be checked for leaks if this method is used.

Model	Description
OM-SAM	SF6 gas sensor pipe fitting for 1 sensor, Mitsubishi circuit breakers only
OM-SAM2	SF6 gas sensor pipe fitting for 2 sensors, Mitsubishi circuit breakers only
OM-SAA1	SF6 gas sensor pipe fitting for first sensor, ABB circuit breakers only
OM-SAA2*	SF6 gas sensor pipe fitting for second sensor, ABB circuit breakers only

*For ABB circuit breakers, if two SF6 gas density sensors are required, an OM-SAA1 must be installed in addition to the OM-SAA2.

VOLTAGE & CURRENT MONITORING

Real-time voltage and current is measured with an array of high-accuracy, loop-powered voltage and current transducers. Applications include motor current, station battery voltage, heater current, and compressor run-time.

AC CURRENT TRANSDUCER

The AC current transducer is a loop-powered, current transducer for measuring 50/60Hz alternating current. This transducer accurately converts measured AC current to a 4-20 milliamp signal, which can be monitored by the Optimizer3.

Model	Description
OM-ACCT	AC current transducer

Specifications

Selectable input current range	0 - 10, 0 - 20, and 0 - 40 amps
Power supply voltage	12 - 30 volts DC
Current accuracy	+/- 2% from 10% to 100% of full scale

AC LOW-CURRENT TRANSDUCER

The AC low-current transducer is a loop-powered current transducer for measuring 50/60Hz alternating current. This transducer accurately converts measured AC current to a 4-20 milliamp signal, which can be monitored by the Optimizer3.

Model	Description
OM-ACLCT	AC low-current transducer

Specifications

Selectable input current range	0 - 2, 0 - 5 amps
Power supply voltage	15 - 40 volts DC
Current accuracy	• +/- 2% of full scale in the low current range • +/- 1% of full scale in the high current range

DC VOLTAGE TRANSDUCER

The DC voltage transducer is a loop-powered voltage transducer which accurately converts measured DC voltage to a 4-20 milliamp signal, which can be monitored by the Optimizer3.

Model	Description
OM-DCVT	DC voltage transducer

Specifications

Voltage range	0 - 150 VDC
Power supply voltage	12 - 32 volts DC
Voltage accuracy	+/- 0.1% of full scale (+/-0.15 volts)

DC CURRENT TRANSDUCER

The DC current transducer is a loop-powered current transducer for measuring direct current. This transducer accurately converts measured direct current to a 4-20 milliamp signal, which can be monitored by the Optimizer3.

Model	Description
OM-DCCT	DC current transducer

Specifications

Selectable current input range	0 - 5, 0 - 10, 0 - 20 & 0 - 40 amps
Power supply voltage	8 - 28 volts DC
Current accuracy	+/- 0.5% of full scale
Output circuit isolation	1,000 volts DC

TEMPERATURE SENSOR

The temperature sensor is a loop-powered sensor which accurately converts the measured temperature to a 4-20 milliamp signal, which can be monitored by the Optimizer3.

Model	Description
OM-TS	Temperature sensor

Specifications

Measured temperature range	-40 to 120˚ C
Powers supply voltage	8 - 30 volts DC
Temperature accuracy	• +/- 1˚ C at 25˚ C • +/- 3˚ C at -40 to 120˚ C
Temperature range	-20 to 80 ° C
Cable Length	10 Feet

TANK HEATER MONITORING

The Optimizer3 monitors the tank heater's supply current using a universal power status monitor. Tank heaters are thermostatically controlled, so they do not run continuously. The power status monitor is wired into the heater supply circuit and enables the current draw of the heaters to be monitored only when they are turned on. If one or more of the heater elements fails, the current draw will be too low and the Optimizer3 will assert a heater alarm.

UNIVERSAL POWER STATUS MONITOR

The universal power status monitor enables the Optimzer3 to monitor the AC current draw of circuit breaker tank heaters, cabinet heaters, or other high-powered electrical loads through its sensor input channels.

Model	Description
UPSM-241	Universal power status monitor with AC current transducer

Universal Power Status Monitor Specifications

Coil voltage	195 - 330 VAC
Fuse rating	3 amps
Dimensions	5.1" (130 mm) L x 5.1" (130 mm) W x 4" (102 mm) H

AC Current Transducer Specifications

Selectable input current range	0 - 10, 0 - 20, and 0 - 40 amps
Power supply voltage	12 - 30 volts DC
Current accuracy	+/- 2% from 10% to 100% of full scale

TRIP CIRCUIT ISOLATION

The OM-TCI is a cost-effective method of complying with the Northeast Power Coordinating Council's regulation requiring physical isolation of critical circuits in medium and high voltage environments. OM-TCI is used to physically isolate dual trip circuits when used in conjunction with the Optimizer Circuit Breaker Monitor (OM3D-F).

Model	Description
OM-TCI	Trip circuit isolator, includes transmitter, receiver, and a fiber optic interconnect
OM-TCI-DIN	Trip circuit isolator DIN Rail mounting kit

Specifications

Dimensions	5.8" (148 mm) L x 2" (53 mm) W x 5.8" (148 mm) H
Power Supply voltage	110-250VDC / 90-264VAC, 50/60Hz