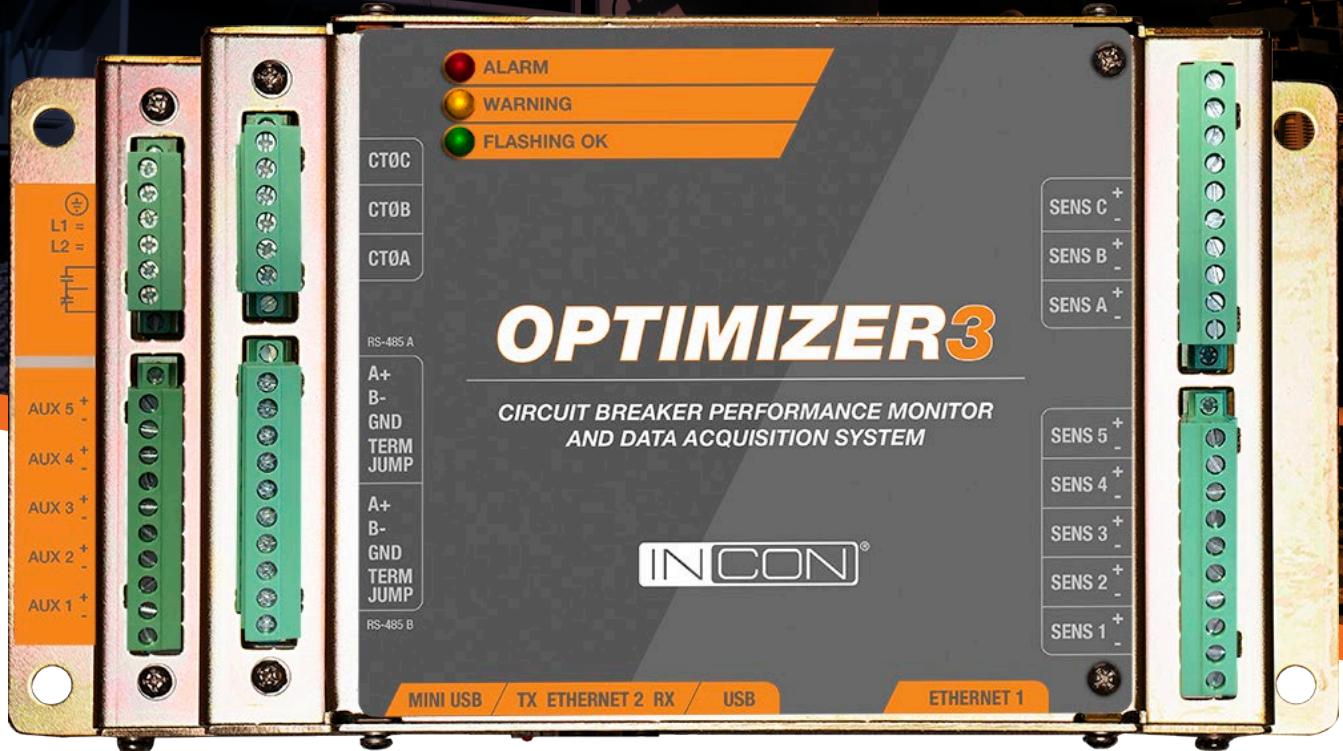




**Franklin Electric**  
GRID SOLUTIONS



**INCON**<sup>®</sup>

**CIRCUIT BREAKER MONITOR**





# 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 improve the efficiency, service life, and reliability of electric utility systems.



## CONDITION BASED MAINTENANCE

Armed with a high degree of circuit breaker performance insight from the Optimizer3, utilities can deploy maintenance with intelligence and only as needed. This limits truck rolls, speeds reaction time, and lowers overall maintenance costs – all while promoting safety with reduced on-site exposure.



## BREAKER TIMING

In the milliseconds it takes for a circuit breaker to trip, the Optimizer3 collects a full battery of timing data. Measurements including opening (trip) time, clearing time, arc duration, and opening/closing travel times and velocities are automatically analyzed to provide a full assessment of the circuit breaker’s health – something off-line testing simply can’t deliver.



## EXTENDED CIRCUIT BREAKER LIFE

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.



## EASY SF6 REPORTING

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.



## 24/7 REAL-TIME MONITORING

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. Reporting is automatically delivered via a number of standard communication paths.



## BREAKER FLEXIBILITY

Often utilities must employ several different types of breakers provided by multiple manufacturers. The highly flexible Optimizer3 integrates seamlessly with any mechanically ganged 12kVAC - 1,000+kVAC circuit breaker. Its modular-based design, flexible programming architecture, and array of various sensor options makes it ideal for use with any live or dead-tank, oil, vacuum, or gas circuit breakers.



- 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

## MONITORING CAPABILITIES

With the Optimizer3 delivering monitoring data on both the mechanical and electrical performance of a circuit breaker, utilities are provided with trending analysis that predicts the date of future service. Get remote access to:

- Breaker state (open/closed)
- Breaker interrupting time
- Days since last operation
- Breaker opening & closing time
- Opening & closing travel velocity
- Trip & close coil circuit integrity
- Breaker opening & closing travel time
- Fault-interrupt count
- Charging motor current draw & run time
- Breaker arc time
- Non-fault-interrupt count
- Contact wear & restrike detection

## REMOTE MONITORING

Monitoring and measuring circuit breaker performance is important, but this data doesn’t become information until it gets to the right people. The Optimizer3’s web-based user interface facilitates remote setup, configuration, and upgrades. All data is seamlessly fed into your existing back-office software via DNP3 network communication protocol.

The Optimizer3 functions as a web server itself, with no additional software required for communication. It is connected to a network via either a fiber optic, Ethernet or RS-485 connection to facilitate the transfer of data.

## NETWORK COMMUNICATION

Performance data is delivered through standard network communication protocols to maintenance, reliability, and environmental protection stakeholders with role-based access and permissions. Data is presented via a user-friendly interface where personnel can identify any potential issues at a glance or be fed into SCADA systems.

## SIMPLIFIED REPORTING

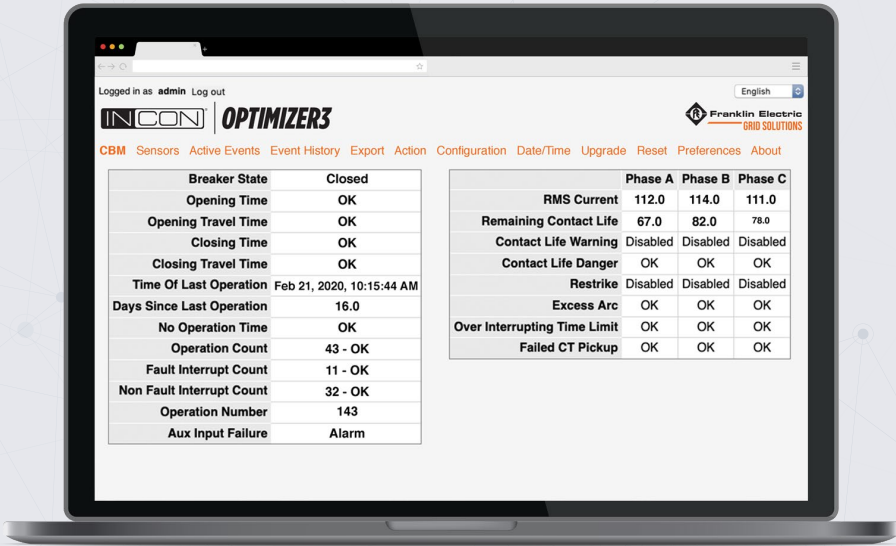
- Circuit breaker performance and SF6 gas compliance reports for regulatory agencies can be easily generated and exported in CSV format including:
- 2-hour current log (5,000 records - FIFO)
  - Event history (5,000 records - FIFO)
  - SF6 daily average (750 Records – FIFO)
  - SF6 2-hour history log (5000 Records – FIFO)

## REMOTE CAPABILITIES

- Remotely execute:
- Setup programming & changes
  - Data & report downloads
  - Alarm clearing & resetting
  - Firmware upgrades

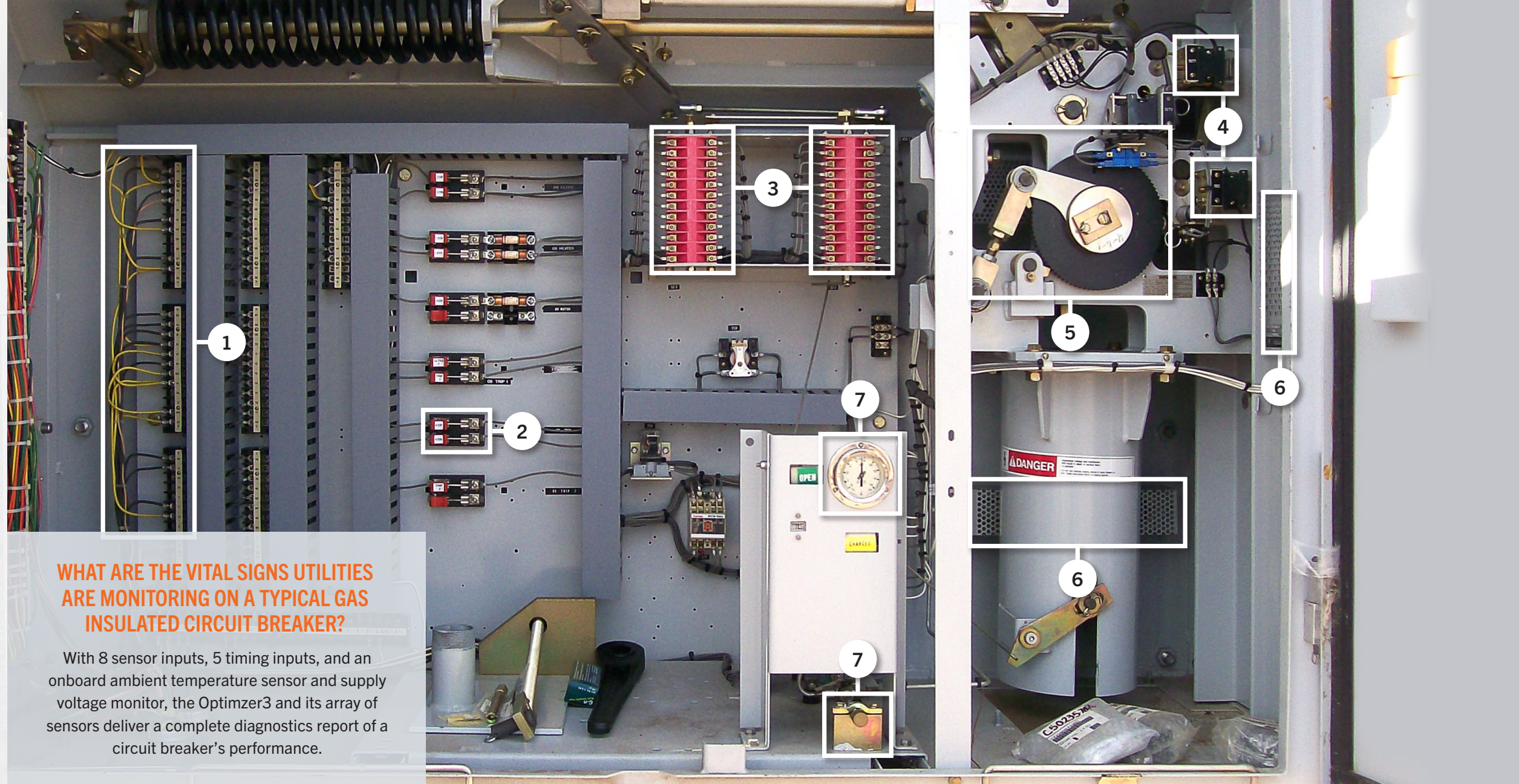
## SCALE DEPLOYMENT

Configurations can be downloaded and saved as an XML file. This configuration file can be edited with a word processor and uploaded to other devices, enabling breakers to be quickly configured for breakers of the same type.





# LOOK INSIDE THE BREAKER CABINET



## WHAT ARE THE VITAL SIGNS UTILITIES ARE MONITORING ON A TYPICAL GAS INSULATED CIRCUIT BREAKER?

With 8 sensor inputs, 5 timing inputs, and an onboard ambient temperature sensor and supply voltage monitor, the Optimzer3 and its array of sensors deliver a complete diagnostics report of a circuit breaker's performance.



### 1. CURRENT TRANSFORMER CURRENT TAPS

**Current Transformer Pickup Coils** enable the Optimzer3 to measure real-time current flow in the bushing current transformer secondaries. The arc duration time is measured via the bushing current transformer's current taps. The main interrupter contact wear is monitored, based upon the fault current and arc duration.



### 2. AC/DC VOLTAGE SUPPLY

The AC or DC voltage supply is continuously monitored by the Optimzer3 via **AC or DC Voltage Transducers**. This provides a health status of the power supply to the breaker's critical mechanisms, including the heaters, air compressors, winding motor, etc. Upper and lower voltage limits can be set to activate an alarm.



### 3. BREAKER TIMING

When the breaker trips, the Optimzer3 measures several important breaker travel timing parameters via a **direct hardwire connection** to the breaker's 52a and 52b switches. Breaker trip coil timing is a key indicator of a breaker's overall state-of-health.



### 4. TRIP & CLOSE COILS

The Optimzer3 measures trip and close latch time via a **direct hardwire connection** to the trip and close coils. The idle condition of the trip and close coils, the time it takes the trip latch to operate, and the time it takes to operate the closing latch are all monitored.



### 5. SPRING WINDING MOTOR

The current draw and run time of the spring winding motor are monitored using **AC or DC Current Transducers**. When the breaker's trip coil pulls the trip latch, an enormous amount of energy stored in the spring is released, opening the breaker in a matter of milliseconds. After the breaker closes, the spring winding motor runs for a short time to compress the spring. The Optimzer3 detects if there is a problem with the motor or the winding mechanism by monitoring the current drawn while running.



### 6. CABINET HEATERS

Continuously-running cabinet heaters keep the inside of the control cabinet warmer than the outside air, preventing moisture from condensing on vital equipment. As these heaters run continuously on AC current, they are monitored using an **AC Current Transducer**. The Optimzer is programmed to issue an alarm if there is a drop in current, indicating the heater may be about to fail.



### 7. SF6 GAS PRESSURE, DENSITY, & DEW POINT

SF6 gas density, temperature, and pressure are monitored using **Density or Pressure Sensors** to ensure its insulating properties are sustained. From these measurements, the Optimzer3 calculates the mass of the gas and can determine if there is a leak while also calculating the leak rate to forecast how long before a low gas alarm will be initiated. The moisture content of SF6 gas can be also monitored using a **Dew Point Sensor**.



# SF6 GAS MONITORING

With its high density, SF6 gas is an excellent dielectric medium insulator for circuit breakers. It allows the interruption of high voltages to be done in a very confined space, and in a very short time. Unfortunately, SF6 is also a very potent greenhouse gas, 23,000 times more damaging than carbon dioxide. The EPA has regulations regarding the release of SF6 into the atmosphere, requiring utilities to report their SF6 use and any losses annually. Monitoring for this gas in circuit breakers is vital to ensuring both circuit breaker performance and EPA compliance.



## SF6 GAS DENSITY SENSOR

Measures both temperature and the true density of SF6 gas.



## SF6 GAS PRESSURE SENSOR

Measures both the temperature and the Temperature-Compensated Pressure of SF6 gas.



## SF6 GAS DEW POINT SENSOR

Measures the moisture content of SF6 gas.



## SF6 GAS SENSOR FILL PORT ADAPTERS

SF6 Gas Sensor Adapters allow the range of sensors to be directly connected to a circuit breaker via the SF6 gas fill port. Integrated check valves and O-Ring seals facilitate a tight connection, mitigating the risk of a gas leak.



## EASY INSTALLATION

Regardless of the breaker type, installing an SF6 sensor is easy. Sensors can be installed directly into the pipe feeding a pressure gauge, into the breaker's SF6 fill port using INCON® Fill Port Adapters, or into a breaker's accessory port.



# » CRITICAL « ASSET MONITORING



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