



## Intelligent metering and control devices

Whether in offices, classrooms, operating rooms, or on the factory floor, reliable electrical power is crucial to your business. PowerLogic CM4000T circuit monitors apply the latest IEEE and IEC power quality standards and provide multiple levels of information on power quality events, helping you pinpoint the source of problems. The circuit monitors are more than just advanced power quality monitors; they are also accurate energy monitors that can measure and record energy usage for all utilities. Flexible I/O for pulse counting, shift energy logging, and energy trending and forecasting are just a few of the features designed to help you manage and reduce total energy costs.



## Typical applications

### Measure and control energy costs

- Verify utility bills; participate in utility rate reduction programs
- Reveal energy waste and inefficiencies to reduce energy consumption
- Verify savings that result from equipment upgrades, energy efficiency programs, or performance contracts
- Perform demand and power factor control to reduce demand charges
- Allocate or sub-bill energy costs to departments, processes, or tenants
- Measure all utilities (water, air, gas, electric, etc.) and optimize energy procurement

### Improve power quality and reliability

- Receive early warning of impending problems that could lead to equipment problems or downtime
- Diagnose and isolate the cause of power quality-related equipment or process problems
- Verify reliable operation of power distribution and mitigation equipment
- Proactively assess power quality trends and conditions to identify vulnerabilities
- Baseline power quality conditions and verify improvements as a result of equipment upgrades

### Optimize equipment use

- Prolong asset life by balancing loading, and measuring and reducing harmonics and other factors that cause heating and shorten equipment life.
- Maximize the use of existing capacity and avoid unnecessary capital purchases by understanding loading and identifying spare capacity on existing equipment



## Features

- Advanced metering for energy, demand, and power values
- Class 0.2s revenue accuracy
- Energy trending and forecasting
- Expandable onboard memory for logging, events, waveforms and more
- Extensive power quality information including sag/swell and transient detection
- Setpoint driven event recording and alarms via e-mail
- Ethernet communications option
- Web-enabled access to information (with Ethernet option)
- Flexible I/O for status monitoring, total utilities monitoring, and control

Features	CM4000T
<b>Metering</b>	
Power, energy, and demand	▶
Accuracy IEC Class	0.2 s
Accuracy ANSI Class	12.2
Anti-aliasing filters	
<b>Power quality</b>	
Sag/swell, harmonics monitoring	▶
Transient detection rate	5MHz
Sampling rate (at 50 Hz)	100,000/512
Sampling rate (at 60 Hz)	83,333/512
Disturbance direction detection	▶
Flicker measurement	▶
Interharmonics	
<b>Logging and Recording</b>	
Memory standard/optional	16 MB/32MB
Min/max, historical, waveform logging	▶
Energy trending and forecasting	▶
Optional GPS time synchronization	▶
<b>Alarming and Control</b>	
High-speed alarms with log	▶
Alarm triggered data logs and control	▶
Alarm setpoint learning	▶
Alarms via e-mail	w/ECC21
Programmable math/logic functions	▶
<b>Communications and I/O</b>	
Onboard Ethernet	w/ECC21
10 customizable web pages	w/ECC21
RS485, RS232 ports	▶
Flexible I/O with 1 ms time stamps	▶

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"The 2007 award recognizes Schneider Electric for its technological advancements and wide product range in the field of power quality (PQ) and energy management solutions. In total, this is the fourth award that Schneider Electric and [recently acquired] Power Measurement have received from Frost & Sullivan in recognition of achievements in this arena."  
Prithvi Raj, Frost & Sullivan research analyst

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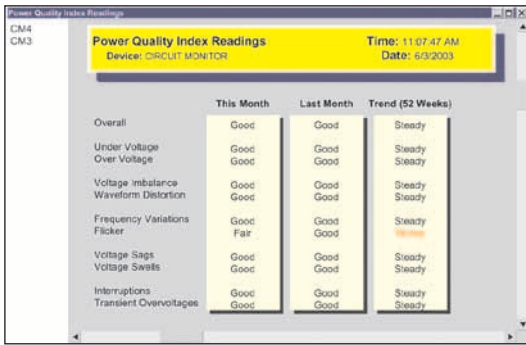
Publication: Schneider Electric  
Production: Schneider Electric PMC  
Printing: Imprimerie du Pont de Claix - made in France

# Gain energy insight and control with PowerLogic™

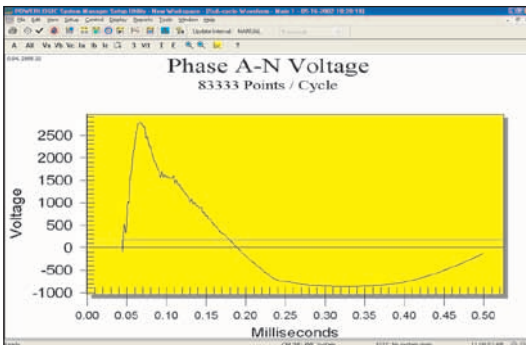
PowerLogic CM4000T  
power and energy meters



# Power quality monitoring and analysis



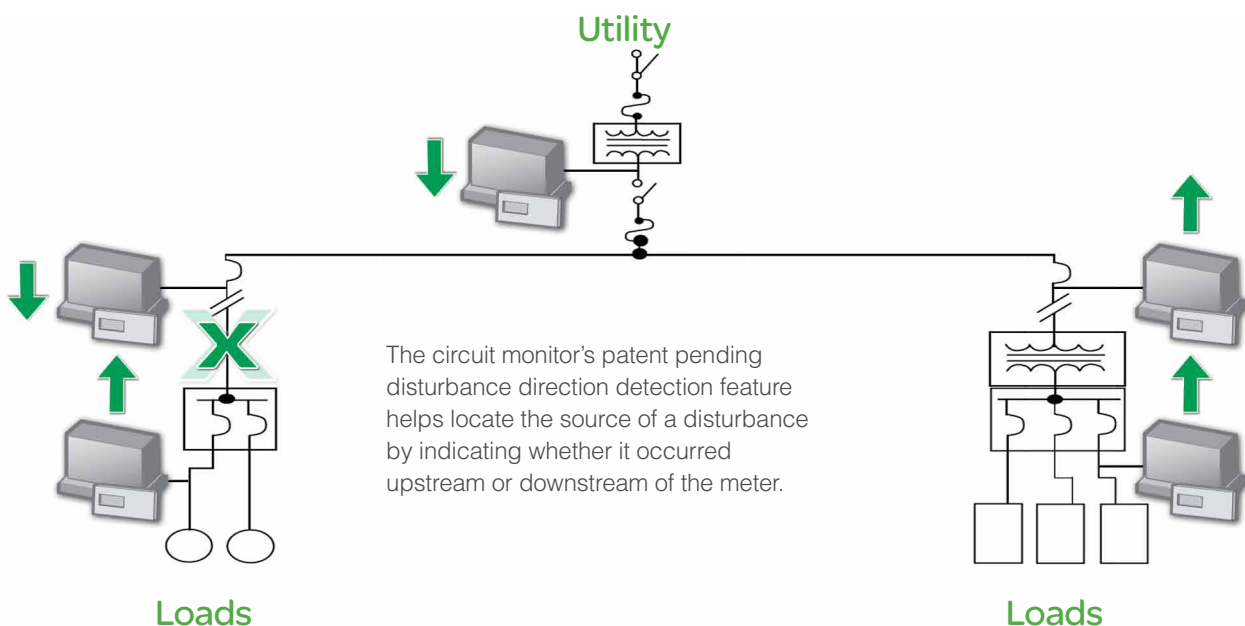
The circuit monitor produces an overall Power Quality Index, and one for each category to indicate system health over time.



At 83,333 samples per cycle (at 60 Hz), The CM4000T captures the true extremes of a transient.

CM4000T circuit monitors provide accurate and fast alarm detection and multiple levels of information on each power quality event to help you pinpoint the source of a problem, including:

- Power quality and alarm summary and trending: provides an indication of system health over time
- Disturbance direction detection: determine the source of a disturbance by indicating whether it originated upstream or downstream of the meter
- High-speed transient detection
  - At 83,333 samples-per-second; captures true deviation extremes
  - Captures impulsive transients shorter than 1 microsecond in duration
  - Calculates transient stress and quantifies by magnitude/duration.
- Harmonic power flows: helps determine the source of harmonic currents
- Flicker measurement and trending: measures, trends voltage flicker according to IEC 61000-4-15 standard
- Waveshape alarm: detects and captures sub-cycle events that do not exceed the thresholds of sag/swell alarms such as capacitor switching transients and sub-cycle transfer switch operations
- 100 ms event recording
  - Records 100 ms average values, for up to 5 minutes, for per-phase amps, volts, kW, kVAR, power factor, freq; triggered by alarm or relay
  - Characterises motor starts, generator startups and shock loads, transformer energizing, cold load pickup, and transfer switch operation
- Cycle-by-cycle event recording: logs cycle-by-cycle values for eight current and voltage channels; triggered by alarm or relay
- EN50160 evaluation: ten power quality categories based on EN50160 standard



The circuit monitor's patent pending disturbance direction detection feature helps locate the source of a disturbance by indicating whether it occurred upstream or downstream of the meter.

# Circuit monitor instrumentation

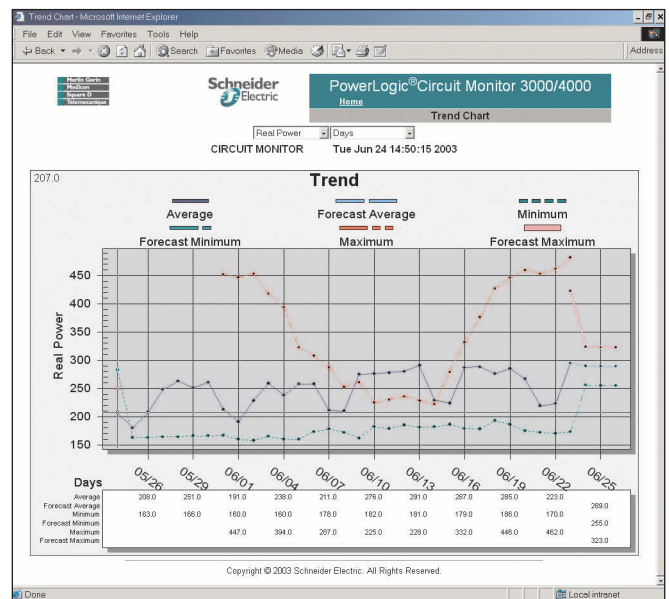
The circuit monitor is a true rms meter capable of exceptionally accurate measurement of highly nonlinear loads. A sophisticated sampling technique enables accurate, true rms measurement through the 255th harmonic. Over 50 metered values plus extensive minimum and maximum data can be viewed on the display or remotely using software.

Real-Time Readings	Energy Readings
• Current (per phase, N, G, 3-Phase)	• Accumulated Energy, Real
• Voltage (L-L, L-N, N-G, 3-Phase)	• Accumulated Energy, Reactive
• Real Power (per phase, 3-Phase)	• Accumulated Energy, Apparent
• Reactive Power (per phase, 3-Phase)	• Bidirectional Readings
• Apparent Power (per phase, 3-Phase)	• Reactive Energy by Quadrant
• Power Factor (per phase, 3-Phase)	• Incremental Energy
• Frequency	• Conditional Energy
• Temperature (internal ambient)	
• THD (current and voltage)	
• K-Factor (per phase)	
Demand Readings	Power Analysis Values
• Demand Current (per phase present, 3-Phase average)	• Crest Factor (per phase)
• Demand Voltage (per phase present, 3-Phase average)	• Displacement Power Factor (per phase, 3-Phase)
• Average Power Factor (3-Phase total)	• Fundamental Voltages (per phase)
• Demand Real Power (per phase present, peak)	• Fundamental Currents (per phase)
• Demand Reactive Power (per phase present, peak)	• Fundamental Real Power (per phase)
• Demand Apparent Power (per phase present, peak)	• Fundamental Reactive Power (per phase)
• Coincident Readings	• Harmonic Power Flow
• Predicted Power Demand	• Unbalance (current and voltage);
	• Phase Rotation
	• Harmonic Magnitudes and Angles (per phase)
	• Sequence Components

## Energy measurement and trending

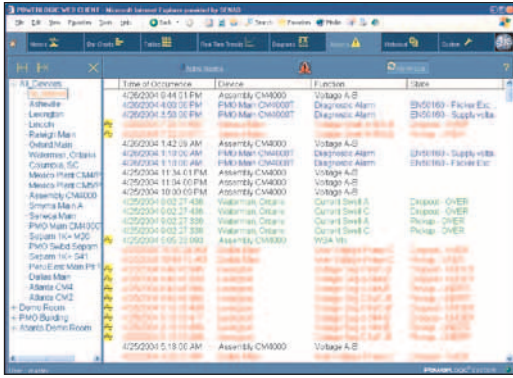
Revenue accurate — Meets IEC 62053-22 and -23, and ANSI C12.20 class 0.2 accuracy standards.

- Accumulates energy in signed (bidirectional) and unsigned (absolute) modes.
- Conditional energy accumulation lets you turn energy accumulation ON or OFF in response to an external command or a digital input state change.
- Energy trends show past performance and forecast usage so you can base purchasing decisions on actual load profiles, negotiate better utility rates, and avoid unnecessary peak demand penalties.
- Shift energy log tracks energy cost per production unit for up to three shifts.



The circuit monitor trends energy and demand info and forecasts usage to help predict future performance. Trend data can be viewed on an ECC web page (above) or in System Manager software.

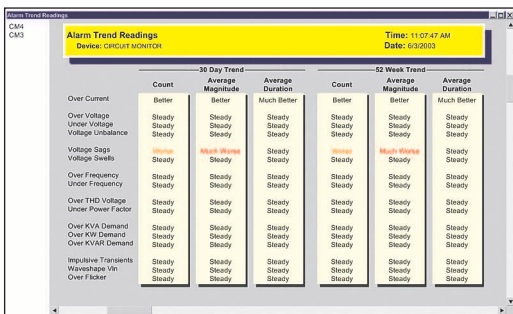




When viewed in System Manager software, the circuit monitor's on-board alarms provide a wealth of information and links to event-triggered waveforms.

### Data and event logging

- 32 MB of standard non-volatile memory (expandable to 64 MB) to capture billing data, events, and waveforms with data gaps.
- Fourteen data log files; user can select the quantities and log interval for each.
- Factory default logs begin logging on power up.
- Additional logs stored in non-volatile memory include energy logs, alarm log, waveform logs, min/max logs, and maintenance log.



The circuit monitor's alarm trend log indicates whether alarm conditions are improving, holding steady, or becoming worse.

### Setpoint driven alarms

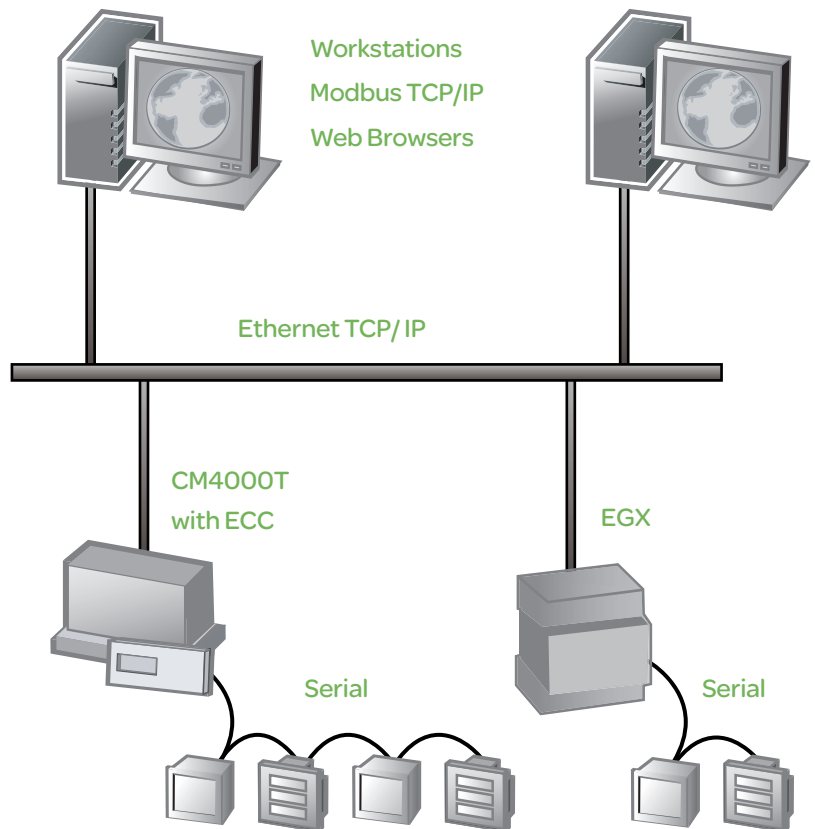
- Over 70 pre-defined alarms
- Factory default alarms are enabled on power up
- Send alarms via e-mail (with Ethernet option)
- Alarms can be configured to turn on a digital output or operate a relay output; trigger a waveform capture, data log entry, 100 ms recording, or cycle-by-cycle recording
- Alarm summary log tracks alarm activity for over 15 alarm categories and trends it over time
- Indicates if an alarm is occurring more or less frequently by placing it in one of five groups: much worse, worse, stable, better, and much better
- Patented alarm setpoint learning feature allows a circuit monitor to learn the normal operating ranges for specified alarm quantities and recommend alarm setpoints
- Create summary alarms by combining alarms using Boolean logic (AND, OR, etc.)

## Wiring connections

- Accepts standard CT and PT inputs
- No PTs needed for systems up to 600 V ac
- Supports 3- and 4-wire Wye, and - 3 and 4-wire Delta system types
- Wiring diagnostics test helps diagnose CT/PT wiring errors

## Communications

- Standard RS-485 and RS-232 Modbus slave ports
- Optional Ethernet card (ECC21) with RS-485 Modbus master port
- 10 Mbaud or 100 Mbaud Ethernet; UTP or fiber
- Gateway functionality; daisy-chain 31 devices to RS-485 port
- Alarm notification via e-mail for up to 15 users
- 10 user-customizable web pages
- Interval energy logging and viewing via web page
- Simultaneous communication on all comm ports.



## Inputs and outputs

- Flexible I/O options provide up to 25 digital and analog I/O points in a single circuit monitor
- Bring in compensated pulse inputs from other utility meters to monitor and reduce total utilities cost
- Incorporate Utility curtailment signals directly to your meter
- Determine the status of loads (on/off) on your system with respect to the peak demand periods
- Shed non-essential loads while maintaining critical processes and lighting requirements



CM4000T circuit monitor with optional I/O card and I/O extender modules

- Two Card slots can each support an I/O Card (IOC44) with:
  - Four digital inputs (1ms time stamps), and three 10-amp relays, 1 solid-state output
- Optional Extender Module (IOX) supports up to 8 digital I/O modules or 4 digital and 4 analog I/O:
  - Digital inputs 120, 240 Vac or 3-32 Vdc
  - Digital outputs 120, 240 Vac or 60, 200 Vdc
  - Analog inputs 0-5 Vdc, 4-20 mA
  - Analog outputs 4-20 mA
  - One standard KYZ output

### Remote display options (CMDLC and CMDVF)

- 4-line display, backlit liquid crystal display (LCD)
- High visibility vacuum fluorescent display (VFD)

## Specifications

### Metering Specifications

#### Current Inputs (each channel)

Current range ..... 0–10 A  
 Nominal current CT sec..... 5, 1 A

#### Voltage Inputs (each channel)

Voltage range ..... 1–600 L-L; 400 L-N  
 Nominal voltage PT sec..... 100, 110, 115, 120 V

**Frequency Range** ..... 40–70 Hz, 350–450 Hz

#### Harmonic Response

Frequency 40-70 Hz ..... Up to 255th harmonic  
 Frequency 350-450 HZ ..... Up to 31st harmonic

**Standard Data Update Rate** ..... 1 second

#### Accuracy

Current (measured) Phase and Neutral:

..... ± (0.04% of reading + 0.025% full scale)  
 (full scale = 10A)

Voltage..... ± (0.04% of reading + 0.025% full scale)  
 (Full scale:= 600 V)

Total power: Real, Reactive, Apparent:

..... 0.075% of reading + 0.025% of full scale

True Power Factor ..... ±0.002 from 0.5 leading to 0.5 lagging

Energy and Demand ..... ANSI C12.20 0.2 Class,  
 IEC 62053-22 and -23 Class 0.2 S

Frequency:

50/60 Hz ..... ±0.01 Hz at 40-70 Hz

400 Hz ..... ±0.10 Hz at 350-450 Hz

Clock/Calendar (at 25 C)..... Less than ±1.5 seconds in 24 hours (1 ms resolution)

### Metering Input Electrical Specifications

#### Current Inputs

Nominal ..... 5.0 A rms

Metering Over-range ..... 10 A maximum

Overcurrent withstand ..... Continuous: 15 A rms

..... 100 A rms 10 seconds in 1 hour

..... 500 A rms 1 second in 1 hour

Input Impedance ..... Less than 0.1 Ohm

Burden ..... Less than 0.15 VA

Analog-to-digital converter..... 14 bit resolution

#### Voltage Inputs

Nominal full scale ..... 347 line-to-neutral; 600 line-to-line

Metering Over-range ..... 50%

Input Impedance ..... greater than 2 MΩ (L-L); 1 MΩ (L-N)

Measurement overvoltage capacity: CAT II up to 2000 m

### Control Power Input Specifications

#### AC Control Power:

Operating Input Range..... 90-305 V ac

Burden, maximum ..... 50 VA

Frequency Range ..... 45-67 Hz, 350-450 Hz

Isolation ..... 2400 V, 1 minute

Ride-through on power loss ..... 0.1 second at 120 V ac

**DC Control Power**

Operating Input Range..... 100-300 V dc  
 Burden, maximum ..... 30 W maximum  
 Isolation ..... 3250 V dc, 1 minute  
 Ride-through on power loss ..... 0.1 second at 120 V dc  
 Overvoltage category..... II per IEC 1010-1, second edition

**Environmental Specifications**

**Operating Temperature**

Meter and optional modules..... -25 to 65° C  
 Remote display..... VFD model is -20 to 70° C  
 ..... LCD model is -20 to +60° C

**Storage Temperature**

Meter and optional modules..... -40 to +85° C (ADD standard)  
 Remote display..... VFD model is -40 to 85° C  
 ..... LCD model is -30 to +80° C  
 Humidity rating ..... 5—95% relative humidity (non-condensing)  
 at 40° C

Pollution degree ..... II per IEC 1010-1  
 Altitude range..... 0 to 2,000 m (6561 ft)

**Physical specifications**

Weight (without modules)..... 1.9 kg (4.2 lb)  
 Dimensions..... see installation bulletin

**Regulatory/Standards Compliance**

**Electromagnetic Interference**

Radiated emissions..... FCC Part 15 Class A/CE Heavy Industrial  
 Conducted emissions..... FCC Part 15 Class A/CE Heavy Industrial  
 Electrostatic discharge (air discharge):  
 ..... IEC 1000-4-2 level 3  
 Immunity to electrical fast transient:  
 ..... IEC 1000-4-4 level 3  
 Immunity to surge..... IEC 1000-4-5 level 4 (up to 6 kv) on voltage  
 inputs  
 Conducted immunity ..... IEC 1000-4-6 Level 3  
 Dielectric withstand ..... UL 508, CSA C22.2-14-M1987, EN 61010  
 Immunity to radiated fields ..... IEC 61000-4-3  
 IEC 6100-4-8 ..... Magnetic fields 30 A/m

**Product Standards**

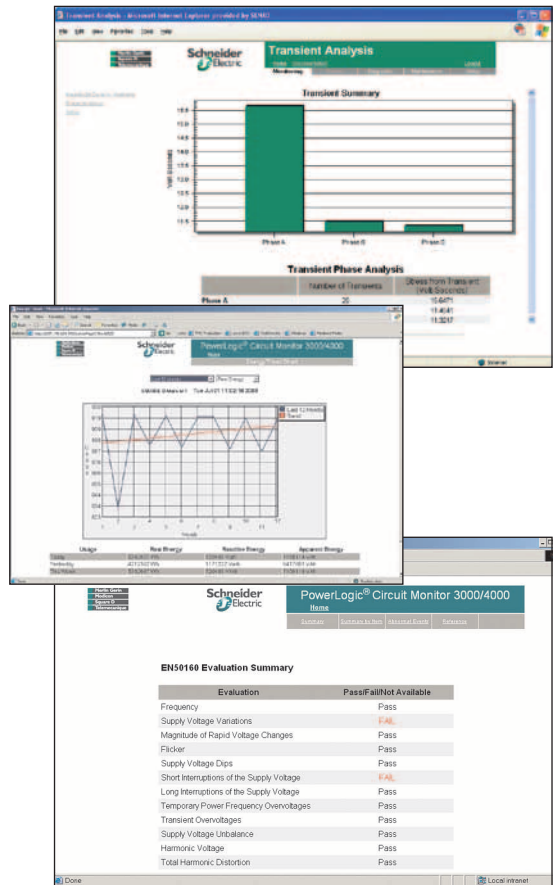
USA ..... UL 508,  
 Canada..... CSA C22.2-2-4-M1987  
 Europe ..... CE per low voltage directive EN 61010  
 Listings ..... CUL and UL Listed 18X5 Ind Cont. Eq.

**KYZ Specifications**

Load voltage..... 240 V ac, 300 V dc maximum  
 Load current..... 100mA maximum at 25° C  
 ON resistance..... 35 Ω maximum  
 Leakage current ..... 0.03 μA (typical)  
 Turn On/Off time ..... 3 ms  
 Input or output isolation..... 3750 V rms

**Customizable web pages**

- Browser access to real-time web pages (with optional ECC card); no special software required.
- Use the default web pages, or replace them with up to 10 custom pages.
- View information from the circuit monitor and from devices connected to the circuit monitor's serial master port.



**Downloadable firmware**

- Download firmware updates over any communications port
- Keep the circuit monitor up-to-date with the latest features