

## 9700 Power Meter



### Application

The 9700 digital power meter offers three-phase power monitoring, ideal for revenue-accurate metering, power quality analysis, and control. You can customize the 9700 for coordinated load shedding, arithmetic calculations, conditional disturbance recording, data logging, programmable logic control, and more.

The 9700 is factory configured to perform all essential power quality monitoring functions. Take advantage of its modular, open-ended design to create unique functions and customize it to virtually any specific application. The 9700 has all the flexibility and power you need to keep on top of your system, now and in the future.

### 9700 Power Meter Features

Below is a list of features offered by the 9700:

- RS-232 or RS-485 ports provide communication to WinPM using SEABus and Modbus RTU protocols.
- Optional multiport Xpress™ Card offers two additional RS-485 ports, one Ethernet port, and expansion memory, plus support for DNP 3.0 protocol and GPS synchronization.
- Combined advanced power quality analysis and data event recording with revenue-class metering.
- Monitor the reliability of key interchange points, perform transformer loss compensation calculations, incorporate several different billing choices, and add value to product and services.
- Flexible communications capabilities allows remote monitoring of transformer, recloser or switch status, and automatically controls capacitor banks, and other equipment.
- Effectively control energy costs in various facilities and meter all utilities.
- Provides the tools necessary to monitor, record, analyze, and respond to power quality problems.
- True RMS measurements of voltage, current, power, and energy. Readings are updated once per cycle and once per second.
- Perform minimum and maximum logging on any parameter over any time interval, such as daily or monthly.
- Unique display provides data, waveforms, trend graphs, and event logs.

## 9700 Power Meter

### Front Panel Display

The separate display module features an easy-to-read, backlit LCD with adjustable contrast.

- 24 customizable screens (you choose the parameters and the format)
- Password protection

### Power Quality

The 9700 provides the tools necessary to monitor, record, analyze, and respond to power quality problems. These tools are critical for pinpointing the source of problems, avoiding service interruption, protecting equipment, and system planning.

#### *Waveform Recording*

Simultaneously captures high resolution waveforms at 128 samples per cycle on all voltage and current channels.

#### *Harmonics*

Individual and Total Harmonic Distortion on voltage and current inputs, up to the 63rd harmonic. Power Harmonics and K-factor for current input also included.

#### *Symmetrical Components*

Zero, negative, and positive sequences.

#### *Sag/Swell Monitoring*

Monitor and record disturbances caused by poor power quality. Graphically display results in CBEMA curve.

#### *Transient Capture*

- Detect and record sub-cycle transients as short as 130 $\mu$ s @60Hz (156 $\mu$ s @50Hz)
- Analyze transients by plotting them on a voltage tolerance curve, for example CBEMA

### Connections and LEDs

#### *Installation*

- 4-wire Wye, 3-wire Wye, 3-wire Delta, and Single Phase systems
- 3 voltage and 3 current inputs
- Fourth current input for neutral or ground current monitoring
- All inputs pass ANSI/IEEE C37.90-1989 surge withstand and fast transient tests

#### *Voltage and Current Inputs*

- No PTs require Wye (star) system up to 347/600 VAC
- For higher voltage system, VTs may be used
- 5 AMP nominal full scale current inputs

### LEDs

There are four LEDs on the back of the base unit:

- 2 LEDs indicate communication activity (transmit and receive)
- 2 LEDs for CPU and DSP status indication

### Communications

The 9700 is available with the following communications features:

- Standard RS-232 or RS-485 port
- Supports SEAbus and Modbus protocols
- Up to five simultaneous ports with Xpress™ Card
- Alarm Dialing Capability
- GPS Time Synchronization Support with Xpress™ Card

#### *Xpress™ Card Options*

The 9700 Xpress™ Card option adds up to four more ports with:

- RS-485 port, supports Seabus, Modbus RTU, DNP 3.0 protocols
- Ethernet (10 Base-T or 10 Base FL), supports SEAbus or Modbus RTU over TCP/IP
- Ethernet to RS-485 Gateways to connect other RS-485 devices to LAN without additional hardware

### Mounting

- 9700 base is surface-mounted and display is flush-mounted
- Separate display can be mounted up to 61 m (200 ft) from the 9700. A single cutout is required with 10 cm (4 in) of clearance behind the panel
- I/O expansion boards can be surface-mounted up to three feet (1 m) from the 9700; no cutouts are required

### Math Logic

The 9700 offers sophisticated logic and mathematical functions to perform on-board calculations on any measured value. For example, you can calculate true quantities from pulse inputs, such as BTU calculations, transformer loss compensation values, or even voltage and current unbalance using symmetrical components. Temperature measurements can be calculated with built-in thermocouple and RTD linearization operators.

## 9700 Power Meter

### Mathematical Functions

Define up to 64 custom formulas using the following operators:

- Arithmetic (+, -, x, ÷)
- Comparison (<, >, =, ≤, ≥, ≠)
- Logical (AND, OR, NOT, TRUE, FALSE, IF)
- Trigonometric (SIN, COS, TAN, ASIN, ACOS, ATAN)
- Math (PI, SQRT, POWER, SUM, SUMSQ, AVG, RMS, LOG10, LN, MAX, MIN)
- Linearization (thermocouple type J, K, R, T, RTD)

### Programmable Logic and Setpoint Control

You can use logical operators and setpoints to implement advanced backup protection for equipment and to define basic control algorithms for capacitor control, power factor control, and demand control.

The 9700 offers 24 regular and 10 relative setpoints that can be configured for one-second and one-cycle operation. Each setpoint can be triggered by the over or under condition you specify.

Use setpoints to trigger:

- Data logging
- Waveform recording with control over pre and post event capture
- Relays
- Clearing and reset functions

### Extensive I/O

The 42 maximum analog and digital I/O capabilities of the 9700 allow you to monitor a wide range of conditions, such as flow rates, device cycles (RPM), fuel levels, oil pressures, and transformer temperatures. You can output energy pulses to an RTU or perform equipment control operations.

### Onboard I/O

The 9700 provides eight standard digital/counter inputs and optional 4 analog inputs. It can expand to 42 analog and digital I/O points with external I/O boards.

### Expandable I/O Options

The 9700 supports up to two external I/O boards. Each board supports up to 15 I/O devices.

### Technical Specifications

Baud Rates	up to 19,200 bps
Power Supply	85 to 240 VAC or 110 to 300 VDC (Optional: 20 to 60 VDC)
Operating Temperature	-20°C to 50°C (-4°F to 122°F) with display: 0°C to 50°C (32°F to 122°F)
Storage Temperature	-30°C to 70°C (-22°F to 158°F) with display: -20°C to 70°C (-4°F to 158°F)
Humidity	5% to 95%, non-condensing
Dimensions (Base Unit)	10.2" h x 6.2" w x 6.2" d (259 mm x 157 mm x 156 mm)
Dimensions (display)	6.5" h x 7.6" w x 1.2" d (150 mm x 192 mm x 29mm)
Weight	15 lbs (7 kg)

### Metered Values Specifications

The following table displays the high accuracy and true RMS measurements for the 9700 meter.

Parameter	Phase Type	Accuracy
Voltage I-to-n Phase	a, b, c, avg	0.1%
Voltage I-to-I	a, b, c, avg	0.5%
Current	a, b, c, avg, neut.	0.1%
kW	a, b, c, total	0.4%
kVAR	a, b, c, total	0.55%
kVA	a, b, c, total	0.2%
kWh, kVARh	Import, export, absolute, net	Class 10*
kVA	Import	0.2%
Power Factor	a, b, c, total	0.55%
Frequency		0.01%

\* Industry Canada revenue metering approval number AE-0688. ANSI c12.16-1991: Contact Siemens.

