DESCRIPTIVE BULLETIN

RGM8000

Power and energy meter for utility and critical industrial substations

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Introduction

Revenue metering
- Certified ANSI C12.20 0.2 accuracy class energy measurement
- High precision frequency measurements — 0.001 Hz
- Cybersecured encrypted configuration
- Perpetual time of use, transformer/line loss and CT/PT compensation, test mode and energy presets
- Rugged design for harsh environments

Power quality metering
- PQ analyzer with limits, THD monitoring and harmonics recording
- 512 samples/cycle waveform recording of up to 319 events
- Millisecond time stamp for accurate CBEMA and SEMI F47 data analysis
- Extensive data logging, including six historical logs of 64+ parameters each
- Email power quality events on alarm

Communication and I/O
- Real-time SCADA communication capability: Modbus RTU, Modbus TCP/IP, level 2 DNP3 and IEC 61850
- Two optional, separately addressable Ethernet ports with email on alarm, data push, web servers, IP whitelisting
- Standard RS485 and front USB ports
- MV90 support

Applications
- Utility substation metering
- Distribution automation
- Alternative energy
- Industrial control panels
- Power quality studies
- Distributed energy
- Microgrid

Primary revenue metering

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01 CT/PT compensation

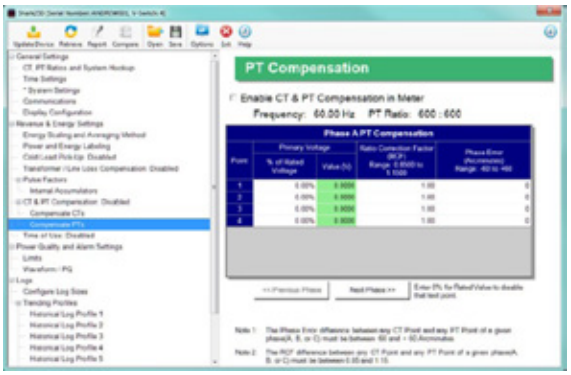
Energy metrology — 0.1% class certified
The RGM8000 is an ANSI C12.20 0.1 accuracy class meter that provides highly stable, precise and reliable measurements that maintain accuracy over time. It has comprehensive revenue energy measurement capability, including:

- Energy test pulse
- Test mode and energy presets
- Pulse accumulators and totalizers
- Up to eight pulse outputs and eight pulse inputs

Terms of use
Set up multiple tariffs that meet any contractual obligation with the RGM8000 meter's time of use (TOU). Features include:

- Perpetual TOU calendar — set up once and use indefinitely
- Up to four customizable seasons
- Up to 12 months per year — set independently from seasons
- Flexible billing periods/rates/holidays/schedules
- Up to 16 configurable datasets with 38 channels of data, including all energy channels, pulse data, readings per quadrant and phase, and pulse aggregators
- Cumulative and continuous cumulative demand

CT/PT compensation
Utility and other critical metering applications have stringent accuracy requirements. Because of this, users need to compensate for inaccuracies of instrument transformers in their system. The RGM8000 meter has built-in features that provide CT/PT compensation through amplitude and phase angle adjustment. CT reversal setting is also supported.



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01

Transformer/line loss compensation
The RGM8000 meter's transformer and line loss compensation (TLC) supports correct energy measurements when the meter is placed on the secondary side of the transformer. Compensate energy readings for TLC to perform accurate customer usage billing.

Cybersecurity for NERC CIP compliance

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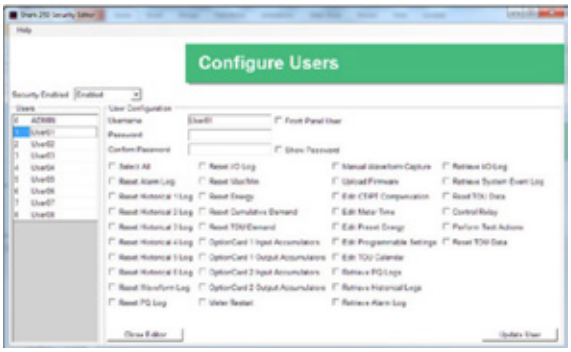
02 Cybersecurity configuration screen

Data security is necessary for all critical metering applications today. The RGM8000 meter provides a multi-level cybersecure encrypted configuration to protect metering data. Meet your security initiatives with the following features:

- Nine user IDs — One administrator, eight users
- Highly secure encrypted passwords — Up to 30 characters to ensure password strength
- Password fail timeouts to eliminate brute force attacks
- Role-based authorization

The meter's cybersecured configuration is easily set up using CommunicatorPQA® software.



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02

Robust communication for critical applications

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03 Communications connections

The RGM8000 meter is equipped with an advanced communication architecture suited to the specific needs of utilities and other critical metering applications. The meter provides up to four serial and Ethernet communication ports. Protocols include Modbus ASCII/RTU/TCP, level 2 DNP3 and IEC 61850. Standard ports are:

- USB front port for data downloads and configuration
- RS485 port

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03

Field expandable I/O and optional communication capabilities

The RGM8000 meter's flexible communication architecture integrates directly into most existing software systems. In addition to its standard communication, the meter offers extensive communication and I/O expandability though its two universal option card slots. The meter accepts and auto-detects new I/O cards even after installation. Up to two cards of any type can be used per meter.

INP100S: 100BaseT Ethernet capability
- Embedded web server
- NTP time server for high accuracy network time synchronization
- 12 simultaneous Modbus TCP/IP connections
- Five simultaneous level 2 DNP3 over Ethernet connections
- Supports alarm emails and periodic email notification of meter status/reading data
- Offers enhanced security to protect from unauthorized programming of meter settings
- Supports data push to cloud servers

INP300S: IEC 61850 protocol Ethernet
- Simultaneous communication of IEC 61850 and Modbus TCP/IP
- Five simultaneous MMS clients
- Multiple logical nodes, including LLN0, LPHD, MMXU, MHAI, MMTR and others
- Polled operation mode (queried reports)
- Buffered and unbuffered reports
- Configurable .CID file
- Offers enhanced security to protect from unauthorized programming of meter settings

RS1S: Serial communication card
- Programmable RS485 or RS232 port
- Up to two ports per meter in addition to the standard RS485 port
- Supports Modbus ASCII/RTU and level 2 DNP3*

* One session at a time of level 2 DNP3 serial communication is available per meter.

1mAOS: Four-channel bi-directional 0–1 mA outputs
- Assignable to any parameter
- 0.1% of full scale
- Max. load impedance 10 kΩ
- Range ± 0–1 mA
- Designed for RTUs and generating stations

20mAOS: Four-channel 4–20 mA outputs
- Assignable to any parameter
- 0.1% of full scale
- 850 Ω at 24 V DC
- Loop powered using up to 24 V DC
- Ideal for any process control application

PO1S: Four pulse outputs/four status inputs
- Programmable to any energy parameter and pulse value
- Form A normally open contacts
- Also used for end of interval pulse
- 120 mA continuous load current
- Status inputs — dry contact status detection only
- Provides KYZ outputs and pulse inputs counting

RO1S: Two relay outputs / two status inputs
- 250 V AC / 30 V DC–0.25 A relays, form C
- Trigger on user-set alarms
- Set delays and reset delays

FOVPS or FOSTS: Fiber optic card
- ABB's exclusive fiber optic daisy chain switchable built-in logic mimics RS485 half-duplex bus. This lets you daisy chain meters for lower installation costs; full duplex is also assignable. This feature requires the software to ignore echoes.
- ST-terminated option (-FOSTS)
- Versatile link-terminated option (-FOVPS)
- Modbus and DNP3 protocols available

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04 Field-expandable options

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04

Rugged design

The RGM8000 meter is designed for harsh environments. It features:

- Compliance with IEC 610186-1/2/3 (high reliability)
- Improved surge withstand capability
- Intrinsically safe current connections

Data trending and analysis

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05 Historical log screen shot
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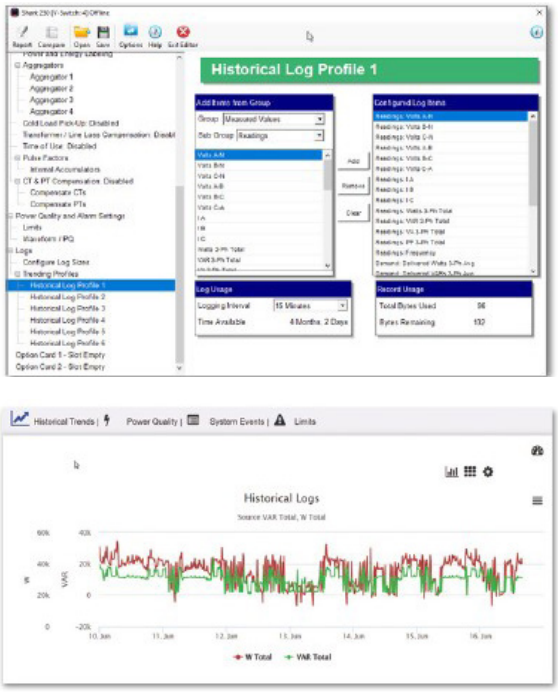
06 Limits programming and alarm/limits polling screen

The RGM8000 meter has up to 128 MB memory for data logging, used for historical trends, limit alarms, I/O changes and sequence of events. The meter's advanced storage means the unit can be programmed to store historical and waveform data for many years. Its real-time clock allows for timestamping of all the data in the meter when log events are created. The clock is accurate to 3.5 ppm and is very stable over temperature.

Historical logs
- Up to six assignable historical logs
- 64+ parameters per log
- Independently programmed trending profiles



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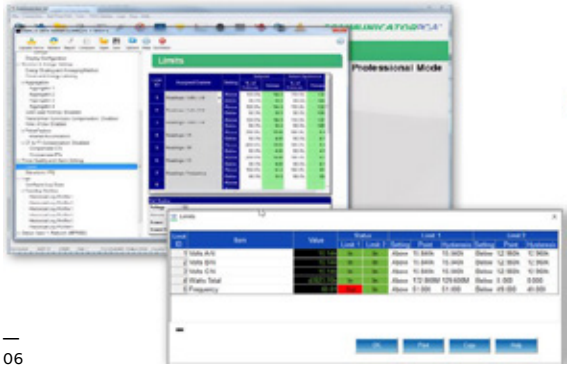
I/O change log
- Provides a timestamped log of any relay output
- Provides a timestamped log of input status changes
- 2048 events available

System events log
For this anti-tampering log, the meter records and logs the following actions with a timestamp:
- Demand resets
- System startup
- Energy resets
- Log resets
- Critical data repairs
- Programmable settings changes
- Password requests/sealing switch changes

Limit/alarm log
- Provides magnitude and duration of an event
- Includes timestamps and alarm value
- 2048 events available

Alarm limits and control capability
- Set limits on any measured parameter
- Up to 16 limits
- Voltage unbalance
- Current unbalance
- Based on % of full scale settings
- Trigger relay outputs or emails for control



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Power quality measurement and analysis

Optional waveform recorder

The RGM8000 meter records up to 512 samples per cycle for a voltage sag or swell or a current fault event. The unit provides the pre- and post-event recording capability shown in the table below. Waveform records are programmable to the desired sampling rate. V4 provides up to 128 MB of storage.

The meter's advanced DSP design allows power quality triggers to be based on a one-cycle updated RMS. Hundreds of events can be stored until the memory is full. The meter stores waveform data in a first-in/first-out circular buffer to ensure data is always recording.

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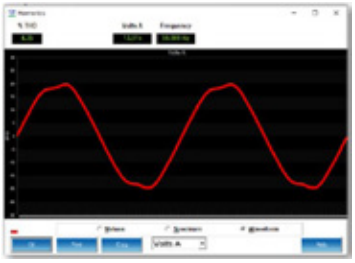
Table 1:

	Samples per cycle	Pre-event cycles	Post-event cycles	Max. waveforms per event	Number of stored events
	32	16	48	128	85
	64	8	24	64	85
V3	128	4	12	32	170
	256	2	6	16	170
V4	512	1	3	8	170

Note: Sampling rate based on 60 Hz systems. For 50 Hz systems, multiply by 1.2.

Waveform scope

The unit uniquely offers a waveform scope that lets you view the real-time waveform for voltage and current. The waveform scope lets you use the meter as a basic oscilloscope throughout a power system.



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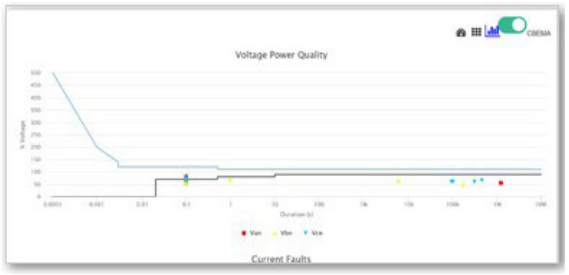
Independent CBEMA or SEMI F47 log plotting

The meter stores an independent CBEMA or SEMI F47 log for magnitude and duration of voltage events. This lets you quickly view total surges, total sags and duration without retrieving waveform data. Timestamps are stored with millisecond accuracy.



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Harmonic recording to the 40th order

The RGM8000 meter provides advanced harmonic analysis to the 40th order for each voltage and current channel in real time. Using the stored waveforms, harmonic analysis is available to the 255th order.

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Specifications

Voltage inputs:
- Absolute range: (20–576) volts line to neutral, (0–721) volts line to line
- Universal voltage input
- Input withstand capability — meets IEEE C37.90.1 (surge withstand capability)
- Programmable voltage range to any PT ratio
- Supports: 3-element wye, 2.5-element WYE, 2-element delta, 4-wire delta systems
- Burden: Input impedance 8 MΩ; burden 0.0018 W at 120 volts
- Input wire gauge: #12–26 AWG/0.129–3.31 mm^2

Current inputs:
- Class 10: (0.005 to 10) A, 5 A nominal CT secondary
- Class 2: (0.001 to 2) A, 1 A nominal CT secondary
- Fault current withstand (at 23 °C), 100 A for 10 seconds, 300 A for 3 seconds, 500 A for 1 second
- Continuous current withstand: 20 A for screw-terminated or pass-through connections
- Programmable current to any CT ratio
- Burden 0.005 VA per phase max. at 11 A
- Pickup current: 0.1% of nominal (Class 10: 5 mA; Class 2: 1 mA)
- Pass-through wire diameter: 0.177"/ 4.5 mm

Isolation:
- All inputs and outputs are galvanically isolated to 2500 volts

Environmental rating:
- Storage: (-20 to +70) °C
- Operating: (-20 to +70) °C
- Humidity: to 95% RH non-condensing
- Faceplate rating: NEMA 1
- Mounting gasket included
- Protection: IP30 — meter front/back, optional DIN rail mounting, optional plug-in I/O modules

Sensing method:
- True RMS
- Sampling at over 400 samples/cycle on all channels of measured readings simultaneously
- Harmonics resolution to 40th order
- Waveform up to 512 samples/cycle

Update rate:
- Watts, VAR and VA — every 6 cycles
- All other parameters — one second

Power supply:
- Option D2: Universal, (90–265) V AC @ 50/60 Hz or (100–370) V DC/10 VA max.
- Option D: (18–60) V DC (24–48 V DC systems)/ 7 W max.

Standard communication:
- 2 Com ports (back and faceplate)
  - RS485 port through backplate
  - USB through faceplate (uses USB mini-B connector)
- Com port baud rate: (1200–57600) bps
- Com port address: 1–247 (RS485); 1–65519 (DNP)
- 8-bit, parity setting: odd, even, none
- Modbus RTU, ASCII or level 2 DNP3 protocols

KYZ pulse:
- Type form C contact
- On resistance: 35 Ω max
- Peak voltage: 350 V DC
- Continuous load current: 120 mA
- Peak load current: 350 mA (10 ms)
- Off-state leakage current @ 350 V DC: 1 µA

Dimensions and shipping:
- Weight: 2 lbs/0.91 kg
- Basic unit: H4.85" x W4.85" x L4.25"
- Shipping container dimensions: 6" cube

Meter accuracy:
- 0.1% energy accuracy
- **Note:** For 2.5-element programmed units, degrade accuracy by an additional 0.5% of reading
- **Note:** For 1A (Class 2) nominal, degrade accuracy to 0.5% of reading for watts and energy; all other values 2 times rated accuracy

Compliance:

- ANSI C12.20 2015 0.1 CL and ANSI C12.1 2014 (Eurofins/MET Labs Certified)*
- FCC Part 15, Class B (Radiated and Conducted Emissions)*
- IEEE C37.90.1 (Surge Withstand)*
- IEEE C62.41 (Surge Immunity)*
- IEC 62053-22 Accuracy, Class 0.2S*
- IEC 62053-23*
- CE (IEC 61326-1*, IEC 61000-6-2, IEC 61000-6-4)
  - IEC 61000-4-2 (Electrostatic Discharge)*
  - IEC 61000-4-4 (EFT)*
  - IEC 61000-4-5 (Surge Immunity)*
  - IEC 61000-4-11 (Voltage Variations Immunity)*
  - IEC/CISPR 11, Class B (Radiated Emissions)*
  - CISPR 16-2-1 (AC Mains
  - Conducted Emissions)*
- EU Directive 2011/65/EU (RoHS 3 Directive)
- REACH Compliant
- Certified to UL/IEC 61010-1 and CSA C22.2 No. 61010-1, UL File: E250818*

*Third-party lab tested

Table 2: Ordering information (all fields must be filled in to create a valid part number)

RGM8000	*	*	*	*	*	*	**Description**
Base unit RGM8000							Standard unit with display, all current/voltage/power/frequency/ energy counters measurement, % load bar, RS485 and IrDA communication parts and one front test pulse output
Frequency	5						50 Hz AC frequency system
	6						60 Hz AC frequency system
Current inputs		5A					5 Amps
		1A					1 Amp
Software			A				Measurement
			B				Measurement + 2 MB memory
			C				Measurement + 10 MB memory and 128 samples per cycle waveform capture
			D				Measurement + 128 MB memory and 512 samples per cycle waveform capture
Power supply				HI			90–265 V AC/100–370 V DC
				LDC			18–60 V DC
I/O modules*					X	X	None
					E1	E1	100BaseT Ethernet
					E2	E2	100BaseT Ethernet with IEC 61850 protocol
					C1	C1	Four-channel bi-directional 0–1 mA outputs
					C2	C2	Four-channel 4–20 mA outputs
					RS	RS	Two relay status outputs/two status inputs
					PS	PS	Four pulse outputs/four status inputs
					F1	F1	Fiber optic interface with ST terminations
					F2	F2	Fiber optic interface with versatile terminations

* Each I/O module con be ordered as a separate upgradeable part.

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1SQC088008B0201 RevA 10.2024