Power quality monitoring for electrical power systems

The SENTRON PAC4200 is a feature packed power monitoring device that is suitable for use in industrial, government and commercial applications where basic to advanced metering, logging, and I/O is required. The meter may be used as a stand alone device monitoring over 200 parameters or as part of an industrial control, building automation or global enterprise wide monitoring system.

Advanced power quality monitoring and logging applications range from single low voltage breaker / building metering to sub-station main feeder monitoring, sub-billing or cost allocation installtions with multiple tariffs. The SENTRON PAC4200 can also be used to support LEED certification and provide the needed energy metering data for federal/local government EPACT 2005 energy reduction programs.

Whether your goal is to reduce operation cost, reduce your carbon footprint or to maintain your power assets, the PAC 4200 meter should be an important part of your power monitoring system.

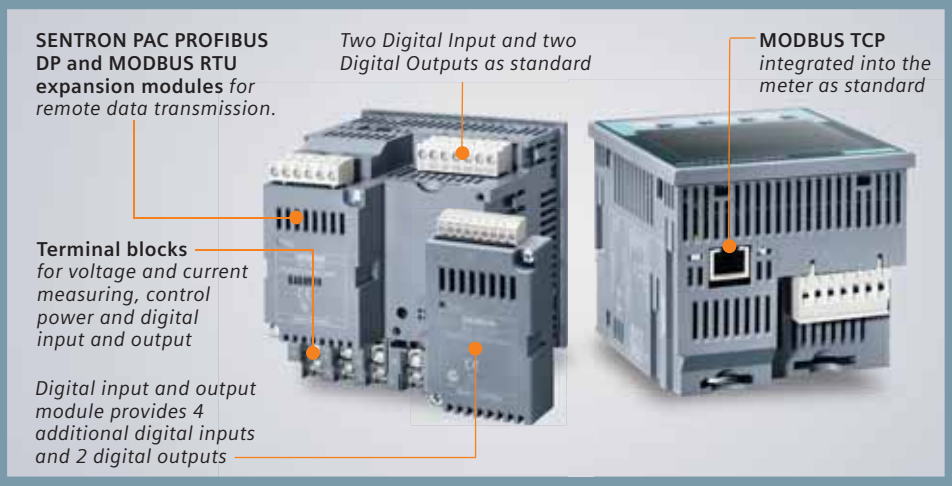
The SENTRON PAC4200 provides open communication using the standard built-in Ethernet Modbus TCP, Optional Modbus RTU or PROFIBUS-DP protocols for easy integration into any local or remote monitoring system. The gateway functionality of this device reduces installation cost by replacing other gateway devices and simplifying wiring. Simple configuration of the meter can be done from the front display or by using a PC with SENTRON powerconfig setup software, supplied with the meter.



SENTRON PAC4200

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1) 99mm, 3.90 in., with expansion module

Power management and SENTRON PAC4200

The SENTRON PAC4200 can easily be integrated into a power management system using Modbus TCP (standard), Modbus RTU (option) or PROFIBUS-DP (option). With communication, the SENTRON PAC4200 transmits measured values to the supervisory systems, where the data can be further processed for display and control. As a serial to Ethernet gateway, this device can reduce cost by replacing other devices and simplifying wiring while giving visibility to down stream devices.

The PAC4200 can also serve two masters via the TCP connection, so multiple supervisory systems can access the data. This helps to reduce system cost by eliminating the need for duplicate devices.

Siemens offers the WinPM.Net power management software which can provide easy integration to the SENTRON PAC4200 meter. WinPM.Net provides standard overview displays allowing detailed analysis of the electrical power, which allows for easy allocation of power consumption and cost. Additionally, unexpected operating conditions can be detected on a timely basis.

SENTRON PAC4200 makes consumption apparent

To accomplish a sustainable reduction of power costs, you must first analyze the electrical system's current consumption and power flows. The SENTRON PAC4200 power meter precisely and reliably delivers the required information of power values to put you on the path to reduce your power cost and provides logging for 40 days at 15 minute intervals in non-volatile RAM.

Applications Summary

- Ideal for replacing multiple analog meters. Use it for external (enclosure) or embedded automatic meter reading in panels, switchboards, switchgear, transformers, and more, to allocate energy costs on a building by building basis.

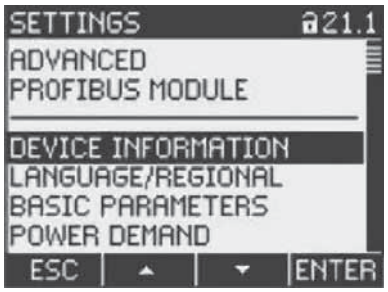
- Basic Metering
  The PAC4200 offers high-accuracy power, energy and demand measurements. These revenue-accurate values can be used for bill verification, monitoring backup power on critical systems and offering cost effective energy solutions.

- Cost Allocation / Energy Monitoring
  Perfect for monitoring right down to the tool level, the meter can help monitor cost centers, identify opportunities for demand control and check energy consumption patterns. The acquisition of power or energy can be based on a certain time frame (15 min. time interval) or controlled by a signal.

- Automation integration monitors critical equipment processes and ties directly to the Siemens family of PLCs and automation networks. Full integration into the Simatic system is made easy using one of several methods. One method is powerrate a premium add-on for WinCC and PCS7. It can be used for energy management and control. Another is pre-engineered faceplates integrated into the Simatic library or by simply using the GSD files available for the meter.

- Sub-Metering
  Low cost, high accuracy and simple retrofit installation enables economical measurement of commercial and residential tenant space. Integrate the PAC4200 with existing energy management systems and RTUs. Reduce energy consumption by eliminating previously uncontrolled expenses.

Example of the PAC4200 menu



Example of operating menu: The texts can be displayed in several languages, which can be selected directly on the device.[2] The large graphic LCD display facilitates reading even from a distance. For optimum visibility even in poor light conditions, the SENTRON PAC4200 comes with a gradually adjustable background illumination.

Large graphic LCD display provides:

- Display title or designation of the displayed measurements
- Phase angles and measurements
- Measured real-time and min/max values
- All reading with appropriate units
- Custom labeling for function keys
- Bar charts showing up to the 31st harmonic
- Four user defined custom screens with numeric or bar chart values

2) Languages included as standard in the meter are English, German, French, Spanish, Italian, Portuguese, Turkish, Russian and Chinese.

Functional features

Instantaneous values		
Voltage	Phase-phase / phase-neutral	✓
Currents	Per phase and neutral (calculated)	✓
Apparent, active and reactive power (kW, kVAR, kVA)	Per phase and total	✓
(PF) and displacement power factor (cos phi)	Per phase and total	✓
Frequency	45...64 Hz	✓
THD for voltage and current	Per phase	✓
Individual harmonics	Through the 31st for volts and amps	✓
Min. / max. values	Voltage - phase-phase, phase-neutral	✓
	Current / Power / Power factor / THD/ φ per phase	✓
	Frequency, phase angle	✓
	Three phase average voltage and current	✓
	Odd harmonics for voltage and current per phase up the 31st	✓
	Demand values for active, apparent and reactive power	✓
Average values	Voltage - phase-phase, phase-neutral	✓
	Voltage min. / max. for phase-phase-phase-neutral	✓
	Current	✓
	Current min. / max.	✓
Energy measurement – logging		
Real (active) energy (kWH)	Import / export; high / low tariff	✓
Reactive energy (kVARH)	Positive / negative; high / low tariff	✓
Apparent energy (kWH)	High / low tariff	✓
Energy demand per measuring period	Three phase average rating for active and reactive power	1 to 60 min.
kW, kWd and Min. / max. logging	40 days Non-volatile log file @ 15 minutes	✓
Event logging	4000 events in non volatile memory	✓
Meter running counter	Uptime in hours	✓
Universal counter	Pulse counting of external devices like water, gas, etc.	✓
Measurement accuracy		
Zero blind	Measurement per IEC 61577-12	✓
Sampling rate	170 samples/cycle at 60Hz (1) [1)]	✓
True RMS measurement	For voltage and current harmonics up to the 31st	✓
Voltages		±0.2
Currents		±0.2
Power factor; active power		2%; 0.2%
Active energy		Class 0.2S to IEC 61577-12 (correlates to Class 0.2S of the IEC62053-22 / ANSI C12.20)
Reactive energy		Class 2 in acc. with IEC 62053-23
Monitoring functions		
Set point monitoring	V, I, power, VAR, VA, Freq. THD, PF	Up to 12 values
Simple logic functions for alarming	Alarm via digital	
Phase unbalance	Voltage and / or >< current	✓
Communication		
Ethernet	Integrated into meter as standard and supports up to 32 Modbus serial devices in gateway mode with Modbus RTU module. (can support two masters simultaneously)	10/100 Base-T (100 Mbit/ sec)
Modbus TCP	Integrated RJ45 port	10/100 Base-T (100 Mbit/ sec)
PROFIBUS DP V1 expansion module	Optional • Parameterization via device front or with SENTRON powerconfig software • Transition of data via GSD file • Support of all baud rates from 9600 BPS to 12 MBPS (9.6 Kbit/ sec to 12 Mbit/sec)	
Modbus RTU expansion module	Optional – required for gateway feature • Parameterization via device front or with SENTRON powerconfig software • Transition of data via MODBUS register based points • Support of all baud rates of 4800, 9600, 19.2K and 38.4K BPS (4.8 / 9.6 / 19.2 and 38.4 kB/sec)	

[1)] Per IEC61557-12, which defines the accuracy as percentage of reading.

Functional features (continued)

Digital inputs / outputs		
Integrated digital inputs	24 Vdc / 4 mA	2; dry contacts, requires external power
Integrated digital outputs	30 Vdc max. / 10-27 mA; 100 mA max.	2
Optional Digital I/O (expansion module)inputs	24 Vdc / 4 mA	4 per module; wet, no external power needed
Optional Digital I/O (expansion module) outputs	30 Vdc max. / 10-27 mA; 100 mA max.	2 per module
General		
Password protection		✓
Technical data		
Two-quadrant (import) / four-quadrant (import and export) measuring		4Q
Measurement types		1 ph, 2 ph or 3 ph
Applicable for network type		TN, TT, IT
Measured voltage without transformer	Direct connection up to max. delta/wye	690 V / 400 V (CAT III) for IEC 600/347 for UL / CSA
Current inputs	Settable on device	1A or 5A nominal
Power supply	AC/DC	95...240V AC (±10%) / 110...340V DC (±10%)
Dimensions	L x W x D in mm Installation depth without module (mm) Installation depth with module (mm)	96 x 96 77 mm / 3.03in. 99 mm / 3.90 in.
Degree of protection	Front Rear	IP65 - NEMA 12 IP20 - NEMA 1
Operating temperature	°C / °F	–5...+55 / +23...+131
Display	Type Resolution (pixels)	Background-illuminated graphic LCD 128 x 96
Text displays		Multilingual
Optional Ports	2	Two ports are available for optional modules

Certifications

UL61010-1, 2nd Ed. Safety of Electrical Equipment for Measurement, Control and Laboratory Use Part 1: General Requirements

CAN/CSA-C22.2 NO. 61010-1-04, 2nd Ed. Safety for Electrical Equipment for Measurement, Control and Laboratory Use

Order information

Product	Order number [1]
SENTRON PAC4200 compression terminals not suitable for use with ring tongue terminals, AC/DC	7KM4212-0BA00-3AA0
SENTRON PAC PROFIBUS DP expansion module	7KM9300-0AB00-0AA0
SENTRON PAC MODBUS RTU expansion module	7KM9300-0AM00-0AA0
SENTRON PAC I/O module 4DI + 2DO	7KM9200-0AB00-0AA0
Connector block suitable for use with ring tongue terminals	Consult Siemens Sales
SENTRON Adapter Plate for 4700/4720 meter cutout	93-47ADAPTER
SENTRON PAC32/4200 Meter DIN Rail adapter – Meter display will not be seen	7KM9900-0YA00-0AA0
SITOP Power Supply AC 99-264VAC, 24 VDC, 0.5A	6EP1331-2BA10

1) Omit dashes from part numbers when ordering except on 93-47ADAPTER.

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