

PAC4200 Intermediate Power Meter

Technical Overview

2018

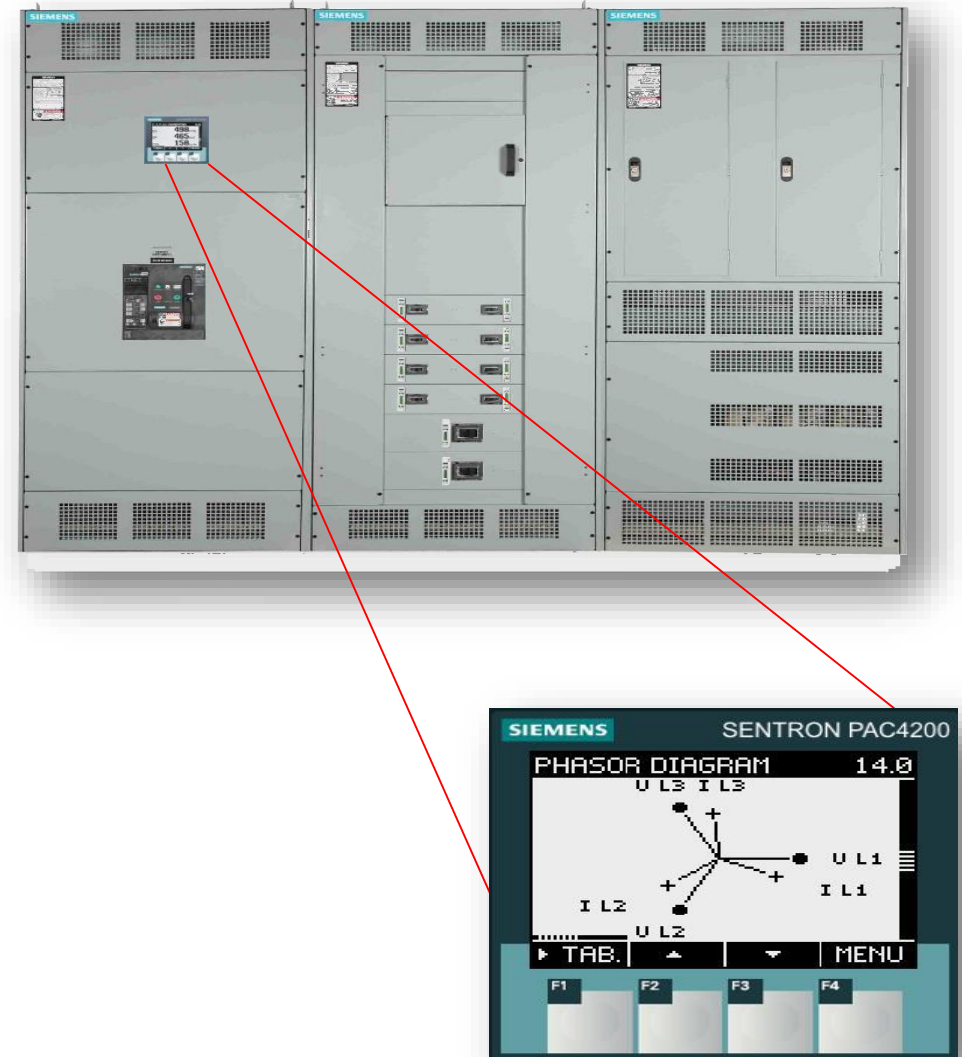
Power Meter Overview

Why Have the PAC4200 Meter?

The **PAC4200** meter is an affordable, compact, intermediate power quality and energy meter designed for customers requiring more Power Quality, logging, custom displays, multiple communication options and the ability to act as a gateway to the Ethernet LAN network.

The **PAC4200** continues to the increased feature set offering of the PAC series meter lineup.

There are two models with either standard 110-340VDC or 22-65VDC voltage inputs. The optional DIN Rail adapter and I/O module provides more flexibility to the meter to meet varying customer installation requirements.



PAC4200 Power Meter Overview

Key Features

Functions

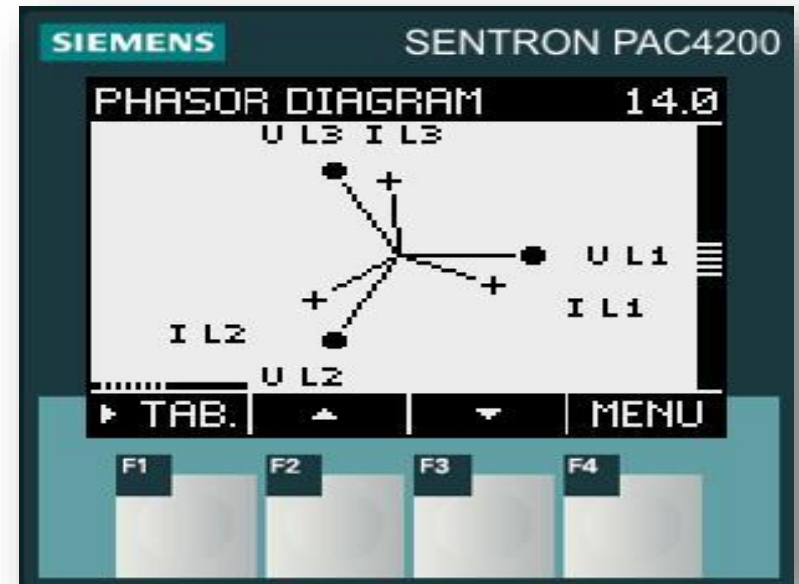
- Measurement of **over 200 parameters** such as Volts, Amps, Power, Energy, Demand Values, & THD with min/max. and average values.
- Voltage and Current Harmonics up to the 31st
- 170 samples/cycle @ 60Hz sampling rate
- Internal **Data Logs w/ 40 day storage capacity**

Innovation

- Display of phasor diagram
- **Supports multiple masters**
- Allows for **2 expansion modules** for extended communication and IO interface

Unique selling proposition

- 2 digital inputs and 2 digital outputs combined with **Modbus TCP communication interface as a standard**
- Custom Limit Logic to create Alarms via dig. out
- Class 0.2S accuracy
- Can be used as a **Modbus Gateway** for up to 32 serial devices



Power Monitoring Device: PAC4200
"for worldwide use"

PAC4200 Power Meter Overview

Key Compliances - IEC 61557-12, UL61010-1, UL50

- Complies with the requirements of the new IEC61557-12 standard for combined performance measuring and monitoring devices (PMD) that measure and monitor the electrical parameters within electrical distribution systems.
- This guarantees, that the scope of supply, safety and operational behavior meets the requirements of modern industrial plants
- cULus certified
- Type enclosure 5 acc. to UL50 (NEMA 250)
- CE conform developed and tested

The image displays a 'Certificate of Compliance' for IEC 61557-12, Edition 1.0, 2007-08. The document is issued by Underwriters Laboratories Inc. (UL) to Siemens AG. It certifies a Multifunctional Measuring Device (Model SENTRON PAC3200, type 7KM2112-0BA00-3AA0, Accessories, SENTRON PAC PROFIBUS DP Expansion Module, type 7KM9300-0AB00-0AA0). The certificate references standard(s) for safety: UL 61010-1, Safety of Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements, second Edition; and CAN/CSAC22.2 No. 61010.1, Safety of Electrical Equipment for Measurement, Control, and Laboratory Use, second Edition. The certificate also includes contact information for project engineers and a note to look for the UL Listing Mark on the product.

IEC IEC 61557-12
Edition 1.0 2007-08

Certificate of Compliance

Certificate Number 040907 - E314880
Report Reference E314880, August 30th, 2007
Issue Date 2007 September 4

Page 1 of 1

UL Underwriters Laboratories Inc.

Issued to: **SIEMENS AG**
A&D CD CC TS2 WERNER-VON-SIEMENS-STRASSE 48
92220 AMBERG GERMANY

This is to certify that representative samples of **Multifunctional Measuring Device**
Model SENTRON PAC3200, type 7KM2112-0BA00-3AA0. Accessories, SENTRON PAC PROFIBUS DP Expansion Module, type 7KM9300-0AB00-0AA0.

Have been investigated by Underwriters Laboratories Inc.® (UL) or any authorized licensee of UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: **UL 61010-1, Safety of Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements, second Edition**
CAN/CSAC22.2 No. 61010.1, Safety of Electrical Equipment for Measurement, Control, and Laboratory Use, second Edition.

Additional Information: **Not Applicable**

Only those products bearing the UL Listing Mark for the US and Canada should be considered as being covered by UL's Listing and Follow-Up Service meeting the appropriate requirements for US and Canada.

The UL Listing Mark for the US and Canada generally includes: the UL in a circle symbol with "C" and "US" identifiers; the word "LISTED"; a control number (may be alphanumeric) assigned by UL; and the product category name (product identifier) as indicated in the appropriate UL Directory.

Look for the UL Listing Mark on the product

Kiya Ghamari, Associat Project Engineer
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Any information and documentation including UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.
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Manfred Mueller, Senior Project Engineer
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PAC4200 Power Meter Overview

Meter Design Features



Same screen size as the other PAC meters, but it is 3.03" in depth.

“Two” usable optional slots that will allow more I/O and communications at the same time!

Optional DIN Rail Adapter



PAC4200 Power Meter Overview

Meter Design Features – Standard Digital Inputs

Standard - 2 Digital inputs, independently configurable:

- ✓ Counting input for \pm kWh, \pm kVARh or free definable energy types – pulse form (S_0)
- ✓ Status monitoring e.g. for switching devices
- ✓ Synchronization of measuring periods, e.g. to sync on the utility interval
- ✓ Time synchronization via „top of minute pulse“ to synchronize different devices
- ✓ on / off peak – tariff switching
- ✓ They are “dry” inputs and require a 24vdc source.



PAC4200 Power Meter Overview

Meter Design Features – Standard Digital Outputs

Standard - 2 Digital outputs, independently configurable:

- ✓ Pulse output for \pm kWh, \pm kVARh – pulse form (S_0)
- ✓ Alarm output for signaling limit violations
- ✓ Operating status display of the SENTRON PAC4200
- ✓ Switching output to remote control via system software
- ✓ Synchronization output for other devices
- ✓ Display of direction of rotation
- ✓ They are “dry” inputs and require a 24vdc source.

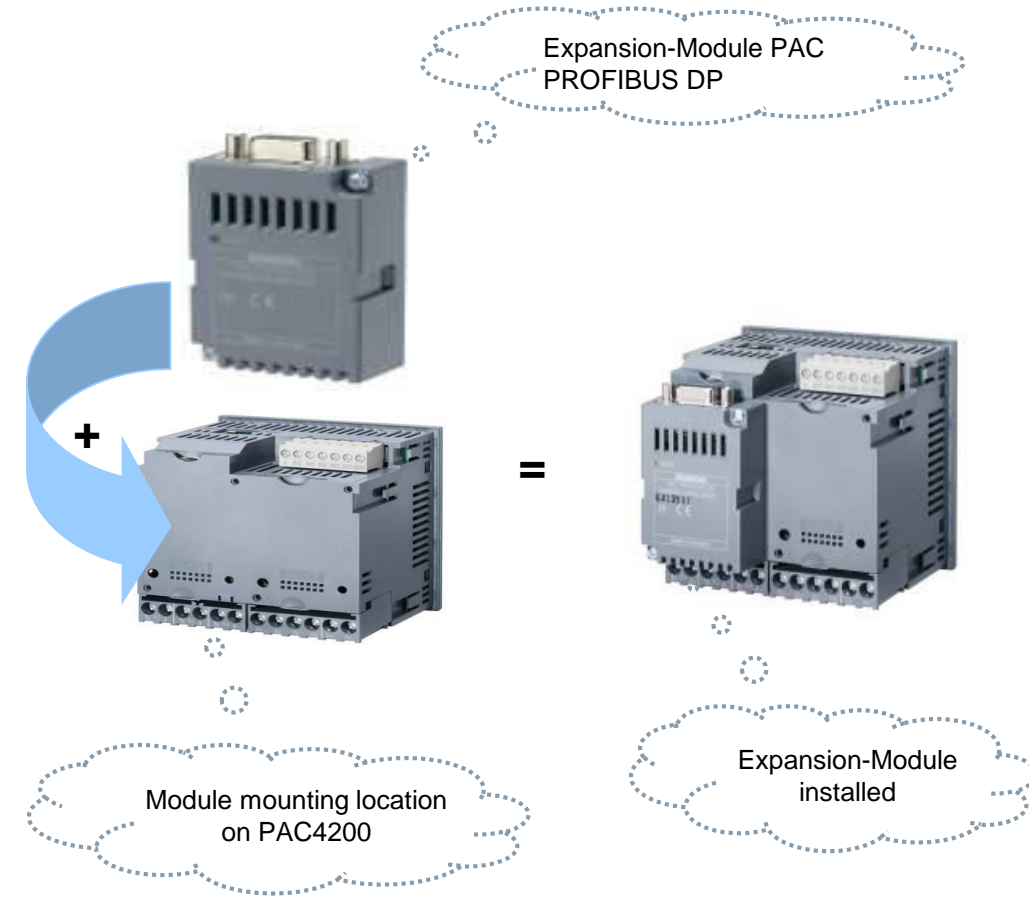


PAC4200 Power Meter Overview

Meter Design Features – Optional Module – PROFIBUS DP

SENTRON PAC PROFIBUS DP extension module

- ✓ Can be parameterized from front of device or via configuration software SENTRON powerconfig
- ✓ Simple integration via GSD file
- ✓ Measurement parameters selectable via GSD file
- ✓ Baud rates of 9.6kBit/s up to 12 MBit/s
- ✓ 9-pole Sub-D plug connection in compliance with IEC 61158
- ✓ No external auxiliary power necessary
- ✓ Status display LED on module
- ✓ Protocol: PPROFIBUS DPV1
Synchronous and Asynchronous data transmission including parameter setting.



PAC4200 Power Meter Overview

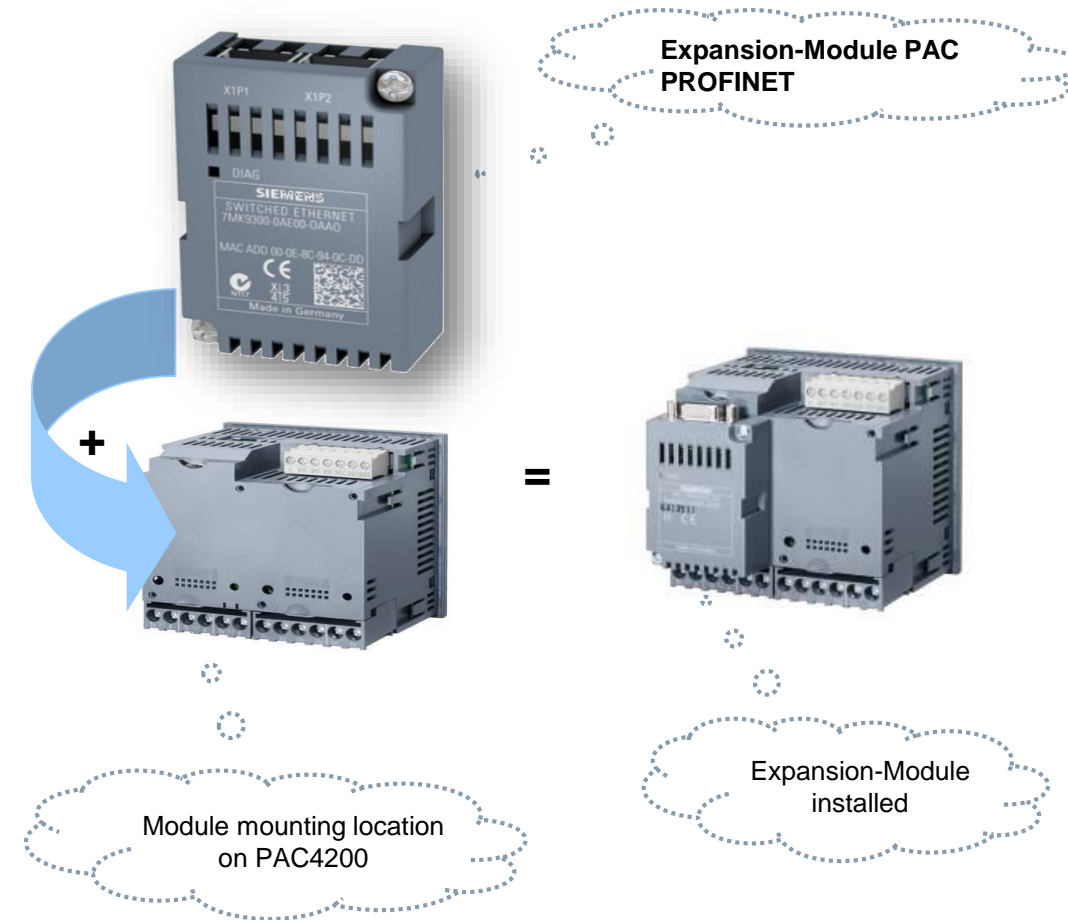
Meter Design Features – Optional Module – ProfiNet



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SENTRON PAC ProfiNet extension module

- ✓ Direct connection to industrial automation Ethernet networks using the **ProfiNet** communications.
- ✓ The module allows Dual ProfiNet and Modbus TCP at the same time!
- ✓ Same easy to screw on optional module.
- ✓ No external auxiliary power necessary
- ✓ Status display LED on module

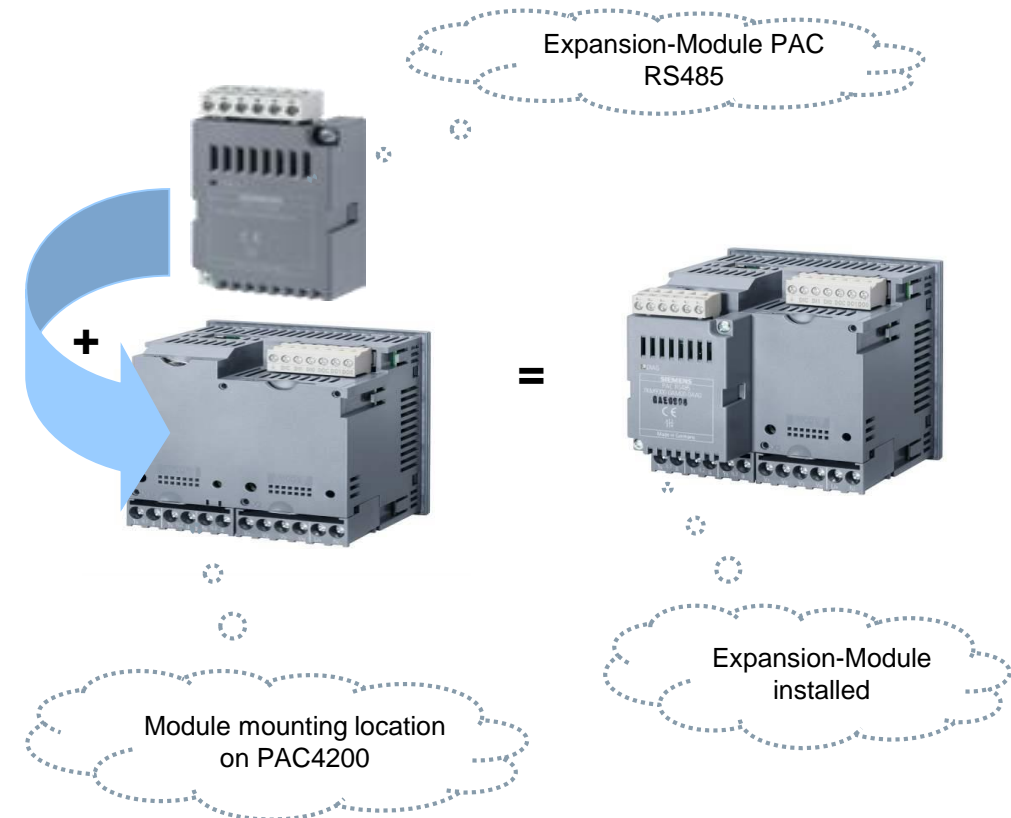


PAC4200 Power Meter Overview

Meter Design Features – Optional Module – Modbus RTU

SENTRON PAC RS485 Modbus extension module

- ✓ Can be parameterized from front of device or via configuration software SENTRON powerconfig
- ✓ Supports Modbus RTU RS-485 Connection
- ✓ Plug and Play
- ✓ Baud rates of 4.8 / 9.6 / 19.2 and 38.4 kBd
- ✓ 6-pole connection via screw terminal
- ✓ No external auxiliary power necessary
- ✓ Status display LED on module
- ✓ All data is register based information

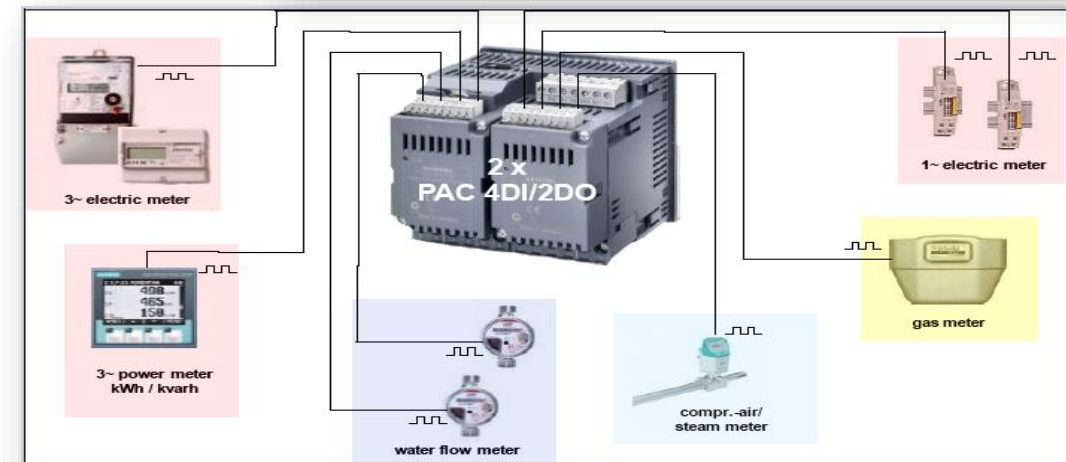
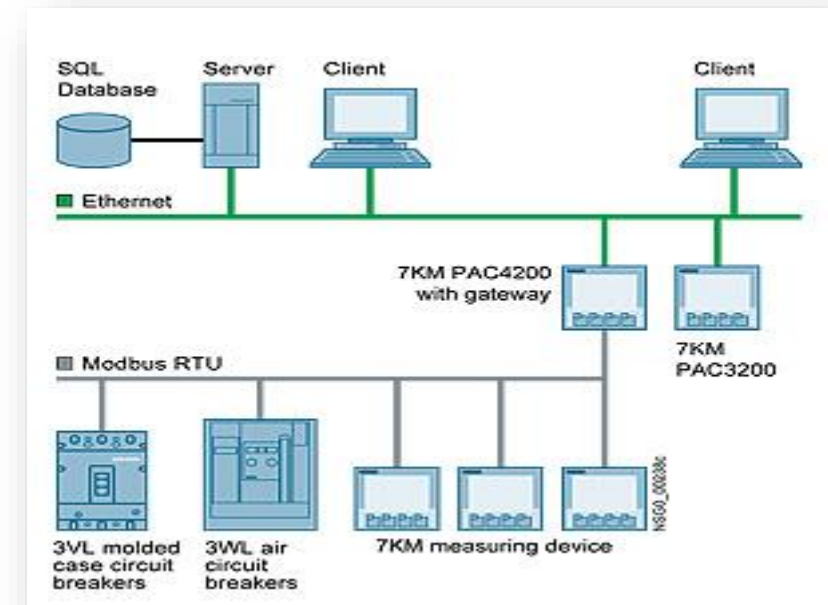


PAC4200 Power Meter Overview

Meter Design Features – Optional Module – 4DI/2DO

SENTRON PAC I/O extension module

- ✓ Can be setup via configuration software SENTRON powerconfig
- ✓ The PAC4200 can support up to **two** PAC 4DI/2DO modules for a total of **8** digital inputs!
- ✓ The built-in digital I/O is “Dry” and the external I/O will be “wet” and does not require a 24vdc source.
- ✓ With the 4200’s logic, simple control can be done with the expanded I/O.
- ✓ Multiple uses for the I/O
 - Water
 - Air
 - Gas
 - Humidity
 - AUX inputs
 - Etc.

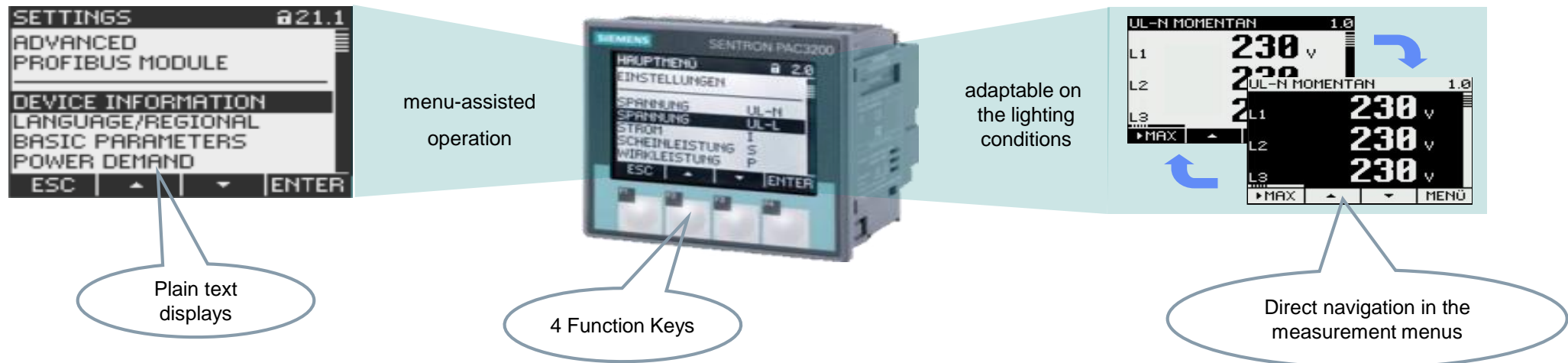


PAC4200 Power Meter Overview

Meter Design Features – Display Screens

Displays written in easy to understand text

- Large, full graphics LCD with backlight and easy-to-read text displays

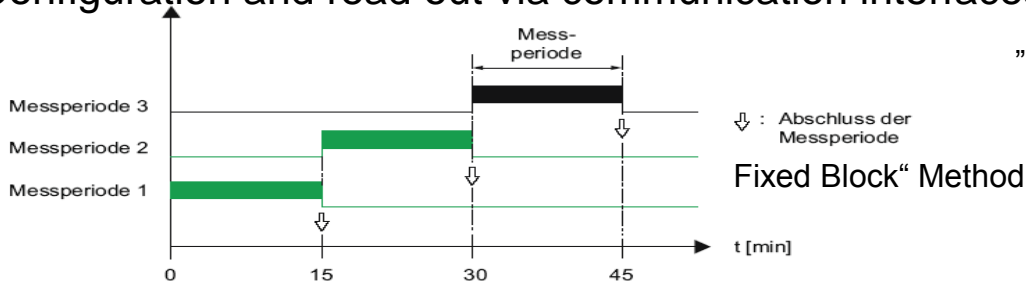
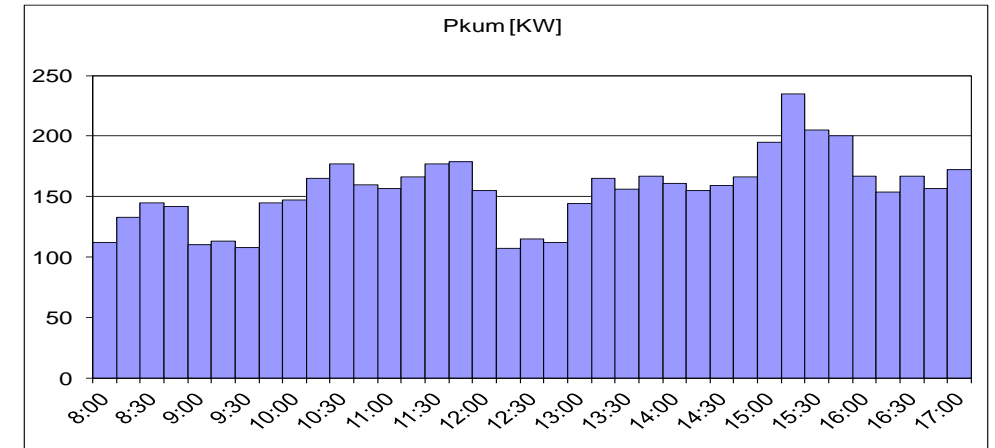


- LCD screen contrast and brightness can be adjusted for ambient conditions
- Display colors can be inverted
- Programmable dimming or “screen off” time to reduce energy and to increase backlight life.

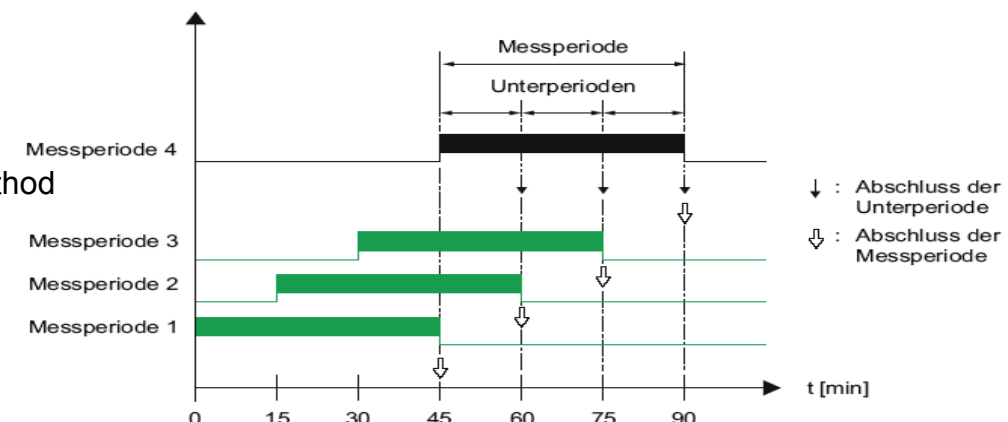
PAC4200 Power Meter Overview

Design Features – On-board Storage for Power

- ✓ Power demand values (load profile) for apparent, active and reactive power for **4 month with minimum & maximum values at a 15min. measuring period**
- ✓ Total reactive power, fundamental reactive power or distorted reactive power selectable
- ✓ Arithmetic or cumulated power demand values could be calculated
- ✓ Synchronization via digital input, communication interfaces or internal clock
- ✓ Supports fixed or rolling block method.
- ✓ Configuration and read out via communication interfaces only



„Rolling Block“ Method



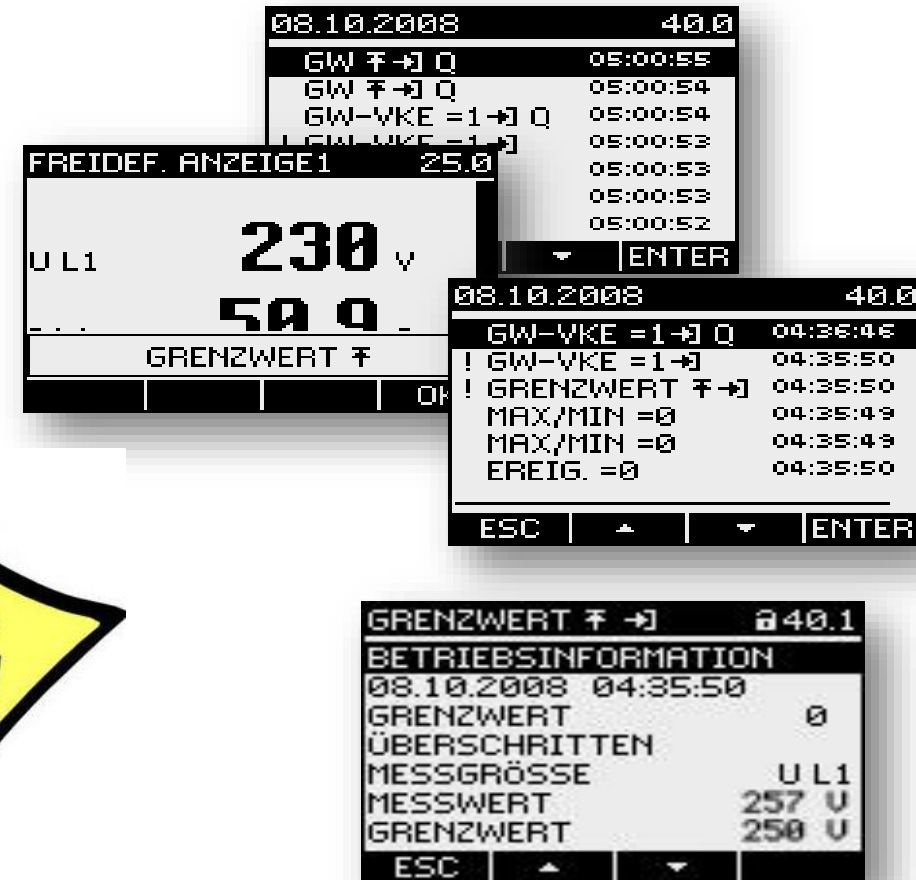
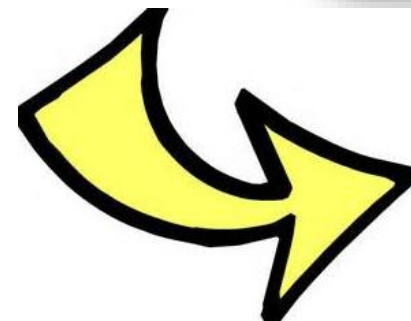
PAC4200 Power Meter Overview

Design Features – On-Board Event Recording

Storage capacity of up to **4096 operations**, control or system events

Selectable features:

- ✓ Different message levels
(alarm / warning / information)
- ✓ selectable priorities for each event
- ✓ **Different information levels**
 - => Popup window for the first indication
 - => List screen as summary of all events
 - => Extra screen for detailed information
- ✓ Configurable acknowledgement for all event message windows
- ✓ Event controlled switching of the digital outputs
- ✓ Configuration via SENTRON powerconfig

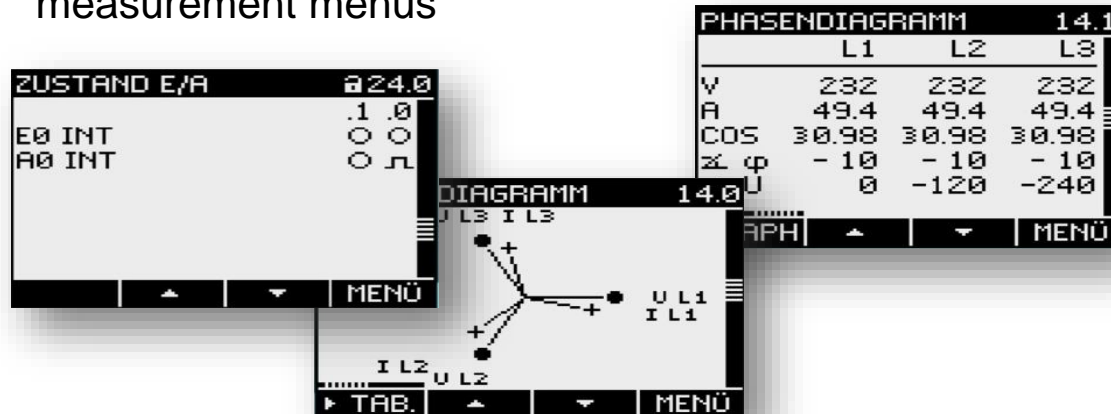


PAC4200 Power Meter Overview

Design Features – Customizable Displays!

Flexible display

- ✓ Up to 4 user defined screens
 - * Screens for 2 or 4 digital values
 - * Bar graph screens for 2 or 3 values
- ✓ Configuration via SENTRON powerconfig
- ✓ Activated user defined screens will be displayed prior to the preconfigured measurement menus



Information overview

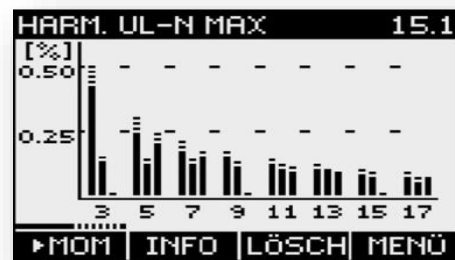
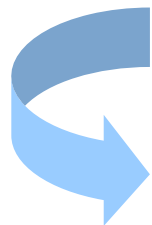
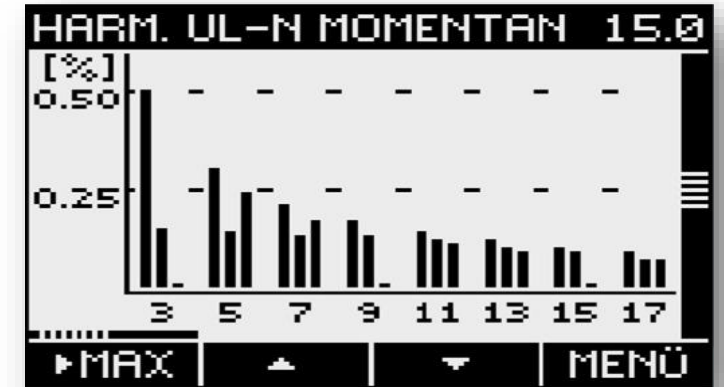
- ✓ Summary screen shows the states of all available in- and outputs
- ✓ Phase diagram and list

PAC4200 Power Meter Overview

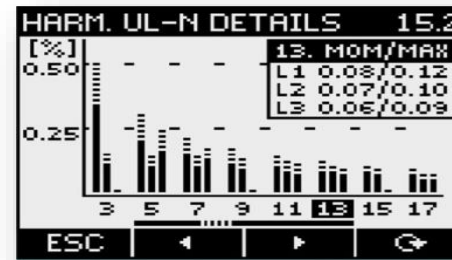
Design Features – Standard Harmonic Displays!

Detailed Real-Time Harmonic Information

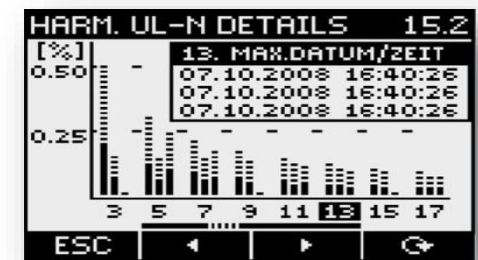
- ✓ Graphical display of the odd harmonics for voltage and current
 - ✓ 3rd to 31st for voltage (V_{ph-n} & V_{ph-ph}) in % based on the fundamental values
 - ✓ 1st to 31st for current as absolute values in Amps
 - ✓ Scrolling function to show all the individual harm.
 - ✓ Maximum values for all individual harmonics with date and time



Maximum screen of the voltage harmonics



Details, e.g. Instantaneous and Maximum values of the 13. harm.
left ↔ right scrolling



Details, e.g. Date and time of the Maximum from the 13. harm.

PAC4200 Power Meter Overview

Design Features – Standard Alarm Limit Displays

Monitoring of up to 12 limits (alarms)

- ✓ Any of the following values can be monitored and alarm limits set: Voltage, current, power, power factor, displacement power factor, phase angle, system phase angle, THD-V/-AMP, frequency, unbalance, distortion current, individual harmonics and the sliding demand values.
- ✓ Custom Delay time and hysteresis can be set for each alarm
- ✓ The following actions can be programmed for each alarm limit:

Switching of digital output

Communication to external system

Log entry into the event log for summarizing events

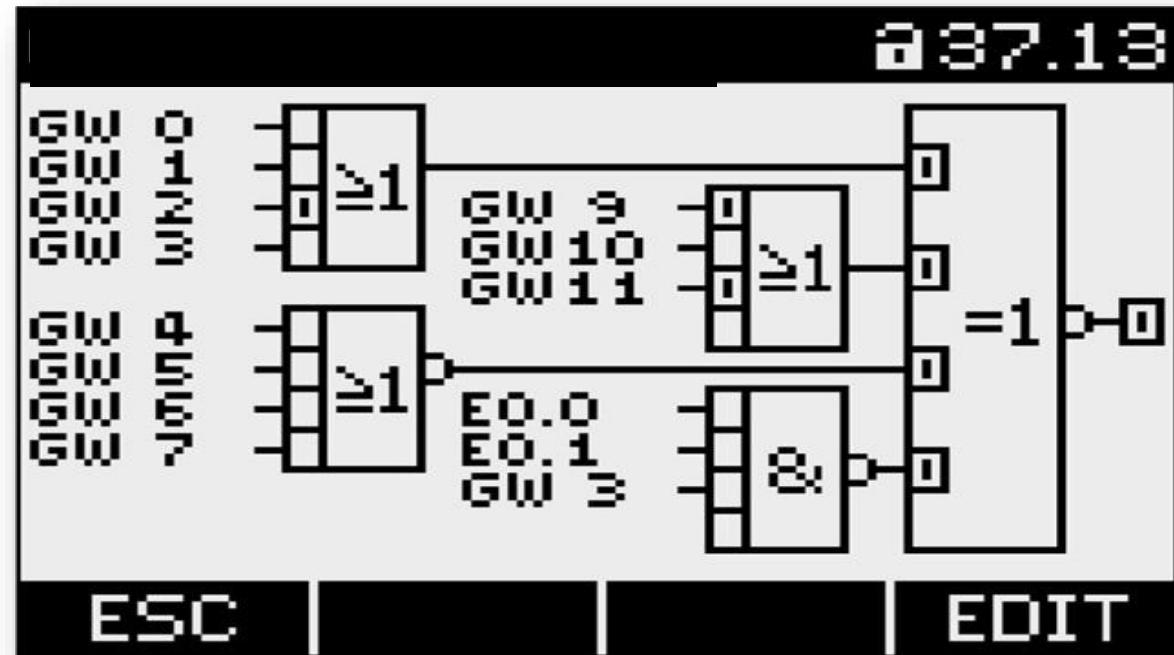
| LIMITS | | 25.1 |
|-------------|-------|------|
| LIMIT 0 | V L1 | ⊗ |
| LIMIT 1 | V L1 | ○ |
| LIMIT 2 | V L1 | ○ |
| LIMIT 3 | VA L1 | ⊗ |
| LIMIT 4 | VA L2 | ○ |
| LIMIT 5 | VA L3 | ○ |
| LIMIT LOGIC | | ○ |
| ESC | ▲ | ▼ |
| ENTER | | |

PAC4200 Power Meter Overview

Design Features – Standard Logic and Logic Screens for Alarm Limits

Logical AND / OR / XOR operations can be used to design a simple logic scheme

- ✓ 5 logic elements (and/or/etc.) with 4 inputs can be used to program the scheme
- ✓ A “Result” of logical operation can itself be used, like the limits, to trigger a wide variety of actions



PAC4200 Power Meter Overview

Simple power quality measurement

Calculation of important parameters to evaluate the plant condition as well as the power quality at the measuring point, e.g.

- ✓ Neutral current AMP_N
- ✓ Power factor PF as well as the displacement power factor $\cos\varphi$
- ✓ Phase angle φ between voltage and current as well as the system phase angle between the phase to phase voltages; U_{L12} , U_{L23} and U_{L31}
- ✓ Unbalance V_{nb} considering the positive and negative sequences
- ✓ Total harmonic distortion factors
THD- V_{ph-ph} , THD- V_{ph-n} , THD-AMP
- ✓ Odd harmonics from the 3rd to the 31st
for voltage (V_{ph-ph} & V_{ph-n}) and current
- ✓ Distortion current I_d



PAC4200 Power Meter Overview

Quick Installation Feature

Quick no-tool installation

Uses a simple combined latching holder

- ⇒ Degree of protection NEMA12 / IP65
- ⇒ Integral seal provided as standard.

Installation with screws

(integrated in combined latching holder)

- ⇒ Increased contact pressure
- ⇒ Increase degree of protection to NEMA 12 / IP65 (front side)

Minimal Space Requirement for latches

- Low installation depth of just 2.0" (51 mm) or 2.875" (73 mm) with extension modules.



PAC4200 Power Meter Overview

Retrofit Installation Feature – for all PAC series meters

Siemens adapter plate #93-47ADAPTER

This plate will work for old 4700 and 4720.



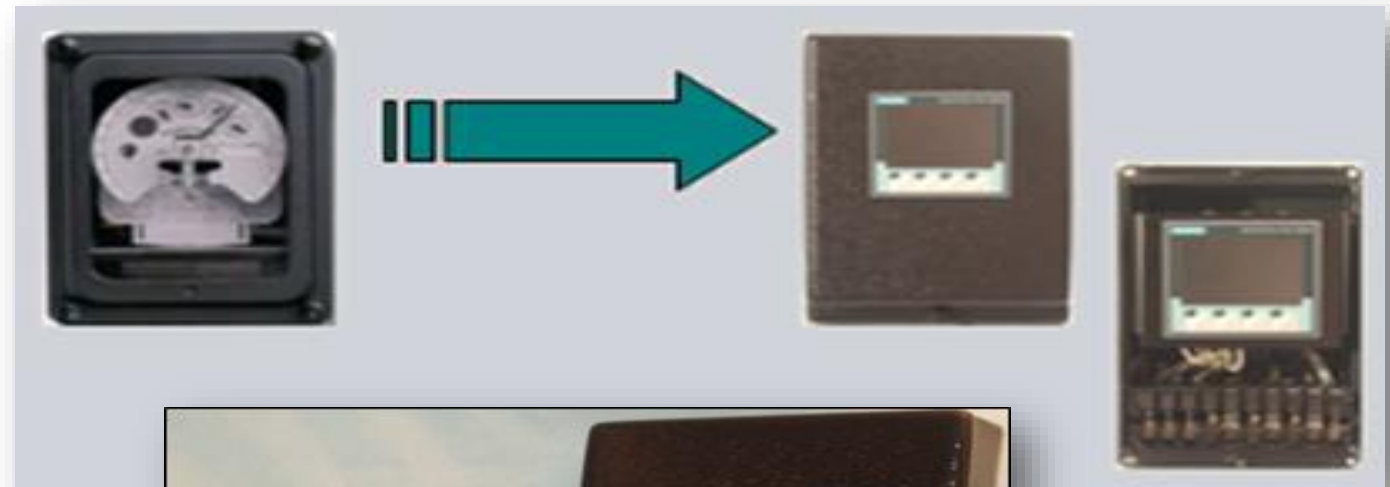
PAC4200 Power Meter Overview

Retrofit Installation Feature – for all PAC series meters

Draw out kWh Meter
Replacement kits for many old
meter designs.



Quoted as a special through
the local Siemens Sales
person.



PAC4200 Power Meter Overview

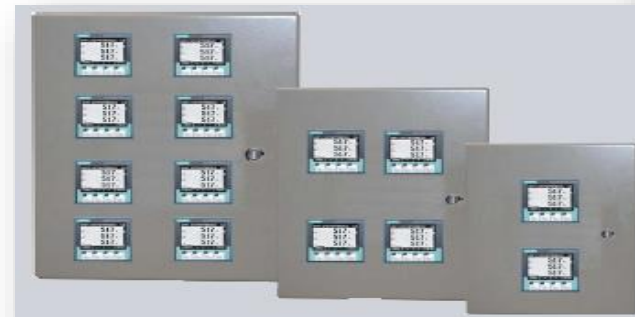
Multi-meter Installation Feature – for all PAC series meters

Siemens Single Unit PAC Meter Enclosure

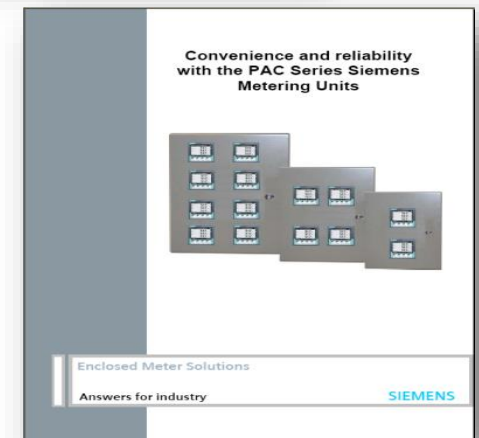


Also available are additional Siemens Metering Units (SMU's) for sizes ranging from 2 to 14 meters and NEMA 1 or 12. Other ratings can be supplied.

All enclosures come pre-wired with shorting blocks, fuse blocks, and CPT if required.



Multi-Meter Enclosures



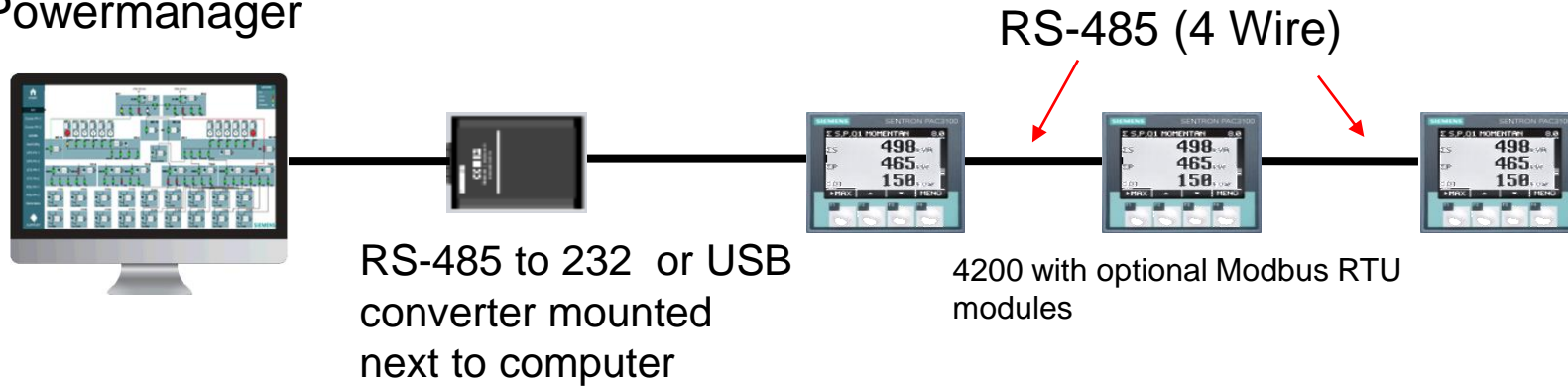
Data Sheets

US EM LP Digital Solutions

PAC4200 Power Meter Overview

Communications Example – Direct Connection

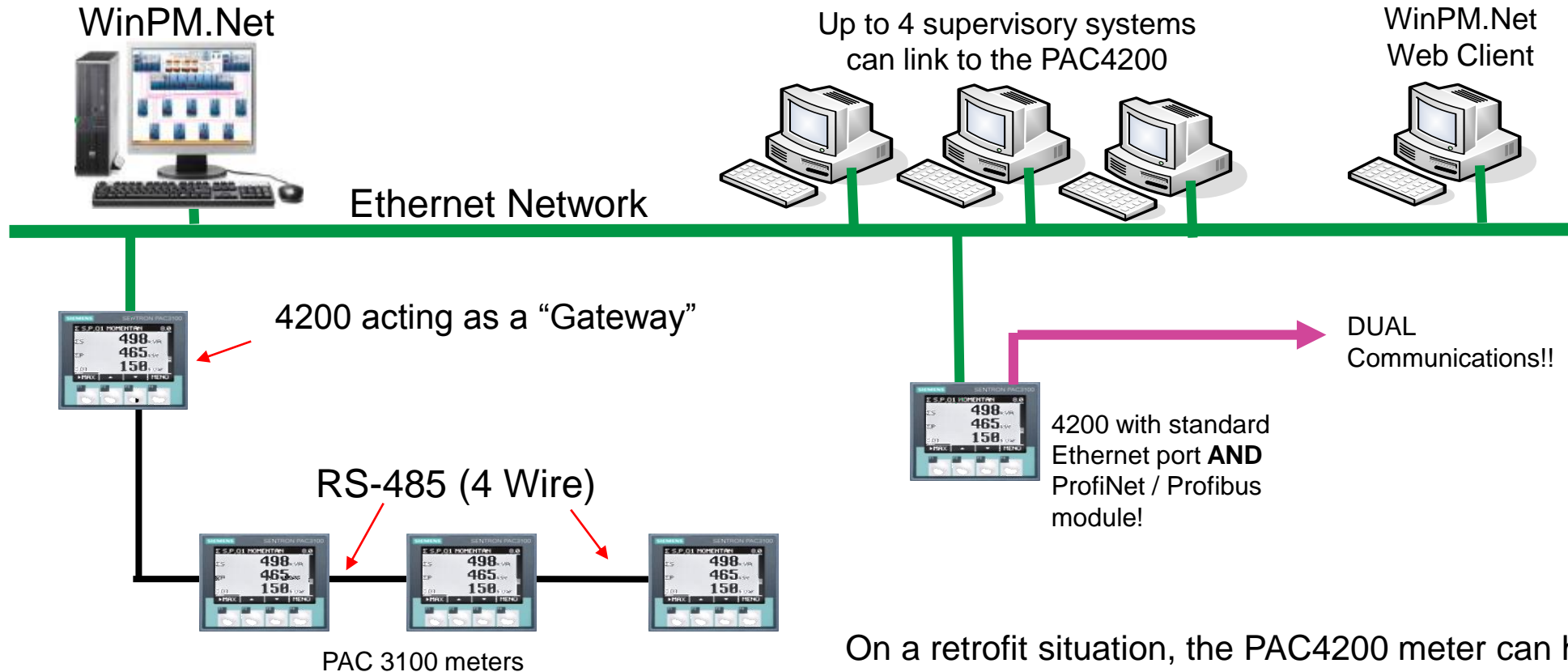
WinPM.Net / Powermanager



Direct connection to a computer via RS-485 serial wire (up to 4,000 Ft). One RS-485 string can support up to 32 meters.

PAC4200 Power Meter Overview

Communications Example – Ethernet Connection Options



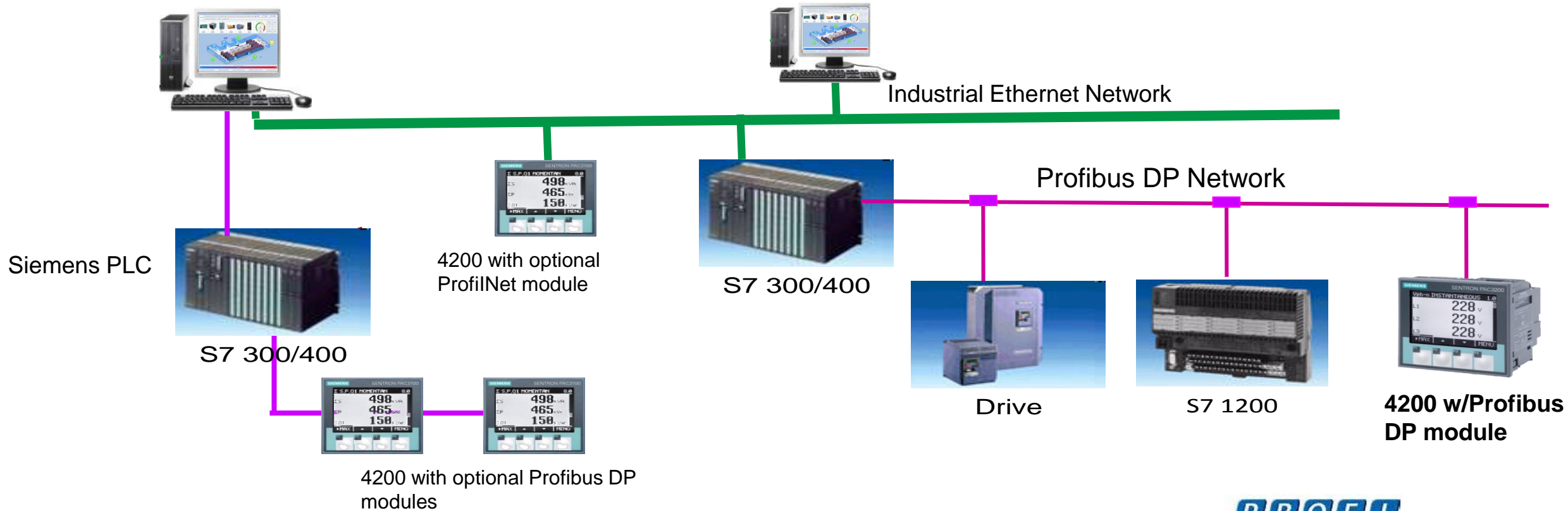
On a retrofit situation, the PAC4200 meter can have up to 32 Modbus serial devices linked to it, providing one Ethernet connection. The PAC4200 is a **gateway device** and can be connected to four master systems at one time over Ethernet!

PAC4200 Power Meter Overview

Communications Example – Siemens IA Automation (Profibus) Connection

SCADA WinCC / PCS7

SCADA Web Clients



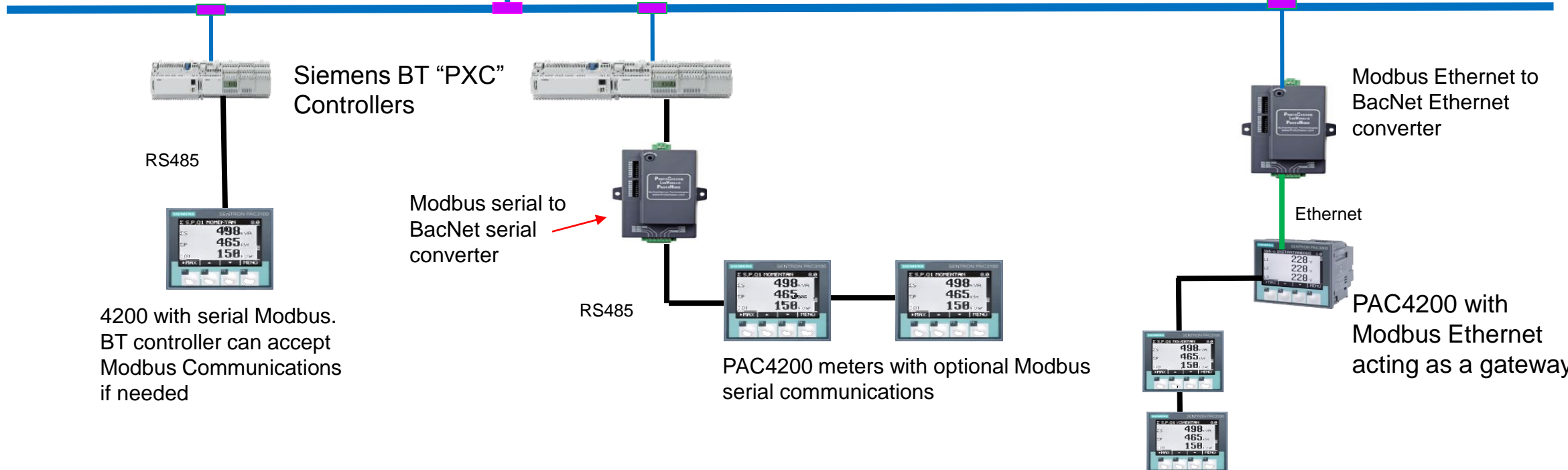
PAC4200 Power Meter Overview

Communications Example – Siemens BT (DesigoCC) BacNet Connection

**Siemens DesigoCC
Building Management
System**



BacNet Ethernet BMS Network



PAC4200 Power Meter Overview

Communications Example – Multiple Connection Methods

WinPM.Net / Powermanager



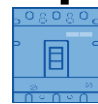
WinPM.Net / Powermanager Web Clients



Ethernet Network



PAC4200



AUX contact wire

Status Monitoring

WL or VL

Breaker Status

Open/Close from AUX contact.



RS-485

9610
9510



4200 w/
Modbus
RTU



PAC4200 can be a "gateway"

RS-485



WL Breaker with COM16 Modbus module

Feeder Monitoring



RS-485



3200 w/
Modbus
RTU



3100

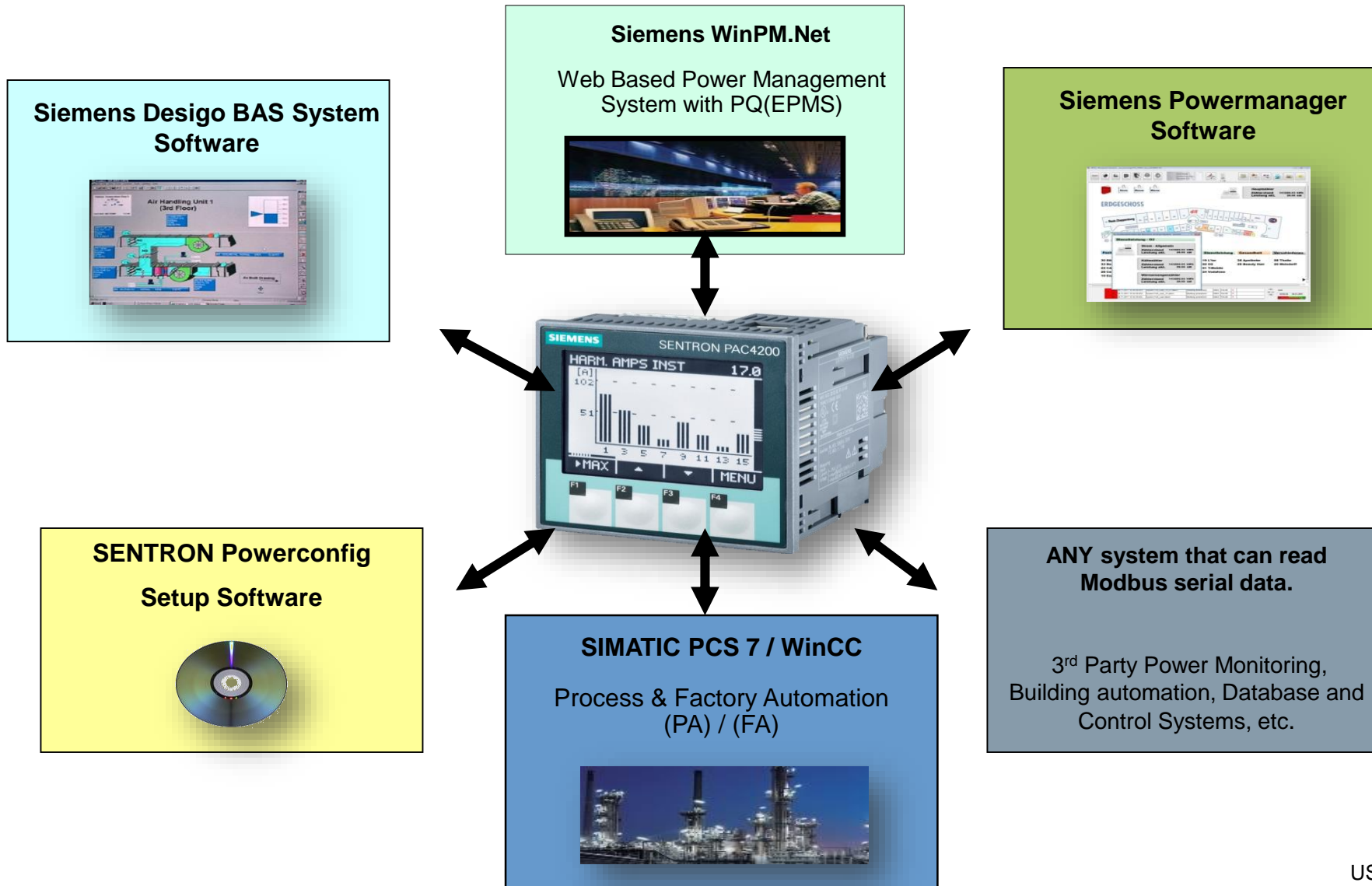


Multiple Meter Monitoring

Used in retrofit or sub billing type applications

Power Management Solutions

Supporting software solutions for PAC4200 Meter



PAC4200 Power Meter Overview

Part numbers



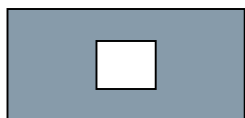
7KM42120BA003AA0



7KM42111BA003AA0



7KM99000YA000AA0



93-47ADAPTER

- Class 0.2 meter, PAC4200, **AC/DC** Comp. Terminals, 200 Basic Measurements, harmonics, logging, alarming, 2-Dig In & 2-Dig Out, custom screens, gateway capability, two optional expansion ports and standard 10/100Base-T Ethernet with dual master ability. Vaux: 110-340VDC / 95-240VAC; Vnom: Max.600/374V; 45-65HZ (UL)
- Class 0.2 meter, PAC4200, **DC ONLY** Comp. Terminals, 200 Basic Measurements, harmonics, logging, alarming, 2-Dig In & 2-Dig Out, custom screens, gateway capability, two optional expansion ports and standard 10/100Base-T Ethernet with dual master ability. Vaux: 22-65 VDC; Vnom: Max.500/289V; 45-65HZ (UL)
- **Optional DIN rail adapter**
- **Adapter Plate** for existing 4700 / 4720 meter with PAC meter cutout.

PAC4200 Power Meter Overview

Part numbers



7KM93000AB000AA0

- SENTRON PAC 3200 or 4200 **PROFIBUS DP** MODULE
- Plugs on the back of the meter, supports baud rates from 9,600 to 12 Mbit/sec



7KM93000AE010AA0

- SENTRON PAC 3200 or 4200 **PROFINET** MODULE
- Plugs on the back of the meter, supports baud rates from 9,600 to 12 Mbit/sec.



7KM93000AM000AA0

- SENTRON PAC 3200 or 4200 **MODBUS RTU** MODULE
- Plugs on the back of the meter, supports baud rates of 4.8, 9.6, 19.2 and 38.4 kBit/sec



7KM92000AB000AA0

- **SENTRON PAC 4200 I/O MODULE**
4DI+2DO (wet)

Thank You

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For additional information on Siemens Digital Solutions contact:

- ✓ Technical Support line at 1-800-333-7421 (M-F) 8-5pm Eastern US.
- ✓ Web Support:
 - ✓ www.usa.Siemens.com/pds
- ✓ Request for Information / Proposal
 - ✓ www.usa.Siemens.com/pds-request