SENTRON PAC – Compact and Powerful Power Monitoring Devices

SENTRON Low-Voltage Controls and Distribution

A sustainable reduction of power costs first requires an analysis of the electrical system's current consumption and power flows. This is supported by our SENTRON PAC power monitoring devices.

Know when and where how much power is consumed

Whether in industrial applications or commercial buildings – our SENTRON PAC power monitoring devices can be employed wherever electric power is distributed and processed. They detect the power values of electrical feeders and individual consumers. In addition, they provide important measured values for assessing the system state and power quality. For further processing of the measured data, the devices can be very easily integrated in superior automation and power management systems.

Highlights

- Easy and space-saving mounting
- Fast commissioning
- Intuitive operation
- Integrated and optional multifunctional digital inputs and outputs
- Straightforward system connection through integrated and optional communication interfaces
- Developed and tested in accordance with European and international standards

Answers for industry.

SIEMENS

SENTRON Power Monitoring Devices

PAC3100, PAC3200 and PAC4200 power monitoring devices

Overview



Instrument variants	SENTRON	PAC3100	PAC3200	PAC4200
Functional overview				
Basic measurement variables				
Voltage, current		✓	✓	✓
Neutral conductor current		✓	--	✓
Apparent power, active power, reactive power, power factor		✓	✓	✓
Power factor of the fundamental wave		--	--	✓
Frequency	Of the reference phase	✓	✓	✓
Min/max values	Slave pointer function | with date & time	✓ | --	✓ | --	✓ | ✓
Power measurement				
Apparent energy		--	✓	✓
Active energy, reactive energy	Input | Output | Balance	✓ | ✓ | ✓	✓ | ✓ | --	✓ | ✓ | --
Number of tariffs	Apparent, active and reactive energy	1	2	2
Daily energy values for 365 days	Apparent, active and reactive energy	--	--	✓
Consumption recording of a sub-process or manufacturing process	Apparent, active and reactive energy	--	--	✓
Power averages of the last measurement period	Active and reactive power average with min / max value	✓	✓	✓
Load profile record		--	--	✓ max. 3840 entries[1]
E-counter for S_0 signal at a digital input	Electrical energy | any energy	-- | --	✓ | --	✓ | ✓
Accuracy class for active energy	According to IEC 62053-21 / 62053-22	Class 1	Class 0.5S	Class 0.2S
Accuracy class for reactive energy	According to IEC 62053-23	Class 3	Class 2	Class 2
Monitoring of state of the plant and quality of the network				
Configurable displays	For presenting up to 4 measured quantities	--	--	4
Operating hours counter	Operating hours of loads	--	✓	✓
Sliding mean values	*U, I, S, P, Q, LF*	--	--	✓
THD voltage, current		--	THD-R	THD
Distortion current strength		--	--	✓
Phase angle, phase displacement angle		--	--	✓
Unbalance	Voltage | current	--	U_{nba} | I_{nba}[2]	U_{nb} | I_{nb}[3]
Harmonics in voltage, current		--	--	3. to 31st
Limit value monitoring	Max. number of limit values	--	6	12
Boolean logic	For limit values | inputs	--| --	✓ | --	✓ | ✓
Event memory for operation, control and system-related events	Including time stamp	--	--	✓ (> 4000 events)
Battery backup for min / max values		--	--	✓



Instrument variants		SENTRON	PAC3100	PAC3200	PAC4200
Functional overview					
System integration and communication					
Ethernet (integrated)			--	10 Mbit/s	10/100 Mbit/s
• Protocol	Modbus TCP		--	✓	✓
• Gateway	Ethernet <--> RS485 (Modbus)		--	--	✓[4]
PROFIBUS DP (V1)			--	Expansion module optional	
RS485			Integrated	Expansion module optional	
• Protocol	Modbus RTU		✓	✓	✓
4DI/2DO expansion module	Expansion to max. 10 DI / 6 DO		--	--	✓ (max. 2 modules)
Number of expansion modules	Max.		--	1	2
Integrated digital inputs (DI)	Number | multifunctional		2 | --	1 | ✓	2 | ✓
Integrated digital outputs (DO)	Number | multifunctional		2 | ✓	1 | ✓	2 | ✓
Installation plan					
Dimensions (L x W x D)	In mm		96 x 96 x 56	96 x 96 x 56	96 x 96 x 82
Mounting depth	PAC | PAC with expansion module (in mm)		51 | --	51 | 73	77 | 99
Panel cut-out (L x W)	In mm		92 x 92	92 x 92	92 x 92
Standards and approvals					
CE / cULus / C-Tick / GOST			✓	✓	✓
IEC 61557-12			✓	--	✓

1) This corresponds for example to a duration of 40 days with a measurement period length of 15 minutes

2) U_{nba}, I_{nba} - Unbalance with regard to amplitude

3) U_{nb}, I_{nb} - Unbalance with regard to amplitude and phase

4) In conjunction with SENTRON PAC RS485 expansion module

✓ Available, -- Not available

Measuring precisely with SENTRON PAC3100/3200/4200 - New dimensions with the power monitoring devices

The SENTRON PAC power monitoring devices:
PAC3200 (left), PAC3100 (center) and PAC4200 (right)

The power monitoring devices of the SENTRON PAC series are used to measure and indicate all relevant network parameters in low-voltage power distribution. They can be used for single-phase measurements as well as for multiphase measurements in 3 and 4-conductor networks (TN, TT, IT).

Power values for main distribution boards, electrical feeders or individual loads are recorded precisely and reliably, and important measured values are supplied in addition for assessing the state of the plant and the quality of the network.

Benefits

General information on the SENTRON PAC

The common features of all power monitoring devices in the SENTRON PAC series:

- Simple mounting and commissioning
- High degree of protection IP65 (from the front when installed) enables use in extremely dusty and wet environments
- Intuitive operation using 4 function keys and multilingual plain-text displays
- Easy adaptation to different systems using integrated and optional
  - Digital inputs and outputs
  - Communication interface
- Global use
  - At least 8 languages
  - International approvals
  - Developed and tested in accordance with European and international standards
- Low mounting depth

SENTRON PAC3200 and SENTRON PAC4200

Additional features of the SENTRON PAC3200 and SENTRON PAC4200:

- Precise power measurement
- Versatile system integration
  - Integrated Ethernet interface
  - Optional communication modules
  - Multifunctional digital inputs and outputs
  - Limit value monitoring
- Can be directly connected to power supply networks up to 690 V AC (UL-L), CATIII without voltage transformer
- User-friendly configuration software included in the scope of supply

SENTRON PAC4200

Additional features of the SENTRON PAC4200:

- Monitoring of the state of the plant and the quality of the network
  - Key data for assessing the quality of the network
  - Logging of plant history in the form of operation, control and system-related events
- Recording of the power characteristic in the form of power averages (load profile)
- Daily power meters for apparent, active and reactive energy over 365 days for cut-off date assessment
- Recording of gas, water, compressed air consumption, or other power sources via pulse counters in the digital inputs
- Can be expanded with modules equipped with up to 10 digital inputs and 6 digital outputs
- Counters for apparent, active and reactive energy for the precise measurement of power consumption of a sub-process or manufacturing process
- 10/100 Mbit/s Ethernet interface with gateway function for the easy connection of devices with a serial RS485 interface to an Ethernet network using a PAC RS485 expansion module
- Extensive convenience indicators such as user-definable indicators, bar and status indicators, phase diagram and list and histogram graphics
- Satisfies the accuracy requirements of class 0.2S high-precision meters used by the power supply companies according to IEC 62053-22, which are normally reserved for exacting industrial applications

Application

Three-phase power monitoring devices are used to measure and indicate all relevant network parameters of an electrical installation and they monitor these parameters permanently.

Applications

Wherever power has to be distributed, be it in industrial or infrastructural buildings, the SENTRON PAC supplies important information to the building services system or the power controlling system.

The many different communication options offered by the SENTRON PAC make it an indispensable supplier of data for power management systems and for plant and building automation.

Industries

Power distribution systems for the power supply are needed in all sectors of industry. SENTRON PAC is used accordingly in all sectors where power consumption and electrical parameters are to be measured.

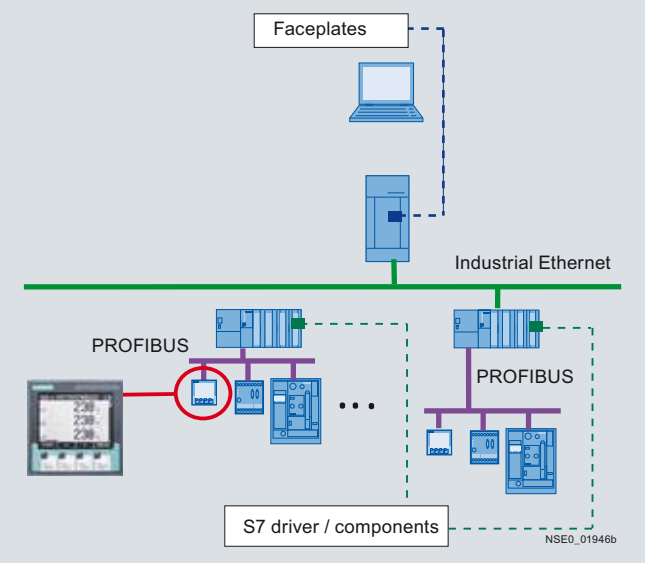
Integration of PAC3200 and PAC4200

When the SENTRON PAC3200 and PAC4200 are fully integrated in a power management system, they monitor the power consumption and help to monitor the operating state of the plant. Measured values, limit value violations, operating hours of a connected load or power flows are supplied by the instruments quickly and reliably.

Using the optionally available interface modules, it is possible to integrate both instruments in every I&C system or every SIMATIC S7 environment.

System integration using function block libraries

Optionally available function block libraries make it easy to integrate the power monitoring devices in the SIMATIC PCS 7 process control system and the SCADA-System SIMATIC WinCC. Together with the faceplates as user interface for SENTRON PAC3200, the driver blocks and diagnostics blocks in the control system enable the operating and monitoring of technologically important values and functions of the measuring devices in the respective target system.



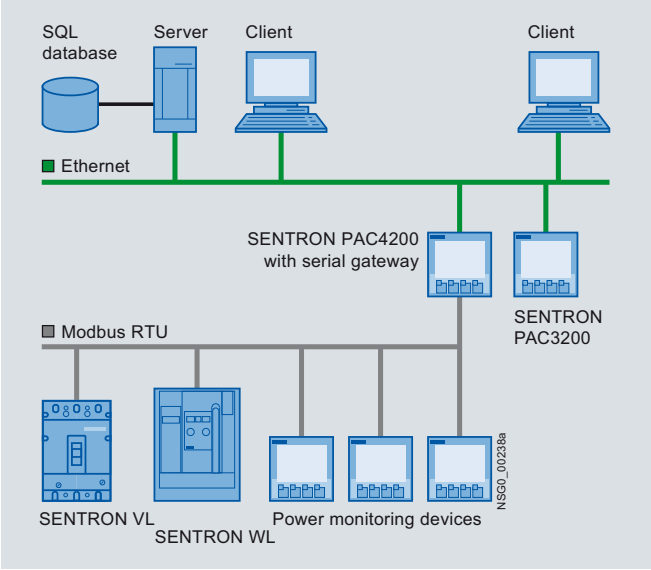
Integration of SENTRON PAC3200 in SIMATIC PCS 7 / WinCC

System integration of RS485 field bus devices through Ethernet

A special feature is the integrated gateway function of the SENTRON PAC4200. It enables a cost-effective and simple connection of devices with a serial RS485 interface to an Ethernet network.

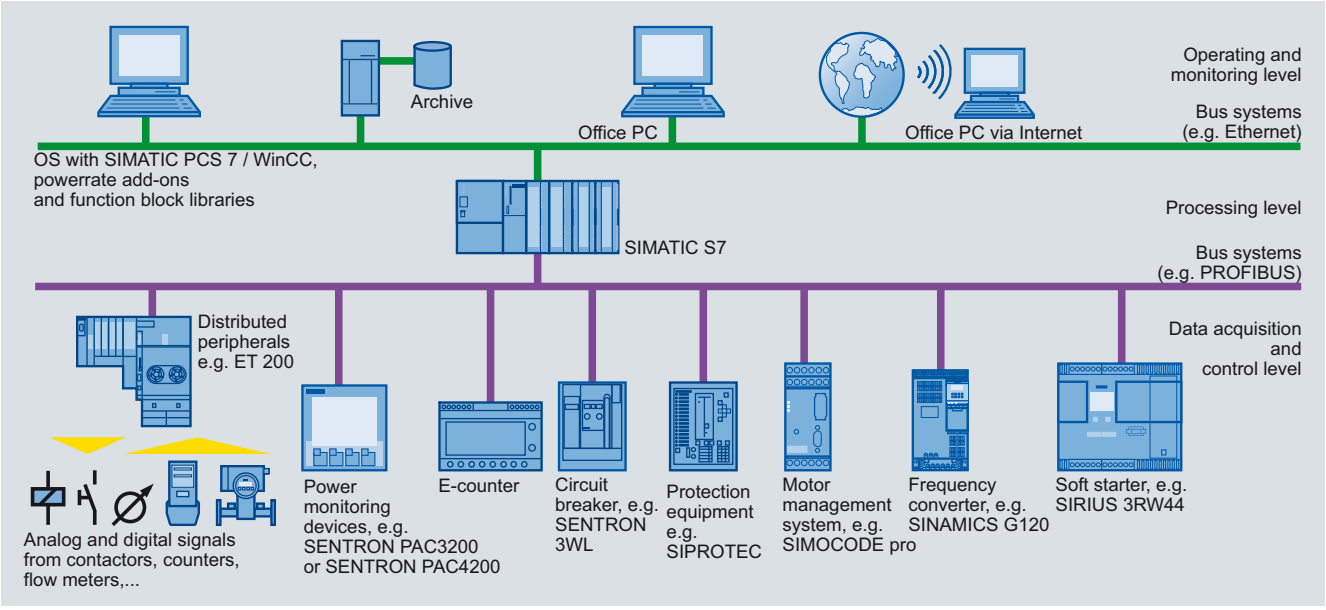
Everything required is provided by the SENTRON PAC RS485 expansion module, to which a maximum of 31 lower-level devices can be connected without a repeater and as many as 247 with a repeater.

The gateway function of the SENTRON PAC4200 supports the Modbus protocol and can be parameterized using SENTRON powerconfig.



Connecting Modbus-RTU devices to a power management system through PAC4200

Power management – system overview



Power Management System: Configuration and assembly of all required components

The continuous increase in energy prices is leading to higher operating costs and can pose a threat to a company's competitiveness.

The goal of our Power Management System is to optimize operating costs and increase plant availability.

As part of TIA and TIP it is fully integrated in the industrial technologies of production and process automation (SIMATIC PCS 7 and SIMATIC WinCC) from Siemens. This means lower costs of implementation and all the following benefits:

- Consistent product design
- Standard components
- Open interfaces
- Uniform operating philosophy
- System-tested, certified products
- Global availability in high Siemens quality
- Optimum support from Siemens hotline

In other words: With power management, you can make full use of all the potential for optimization provided by a consistent power management solution.

The power management system comprises both hardware components and software components.

Hardware components

The hardware components are:

- Communication-capable measuring devices such as
- SENTRON PAC3200 and SENTRON PAC4200
- Switching and protection devices (3VL/3WL)
- The SIMOCODE pro motor management system
- E-counters
- Protection equipment such as SIPROTEC
- And diverse other communication-capable devices

Software components

The software components are:

- SIMATIC PCS 7 powerrate/SIMATIC WinCC powerrate as expansions to SIMATIC PCS 7 and SIMATIC WinCC
- SIMATIC PCS 7 Library PAC3200 as driver/faceplate for SIMATIC PCS 7
- Switch ES Power

SIMATIC PCS 7 powerrate, SIMATIC WinCC powerrate

SIMATIC PCS 7 and WinCC powerrate are expansions to PCS 7 and WinCC respectively and throw light on power consumption from the infeed to the load:

- Identification of power-intensive consumer devices and processes in order to introduce measures for improving power efficiency
- Comparison of consumption profiles for greater efficiency of process design, batch-related consumption recording
- Optimizing the company according to energy parameters based on an assessment of consumption and costs
- Complying with the contractually agreed power limit, thus preventing higher power supply costs or penalty payments

SIMATIC PCS 7 Library PAC3200 and PAC3200 function block library for SIMATIC WinCC

The SIMATIC PCS 7 and WinCC function block libraries for PAC3200 enable optimum integration of the SENTRON PAC3200 power monitoring device in SIMATIC PCS 7 and WinCC respectively.

Hardware components of the Power Management Systems are dealt with in the catalog LV 1, chapter 13, its software components in chapter 18.
You can find more information on the Internet at:
www.siemens.com/powermanagementsystem

Selection and ordering data (Dated 12/2009)

	Version	DT	Order No.	PU (UNIT, SET, M)	PS*	PG	Weight per PU approx. kg
 7KM3 133-0BA00-3AA0	**SENTRON PAC3100** Control panel instrument 96 mm x 96 mm Screw terminals for connecting current and voltage AC/DC power supply unit with wide voltage range U_{AUX}: 100 … 240 V AC ± 10 %, 50/60 Hz 110 … 250 V DC ± 10 % Measuring inputs U_e: max. 3 AC 480/277 V, 50/60 Hz I_e: /5 A	A	**Screw terminals** **7KM3 133-0BA00-3AA0**	1	1 unit	133	0.325
 7KM2 112-0BA00-3AA0	**SENTRON PAC3200** Control panel instrument 96 mm x 96 mm Screw terminals for connecting current and voltage AC/DC power supply unit with wide voltage range U_{AUX}: 95 … 240 V AC ± 10 %, 50/60 Hz 110 … 340 V DC ± 10 % Measuring inputs U_e: max. 3 AC 690/400 V, 50/60 Hz I_e: /1 A or /5 A	A	**Screw terminals** **7KM2 112-0BA00-3AA0**	1	1 unit	133	0.325
 7KM2 111-1BA00-3AA0	**SENTRON PAC3200** Control panel instrument 96 mm x 96 mm Screw terminals for connecting current and voltage DC power supply unit with extra-low voltage U_{AUX}: 22 … 65 V DC ± 10 % Measuring inputs U_e: max. 3 AC 500/289 V, 50/60 Hz I_e: /1 A or /5 A	A	**Screw terminals** **7KM2 111-1BA00-3AA0**	1	1 unit	133	0.325
 7KM2 112-0BA00-2AA0	**SENTRON PAC3200** Control panel instrument 96 mm x 96 mm Cable lug terminals for connecting current and voltage AC/DC power supply unit with wide voltage range U_{AUX}: 95 … 240 V AC ± 10 %, 50/60 Hz 110 … 340 V DC ± 10 % Measuring inputs U_e: max. 3 AC 690/400 V, 50/60 Hz I_e: /1 A or /5 A	A	**Cable lug terminals** **7KM2 112-0BA00-2AA0**	1	1 unit	133	0.325
 7KM4 112-0BA00-3AA0	**SENTRON PAC4200** Control panel instrument 96 mm x 96 mm Screw terminals for connecting current and voltage AC/DC power supply unit with wide voltage range U_{AUX}: 95 … 240 V AC ± 10 %, 50/60 Hz 110 … 340 V DC ± 10 % Measuring inputs U_e: max. 3 AC 690/400 V, 50/60 Hz I_e: /1 A or /5 A	A	**Screw terminals** **7KM4 212-0BA00-3AA0**	1	1 unit	133	0.450

	Version	DT	Order No.	PU (UNIT, SET, M)	PS*	PG	Weight per PU approx. kg
  7KM4 112-0BA00-2AA0	**SENTRON PAC4200**		**Cable lug terminals**				
	Control panel instrument 96 mm x 96 mm Cable lug terminals for connecting current and voltage AC/DC power supply unit with wide voltage range U_{AUX}: 95 … 240 V AC ± 10 %, 50/60 Hz 110 … 340 V DC ± 10 % Measuring inputs U_e: max. 3 AC 690/400 V, 50/60 Hz I_e: /1 A or /5 A	A	**7KM4 212-0BA00-2AA0**	1	1 unit	133	0.450

* You can order this quantity or a multiple thereof.

Accessories

	Version	DT	Order No.	PU (UNIT, SET, M)	PS*	PG	Weight per PU approx. kg
 7KM9 900-0YA00-0AA0	**SENTRON PAC TMP**						
	Adapter for mounting SENTRON PAC3100, PAC3200 or PAC4200 onto standard mounting rail	A	**7KM9 900-0YA00-0AA0**	1	1 unit	133	0.105
	SIMATIC PCS 7 Library PAC3200						
	Software for integration of the SENTRON PAC3200 in SIMATIC PCS 7						
	• Engineering + Runtime license	B	**3ZS2 781-1CC10-0YG0**	1	1 unit	133	0.250
	• Runtime license	B	**3ZS2 781-1CC10-6YH0**	1	1 unit	133	0.250
	PAC3200 function block library for SIMATIC WinCC						
	Software for integration of the SENTRON PAC3200 in SIMATIC WinCC						
	• Engineering + Runtime license	B	**3ZS2 791-1CC10-0YG0**	1	1 unit	133	0.250
	• Runtime license	B	**3ZS2 791-1CC10-6YH0**	1	1 unit	133	0.250

* You can order this quantity or a multiple thereof.

More information

Suitable current transformers can be found

- in the Catalog LV 1, Chapter 16
- in the Industry Mall, Section
  "Low-Voltage Controls and Distribution"
  --> "Low-Voltage Power Distribution"
  --> "Switching and Protection Devices for Power Distribution"
  --> "Molded Case Circuit Breakers"
  -->"3VL Molded Case Circuit Breakers up to 1600 A"
  --> "Accessories and spare parts"

For more information about the software components of the Power Management System, see the Catalog LV 1, Chapter 18 and on the Internet at:
www.siemens.com/powermanagementsystem

SENTRON Power Monitoring Devices

PAC PROFIBUS DP, PAC RS485 and PAC 4DI/2DO expansion modules

Overview

SENTRON PAC PROFIBUS DP expansion module

The PAC PROFIBUS DP expansion module has the following features:

- PROFIBUS DP plug-in communication module for SENTRON PAC3200 and PAC4200 power monitoring devices
- Parameterizable from the front of the device or using parameterization software
- Using PROFIBUS DPV1, data can be transferred in both cyclic and acyclic modes
- Easy integration using GSD file, with free choice of the measurement variables to be transmitted
- Plug and play
- All baud rates from 9.6 Kbit/s to 12 Mbit/s are supported
- Connection through 9-pole Sub-D connector according to IEC 61158
- No external auxiliary power necessary
- Status indication via the device display and by LED on the module

Application

The SENTRON PAC PROFIBUS DP communication module is plugged onto the rear of the power monitoring device.
The device identifies the module automatically and presents the parameters of relevance for this module for selection in the parameterization menu.

All measurement variables supplied by the SENTRON PAC power monitoring devices can be individually selected and cyclically transmitted by means of the GSD file. This allows optimum use of the profibus master's process image.

SENTRON PAC RS485 expansion module

The SENRTON PAC RS485 expansion module has the following features:

- PAC RS485 plug-in communication module for SENTRON PAC3200 and PAC4200 power monitoring devices
- Parameterizable from the front of the device or using parameterization software
- Support for Modbus RTU protocol
- Plug and play
- Baud rates of 4.8/9.6/19.2 and 38.4 kBd are supported
- Connection by means of 6-pole screw terminals
- No external auxiliary power necessary
- Status indication by LED on the module

Application

The SENTRON PAC RS485 communication module is plugged onto the rear of the power monitoring device.
The device identifies the module automatically and presents the parameters of relevance for this module for selection in the parameterization menu. The state of the module is indicated by the integrated LED.

In connection with the SENTRON PAC power monitoring device, the Modbus RTU protocols are supported with baud rates of 4.8/9.6/19.2 and 38.4 kBd.

The SENRTON PAC RS485 expansion module is essential for the gateway function of the PAC4200 to access simple devices with an RS485 interface, for example, the PAC3100 via Ethernet (Modbus TCP).

SENTRON PAC 4DI/2DO expansion module

The SENTRON PAC 4DI/2DO expansion module serves to expand the SENTRON PAC4200 power monitoring device by up to 10 digital inputs and 6 digital outputs.
It offers the following features:

- Up to two 4DI/2DO modules can be plugged into a PAC4200
- The 4DI/2DO modules facilitate the expansion of the internal digital inputs and outputs by up to 8 inputs and 4 outputs
- The 4DI/2DO expansion modules can be parameterized from the front of the device or using the SENTRON powerconfig configuration software
- The device is commissioned via plug and play
- All functions of the integrated multifunctional inputs/outputs of the PAC4200 are also available in the 4DI/2DO expansion module
- Inputs and outputs can be used as a S0 interface according to IEC 62053-31
- The device is connected using a 9-pin screw terminal
- An external auxiliary power supply is not required

Application

The SENTRON PAC 4DI/2DO expansion module offers a wide range of applications, including, among other things:

- Connecting up to 10 optional power meters with a pulse output (S0) for recording gas, water, compressed air consumption, or other power sources
- Integrating other media into a power management system
- Monitoring several, simple switches using auxiliary contacts by a PAC4200
- Using the digital outputs as a pulse output for active and reactive energy
- Using the digital outputs as outputs for switching operations and/or time synchronization

Benefits

Advantages of the digital inputs

Recording and assessing consumption

- More cost-effective media counters can be used in place of communication-capable power meters.
- The meter does need to be replaced, since existing simple power meters with a pulse output can be used.
- Other media can be easily integrated in a power management system.
- Increases the transparency of the power flows, since, for example, the power consumption of a sub-process or the product-related power consumption can be recorded and assessed.
- Pulse counters can be easily assigned through user-definable indicators.

Status monitoring

The digital inputs reduces the wiring outlay by effectively integrating simple protection equipment and switchgear.

Advantages of the digital outputs

The digital outputs offer a high degree of flexibility, since they can be used as follows:

- For displaying the status
  - of a limit value violation
  - of a rotary field direction
  - of an operating state of the PAC4200
- As remote-controlled switching outputs
- For synchronizing the recording periods of the load profile in other devices
- For signaling power measurements
  - Imported active energy
  - Exported active energy
  - Imported reactive energy
  - Exported reactive energy

Selection and ordering data (Dated 12/2009)

	Version	DT	Order No.	PU (UNIT, SET, M)	PS*	PG	Weight per PU approx. kg
	PAC PROFIBUS DP						
 7KM9 300-0AB00-0AA0	Expansion module for SENTRON PAC3200 and PAC4200 (PROFIBUS DP V1)	A	**7KM9 300-0AB00-0AA0**	1	1 unit	133	0.045
	PAC RS485						
 7KM9 300-0AM00-0AA0	Expansion module for SENTRON PAC3200 and PAC4200 (Modbus RTU)	A	**7KM9 300-0AM00-0AA0**	1	1 unit	133	0.041
	PAC 4DI/2DO						
 7KM9 200-0AB00-0AA0 (two modules connected on PAC4200 from the rear)	Expansion module for SENTRON PAC4200	A	**7KM9 200-0AB00-0AA0**	1	1 unit	133	0.041

* You can order this quantity or a multiple thereof.

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