

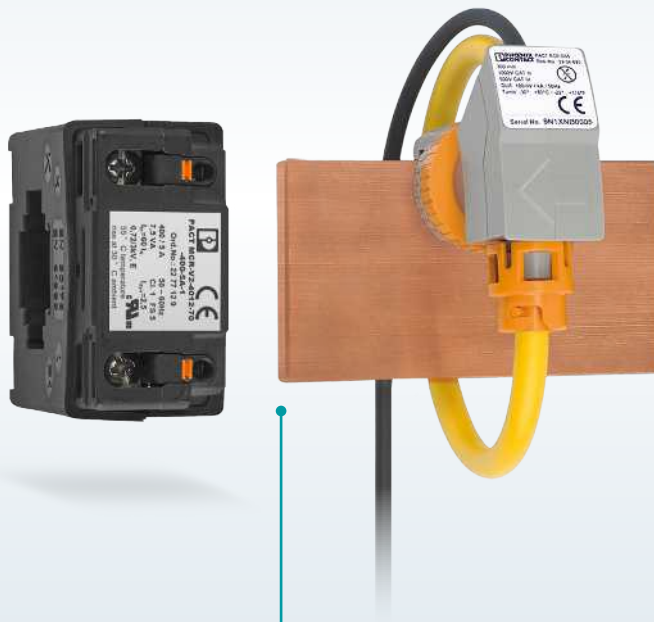


# Energy monitoring

Current sensors, current and voltage measuring technology, energy and power measuring technology

# Products and services for managing your energy

Energy efficiency is truly a key to economic success. Therefore, an energy management system must be easy to implement. Our innovative and coordinated portfolio of sensor technology and measurement technology products can save you a great deal of effort when it comes to energy data acquisition. Future-oriented communication solutions and digital services help you to integrate, manage, and process your data.



## 1 Current sensors

- Current transformers for new installations
- Current transformers for retrofitting

More information starting on page 4.



## 2 Current and voltage measuring technology

- AC/DC current transducers
- AC current transducers
- AC and DC voltage transducers

More information starting on page 14.

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### 3 Energy and power measuring technology

- Energy meters with MID approval
- Multifunctional energy measuring devices and Smart Services
- Photovoltaic string monitoring

More information starting on page 22.

# Current sensors

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Whether for a new installation or for quick and easy retrofitting, our current transformers offer a comprehensive product range for converting alternating currents up to 4,000 A AC into low secondary currents.

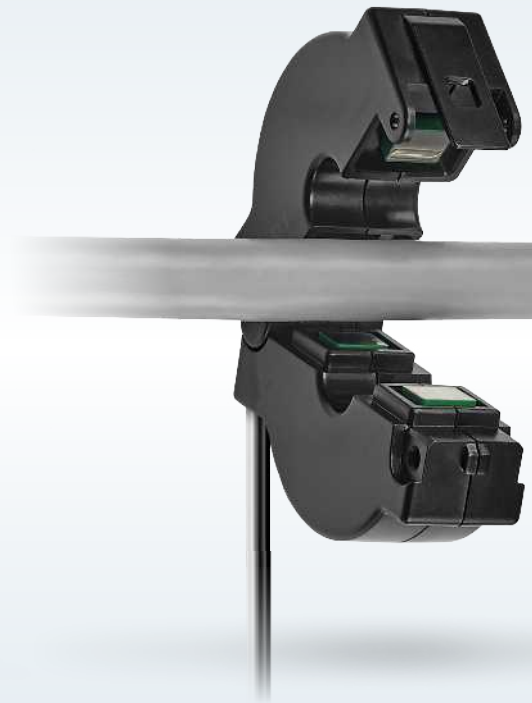


## Current transformers for new installations

PACT current transformers for new installations offer a complete range for converting alternating currents up to 4,000 A AC into secondary currents of 1 A AC and 5 A AC.

- Window-type current transformers
- Bus-bar current transformers
- Winding current transformers

More information starting on page 6.



### Current transformers for retrofitting

Choose from two designs for easy retrofitting of new measuring points in the field without having to remove system parts:

- PACT RCP, based on the Rogowski coil, for currents up to 4,000 A AC
- PACT SPC split-core current transformer for round conductors with currents up to 100 A AC

More information starting on page 10.

## Current sensors

# Current transformers for new installations

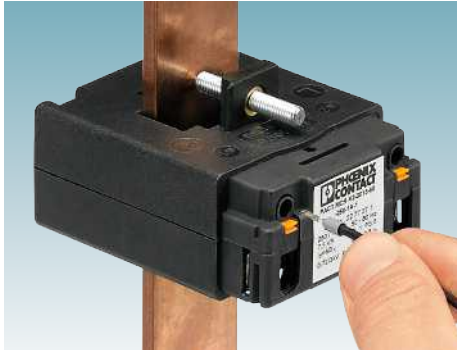
PACT current transformers offer a complete product family for converting alternating currents up to 4,000 A into secondary currents of 1 A and 5 A. Depending on requirements, bus-bar, plug-in, and winding current transformers are available. PACT current transformers come in a range of various transformation ratios, accuracy classes, and rated powers for your current measurement tasks.



## Your advantages

- ✓ Variable mounting, thanks to flexible mounting options
- ✓ Space-saving installation with compact design and consistent 30 mm housing width
- ✓ Detect peak loads reliably with a thermal nominal continuous current that is 120% of the primary rated current
- ✓ Safe wiring, thanks to professional connection technology
- ✓ Save space and time – tool-free mounting with the transformer's quick-action mechanism

# Your advantages in detail



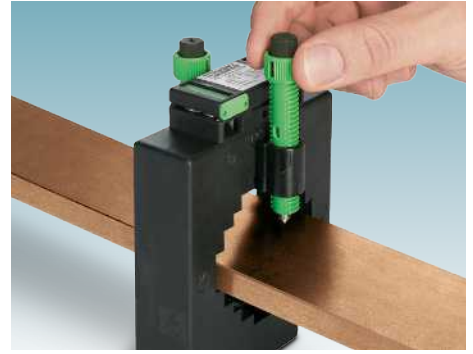
## Easy and direct wiring

The Push-in connection technology enables easy insertion of the conductor without tools and features a high contact quality.



## Safe and durable connection

The screw terminal block ensures low contact resistances and prevents damage as well as the penetration of corrosive gases.



## Fast and secure mounting

The transformer's quick-action mechanism saves space and time. Mount the transformer in no time even in tight spaces.

	EN 61869 (transformer standard)	PACT MCR-V...
<b>Rated insulation voltage</b> (operating voltage)	480 V (L-L)	277 V (L-N)
	720 V (L-L)	416 V (L-N)
	1000 V (L-L)	577 V (L-N)
	–	1000 V (L-N) PACT
<b>Impulse withstand voltage</b> for transformer testing		
	– At 277 V (L-N)	3 kV
	– At 1000 V (L-N)	6 kV
		12 kV PACT

## Comparison of operating voltages

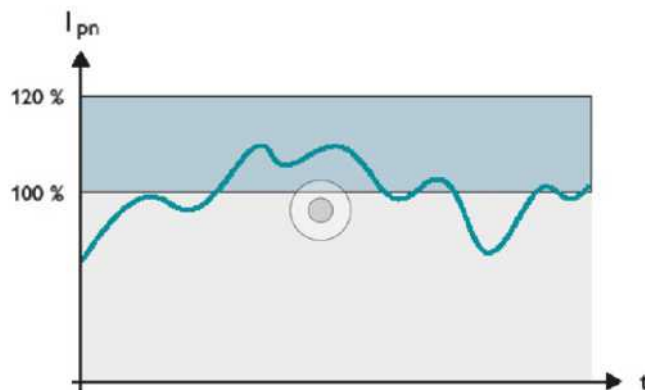
The housing walls of PACT MCR current transformers have a 14 mm overlap, thus offering better electrical safety than required by the standard.

These overlaps significantly increase the air clearances and creepage distances and thereby prevent electrical sparkovers from the primary to the secondary side.

The rated insulation voltage of a typical 720 V transformer is only 416 V (L-N). PACT MCR current transformers even allow for a maximum rated insulation voltage of up to 1,000 V (L-N).



## Safe detection of current peaks





PACT current transformers can be used to safely detect greater current peaks – without resulting in damage. This is because the current transformers are designed for a continuous nominal current that is 120% of the primary rated current strength. This means that for a rated current that is 1.2 times greater, a PACT current transformer with a specified rated power of 10 VA actually delivers 14.4 VA – and on a continual basis.



PACT current transformers also safely detect higher current peaks

# Product overview: PACT current transformers for new installations

PACT current transformers		
		
Description	Winding current transformers	Bus-bar current transformers
Primary rated current	0 ... 1 A 0 ... 2 A 0 ... 5 A 0 ... 10 A 0 ... 15 A 0 ... 20 A 0 ... 25 A 0 ... 30 A 0 ... 40 A	0 ... 50 A 0 ... 75 A 0 ... 100 A 0 ... 125 A 0 ... 150 A 0 ... 200 A 0 ... 250 A 0 ... 300 A 0 ... 400 A
Secondary rated current	1 A AC / 5 A AC	
Accuracy class	0.5 / 1	
Frequency range	50 Hz / 60 Hz	
Circular conductor dimensions		21 mm
Connection method	Screw connection	
Item number	<a href="#">2277417</a>	<a href="#">2277268</a>

PACT current transformers				
				
Description	Window-type current transformers			
Primary rated current	0 ... 60 A 0 ... 80 A 0 ... 100 A 0 ... 125 A 0 ... 150 A 0 ... 200 A 0 ... 250 A 0 ... 300 A 0 ... 400 A 0 ... 500 A 0 ... 600 A 0 ... 750 A		0 ... 100 A 0 ... 150 A 0 ... 200 A 0 ... 250 A 0 ... 300 A 0 ... 400 A 0 ... 500 A 0 ... 600 A 0 ... 750 A 0 ... 800 A 0 ... 1000 A	
Secondary rated current	1 A AC / 5 A AC			
Accuracy class	0.5 / 1			
Frequency range	50 Hz / 60 Hz			
Circular conductor dimensions	28 mm		33 mm	
Rail dimensions	30 mm x 15 mm 20 mm x 20 mm		40 mm x 12 mm 2 x 30 mm x 10 mm	
Connection method	Screw connection	Push-in connection	Screw connection	Push-in connection
Item number	<a href="#">2277271</a>	<a href="#">2907413</a>	<a href="#">2277284</a>	<a href="#">2907414</a>



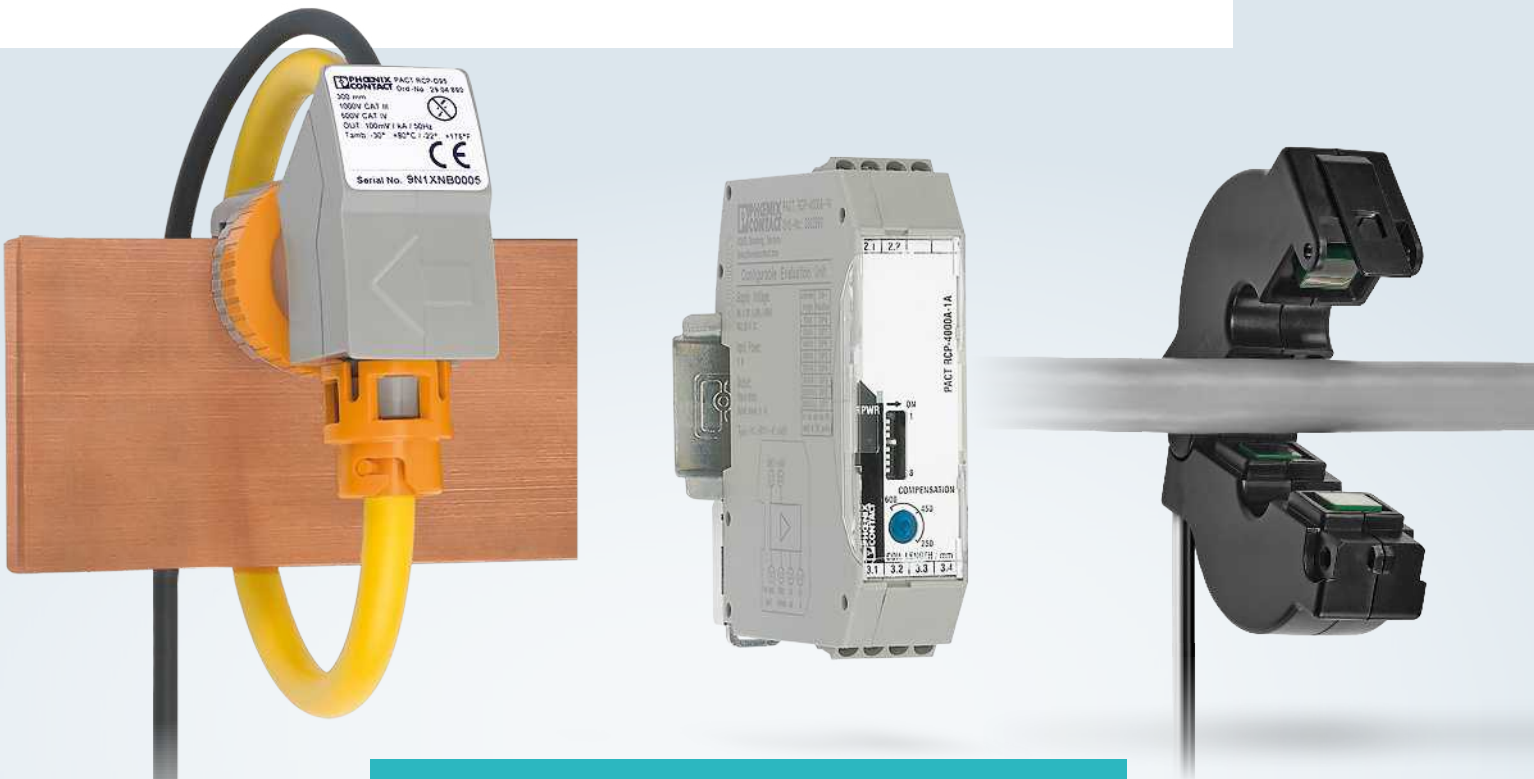
## PACT current transformers

					
<b>Description</b>	<b>Window-type current transformers</b>				
Primary rated current	0 ... 100 A 0 ... 150 A 0 ... 200 A 0 ... 250 A 0 ... 300 A 0 ... 400 A 0 ... 500 A 0 ... 600 A 0 ... 750 A 0 ... 800 A 0 ... 1000 A 0 ... 1250 A 0 ... 1500 A		0 ... 200 A 0 ... 300 A 0 ... 400 A 0 ... 500 A 0 ... 600 A 0 ... 750 A 0 ... 800 A 0 ... 1000 A 0 ... 1250 A		0 ... 800 A 0 ... 1000 A 0 ... 1500 A 0 ... 2000 A 0 ... 2500 A 0 ... 3000 A 0 ... 4000 A
Secondary rated current	1 A AC / 5 A AC				
Accuracy class	0.5 / 1				
Frequency range	50 Hz / 60 Hz				
Circular conductor dimensions	42 mm		52 mm		85 mm
Rail dimensions	50 mm x 12 mm 2 x 40 mm x 10 mm		60 mm x 15 mm 2 x 50 mm x 10 mm 40 mm x 40 mm		2 x 100 mm x 10 mm 80 mm x 64 mm
Connection method	Screw connection	Push-in connection	Screw connection	Push-in connection	Screw connection
Item number	<a href="#">2277297</a>	<a href="#">2907416</a>	<a href="#">2277336</a>	<a href="#">2907417</a>	<a href="#">2277378</a>

## Current sensors

# Current transformers for retrofitting

Use the PACT RCP Rogowski coil to capture AC currents up to 4,000 A and convert them into a secondary current or into an analog standard signal, depending on the type of downstream measuring transducer. The PACT SCP split-core current transformers allow you to quickly retrofit new measuring points for smaller currents up to 100 A. The direct connection to our EMpro energy measuring devices is especially practical.



### Your advantages

- ✓ Quick retrofitting of new measuring points without separating electrical conductors
- ✓ Practical direct connection to all EMpro energy measuring devices with 0 ... 1 A AC current input
- ✓ Space-saving due to the compact design
- ✓ Secure fit on rail or round conductors due to professional mounting options
- ✓ Various measuring ranges provide suitability for any application

## Your advantages in detail



### Compact, safe, and flexible

Capture alternating currents up to 4,000 A using a single compact coil type. The frequency spectrum ranges from 40 to 20,000 Hz. You can therefore also measure harmonics and transients with phase accuracy. Neither magnetic saturation nor dangerous open-circuit voltages occur.



### UV protection for outdoor use

For permanent outdoor use, the Rogowski coil of the UV version is equipped with a UV-resistant housing and UV-protected cables.



### Eight current measuring ranges

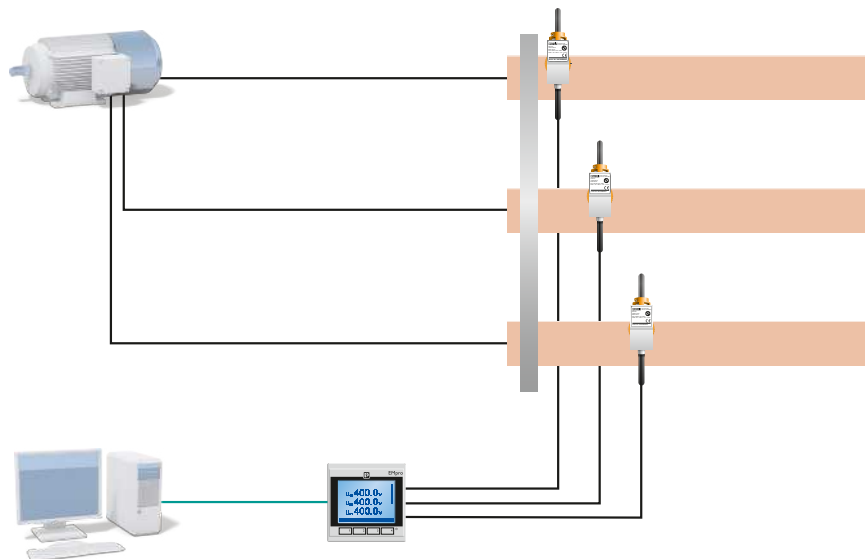
The measuring transducer connected downstream supplies the typical 0 ... 1 A AC secondary current just like a standard current transformer does. Use a DIP switch to choose between eight different current measuring ranges. For optimum measuring accuracy, simply use a potentiometer to compensate for the different coil lengths.

## Optimum interaction with our EMpro energy measuring devices

Certain product types of our EMpro energy measuring devices can be connected directly to Rogowski coils from any manufacturer. The mV signal is processed in the device. You don't need any external measuring transducer.



Choose a Rogowski coil from Phoenix Contact to benefit from both a very high measuring accuracy and a particularly easy configuration at the same time.


When the coil is connected, the respective phase can be inverted by the firmware as needed. It is no longer necessary to rewire the two conductors.




Central energy data acquisition with a PACT RCP Rogowski coil and an EMpro energy measuring device


# Product overview: PACT RCP current transformers for retrofitting


PACT RCP current transformers for retrofitting									
									
<b>Product type</b>	<b>Current transformers</b>								
Description	Rogowski coil and measuring transducer for energy measurement							Rogowski coil and measuring transducer with UV protection for outdoor use	
Primary rated current	0 ... 100 A 0 ... 250 A 0 ... 400 A 0 ... 630 A 0 ... 1000 A 0 ... 1500 A 0 ... 2000 A 0 ... 4000 A								
Accuracy class	<1								
Output signal	0 ... 1 A AC								
Length of measuring coil	300 mm			450 mm		600 mm		450 mm	600 mm
Length of signal line	3 m	5 m	10 m	3 m	10 m	3 m	10 m	3 m	
Connection method	Screw connection								
Item number	2904921	2910325	2910326	2904922	1033483	2904923	2910327	1058044	1033485

PACT RCP current transformers for retrofitting						
						
<b>Product type</b>	<b>Current transformers</b>					
Description	Rogowski coil and measuring transducer for current measurement					
Primary rated current	0 ... 100 A 0 ... 250 A 0 ... 400 A 0 ... 630 A 0 ... 1000 A 0 ... 1500 A 0 ... 2000 A 0 ... 4000 A					
Accuracy class	1					
Output signal	0 ... 20 mA / 4 ... 20 mA / 0 ... 10 mA / 2 ... 10 mA / 0 ... 21 mA / 0 ... 10 V / 2 ... 10 V / 0 ... 5 V / 1 ... 5 V / 0 ... 10.5 V					
Length of measuring coil	300 mm		450 mm		600 mm	
Length of signal line	3 m					
Connection method	Screw connection	Push-in connection	Screw connection	Push-in connection	Screw connection	Push-in connection
Item number	2906231	2906234	2906232	2906235	2906233	2906236

# Product overview: PACT SPC current transformers for retrofitting

PACT RCP Rogowski coils							
							
<b>Product type</b>	<b>Rogowski coil</b>						
Description	Rogowski coil for current measurement – can be connected directly to energy measuring devices						
Frequency range	40 Hz ... 20000 Hz						
Output signal	100 mV (no load, at 1000 A)						
Length of measuring coil	300 mm			450 mm		600 mm	
Length of signal line	3 m	5 m	10 m	3 m	10 m	3 m	10 m
Item number	2904890	2910322	2910323	2904891	1033482	2904892	2910324

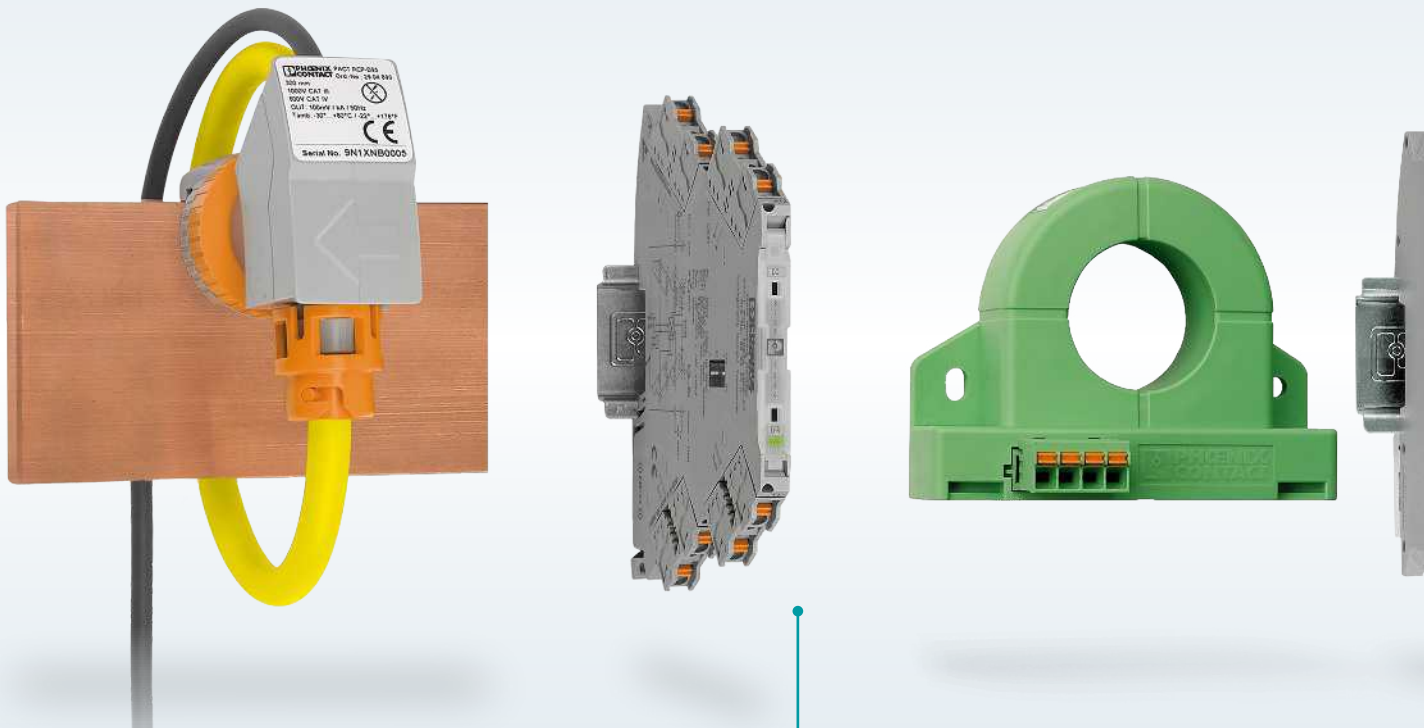
Accessories			
	Description	Item number	Type
	The optional holding device ensures the Rogowski coil is securely seated on busbars with a thickness of 10 ... 15 mm. During installation, the coil housing is pushed onto the flange of the holding device and snaps in automatically.	2904895	PACT RCP-CLAMP
	The optional holding device ensures the Rogowski coil is securely seated on busbars with a thickness of 5 ... 10 mm. During installation, the coil housing is pushed onto the flange of the holding device and snaps in automatically.	2907888	PACT RCP-CLAMP-5-10

PACT SPC current transformers for retrofitting			
			
<b>Product type</b>	<b>Current transformers</b>		
Description	Split-core current transformer for retrofitting		
Primary rated current	0 ... 20 A AC	0 ... 50 A AC	0 ... 100 A AC
Secondary rated current	0 ... 1 A AC		
Accuracy class	3	1	0.5
Frequency range	50 Hz / 60 Hz		
Circular conductor dimensions	13 mm		
Length of signal line	2 m	3 m	
Item number	1382378 <span style="background-color: #e91e63; color: white; padding: 2px;">new</span>	1382384 <span style="background-color: #e91e63; color: white; padding: 2px;">new</span>	1382387 <span style="background-color: #e91e63; color: white; padding: 2px;">new</span>

# Current and voltage measuring technology

2

Use our current transducers to measure direct and alternating currents of any waveform, including distorted alternating currents, and convert them into a standard analog signal. Our voltage transducers capture DC voltages and sinusoidal AC voltages in various signal ranges and convert these into standard analog signals as well.



## Current transducers

Here you can find the right measuring transducer for capturing of direct, alternating, and distorted currents:

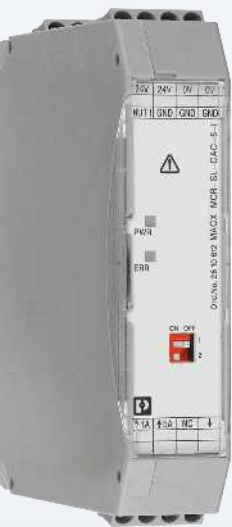
- MCR current transducers for measuring direct and alternating currents as well as distorted currents
- PACT RCP AC measuring transducers based on an upstream Rogowski coil are described in the section “Current transformers for retrofitting”

More information starting on page 16.

## Current and voltage monitoring relays

Our monitoring relays detect faults as soon as they occur. As soon as the set limit value is exceeded or not reached, system parts can be shut down selectively, or an error message can be sent to a controller.

Are you also interested in this subject? For further information on this, see our website and the “Relays, optocouplers, and logic modules” selection guide.



## Voltage transducers

Choose the suitable measuring transducer for capturing direct and alternating voltages in various signal ranges:

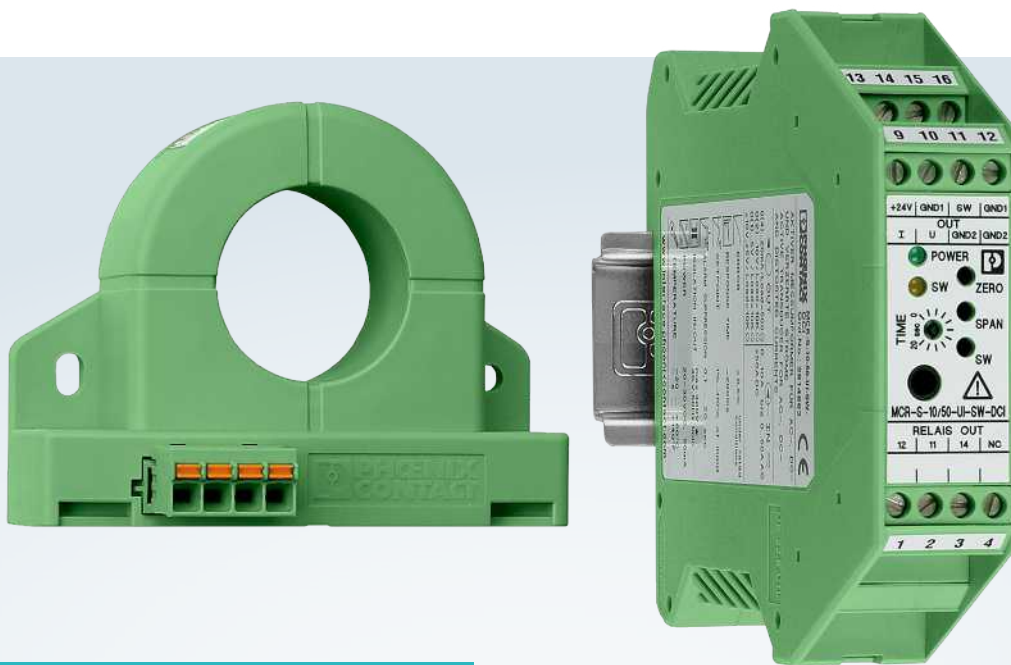
- MCR AC voltage transducers for AC voltages up to 550 V AC
- MCR DC voltage transducers for DC voltages up to 550 V DC
- SOLARCHECK DC voltage transducers for DC voltages up to 1,500 V DC are described in the section “Energy and power measuring technology”

More information starting on page 20.

## Current and voltage measuring technology

# MCR AC/DC current transducers

MCR AC/DC current transducers measure direct and alternating currents of any waveform and convert them into a standard analog signal. Choose between adjustable devices for precise mapping of small measuring ranges up to 55 A or compact devices in graded measuring ranges for measuring high currents up to 600 A.



### Your advantages


- ✓ For decentralized use as well, thanks to compact dimensions
- ✓ Variable mounting on DIN rail or mounting plate
- ✓ Easy wiring due to plug-in connection terminal blocks
- ✓ For insulated conductors up to 32 mm in diameter





### Your advantages

- ✓ Quick basic configuration via DIP switches
- ✓ Advanced configuration and diagnostic options via software
- ✓ Optimum mapping of the measuring range, thanks to programmable upper and lower limits
- ✓ Limit value alarm via relay or transistor output



# Product overview: MCR AC/DC current transducers for alternating currents

Current transducers for direct, alternating, and distorted currents									
									
<b>Frequency range</b>	<b>20 Hz ... 6000 Hz</b>								
Description	3-way isolation, COMBICON connector for supply and output signal, max. cable diameter 32 mm								
Measuring range	0 ... 100 A		0 ... 200 A		0 ... 300 A		0 ... 400 A	0 ... 500 A	0 ... 600 A
Output signal	4 ... 20 mA	0 ... 10 V	4 ... 20 mA	0 ... 10 V	4 ... 20 mA	0 ... 10 V	4 ... 20 mA		
Supply voltage	20 V DC ... 30 V DC								
Degree of protection	IP20								
Maximum transmission error	<±1%								
Ambient temperature range	-40°C ... 65°C								
Delivery state	Unconfigured								
Connection method	Push-in connection								
Item number	2308027	2308108	2308030	2308205	2308043	2308302	2308072	2308085	2308098

Current transducers for direct and alternating currents									
									
<b>Frequency range</b>	<b>15 Hz ... 400 Hz</b>								
Description	The current-carrying conductor makes contact at a connection terminal block				The current-carrying conductor is pulled through the housing without making contact. Through connection: Ø 10.5 mm				
Measuring range	0 ... 11 A AC/DC				0 ... 55 A AC/DC				
Output signal	0 ... 20 mA / 4 ... 20 mA / 20 ... 0 mA / 20 ... 4 mA / 0 ... 5 V / 1 ... 5 V / 0 ... 10 V / 2 ... 10 V / -5 ... 5 V / -10 ... 10 V / 10 ... 0 V / 10 ... 2 V / 10 ... -10 V / 5 ... 0 V / 5 ... 1 V / 5 ... -5 V								
Switching output	Relay output: 1 changeover contact / transistor output, PNP			Relay output: 1 changeover contact / transistor output, PNP					
Supply voltage	20 V DC ... 30 V DC								
Degree of protection	IP20								
Maximum transmission error	<0.5%								
Ambient temperature range	-20°C ... 60°C								
Delivery state	Preconfigured	Unconfigured	Preconfigured	Unconfigured	Preconfigured	Unconfigured	Preconfigured	Unconfigured	
Connection method	Screw connection								
Item number	2814650	2814731	2814634	2814715	2814663	2814744	2814647	2814728	

## Current and voltage measuring technology

# MCR AC current transducers

With our MCR AC current transducers, even distorted alternating currents can be captured and converted into a standard analog signal. There are two product families: one with adjustable versions with a variable supply concept, and one with versions with a hinged Rogowski sensor for easy installation and retrofitting.







### Your advantages






- ✓ Hinged sensor provides for uninterrupted installation
- ✓ Current measurement without shunt via the Rogowski sensor
- ✓ Easy wiring, thanks to plug-in connection terminal blocks
- ✓ Can be mounted on DIN rail or mounting plate

### Your advantages

- ✓ Input and output signal setting via DIP switch
- ✓ Versions for worldwide use with wide-range input
- ✓ 24-volt power supply and voltage bridging via DIN rail connector
- ✓ Operating state diagnostics by means of an LED on the front
- ✓ Protection against interference, thanks to 3-way electrical isolation

# Product overview: MCR AC current transducers

Current transducers for alternating currents				
				
<b>Frequency range</b>	<b>30 Hz ... 6000 Hz</b>			
Description	Current transducer for opening, max. cable diameter 18.5 mm			
Measuring range	0 ... 50 A / 0 ... 75 A / 0 ... 100 A		0 ... 100 A / 0 ... 150 A / 0 ... 200 A	
Output signal	0 ... 5 V / 0 ... 10 V	4 ... 20 mA	0 ... 5 V / 0 ... 10 V	4 ... 20 mA
Supply voltage	20 V DC ... 30 V DC	Loop-powered, no external supply necessary	20 V DC ... 30 V DC	Loop-powered, no external supply necessary
Degree of protection	IP20			
Maximum transmission error	<1%			
Ambient temperature range	-20°C ... 60°C			
Delivery state	Unconfigured			
Connection method	Screw connection			
Item number	2813457	2813486	2813460	2813499

Current transducers for sinusoidal alternating currents					
					
<b>Frequency range</b>	<b>45 Hz ... 65 Hz</b>			<b>45 Hz ... 60 Hz</b>	<b>45 Hz ... 65 Hz</b>
Description	3-way isolation, measuring range and output signal configurable	3-way isolation, measuring range and output signal configurable, wide-range supply for implementation worldwide		Passive current transducer for sinusoidal AC currents	Current monitor for sinusoidal AC currents. Through connection: Ø 4.2 mm
Measuring range	0 ... 1 A AC / 0 ... 5 A AC		0 ... 5 A AC / 0 ... 12 A AC	0 ... 1 A AC / 0 ... 5 A AC	0 ... 16 A AC
Output signal	0 ... 20 mA / 4 ... 20 mA			0 ... 20 mA / 0 ... 10 V	
Switching output					Relay output: 1 changeover contact
Supply voltage	19.2 V DC ... 30 V DC	19.2 V AC/DC ... 253 V AC/DC			20 V DC ... 30 V DC
Degree of protection	IP20				
Maximum transmission error	≤0.5%			<0.5%	
Ambient temperature range	-20°C ... 65°C			-25°C ... 60°C	-20°C ... 65°C
Delivery state	Unconfigured				
Connection method	Screw connection				
Item number	2810612	2810625	2810638	2814359	2864464

Current and voltage measuring technology

## MCR AC and DC voltage transducers





Capture AC and DC voltages in various signal ranges and convert them into standard analog signals with our MCR AC and DC voltage transducers.





### Your advantages

- ✓ Bidirectional output signals
- ✓ Optimum measuring accuracy with eight finely graduated voltage measuring ranges
- ✓ ZERO/SPAN adjustment  $\pm 20\%$
- ✓ High operational safety due to 3-way electrical isolation

# Product overview: MCR AC and DC voltage transducers

Voltage transducers				
				
Voltage type	DC voltage		AC voltage	
Description	Voltage transducer for DC voltages up to $\pm 660$ V DC, ZERO/SPAN adjustment $\pm 20\%$		Voltage transducer for sinusoidal AC voltages up to $\pm 660$ V AC, ZERO/SPAN adjustment $\pm 20\%$	
Measuring range	-550 V DC ... 550 V DC / -370 V DC ... 370 V DC / -250 V DC ... 250 V DC / -170 V DC ... 170 V DC / -120 V DC ... 120 V DC / -80 V DC ... 80 V DC / -54 V DC ... 54 V DC / -36 V DC ... 36 V DC / -24 V DC ... 24 V DC		0 V AC ... 550 V AC / 0 V AC ... 370 V AC / 0 V AC ... 250 V AC / 0 V AC ... 170 V AC / 0 V AC ... 120 V AC / 0 V AC ... 80 V AC / 0 V AC ... 54 V AC / 0 V AC ... 36 V AC / 0 V AC ... 24 V AC	
Frequency range			45 ... 405 Hz	
Output signal	-20 ... 20 mA / -10 ... 10 V		0 ... 20 mA / 4 ... 20 mA / 0 ... 10 V / 2 ... 10 V	
Supply voltage	19.2 V DC ... 30 V DC			
Degree of protection	IP20			
Maximum transmission error	<1%			
Ambient temperature range	-25°C ... 60°C			
Connection method	Screw connection	Push-in connection	Screw connection	Push-in connection
Item number	<a href="#">2906242</a>	<a href="#">2906243</a>	<a href="#">2906239</a>	<a href="#">2906244</a>

Voltage transducers		
		
Voltage type	DC voltage	
Description	Voltage measuring module	
Measuring range	0 V DC ... 1500 V DC / 0 V DC ... 1000 V DC (UL)	
Temperature coefficient	<0.01%/K	
Output signal	2 ... 10 V DC	
Supply voltage	21.6 V DC ... 30 V DC	
Internal current consumption	8 mA (typical) / 65 mA (maximum)	
Degree of protection	IP20	
Maximum transmission error	$\pm 1\%$	
Ambient temperature range	-20°C ... 70°C	
Connection method	Screw connection	
Items per packing unit	1	10
Item number	<a href="#">2903591</a>	<a href="#">1084352</a>

# Energy and power measuring technology

3

Whether for complex energy measurements, simple cost center billing, or monitoring the performance of your photovoltaic system, our products for energy and power measuring record all electrical variables that are relevant to your energy monitoring system. To ensure easy device installation and startup, we have focused in particular on easy usability and optimum interaction with the current sensors.



## Energy meters with MID approval

EMpro energy meters make it possible to calculate energy data for the exact cost center. Standard communication interfaces enable easy integration into existing bus and network structures. Special versions are especially suited for collecting energy data for billing purposes in e-mobility charging stations.

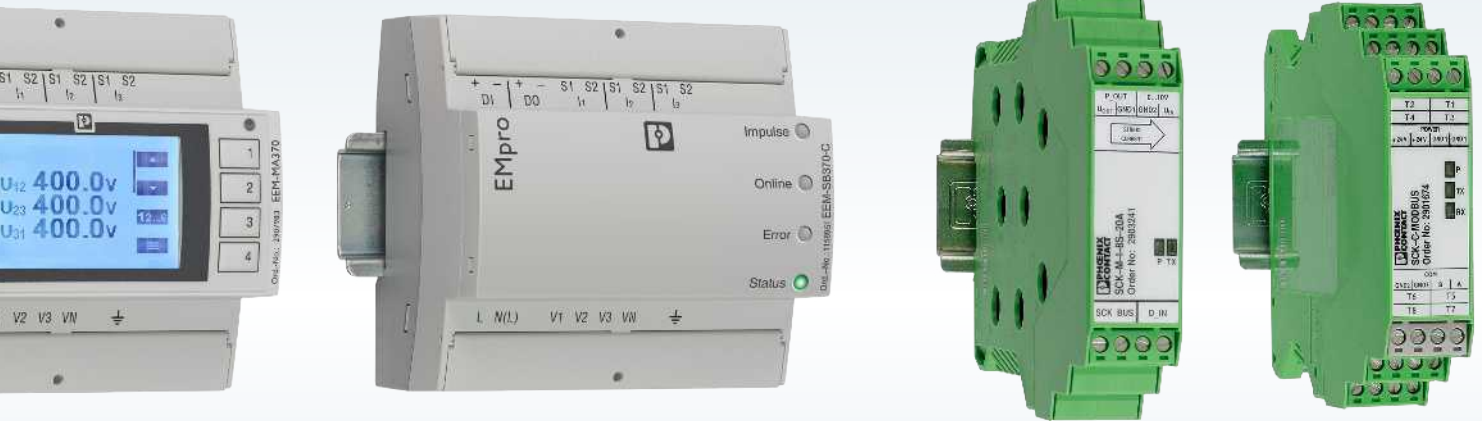
More information starting on page 24.



## Multifunctional energy measuring devices

EMpro energy measuring devices capture your energy data and communicate it to higher-level control and management systems. These products can be configured and integrated into your network in minutes. The integrated REST interface (Representational State Transfer) and direct connection to the cloud pave the way to the digital world.

More information starting on page 28.



### PV string monitoring

The SOLARCHECK PV string monitoring system provides reliable information on the status of your photovoltaic system. Detect power losses in individual lines, which may be caused by damaged panels or defective contacts and cabling.

More information starting on page 34.

## Energy and power measuring technology

# EMpro energy meters with MID approval

EMpro energy meters with MID certification in accordance with EN 50470 enable cost-center-specific energy data billing. The measuring devices record key electrical parameters such as currents, voltages, power factors, powers, and energy values in all four quadrants. The data is forwarded to your higher-level control system via standard communication interfaces.

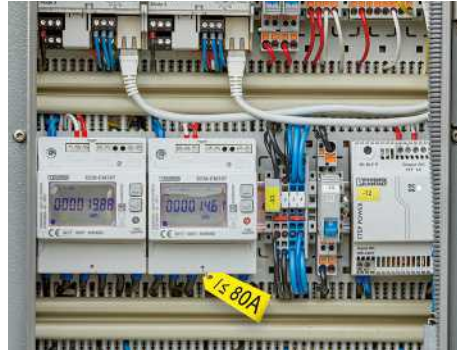


### Your advantages

- ✓ Simple bus and network connection via M-Bus, Modbus/RTU, or Modbus/TCP interface
- ✓ Overall width of just 17.5 mm or 72 mm takes up little space on the DIN rail
- ✓ Save time and money with versions for direct current measurement up to 40 A or 80 A
- ✓ Remote data access, storage, and export with Ethernet-based devices



## Your advantages in detail



### A good basis for your audit

With the MID-certified measuring devices of the EMpro product family, you can easily and cost-effectively measure energy data and bill energy consumption in accordance with the European Measuring Instruments Directive. The continuous data acquisition provides you with the basic data you need for your energy audit.

### Flexible current measurement

All product types are available either with a measurement input for an external current transformer or with an input for direct measurement. The current transformer measurement input is configurable for 1 A and 5 A transformers. The transformer ratio can also be configured. Currents up to 40 A or 80 A are captured directly via an internal current transformer.

### Integrated web server

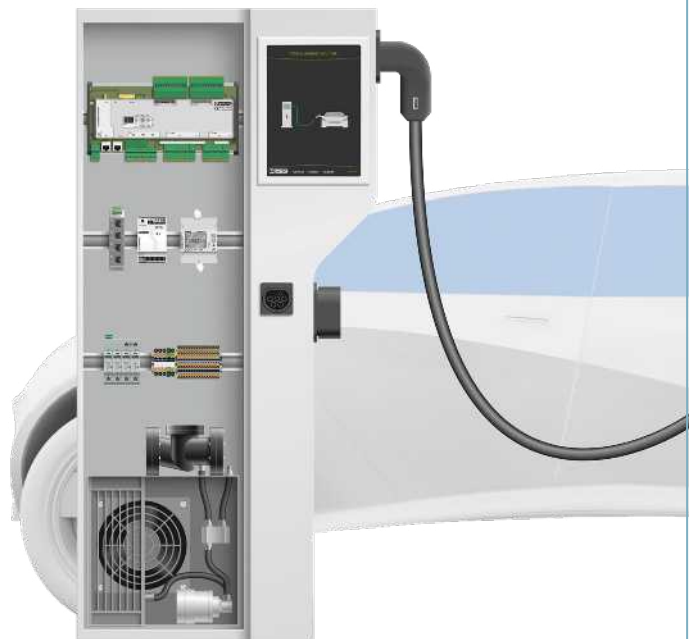
The web server integrated into the Ethernet-based measuring devices allows you to perform remote configuration, access data remotely, and save energy data. The data can be downloaded manually or exported automatically via the FTP function.

## MID energy meters for the charging infrastructure

### Energy data for billing purposes in e-mobility charging stations

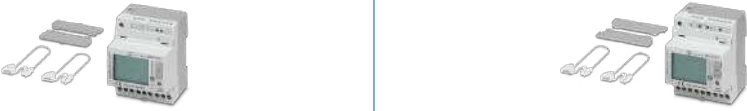
The new EMpro energy meters are suited for collecting energy data for billing purposes in e-mobility charging stations. The Modbus/RTU register tables are optimized for communication with charging technology components.


- Direct measurement of charging currents up to 80 A without an additional current transformer
- Saves space in the charging station thanks to a low overall width of just 17.5 mm or 72 mm
- Designed for extreme temperatures up to +70°C
- Billing of charging processes thanks to MID approval
- Fully bi-directional 4-quadrant measurement for all energy and power values







Energy data for billing purposes in e-mobility charging stations

# Product overview: EMpro energy meters with MID approval


EMpro energy meters for alternating current		
		
<b>Maximum input current</b>	<b>6 A</b>	
Description	Transformer-rated meter with pulse output and tariff input	
Input voltage range	3x 184 V ... 288 V (320 V ... 500 V)	
Max. measurement connection	6 mm <sup>2</sup>	
S0 output	Yes	
Supply voltage	Supply from the measuring circuit	
Compliance	MID-compliant	
Communication protocol	Modbus	M-Bus
Ambient temperature range	-25°C ... 55°C	
Connection method	Screw connection	
Item number	2908578	2908576

EMpro energy meters for alternating current		
		
<b>Maximum input current</b>	<b>6 A</b>	
Description	Transformer-rated meter with pulse output and web-based management including save function	
Input voltage range	3x 184 V ... 288 V (320 V ... 500 V)	
Max. measurement connection	6 mm <sup>2</sup>	
S0 output	Yes	
Supply voltage	Supply from the measuring circuit	
Compliance	MID-compliant	
Communication protocol	Modbus/TCP HTTP NTP DHCP FTP	
Ambient temperature range	-25°C ... 55°C	
Connection method	Screw connection	
Item number	2908581	

### EMpro energy meters for alternating current

				
<b>Maximum input current</b>	<b>40 A</b>	<b>63 A</b>	<b>80 A</b>	
Description	Directly connected meter with pulse output	Directly connected meter with pulse output and tariff input		
Input voltage range	184 V ... 276 V	3x 184 V ... 288 V (320 V ... 500 V)		
Max. measurement connection	6 mm <sup>2</sup>	35 mm <sup>2</sup>		
S0 output	Yes			
Supply voltage	Supply from the measuring circuit			
Compliance	MID-compliant			
Communication protocol	Modbus		M-Bus	
Ambient temperature range	-25°C ... 70°C		-25°C ... 55°C	
Connection method	Screw connection			
Item number	1219090	1219095	1252817	2908586

### EMpro energy meters for alternating current

	
<b>Maximum input current</b>	<b>80 A</b>
Description	Directly connected meter with pulse output and web-based management including save function
Input voltage range	3x 184 V ... 288 V (320 V ... 500 V)
Max. measurement connection	35 mm <sup>2</sup>
S0 output	Yes
Supply voltage	Supply from the measuring circuit
Compliance	MID-compliant
Communication protocol	Modbus/TCP HTTP NTP DHCP FTP
Ambient temperature range	-25°C ... 55°C
Connection method	Screw connection
Item number	2908590

## Energy and power measuring technology

# EMpro multifunctional energy measuring devices

EMpro energy measuring devices acquire your energy data and communicate it to superordinate control and management systems. Configure and integrate the devices in just a few steps using the web-based, user-guided installation wizard. You can also benefit from the simple, direct connection of conventional Rogowski coils, and from the many practice-oriented web server and device functions.



### Your advantages

- ✓ Energy measurement in just three steps with the intuitive installation wizard
- ✓ Reduce wiring and configuration effort with the direct connection of conventional Rogowski coils
- ✓ Easy startup and servicing with intelligent web server and display functions
- ✓ Data protection through the targeted deactivation of key configuration functions and interfaces
- ✓ Fast integration into control and management systems with future-oriented communication solutions and digital services



EtherNet/IP



Proficloud.io

{ REST API }

# Your advantages in detail



## Intuitive installation wizard

Set up the communication interface, select the grid type, and configure the measuring input. EMpro measuring devices can be configured and integrated into the network in just three steps. The installation wizard starts up automatically when the device is switched on for the first time. Alternatively, you can set the configuration baseline directly on the device via the user-guided operating keys.



## Intelligent web server and device functions

A large number of practical web server and device functions simplify day-to-day work, such as monitoring the correct operation of the system, as well as troubleshooting in the event of service and support actions. In addition to configuring the device, you can use the web server to perform other functions such as data logging, assessing the network quality, and displaying the energy flows in clear trend diagrams.



## Fast wiring and configuration

The Rogowski measuring input saves you a great deal of time during wiring and configuration. Directly connect any conventional Rogowski coil, and the products will process the mV signal directly. The measuring transducer that is normally used is no longer required. Configure your current input with a single click. The coil parameters are already stored on the web server.

## Easy networking

In local networks, the devices can be easily accessed via the integrated REST API. REST or “Representational State Transfer” is a widely used architecture in the field of IT, which is also gradually being adopted in industrial applications. The user-friendly interface architecture uses well-known Internet protocols. Using any browser, data can be retrieved with just a few commands via an HTTP GET request, for example. You do not need long register tables or special knowledge of industrial communication protocols.

### Your advantages with the REST API

- The HTTP/REST/JSON format enables the quick and convenient development of system integration
- Simplified data analysis with configurable requests and additional information, such as the serial number and device designation
- Read-only concept provides added security
- Communication interfaces such as Modbus/TCP can be used in parallel
- Continuous expansion of the scope of functions with firmware updates



Easy data access via the REST API

# Energy and power data analysis

## Smart energy measuring devices and services

### Energy, Monitoring, Management, Analytics:

With the EMMA Smart Service and the IoT-capable EMpro energy measuring devices, you get a complete package for your digitalized energy and power data analysis.

### Directly to the cloud – without a gateway

EMpro energy measuring devices with a direct connection to the cloud enable interaction with the devices from anywhere, and at any time. Access your energy data and component information anywhere in the world, without an additional gateway.

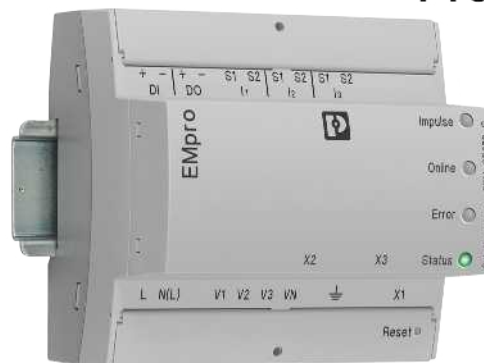
### Your advantages

- Direct connection of the energy measuring device to Proficloud.io without using an IoT gateway
- Flexible access to energy data and component information any time, anywhere with Smart Services on Proficloud.io

- Secure communication between the IoT-capable energy measuring device and Proficloud.io via TLS encryption
- Easy extension and scalability with dynamic IT resources that can be quickly and individually tailored to new requirements



Proficloud.io



## EMMA, the smart energy management service

Take advantage of Proficloud.io and benefit from the EMMA energy management service with numerous intuitive and flexible functions for monitoring, analyzing, and evaluating your energy and power data – any time, anywhere. A series of intuitive dashboards makes energy management much easier. With EMMA, you can make faster, better-informed decisions and optimize work sequences through remote monitoring.

EMMA thus supports energy managers proportionally in the check step of the PDCA cycle (Plan, Do, Check, Act) in accordance with the international standard ISO 50 001:2018 (Energy management systems – Requirements with guidance for use).

### Your advantages

- Easy and fast retrofitting of energy measuring technology using IoT-capable EMpro energy measuring devices, which can be connected directly to the Proficloud.io IoT cloud environment via Ethernet interface through a plug-and-play principle

- The energy manager can collect energy data with little effort and immediately visualize it graphically, without programming or necessary expertise
- Tracking of energy data and key figures offers the opportunity to make production more efficient
- Continuous improvement process through full transparency of energy data and thus uncovered efficiency potential



## Device Management Service

Manage and monitor your cloud-capable energy measuring devices and other smart devices from Phoenix Contact with the Device Management Service. A digital nameplate gives you a direct overview of device information, such as the device type, serial number, and installed firmware and hardware version.

In addition, the health status is visible. Via TrafficLight, you directly see when a warning or a fault has occurred on the device. More detailed information can be retrieved from the device logs.

Regularly updating the firmware is essential to ensure security of the device. A direct update function is available for this in the service.

Your advantages

- Overview of your devices
- Health status of the devices
- Firmware update from the cloud
- Digital nameplate and device logs

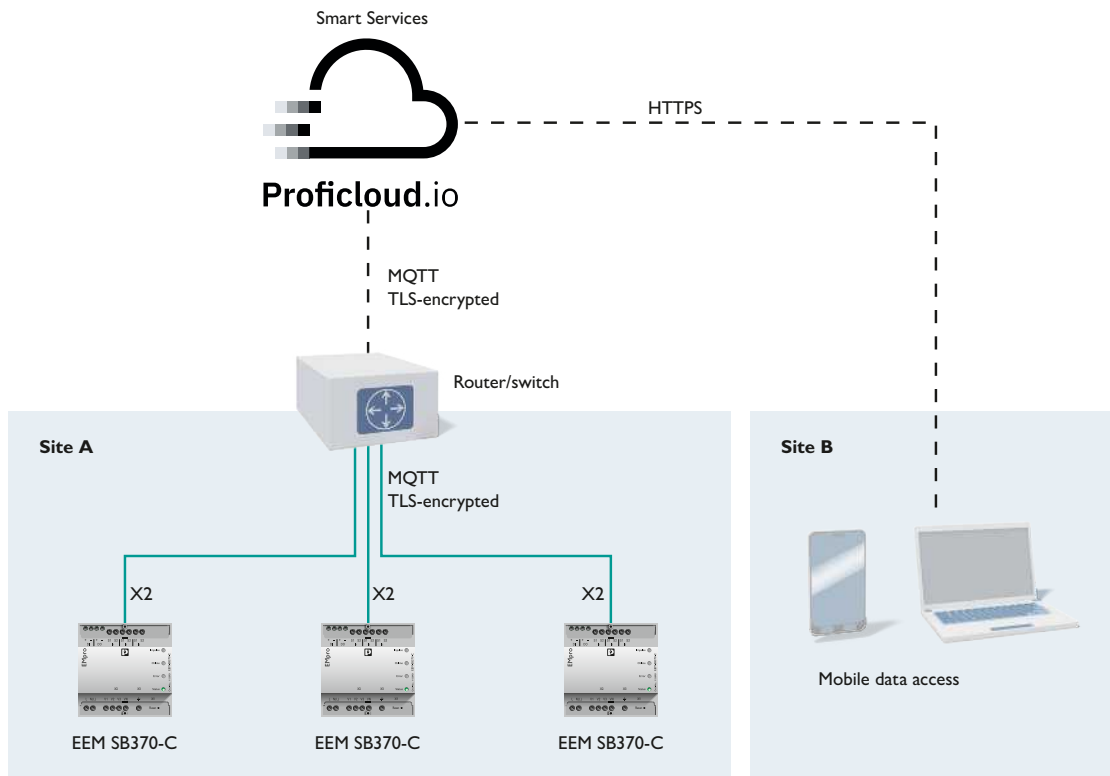


## Topology of IoT-based energy management


IoT-capable measuring devices (smart devices) are connected directly to the Proficloud.io cloud platform via an Ethernet interface and the MQTT protocol using plug-and-play. Within the cloud environment, the measuring devices can be easily and quickly integrated into a new or


existing system via the Device Management Service. The selected measured values are automatically transferred and stored. Energy management managers have immediate access to this data via the EMMA Smart Service and can use it directly. Complex configurations of classic industrial networks

(e.g., Modbus or PROFINET) are now a thing of the past.



# Product overview: EMpro multifunctional energy measuring devices

EMpro energy measuring devices								
								
Measurement process	Current transformers				Rogowski coil			
Mounting type	Front panel installation							
Voltage measuring input (direct)	35 V AC ... 690 V AC (phase/phase)							
Current measuring input L1, L2, L3	Secondary: 1 A / 5 A				4000 A			
Power measurement, active energy	Class 0.5 S (IEC 62053-22)				Class 1 (IEC 62053-21)			
Supply voltage	100 V AC ... 400 V AC (±20%) / 150 V DC ... 250 V DC (±20%)							
Connection method	Screw connection							
Communication protocol	Modbus/TCP							
	REST							
		Modbus/RTU	PROFINET RT	EtherNet/IP™		Modbus/RTU	PROFINET RT	EtherNet/IP™
Item number	2907945	2907944	2907946	2907953	2908286	2908285	2908301	2908302

EMpro energy measuring devices				
				
Measurement process	Current transformers		Rogowski coil	
Mounting type	DIN rail mounting			
Voltage measuring input (direct)	35 V AC ... 690 V AC (phase/phase)			
Current measuring input L1, L2, L3	Secondary: 1 A / 5 A		4000 A	
Power measurement, active energy	Class 0.5 S (IEC 62053-22)		Class 1 (IEC 62053-21)	
Supply voltage	100 V AC ... 230 V AC (±20%) / 150 V DC ... 250 V DC (±20%)			
Connection method	Screw connection			
Communication protocol	Modbus/TCP			
	REST			
		Modbus/RTU		Modbus/RTU
Item number	2907983	2907980	2908307	2907985



## EMpro energy measuring devices



Measurement process	Current transformers				Rogowski coil			
Mounting type	DIN rail mounting							
Voltage measuring input (direct)	35 V AC ... 690 V AC (phase/phase)							
Current measuring input L1, L2, L3	Secondary: 1 A / 5 A				4000 A			
Power measurement, active energy	Class 0.5 S (IEC 62053-22)				Class 1 (IEC 62053-21)			
Supply voltage	100 V AC ... 230 V AC (±20%) / 150 V DC ... 250 V DC (±20%)							
Connection method	Screw connection							
Communication protocol	Modbus/TCP							
	REST							
		PROFINET RT	EtherNet/IP™	MQTT		PROFINET RT	EtherNet/IP™	MQTT
Item number	2907954	2907984	2907971	1158951	2907955	2908308	2907976	1158947

## EMpro energy measuring devices with 24 V DC supply



Measurement process	Current transformers			Rogowski coil		
Mounting type	Front panel installation	DIN rail mounting		Front panel installation	DIN rail mounting	
Voltage measuring input (direct)	35 V AC ... 690 V AC (phase/phase)					
Current measuring input L1, L2, L3	Secondary: 1 A / 5 A			4000 A		
Power measurement, active energy	Class 0.5 S (IEC 62053-22)			Class 1 (IEC 62053-21)		
Supply voltage	18 V DC ... 30 V DC					
Connection method	Screw connection					
Communication protocol	Modbus/TCP					
	REST					
Item number	1127052	1127059	1127061	1127060	1127058	1127055

## Energy and power measuring technology

# PV string monitoring

Detect errors – increase efficiency: Photovoltaic systems should achieve maximum energy yield in the shortest possible time.

SOLARCHECK provides reliable information about the status of your photovoltaic system. You can therefore respond to malfunctions in individual strings promptly and take appropriate countermeasures.



### Your advantages

- ✓ Low costs and wiring effort, as an additional power supply unit is not required in the device connection box
- ✓ Design flexibility for string combiner boxes, thanks to 4- and 8-channel versions
- ✓ Space-saving installation due to the compact design
- ✓ Easy integration into monitoring systems via Modbus/RTU communication
- ✓ Monitoring of remote indication contacts via an additional digital input

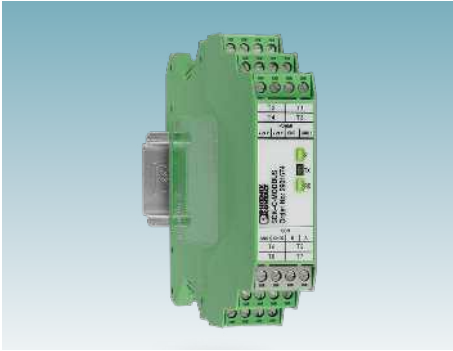
# Product overview: EMpro multifunctional energy measuring devices

1

2

3

Energy and power measuring technology



## Communicate and supply

The communication module collects the values from the measuring modules and, as a Modbus slave, forwards them to your central control system. It is also used to supply the measuring modules in the field. The communication module is simply integrated into an existing network as a Modbus/RTU device.



## Contact-free current measurement

In a current measuring module just 22.5 mm wide, the parameters of your PV systems are determined on a contact-free basis with the aid of Hall sensors and forwarded to the communication module. 4- and 8-channel versions are available.



## Measure DC voltages up to 1,500 V

With the voltage measuring module, you can measure DC voltages up to 1,500 V. The module is suitable for measuring in both grounded and isolated PV systems. You can also flexibly use the voltage measurement outside the monitoring system as a simple analog device.

## PV string monitoring couldn't be easier with SOLARCHECK

Feed the power cables quickly and easily through the openings in the measuring module. The two-wire communication cable is also used to supply the measuring modules with power. This means that you can supply up to 16 measuring modules with one communication module – without an additional power supply. With a width of just 22.5 mm, the narrow measuring module bundles the cables in a very compact space. This saves space in your control cabinet. Combine 4- and 8-channel current measuring modules to tailor the system perfectly to your application.



20-channel current measurement (8+8+4) with two 8-channel devices and one 4-channel device

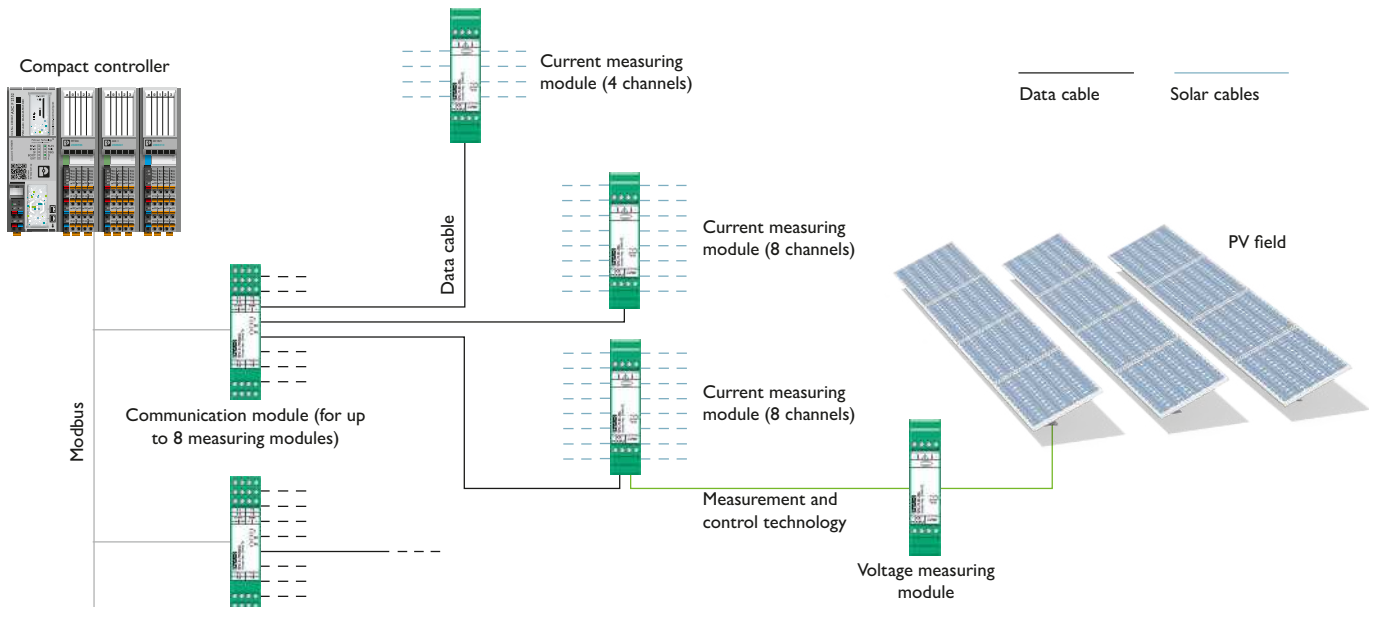
# Application examples

## Monitoring photovoltaic strings

The measuring system can be used to measure up to 64 direct currents and eight DC voltages at the same time. The complete system enables you to

operate 16 measuring modules on one communication module. The two-wire communication cable is also used to supply the measuring modules with power. That

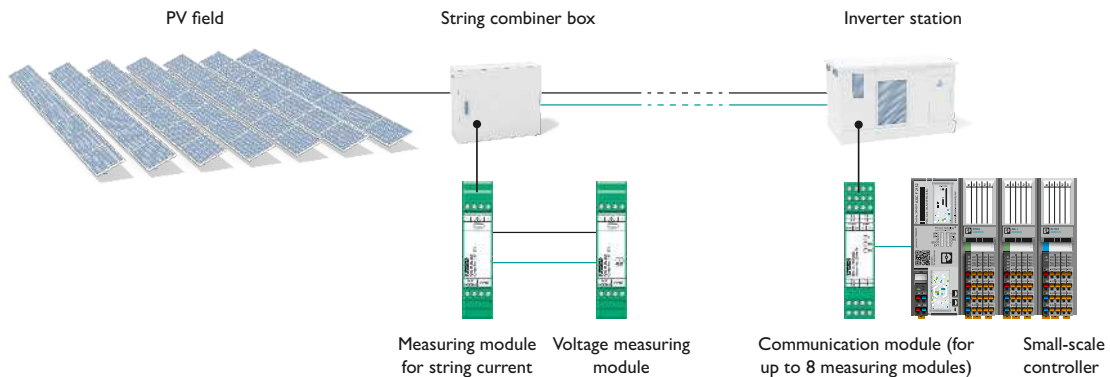
means only one central power supply is required for the communication module for this system.



## Automation and visualization

Use the continuous process data acquisition as well as the data management. In doing so, you enhance the efficiency and yield of your photovoltaic system. Automation and visualization tools from Phoenix Contact enable worldwide

networking of ground-mounted systems. This enables you to acquire and evaluate data at all times. The open register structure of the Solarcheck system enables quick and easy integration into your individual software environment.



# Product overview: SOLARCHECK PV string monitoring







1

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3

Energy and power measuring technology

## SOLARCHECK current and voltage measuring modules

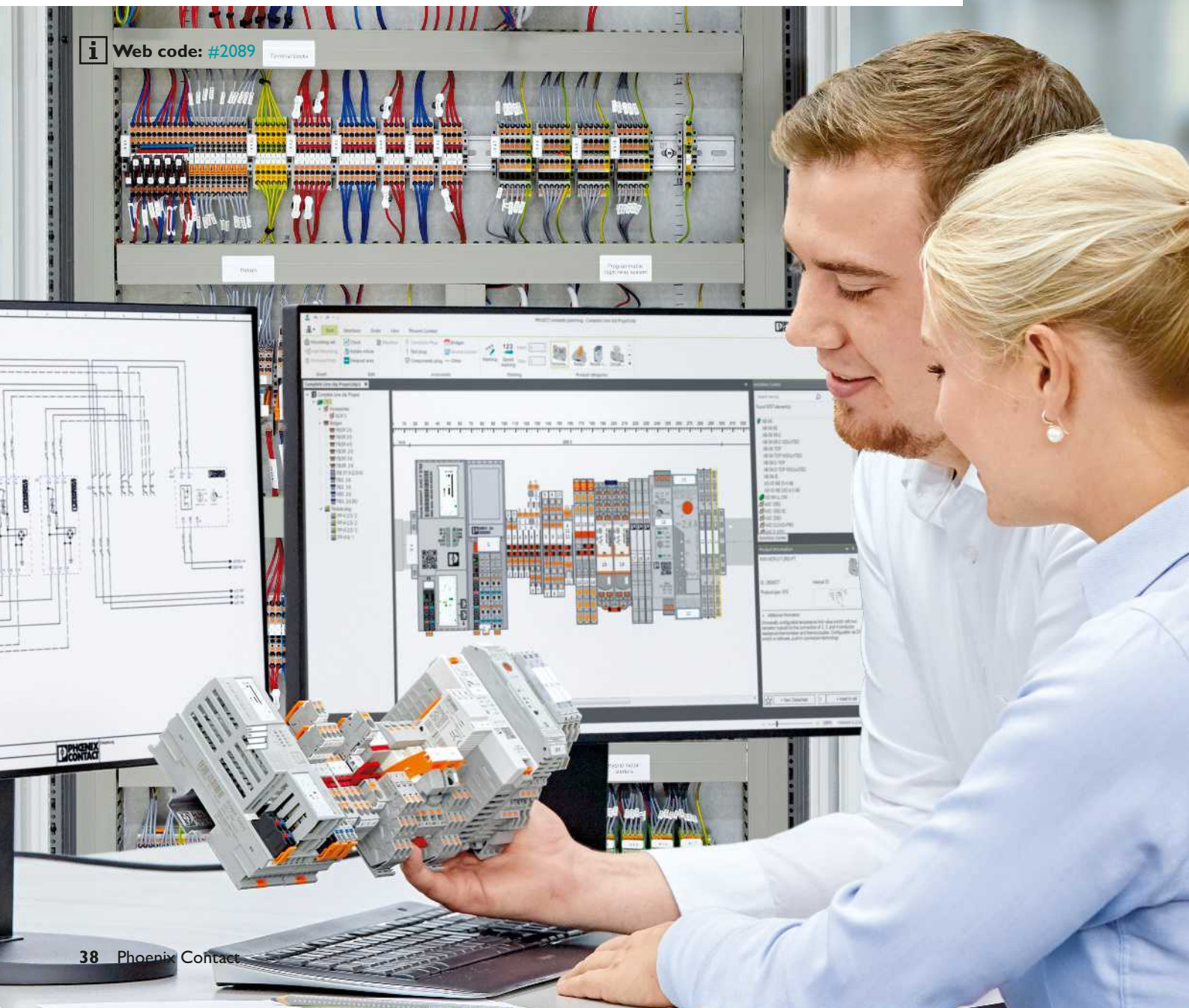
						
Product type	Current transducers				Voltage transducers	
Description	Current measuring module, 8-channel, incl. connection for voltage measuring module		Current measuring module, 4-channel		Voltage measuring module	
Measuring range	0 ... 20 A DC				0 V DC ... 1500 V DC / 0 V DC ... 1000 V DC (UL)	
Analog input	0 V ... 10 V					
Temperature coefficient	0.02%/K				<0.01%/K	
Output signal	Proprietary to the SOLARCHECK communication module				2 ... 10 V DC	
Supply voltage	Via the SOLARCHECK communication module				21.6 V DC ... 30 V DC	
Internal current consumption	43 mA (typical) / 50 mA (maximum)				8 mA (typical) / 65 mA (maximum)	
Degree of protection	IP20					
Maximum transmission error	±1%					
Ambient temperature range	-20°C ... 70°C					
Connection method	Screw connection					
Items per packing unit	1	10	1	10	1	10
Item number	2903241	1084349	2903242	1084351	2903591	1084352

## SOLARCHECK communication modules

		
Product type	Gateways/proxies	
Description	Communication module	
Supply voltage	21.6 V DC ... 30 V DC	
Internal current consumption	22 mA (typical) / 45 mA (maximum)	
Communication protocol	Modbus/RTU	
Serial transmission speed	9.6/14.4/19.2/38.4 Kbps	
Degree of protection	IP20	
Ambient temperature range	-20°C ... 70°C	
Connection method	Screw connection	
Items per packing unit	1	10
Item number	2901674	1084335

# COMPLETE line – the comprehensive solution for the control cabinet

The COMPLETE line system encompasses technologically leading and coordinated hardware and software products, consulting services, and system solutions that help you optimize your processes in control cabinet building. Engineering, purchasing, installation, and operation become significantly easier for you.



## Your advantages in detail:



### Comprehensive product portfolio

With COMPLETE line, we offer a complete product portfolio of technologically leading products. This includes:

- Controllers and I/O modules
- Power supplies and device circuit breakers
- Terminal blocks and distribution blocks
- Relay modules and motor starters
- Signal conditioners
- Safety technology
- Surge protection
- Heavy-duty connectors



### Intuitive handling

With the simple, intuitive handling of the coordinated hardware components, you will save time during installation, startup, and maintenance. With Push-in connection technology, you can wire applications quickly and without using tools. The broad, technologically leading product portfolio will always provide you with the right product for standard or special applications.



### Save time throughout the entire engineering process

The clipx ENGINEER planning and marking software supports the entire process of control cabinet manufacturing. The program features an intuitive user interface that allows the individual planning, automatic checking, and direct ordering of terminal strips.



### Reduced logistics costs

Reduced variety of parts with standardized marking, bridging, and testing accessories. The COMPLETE line system coordinates products, design, and accessories so that you benefit from maximum reusability and thus reduce your logistics costs.



### Optimized processes in control cabinet manufacturing

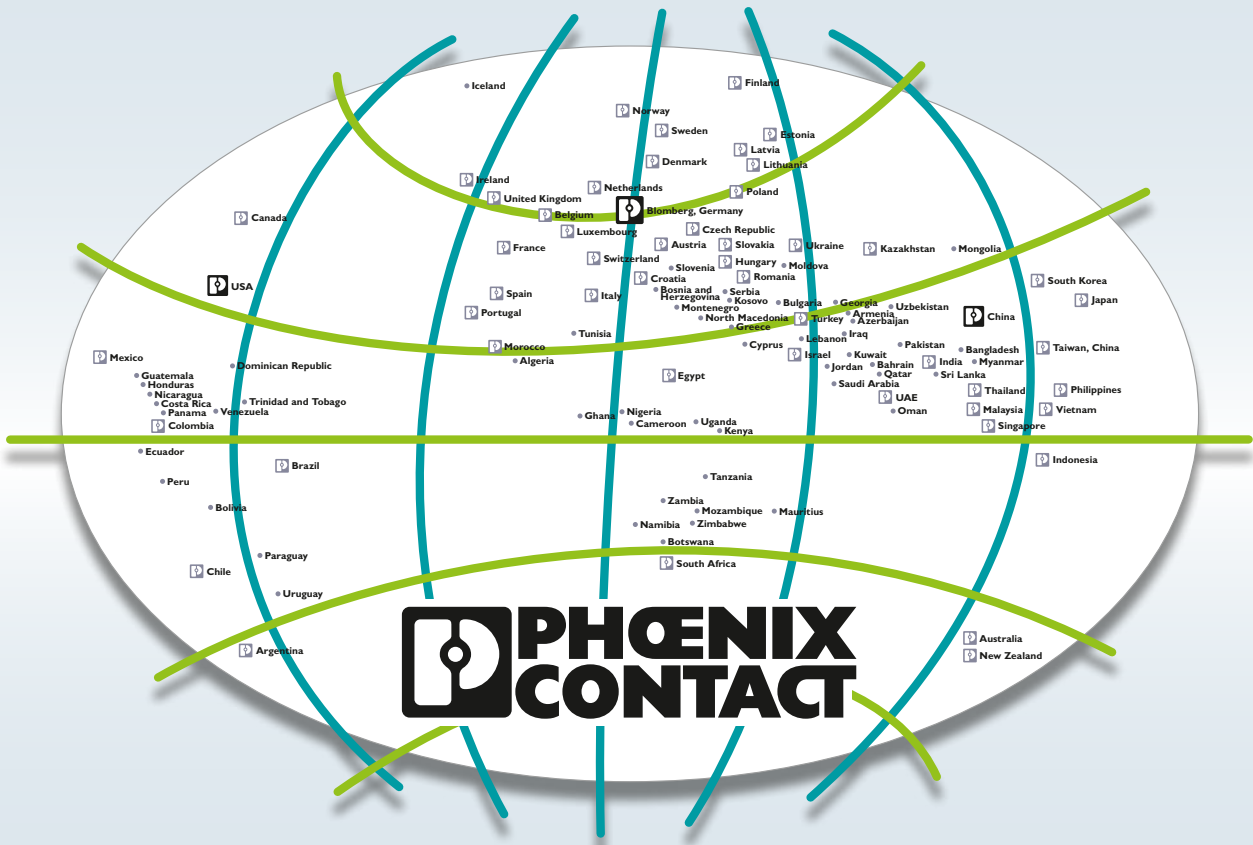
COMPLETE line supports you, from engineering through to manufacturing, in designing your control cabinet production as efficient as possible. This is how your customized concept for optimizing your processes in control cabinet building is created. Our terminal strip production helps you to flexibly manage order peaks or to supply your control cabinet production with fully assembled DIN rails just in time.



### The new standard for the control cabinet

Discover the extensive COMPLETE line product portfolio and find out more about COMPLETE line and the comprehensive solutions for your control cabinet.

Visit our website:  
[phoenixcontact.com/completeline](https://phoenixcontact.com/completeline)



## Open communication with customers and partners worldwide

Phoenix Contact is a global market leader based in Germany. We are known for producing future-oriented products and solutions for the electrification, networking, and automation of all sectors of the economy and infrastructure. With a global network reaching across more than 100 countries with over 20,000 employees, we maintain close relationships with our customers, something we believe is essential for our common success.

Our wide range of innovative products makes it easy for our customers to implement the latest technology in a variety of applications and industries. This especially applies to the target markets of energy, infrastructure, industry, and mobility.

You can find your local partner at  
[phoenixcontact.com](https://www.phoenixcontact.com)