



# Energy and current measuring technology

Converting, measuring, and monitoring

# Energy and current measuring technology – Converting, measuring, and monitoring

Reduce costs – increase efficiency:

Systematic energy management is an ideal tool for continuously increasing energy efficiency in companies and organizations.

Identify potential cost savings for the cost-effective and environmentally-friendly operation of your machines and systems.

Phoenix Contact offers professional products for energy and power measurement.



## Energy measurement devices

EMpro energy measurement devices acquire and monitor the characteristic electrical data of your machines and systems centrally and on site.

## Current transformers for retrofitting

You can easily install PACT RCP current transformers for retrofitting even where space is too tight for a split core current transformer.

## Current transformers

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

## Advantages of energy management

**Continuously recorded energy flow provides the basis for a target-oriented operational energy management system.**

### Reduce energy costs

By identifying potential energy savings.

### Optimize system capacity

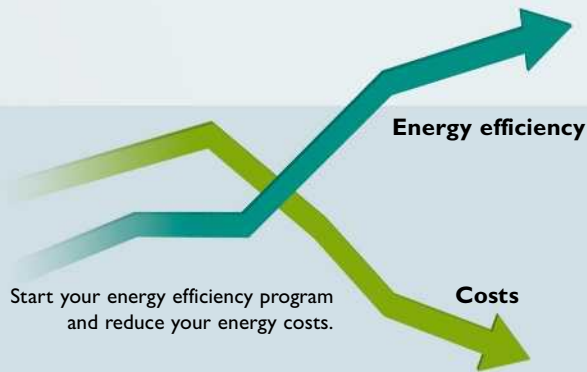
Through intelligent switching of system parts, uniform network load, and reduced harmonics.

### Reduce peak loads

With intelligent trend calculation and load management.

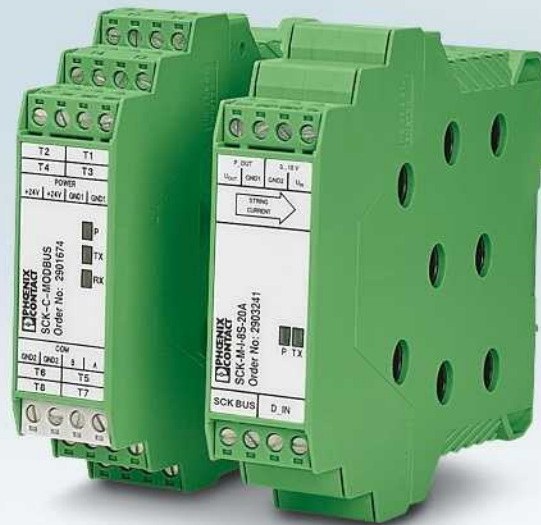
### Safeguard production processes and minimize downtimes

Through continuous monitoring of system parameters.



### Current and voltage measuring technology

You can use MCR current and voltage transducers to convert currents and voltages of all waveforms into standard analog signals.



### PV string monitoring

SOLARCHECK provides reliable information regarding the performance of your photovoltaic system. You can therefore detect errors and take appropriate countermeasures.

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# EMpro energy measurement devices – For your energy management

EMpro energy measurement devices acquire and monitor the characteristic electrical data of your machines and systems. Using network-capable devices ensures that all measuring data is available centrally and on site.

With EMpro, you can be confident you have the right measuring device solution for your energy management.

## Your advantages:

- Direct access to measured values – at the touch of a button on the device or remotely from the host computer
- User-friendly configuration – on site by following the operator guidance or using the integrated web server
- Easy integration into network structures, thanks to flexible connection options
- High planning reliability and investment security, thanks to expansion with additional function modules and communication modules

Ethernet

RS-485

PROFI<sup>®</sup>  
BUS

Modbus



## The communication expert

### EMpro MA600

- Performs measuring tasks in the energy feed-in up to 700 V AC
- Can be extended with communication modules and special function modules
- Remote access via web server

## Energy data acquisition with cost center accuracy

The new MID power meters are used for billing cost centers. The measuring devices record the most important electric parameters and make the data available to higher-level control systems using common communication interfaces.

### Main features:

- MID approval in accordance with EN 50470
- Measures current, voltage, power, and energy
- Direct current measurement up to 80 A without current transformer, or measurement via current transformer
- Communication via Modbus/TCP, Modbus/RTU, M-Bus or S0 pulses



The universal solution on the front panel

### EMpro MA400

- Performs standard measuring tasks up to 500 V AC
- Can be extended with RS-485 module and pulse module



The compact DIN rail solution

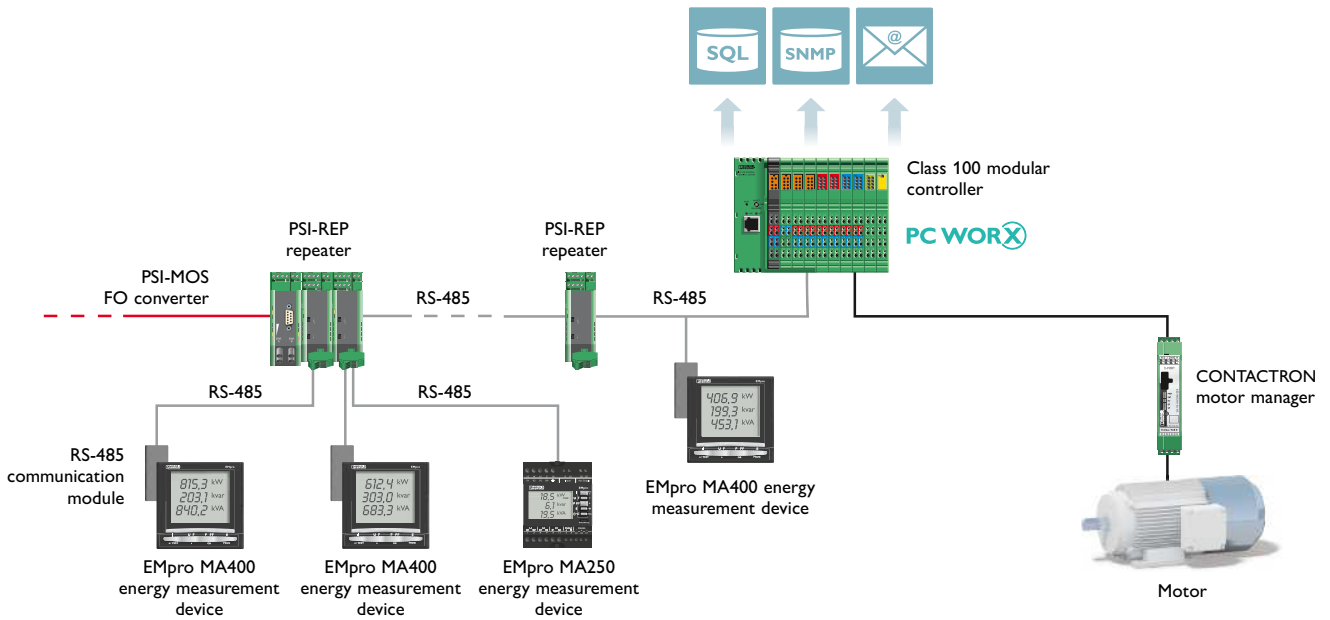
### EMpro MA250

- Performs measuring tasks in small control cabinets directly on the machine
- Integrated RS-485 interface

## Monitoring energy flow and logging energy data

Use network-capable EMpro measuring devices to monitor characteristic electrical data centrally and on site.

The modular controller gathers all relevant energy characteristics of the production processes and logs these in an SQL database.



### Repeaters

PSI repeaters increase the performance and availability of bus systems.

- Increased range and number of devices
- Individual network structures
- 4-way electrical isolation
- Can be combined with PSI-MOS FO converter



### FO converters

PSI-MOS FO converters contribute to interference-free data transmission in serial Ethernet and fieldbus applications.

- FO connections of up to 45 km
- Individual network structures
- High-grade electrical isolation
- Can be combined with PSI-MOS repeaters



### Usage data acquisition

The EMlog software from Phoenix Contact provides an efficient solution for recording energy data relating to heat, cold, air, and electricity when used in conjunction with the ILC 191 ME/AN modular Inline controller. This allows you to keep an eye on your resources and manage the consumption levels of your machines and systems.

## Product overview: EMpro energy measurement devices

The DIN rail adapter enables EMpro MA600 and EMpro MA400 built-in devices to also be mounted on the DIN rail.

Order No.: [2902078](#)  
Type: EEM-MKT-DRA



**EMpro MA600**

**EMpro MA400**

**EMpro MA250**

**EMpro MA200**

<b>Type</b>	EMpro MA600	EEM-MA400	EEM-MA250	EEM-MA200
<b>Order no.</b>	<a href="#">2901366</a>	<a href="#">2901364</a>	<a href="#">2901363</a>	<a href="#">2901362</a>
<b>Type</b>	EMpro MA600-24DC			
<b>Order no.</b>	<a href="#">2902352</a>			

Measuring					
<b>Currents</b>	I1, I2, I3, ΣI	●			
	I1, I2, I3, IN (calculation)	●	●	●	●
	Maximum values	●	●	●	●
	Mean values	●			
	Current measurement	Direct/via current transformer	Via current transformer	Via current transformer	Via current transformer
<b>Voltages</b>	U12, U23, U31, V1, V2, V3	●	●	●	●
	Maximum values, mean values	●			
	Voltage measurement via voltage transducer	●			
	Voltage measurement direct (AC)	Up to 700 V	Up to 500 V	Up to 500 V	Up to 500 V
<b>Frequency</b>	F	●	●	●	●
<b>Power</b>	ΣP, ΣQ, ΣS (+/-)	●	●	●	●
	P, Q, S per phase (+/-)	●	●	●	●
	Maximum values P, Q, S	●	●	●	●
	Mean values P, Q, S	●			
	Trend power	●			
<b>Power factor</b>	ΣPF; PF per phase	●	●	●	●
<b>Metering</b>	Active/reactive energy	kWh +/- / kvarh +/-	kWh + / kvarh +	kWh + / kvarh +	kWh + / kvarh +
	2-tariff meter			●	●
	Operating hours	●	●	●	●
<b>Harmonics</b>	THD I/U in %	Up to 63rd harmonic	Up to 51st harmonic	Up to 51st harmonic	Up to 51st harmonic
	Harmonics analysis	Up to 63rd harmonic			
<b>Outputs</b>	1 config. Pulse/alarm output			●	●
<b>Inputs</b>	1 config. Input			●	●

Communication modules (optional)					
<b>RS-485 JBUS/Modbus</b>	EEM-RS485-MA600 <a href="#">2901367</a>	EEM-RS485-MA400 <a href="#">2901365</a>	Integrated RS-485 interface		
<b>PROFIBUS 1.5 Mbps</b>	EEM-PB-MA600 <a href="#">2901368</a>				
<b>PROFIBUS 12 Mbps</b>	EEM-PB12-MA600 <a href="#">2901418</a>				
<b>Ethernet with integrated web server</b>	EEM-ETH-MA600 <a href="#">2901373</a>				
<b>RS-485/Ethernet gateway with integrated web server</b>	EEM-ETH-RS485-MA600 <a href="#">2901374</a>				

Function modules (optional)					
<b>Memory (512 kB)</b>	EEM-MEMO-MA600 <a href="#">2901370</a>				
<b>2 digital inputs/outputs</b>	EEM-2DIO-MA600 <a href="#">2901371</a>				
<b>2 analog outputs</b>	EEM-2AO-MA600 <a href="#">2901475</a>				
<b>2 pulse outputs</b>	EEM-IMP-MA600 <a href="#">2904313</a>				
<b>1 pulse output or one threshold value</b>		EEM-IMP-MA400 <a href="#">2904314</a>			

# Current transformers for retrofitting – Fast installation in a confined space

You can easily mount PACT RCP current transformers for retrofitting even where space is too tight for a split core current transformer. Acquire alternating currents up to 4,000 A with the universal current measuring system. Benefit from fast installation that does not require you to remove system parts.



## UV protection for permanent outdoor use

The PACT RCP current transformer set is now also available for outdoor use. The Rogowski coil of the UV version is equipped with a UV-resistant housing and UV-protected cables. This enables permanent installation outdoors. PACT RCP-4000A-1A-D190-3M-UV  
Order No.: [1033485](#)



## Fast installation

Simply place the handy Rogowski coil quickly around busbars and circular conductors. The professional fastener ensures a solid long-term hold.

## Your advantages:

- Fast installation of the Rogowski coil without having to disconnect electrical lines
- High level of accuracy: 8 measuring ranges for currents up to 4,000 A
- Space saving and practical: just one compact coil for all current strengths
- Harmonics and transients detected with phase accuracy in the frequency range from 40 Hz to 20 kHz
- Safe installation and operation: no dangerous open circuit voltages



## Product overview: PACT RCP current transformers for retrofitting

The holder for busbars from the accessories ensures secure positioning and is ideal for all coil lengths.

### Busbar thickness 10 ... 15 mm:

Type: PACT RCP-CLAMP  
Order No.: 2904895

### Busbar thickness 5 ... 10 mm:

Type: PACT RCP-CLAMP-5-10  
Order No.: 2907888



Rogowski coil and measuring transducer, current output 1 A, for energy measurement



Rogowski coil and measuring transducer, standard signal output, for current measurement

Measuring coil 300 mm (screw conn., signal cable 3 m) Order No.	PACT RCP-4000A-1A-D95 2904921	PACT RCP-4000A-UIRO-D95 2906231
Measuring coil 450 mm (screw conn., signal cable 3 m) Order No.	PACT RCP-4000A-1A-D140 2904922	PACT RCP-4000A-UIRO-D140 2906232
Measuring coil 600 mm (screw conn., signal cable 3 m) Order No.	PACT RCP-4000A-1A-D190 2904923	PACT RCP-4000A-UIRO-D190 2906233
Measuring coil 300 mm (Push-in conn., signal cable 3 m) Order No.		PACT RCP-4000A-UIRO-PT-D95 2906234
Measuring coil 450 mm (Push-in conn., signal cable 3 m) Order No.		PACT RCP-4000A-UIRO-PT-D140 2906235
Measuring coil 600 mm (Push-in conn., signal cable 3 m) Order No.		PACT RCP-4000A-UIRO-PT-D190 2906236
Measuring coil 300 mm (screw conn., signal cable 5 m) Order No.	PACTRCP-4000A-1A-D95-5M 2910325	
Measuring coil 300 mm (screw conn., signal cable 10 m) Order No.	PACTRCP-4000A-1A-D95-10M 2910326	
Measuring coil 450 mm (screw conn., signal cable 10 m) Order No.	PACTRCP-4000A-1A-D140-10M 1033483	
Measuring coil 600 mm (screw conn., signal cable 10 m) Order No.	PACT RCP-4000A-1A-D190-10M 2910327	

### Technical data for measuring coil

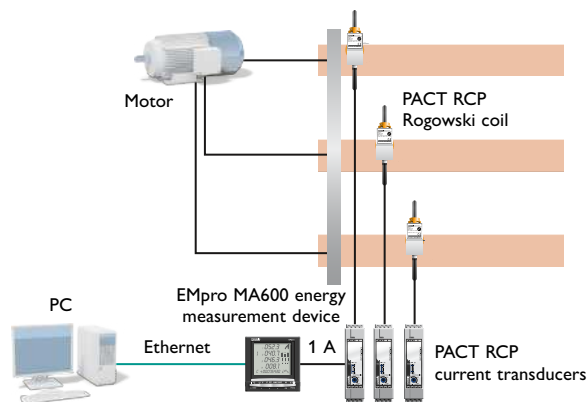
Frequency range	40 Hz ... 20,000 Hz
Position error	< 1%
Rated insulation voltage	1,000 V AC (rms CAT III); 600 V AC (rms CAT IV)
Ambient temp. (operation)/(storage/transport)	-30°C ... +80°C / -40°C ... +80°C

### Technical data for measuring transducer

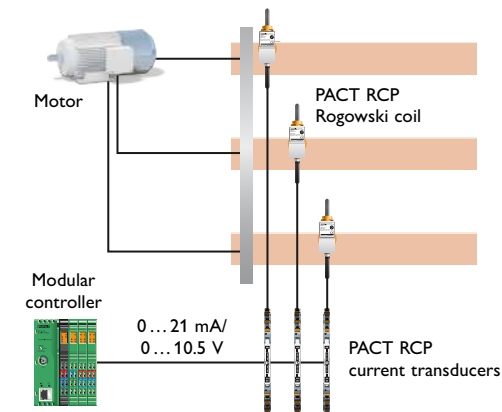
Measuring ranges (current) via DIP switch	0 ... 100 A, 250 A, 400 A, 630 A, 1,000 A, 1,500 A, 2,000 A, 4,000 A	
Current output signal	1 A AC (effective at sine)	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 mA, 2 ... 10 mA, 0 ... 21 mA
Voltage output signal		0 ... 10 V, 2 ... 10 V, 0 ... 5 V, 1 ... 5 V, 0 ... 10.5 V
Nominal supply voltage range	19.2 V DC ... 30 V DC	9.6 V DC ... 30 V DC
Maximum transmission error	≤ 0.5%	
Rated power	1.5 VA	
Frequency range	< 2 kHz	16 Hz ... 1,000 Hz
Ambient temp. (storage/transport)	-20°C ... +70°C / -25°C ... +85°C	-40°C ... +70°C / -40°C ... +85°C

## Application examples for retrofitting current measuring technology

### Central energy data acquisition with the PACT RCP-4000A-1A set and an EMpro energy measurement device



### Standard signal generation with the PACT RCP-4000A-UIRO set

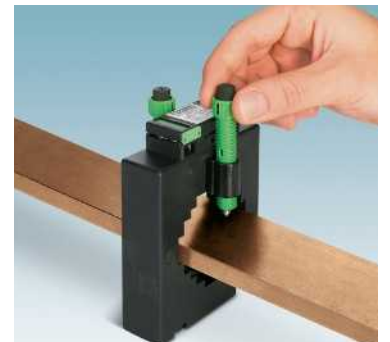


# Plug-in and winding current transformers – Extreme versatility

The PACT current transformers offer you a complete product range for converting alternating currents up to 3,000 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 are available with a range of different transformation ratios, accuracy classes, and rated power values for your current measurement tasks.



### Space and time savings

The tool-free quick-action transformer fastener from the accessories offers secure and precise positioning on the busbar. You can use this to mount the transformer even in places too tight for using a screwdriver.



### Your advantages:

- Complete range for converting currents up to 3,000 A
- Variable mounting, thanks to flexible fixing options
- Space-saving installation with compact design and consistent 30 mm housing width
- Extra safety – safe isolation in accordance with EN 50178 up to 1,000 V
- Detect peak loads reliably with a thermal nominal continuous current that is 120% of the primary rated current

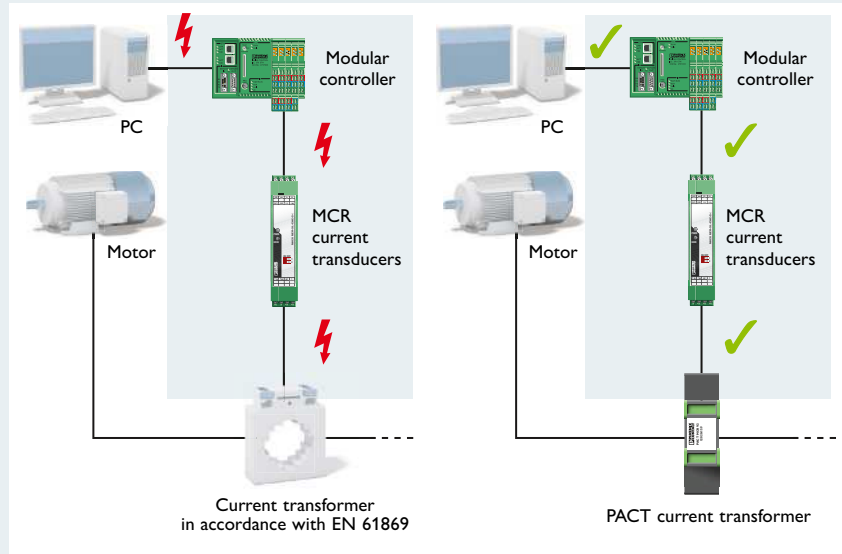
## Extra safety across the entire system application

### Safe isolation in accordance with EN 50178

PACT current transformers offer safe isolation in accordance with standard EN 50178. This applies to "electronic equipment for use in power installations."

PACT current transformers ensure the following:

- No sparkover can occur on the secondary side of the transformer.
- Human life is protected inside and outside the control cabinet.
- It is impossible to have sparkovers with up to 1,000 V AC from the primary side to the safe secondary side (SELV). This also applies in the event of transient overvoltages of 12 kV.



### Operating voltage comparison

	EN 61869 (transformer standard)	EN 50178 (for power installations)
<b>Rated insulation voltage</b> (operating voltage)	480 V (L-L)	277 V (L-N)
	720 V (L-L)	416 V (L-N)
	1,000 V (L-L)	577 V (L-N)
	–	1,000 V (L-N) PACT
<b>Impulse withstand voltage</b> for transformer testing		
	- At 277 V (L-N)	3 kV
	- At 1,000 V (L-N)	6 kV
		12 kV PACT

EN 50178 prescribes significantly higher impulse withstand voltages for transformer testing. When testing is done according to EN 61869, these requirements are no longer met at a rated insulation voltage of 480 V (L-L) or more.

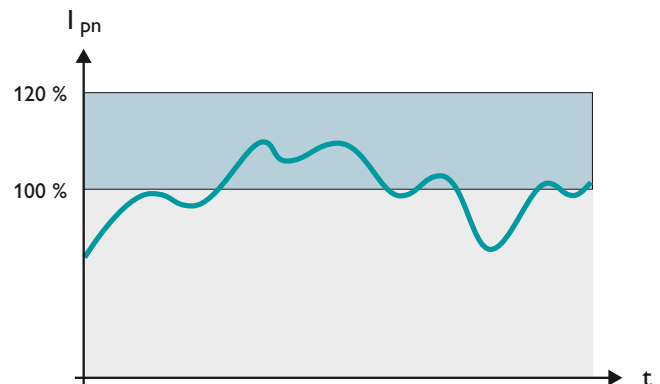
PACT current transformers have significantly greater air clearances and creepage distances and are individually tested with 12 kV. This ensures increased safety.

In EN 50178, the specified voltage relates to the phase/neutral conductor, which means that in this case, the rated insulation voltage of a typical 720 V transformer is only 416 V (L-N). In system applications, PACT current transformers even support use up to 1,000 V (L-N).

### Safely detecting current peaks

PACT current transformers can be used to safely detect greater current peaks – without resulting in any damage. This is due to the fact that 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 does indeed deliver 14.4 VA – and on a continual basis.

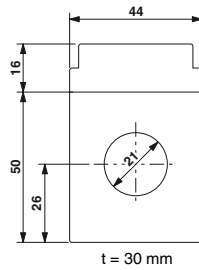


PACT current transformers also safely detect higher current peaks

## Product overview: PACT current transformers



**50 ... 500 A**



t = 30 mm

Type Order No. **PACT MCR-V1-21-44** [2277268](#)

### Technical data

Circular conductor dimensions	Ø 21 mm
Rail dimensions (maximum)	
Secondary current $I_{sn}$	1 A/5 A
Accuracy class	C05 = 0.5/C10 = 1

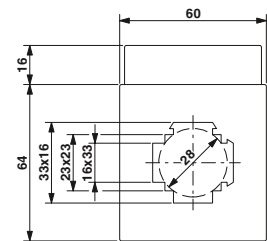
### Primary rated current and rated power

	$I_{pn}$	$S_n$
$I_{sn}$ : 1 A/KI.: 0.5	100 ... 200 A	1.25 ... 5 VA
$I_{sn}$ : 1 A/KI.: 1	50 ... 500 A	1.25 ... 10 VA
$I_{sn}$ : 5 A/KI.: 0.5	100 ... 200 A	1.25 ... 3.75 VA
$I_{sn}$ : 5 A/KI.: 1	50 ... 400 A	1.25 ... 10 VA

Calibratable version Order No. **PACT MCR-V1C-21-44** [2277420](#)



**50 ... 750 A**



t = 30 mm

Type Order No. **PACT MCR-V2-3015-60** [2277271](#)

### Technical data

Circular conductor dimensions	Ø 28 mm
Rail dimensions (maximum)	30 x 15 mm 20 x 20 mm
Secondary current $I_{sn}$	1 A/5 A
Accuracy class	C05 = 0.5/C10 = 1

### Primary rated current and rated power

	$I_{pn}$	$S_n$
$I_{sn}$ : 1 A/KI.: 0.5	100 ... 400 A	1.25 ... 5 VA
$I_{sn}$ : 1 A/KI.: 1	50 ... 750 A	1.25 ... 7.5 VA
$I_{sn}$ : 5 A/KI.: 0.5	200 ... 400 A	2.5 ... 10 VA
$I_{sn}$ : 5 A/KI.: 1	60 ... 750 A	1.25 ... 15 VA

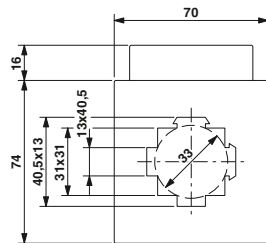
Calibratable version Order No. **PACT MCR-V2C-3015-60** [2277433](#)

Quick-action mechanism Order No. **PACT FAST-MNT-W16-L40** [2276638](#)

Quick-action mechanism Order No. **PACT FAST-MNT-W16-L65** [2276641](#)



**100 ... 1,000 A**



t = 30 mm

Type Order No. **PACT MCR-V2-4012-70** [2277284](#)

### Technical data

Circular conductor dimensions	Ø 33 mm
Rail dimensions (maximum)	40 x 12 mm 2 x 30 x 10 mm
Secondary current $I_{sn}$	1 A/5 A
Accuracy class	C05 = 0.5/C10 = 1

### Primary rated current and rated power

	$I_{pn}$	$S_n$
$I_{sn}$ : 1 A/KI.: 0.5	125 ... 600 A	1.25 ... 10 VA
$I_{sn}$ : 1 A/KI.: 1	100 ... 600 A	1.25 ... 10 VA
$I_{sn}$ : 5 A/KI.: 0.5	150 ... 600 A	1.25 ... 10 VA
$I_{sn}$ : 5 A/KI.: 1	100 ... 1,000 A	2.5 ... 15 VA

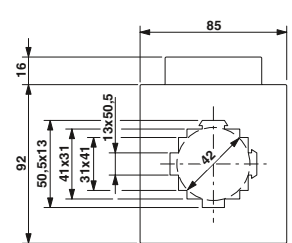
Calibratable version Order No. **PACT MCR-V2C-4012-70** [2277446](#)

Quick-action mechanism Order No. **PACT FAST-MNT-W13-L40** [2276612](#)

Quick-action mechanism Order No. **PACT FAST-MNT-W13-L65** [2276625](#)



**100 ... 1,500 A**



t = 30 mm

Type Order No. **PACT MCR-V2-5012-85** [2277297](#)

### Technical data

Circular conductor dimensions	Ø 42 mm
Rail dimensions (maximum)	50 x 12 mm 2 x 40 x 10 mm
Secondary current $I_{sn}$	1 A/5 A
Accuracy class	C05 = 0.5/C10 = 1

### Primary rated current and rated power

	$I_{pn}$	$S_n$
$I_{sn}$ : 1 A/KI.: 0.5	150 ... 1,250 A	1.25 ... 10 VA
$I_{sn}$ : 1 A/KI.: 1	100 ... 1,250 A	1.25 ... 15 VA
$I_{sn}$ : 5 A/KI.: 0.5	150 ... 1,000 A	1.25 ... 10 VA
$I_{sn}$ : 5 A/KI.: 1	100 ... 1,500 A	1.25 ... 15 VA

Calibratable version Order No. **PACT MCR-V2C-5012-85** [2277459](#)

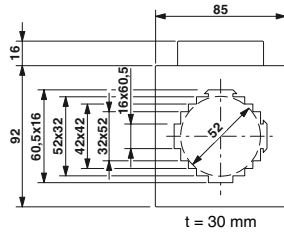
Quick-action mechanism Order No. **PACT FAST-MNT-W13-L40** [2276612](#)

Quick-action mechanism Order No. **PACT FAST-MNT-W13-L65** [2276625](#)

## Product overview: PACT current transformers



**200 ... 1600 A**



Type Order No. **PACT MCR-V2-6015-85** [2277336](#)

### Technical data

Circular conductor dimensions	Ø 52 mm
Rail dimensions (maximum)	60 x 15 mm 2 x 50 x 10 mm 40 x 40 mm
Secondary current $I_{sn}$	1 A / 5 A
Accuracy class	C05 = 0.5 / C10 = 1

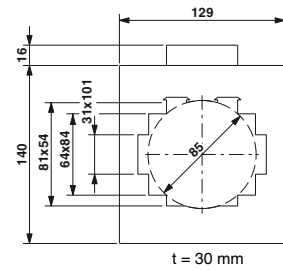
### Primary rated current and rated power

	$I_{pn}$	$S_n$
$I_{sn}$ : 1 A / Kl.: 0.5	300 ... 1,000 A	1.25 ... 2.5 VA
$I_{sn}$ : 1 A / Kl.: 1	300 ... 1,250 A	2.5 ... 3.75 VA
$I_{sn}$ : 5 A / Kl.: 0.5	400 ... 1,600 A	1.25 ... 15 VA
$I_{sn}$ : 5 A / Kl.: 1	200 ... 1,600 A	2.5 ... 15 VA

Calibratable version Order No. **PACT MCR-V2C-6015-85** [2277462](#)  
 Quick-action mechanism Order No. **PACT FAST-MNT-W16-L40** [2276638](#)  
 Quick-action mechanism Order No. **PACT FAST-MNT-W16-L65** [2276641](#)



**800 ... 3000 A**



Type Order No. **PACT MCR-V2-10020-129** [2277378](#)

### Technical data

Circular conductor dimensions	Ø 85 mm
Rail dimensions (maximum)	2 x 100 x 10 mm 80 x 64 mm
Secondary current $I_{sn}$	1 A / 5 A
Accuracy class	C05 = 0.5 / C10 = 1

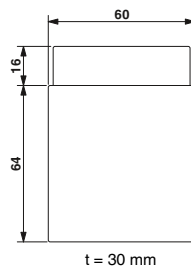
### Primary rated current and rated power

	$I_{pn}$	$S_n$
$I_{sn}$ : 1 A / Kl.: 0.5	1,000 ... 3,000 A	2.5 ... 15 VA
$I_{sn}$ : 1 A / Kl.: 1	1,000 ... 3,000 A	10 ... 30 VA
$I_{sn}$ : 5 A / Kl.: 0.5	1,000 ... 4,000 A	5 ... 25 VA
$I_{sn}$ : 5 A / Kl.: 1	800 ... 3,000 A	10 ... 30 VA

Calibratable version Order No. **PACT MCR-V2C-10020-129** [2277514](#)



**1 ... 40 A**



Type Order No. **PACT MCR-V3-60** [2277417](#)

### Technical data

Circular conductor dimensions	-
Rail dimensions (maximum)	-
Secondary current $I_{sn}$	1 A / 5 A
Accuracy class	C05 = 0.5 / C10 = 1

### Primary rated current and rated power

	$I_{pn}$	$S_n$
$I_{sn}$ : 1 A / Kl.: 0.5	1 ... 40 A	2.5 ... 5 VA
$I_{sn}$ : 1 A / Kl.: 1	5 ... 40 A	2.5 ... 5 VA
$I_{sn}$ : 5 A / Kl.: 0.5	5 ... 40 A	2.5 ... 5 VA
$I_{sn}$ : 5 A / Kl.: 1	5 ... 40 A	2.5 ... 5 VA

# AC/DC current transducers – Current measurement for all waveforms

MCR current transducers can be used to measure direct and alternating currents of any waveform. 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.

**For high currents**  
Current transducer  
up to 600 A AC/DC



#### Your advantages:

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

#### Flexible signal conditioning

Current transducer up to  
55 A AC/DC



#### Your advantages:

- Fast basic configuration via DIP switch
- 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 current transducers for direct and alternating currents

The MCR-S-...-UI(-SW)-DCI current transducers record direct, alternating, and distorted currents from 0 ... 11 A and 0 ... 55 A.

- r.m.s. value measurement
- 3-way isolation

Further information on current measurement and true r.m.s. value measurement can be found on page 23.



**For direct, alternating, and distorted currents, 0 ... 11 A, programmable and configurable**



**For direct, alternating, and distorted currents, 0 ... 55 A, programmable and configurable**

<b>Configurable, with switching output</b>	Order No.	<b>MCR-S-1-5-UI-SW-DCI</b>	<a href="#">2814650</a>	<b>MCR-S-10-50-UI-SW-DCI</b>	<a href="#">2814663</a>
<b>Standard product, with switching output</b>	Order No.	<b>MCR-S-1-5-UI-SW-DCI-NC</b>	<a href="#">2814731</a>	<b>MCR-S10-50-UI-SW-DCI-NC</b>	<a href="#">2814744</a>
<b>Configurable, no switching output</b>	Order No.	<b>MCR-S-1-5-UI-DCI</b>	<a href="#">2814634</a>	<b>MCR-S-10-50-UI-DCI</b>	<a href="#">2814647</a>
<b>Standard product, no switching output</b>	Order No.	<b>MCR-S-1-5-UI-DCI-NC</b>	<a href="#">2814715</a>	<b>MCR-S10-50-UI-DCI-NC</b>	<a href="#">2814728</a>

### Technical data

Technical data	0 ... 11 A AC/DC (programmable, configurable)	0 ... 55 A AC/DC (programmable, configurable)
<b>Current measurement</b>	0 ... 11 A AC/DC (programmable, configurable)	0 ... 55 A AC/DC (programmable, configurable)
<b>Frequency range</b>	15 ... 400 Hz	15 ... 400 Hz
<b>Connection method</b>	Screw connection	Through connection, Ø 10.5 mm
<b>Output signal (current output)</b>	0 ... 20 mA / 4 ... 20 mA	0 ... 20 mA / 4 ... 20 mA
<b>Output signal (voltage output)</b>	0 ... 5 V/1 ... 5 V/0 ... 10 V/2 ... 10 V/-5 ... 5 V/-10 ... 10 V	0 ... 5 V/1 ... 5 V/0 ... 10 V/2 ... 10 V/-5 ... 5 V/-10 ... 10 V
<b>Supply voltage U<sub>B</sub></b>	20 ... 30 V DC	20 ... 30 V DC
<b>Maximum transmission error</b>	< 0.5% (of nominal range value under nominal conditions)	< 0.5% (of nominal range value under nominal conditions)
<b>Ambient temperature range</b>	-20°C ... +60°C	-20°C ... +60°C

The MCR-SL-CUC-... current transducers record direct, alternating, and distorted currents from 0 ... 600 A.

- Universal current measurement, no shunt required
- 3-way isolation

Further information on current measurement and true r.m.s. value measurement can be found on page 23.



**For direct, alternating, and distorted currents, 0 ... 300 A, voltage output**



**For direct, alternating, and distorted currents, 0 ... 600 A, current output**

<b>Input current range: 0 ... 100 A</b>	Order No.	<b>MCR-SL-CUC-100-U</b>	<a href="#">2308108</a>	<b>MCR-SL-CUC-100-I</b>	<a href="#">2308027</a>
<b>Input current range: 0 ... 200 A</b>	Order No.	<b>MCR-SL-CUC-200-U</b>	<a href="#">2308205</a>	<b>MCR-SL-CUC-200-I</b>	<a href="#">2308030</a>
<b>Input current range: 0 ... 300 A</b>	Order No.	<b>MCR-SL-CUC-300-U</b>	<a href="#">2308302</a>	<b>MCR-SL-CUC-300-I</b>	<a href="#">2308043</a>
<b>Input current range: 0 ... 400 A</b>	Order No.			<b>MCR-SL-CUC-400-I</b>	<a href="#">2308072</a>
<b>Input current range: 0 ... 500 A</b>	Order No.			<b>MCR-SL-CUC-500-I</b>	<a href="#">2308085</a>
<b>Input current range: 0 ... 600 A</b>	Order No.			<b>MCR-SL-CUC-600-I</b>	<a href="#">2308098</a>

### Technical data

Technical data	0 ... 100 A, 200 A, 300 A	0 ... 100 A, 200 A, 300 A, 400 A, 500 A, 600 A
<b>Current measurement</b>	0 ... 100 A, 200 A, 300 A	0 ... 100 A, 200 A, 300 A, 400 A, 500 A, 600 A
<b>Frequency range</b>	20 ... 6,000 Hz	20 ... 6,000 Hz
<b>Connection method</b>	Cable fit, Ø 32 mm	Cable fit, Ø 32 mm
<b>Output signal</b>	0 ... 10 V	4 ... 20 mA
<b>Supply voltage U<sub>B</sub></b>	20 ... 30 V DC	20 ... 30 V DC
<b>Maximum transmission error</b>	< ±1% (of final value)	< ±1% (of final value)
<b>Ambient temperature range</b>	-40°C ... +65°C	-40°C ... +65°C

# AC current transducers – For sinusoidal and non-sinusoidal alternating currents

MCR current transducers can also be used to acquire distorted alternating currents and convert them into a standard analog signal. There are two product ranges: an adjustable version with a variable supply concept or a version with a hinged Rogowski sensor for easy installation and retrofitting.

## Easy to install

Current transducer  
up to 200 A



### Your advantages:

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

## Adjustable and flexible supply

Current transducer  
up to 12 A



Ex n

### Your advantages:

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



## Product overview: MCR current transducers for alternating currents

The MCR-SL-CAC-... current transducers record sinusoidal alternating currents of 0... 1/5/12 A.

- Wide-range version from 19.2... 253 V AC/DC
- 3-way isolation

The MCR-SL-S-...00-... current transducers record sinusoidal and non-sinusoidal alternating currents of 0... 200 A.

- r.m.s. value measurement (30... 6,000 Hz)
- Measuring range selection via slide switch
- Loop-powered

Further information on current measurement and true r.m.s value measurement can be found on page 23.



**Configurable for sinusoidal alternating currents up to 0... 5 A/0... 12 A**



**For sinusoidal and non-sinusoidal alternating currents up to 0... 200 A, with voltage output (...-U), with current output, loop-powered (...-I-LP)**

Type	Order No.	<b>MACX MCR-SL-CAC-5-I</b>	<a href="#">2810612</a>	<b>MCR-SL-S-100-U</b>	<a href="#">2813457</a>
Type	Order No.	<b>MACX MCR-SL-CAC-5-I-UP</b>	<a href="#">2810625</a>	<b>MCR-SL-S-100-I-LP</b>	<a href="#">2813486</a>
Type	Order No.	<b>MACX MCR-SL-CAC-12-I-UP</b>	<a href="#">2810638</a>	<b>MCR-SL-S-200-U</b>	<a href="#">2813460</a>
Type	Order No.			<b>MCR-SL-S-200-I-LP</b>	<a href="#">2813499</a>

### Technical data

<b>Current measurement</b>	0... 1 A/0... 5 A (configurable, ...-5-I and ...-5-I-UP) 0... 5 A/0... 12 A (configurable, ...-12-I-UP)	0... 50/75/100 A (...-S-100-U and ...-S-100-I-LP) 0... 100/150/200 A (...-S-200-U and ...-S-200-I-LP)
<b>Frequency range</b>	45... 65 Hz	30... 6,000 Hz
<b>Connection method</b>	Screw connection	Cable fit, Ø 18.5 mm
<b>Output signal</b>	0... 20 mA/4... 20 mA (configurable)	0... 5 V/0... 10 V (...-U); 4... 20 mA (...-I-LP)
<b>Supply voltage U<sub>B</sub></b>	19.2... 30 V DC (...-5-I) 19.2... 253 V AC/DC (...-UP versions)	20... 30 V DC
<b>Maximum transmission error</b>	< 0.5% (of nominal range value under nominal conditions)	< 1% (of final value)
<b>Ambient temperature range</b>	-20°C... +65°C	-20°C... +60°C

Passive current transducer for sinusoidal alternating currents from 0... 1 A/0... 5 A

- Loop-powered
- Measuring ranges 1 A AC and 5 A AC reconnectable

The current relay converts sinusoidal alternating currents of up to 16 A AC to binary switch signals.

- Freely selectable switching point
- Relay changeover contact output
- Adjustable switching hysteresis
- 3-way isolation
- Adjustable operating/closed-circuit current behavior



**Passive current transducer for sinusoidal alternating currents 0... 1 A/0... 5 A loop-powered**



**Current relay for sinusoidal alternating currents 0... 16 A AC**

Type	Order No.	<b>MCR-SLP-1-5-UI-0</b>	<a href="#">2814359</a>	<b>MCR-SL-S-16-SP-24</b>	<a href="#">2864464</a>
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### Technical data

<b>Current measurement</b>	0... 1 A/0... 5 A (reconnectable)	0... 16 A AC
<b>Frequency range</b>	45... 60 Hz	45... 65 Hz
<b>Connection method</b>	Screw connection	Through connection, Ø 4.2 mm
<b>Output signal</b>	0... 10 V/0... 20 mA	Relay output: 1 changeover contact
<b>Response delay</b>	–	Typically 0.1... 10 s (adjustable via potentiometer)
<b>Supply voltage U<sub>B</sub></b>	Loop-powered	20... 30 V DC
<b>Maximum transmission error</b>	< 0.5% (of final value)	< 0.5% (of final value)
<b>Ambient temperature range</b>	-25°C... +60°C	-25°C... +65°C

# PV string monitoring – Utilize solar power efficiently

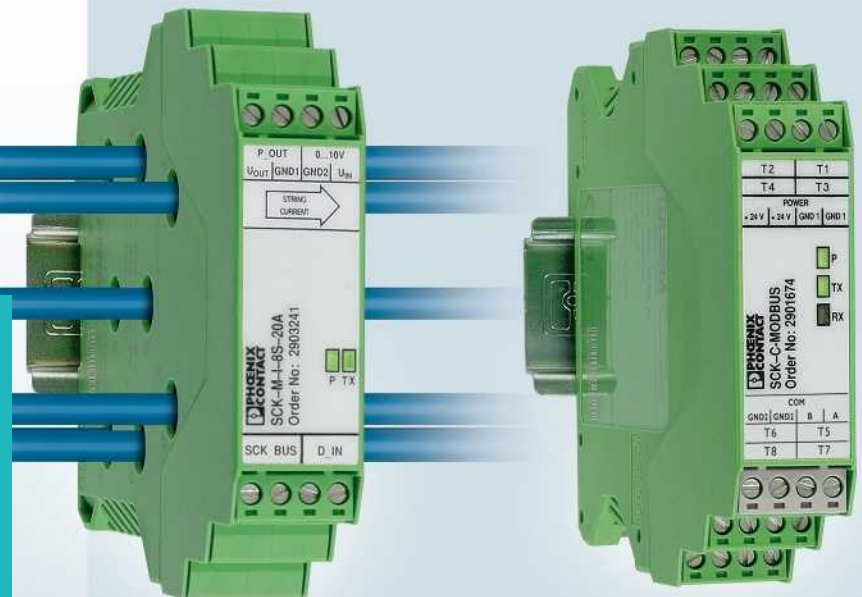
Detect errors – increase efficiency:  
Photovoltaic systems should achieve maximum energy yield in the shortest possible time.

SOLARCHECK provides reliable information about the status of your photovoltaic system. You can therefore respond to errors in individual strings directly 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 boxes, thanks to 4- and 8-channel versions
- Space-saving installation, thanks to the compact design
- Easy integration into monitoring systems, thanks to Modbus/RTU communication
- Monitoring of remote indication contacts, thanks to an additional digital input
- Flexible expansion, thanks to optional voltage measurement of up to 1,500 V DC





### Communication module

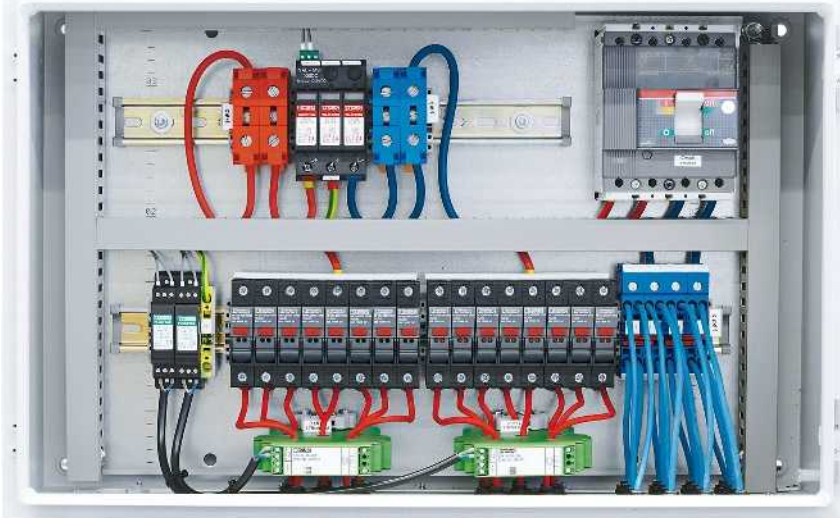
The communication module collects the values from the measuring modules and, as a Modbus slave, forwards them to your central control system. It is also used to supply the measuring modules in the field. The communication module is simply integrated into an existing network as a Modbus/RTU device.

### Current measuring modules

In a measuring module just 22.5 mm wide, the characteristic data of your PV systems is 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.

### Voltage measuring module

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.



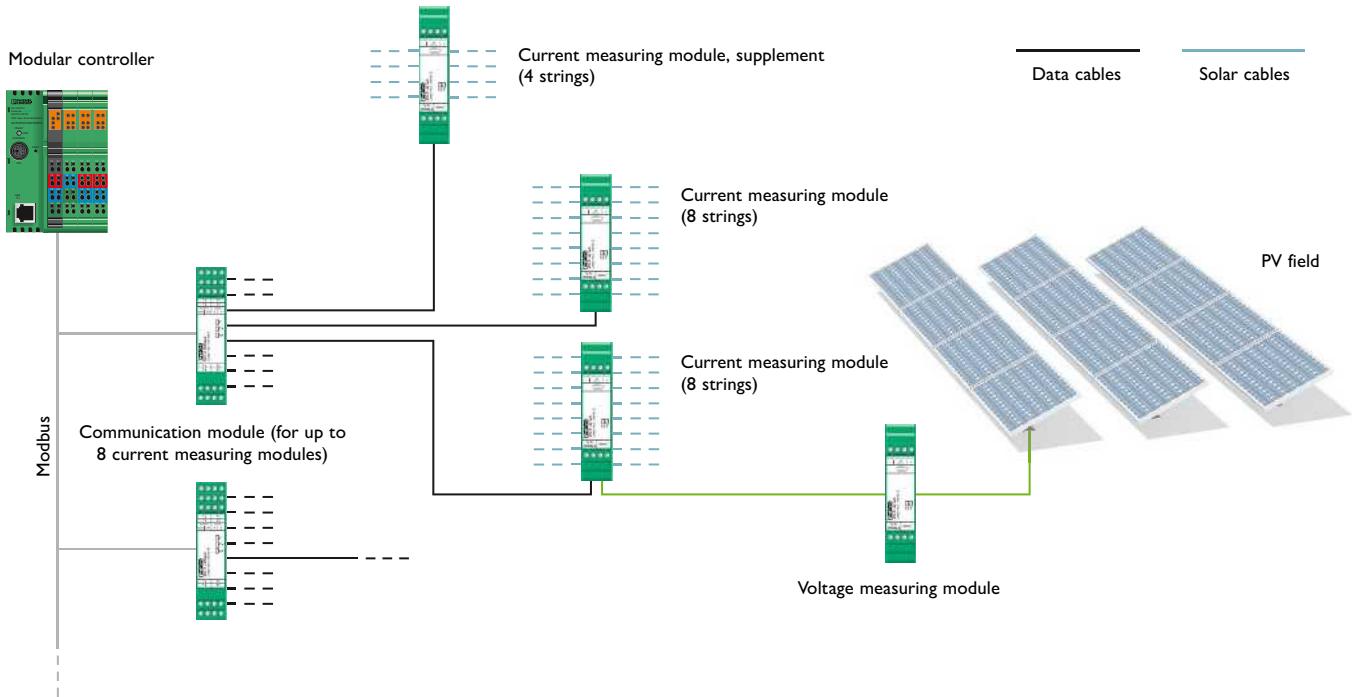
16-channel current measurement with space-saving installation

### PV string monitoring could not be easier with SOLARCHECK

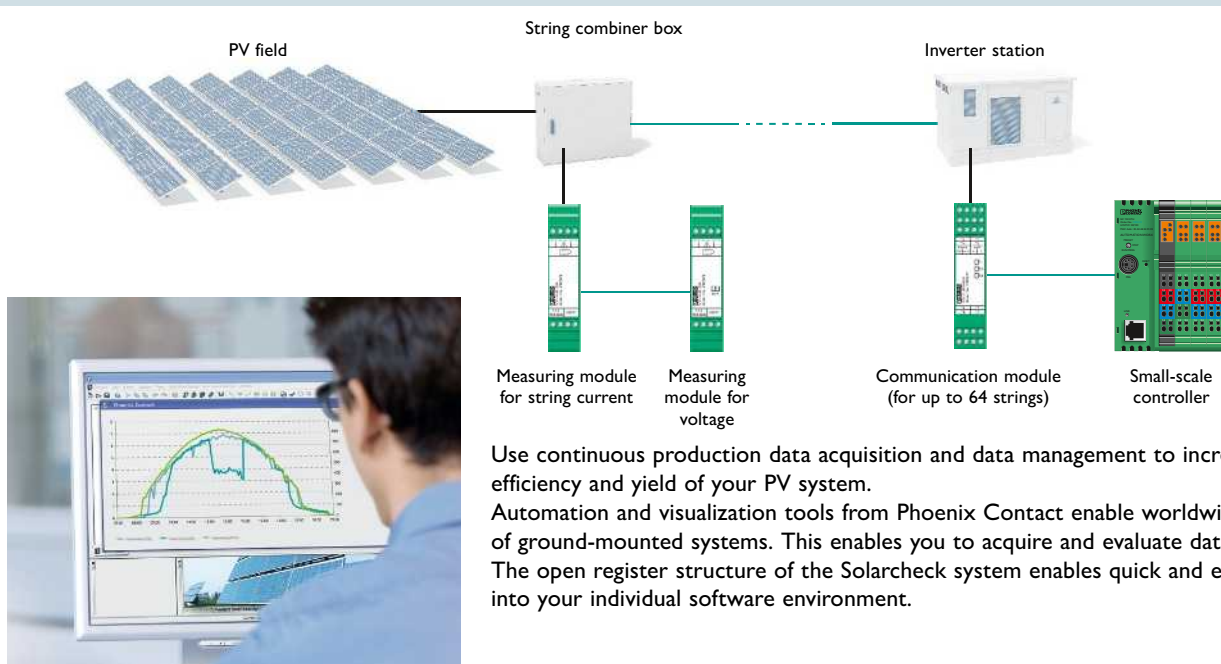
Feed the power cables quickly and easily through the openings in the measuring module. The 2-conductor communication cable is also used to supply the measuring modules with power. This means that you can supply up to eight measuring modules with one communication module – without an additional power 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.

## Monitoring photovoltaic strings

The measuring system can be used to measure up to eight direct currents and one DC voltage value at the same time. The complete system enables you to operate eight 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 on the communication module for this configuration.



## Automation and visualization



Use continuous production data acquisition and data management to increase the efficiency and yield of your PV 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

The modular Solarcheck monitoring system consists of various devices for current and voltage measurement and a corresponding communication module.



**Current measuring module,  
20 A DC, 8-channel**



**Current measuring module (supplement),  
20 A DC, 4-channel**

Type	Order No.	SCK-M-I-8S-20A	2903241	SCK-M-I-4S-20A	2903242
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### Technical data

Current measurement	0 ... 20 A	0 ... 20 A
Reverse current detection	-1 A ... 0 A	-1 A ... 0 A
Supply voltage $U_b$	Via SCK-C-Modbus module	Via SCK-C-Modbus module
Internal power consumption	45 mA	45 mA
Temperature coefficient	0.02%/K (from T > 25°C)	0.02%/K (from T > 25°C)
Maximum transmission error	< 1%	< 1%
Degree of protection	IP20	IP20
Ambient temperature range	-20°C ... +70°C	-20°C ... +70°C
Analog input: voltage range	0 ... 10 V	-
Analog output: voltage range (supply for 2903591)	24 V	-
Analog output: cable type	Twisted, shielded	-



**Communication module  
RS-485 (Modbus/RTU)**



**Voltage measuring module  
0 ... 1,500 V DC**

Type	Order No.	SCK-C-MODBUS	2901674	SCK-M-U-1500V	2903591
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### Technical data

Voltage measurement	-	0 ... 1,500 V DC
Analog output: voltage signal	-	Analog signal 2 ... 10 V
Interfaces	RS-485 Modbus/RTU	-
Serial transmission speed	9.6/14.4/19.2/38.4 kbps	-
Supply voltage $U_b$	24 V DC (-10% ... +25%)	Via SCK-M-I module or separate
Internal power consumption	12 mA	35 mA
Temperature coefficient	-	< 0.03%/K (from T > 25°C)
Maximum transmission error	-	< 1% (following additional adjustment)
Degree of protection	IP20	IP20
Ambient temperature range	-20°C ... +70°C	-20°C ... +70°C

# Voltage transducers

MCR voltage transducers can be used to acquire DC and AC voltages in various signal ranges and convert them into standard analog signals.



## Your advantages:

- Bidirectional output signals
- Eight finely graded voltage measuring ranges for optimum measurement accuracy
- ZERO/SPAN adjustment  $\pm 20\%$
- High operational safety, thanks to 3-way electrical isolation

## Product overview: MCR voltage transducers



For direct voltages  
0...±660 V DC



For sinusoidal alternating voltages  
0...660 V AC

Type (screw connection)	Order No.	<b>MACX MCR-VDC</b>	2906242	<b>MACX MCR-VAC</b>	2906239
Type (Push-in connection)	Order No.	<b>MACX MCR-VDC-PT</b>	2906243	<b>MACX MCR-VAC-PT</b>	2906244

Technical data		
Voltage measuring range	bipolar: 0 ... 24/36/54/80/120/170/250/370/550 V DC	0 ... 24/36/54/80/120/170/250/370/550 V AC
ZERO/SPAN adjustment	± 20%/± 20%	± 20%/± 20%
Frequency range	–	45 ... 405 Hz
Output signal	-10 V... 10 V/-20 mA... 20 mA	0... 10 V/0... 20 mA/4... 20 mA
Supply voltage $U_b$	24 V DC (19.2... 30 V DC)	24 V DC (19.2... 30 V DC)
Maximum transmission error	< 1% (of final value)	< 1.2% (of final value), 45 ... 65 Hz < 1.5% (of final value), 65 ... 405 Hz
Ambient temperature range	-25°C... +60°C	-25°C... +60°C

## More products involving energy and current measuring technology



### Data logger

Optimize your energy and resource use. Monitor standalone data loggers or software solutions for data logging and log the consumption of water, compressed air, and electricity in your system. This indicates optimization potential and provides efficient cost monitoring.



### Test disconnect terminal block

The compact disconnect terminal blocks in the CLIPLINE complete system reliably protect your current transformers against damage. The patented plug ensures a convenient automatic, leading short circuit.



### FAME plug-in test system

FAME is the modular test system for all measuring and testing tasks in network protection technology for medium- and high-voltage switchgear. You can now perform manual testing operations automatically, safely, and more quickly using FAME.

## In dialog with customers and partners worldwide

Phoenix Contact is a globally present, Germany-based market leader. Our group is synonym for future-oriented components, systems, and solutions in the fields of electrical engineering, electronics, and automation. A global network across more than 100 countries, and 16,500 employees ensure a close proximity to our customers, which we believe is particularly important.

The wide variety of our innovative products makes it easy for our customers to find future-oriented solutions for different applications and industries. We especially focus on the fields of energy, infrastructure, process and factory automation.



You will find our complete product range at:  
[phoenixcontact.com](http://phoenixcontact.com)

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