

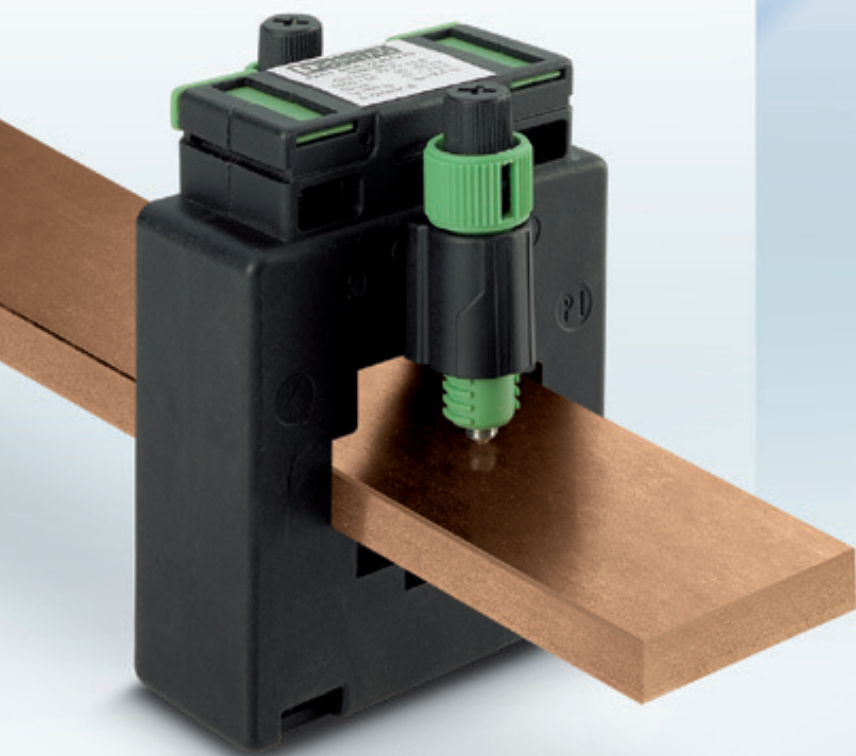


# Energy and current measuring technology

Converting, measuring, and monitoring

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

Phoenix Contact's range of products for energy and current measuring technology allows you to continually keep an eye on all key characteristics – from local current measurement to central energy data acquisition.



## Current transformers

PACT current transformers offer a complete product range for the conversion of alternating currents up to 4000 A to secondary currents of 1 A and 5 A.



## Current and voltage transducers

MCR current and voltage transducers convert direct, alternating, and distorted currents of up to 600 A as well as voltages to standard analog signals.



## What advantages does energy management offer?

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

### Reduced energy costs

by identifying energy-saving potential

### Optimized system capacity

by intelligent switching of system parts, even network loading and reduced harmonics

### Decreased peak loads

by intelligent trend calculation and load management

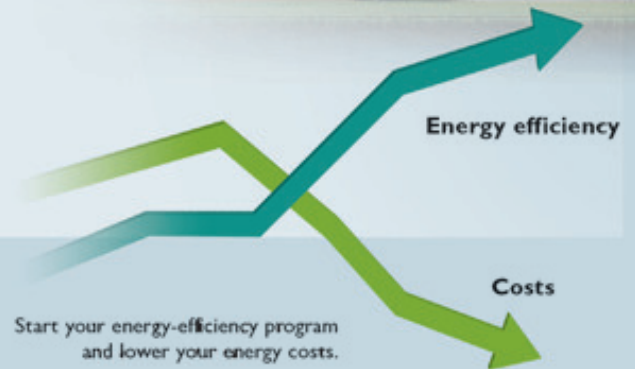
### Secured production processes

by continuously monitoring the system parameters, system downtimes can be minimized



## Energy measuring devices

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



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# EMpro energy measuring devices – For your energy management

EMpro energy measuring devices detect 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.

Ethernet

RS485

PROFI  
BUS

Modbus

## The advantages

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



## The communication expert

### EMpro MA600

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



## Monitoring web server

### Remote access to several meters – with just one IP address

The web server that has been integrated into the Ethernet communication modules allows you to easily configure key parameters online. It also allows remote access to key electrical characteristics such as current, voltage, power, energy, and harmonics.

In your monitoring network, the master comprises an EMpro MA600 measuring device, combined with an Ethernet gateway. You can easily configure the connected measuring devices as slaves via the web server interface. You can therefore access all energy data – with one IP address.



### The universal solution on the front panel

#### EMpro MA400

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



### The compact DIN rail solution

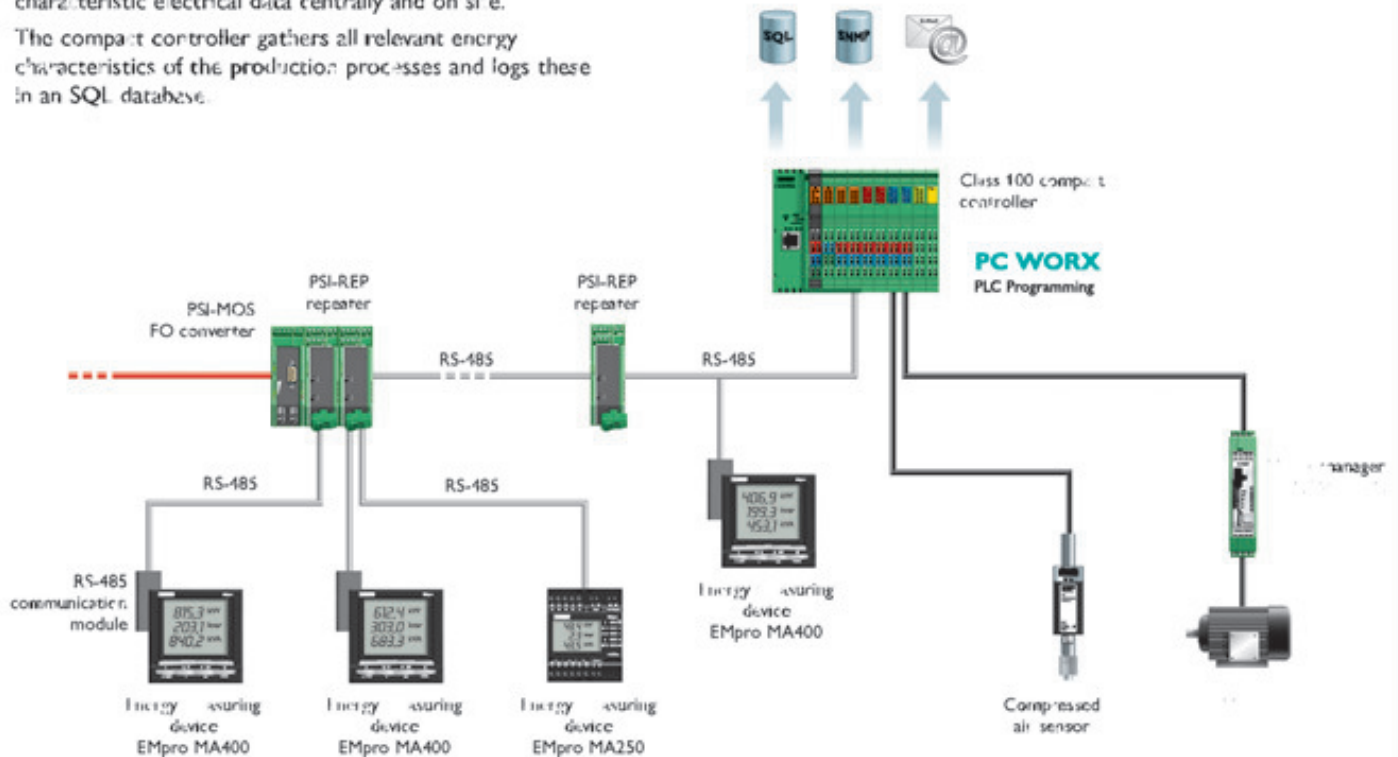
#### EMpro MA250

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



### Repeaters

PSI repeaters increase the high performance and availability of bus systems.

- increased ranges and devices
- individual network structures
- 4-way electrical isolation
- Can be combined with PSI-MOS FO converters



### 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



### Data logger kits

PSK DL data logger kits monitor the operating state of your plant and inform you of any state change by SMS.

- The complete package is available in two versions:
- PSK DL BASIC with all basic functions
  - PSK DL FLEX allows programming directly in SQL and supports modular expansion. This kit also enables you to send e-mails via GPRS or DSL.

## Product overview: EMpro energy measuring devices

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

Order No.: 902078  
 Price: EEM-MKT-DRA



EMpro MA600



EMpro MA400



EMpro MA250



EMpro MA200

Type	EMpro MA600	EMpro MA400	EMpro MA250	EMpro MA200
Order No.	902078	902079	902080	902081
<b>Measurements</b>				
<b>Currents</b>				
• 3-phase (3-wire calculation)	•	•	•	•
• Minimum values	•	•	•	•
• Average values	•			
• Current measurement	Direct/ via current transformer	Via current transformer	Via current transformer	Via current transformer
<b>Voltages</b>				
• 3-phase (3-wire calculation)	•	•	•	•
• Minimum values	•			
• Average values	•			
• Voltage measurement via voltage transformer	•			
• Voltage measurement, circuit (AC)	Up to 700 V	Up to 500 V	Up to 500 V	Up to 500 V
<b>Frequency</b>	•	•	•	•
<b>Power</b>				
• 3-phase (3-wire calculation)	•	•	•	•
• 3-phase per phase (+/-)	•	•	•	•
• Minimum values P, Q, S	•	•	•	•
• Average values P, Q, S	•			
• Power factor	•			
<b>Power factor</b>				
• 3-phase	•	•	•	•
• per phase	•	•	•	•
<b>Harmonics (TDH)</b>				
• 3-phase (3-wire calculation)	Up to the 61st harmonic	Up to the 51st harmonic	Up to the 51st harmonic	Up to the 51st harmonic
• 3-phase per phase (3-wire calculation)	Up to the 61st harmonic	Up to the 51st harmonic		
<b>Temperature</b>	• 3-phase measurement	With special function module	• (optional)	• (optional)
<b>Counting</b>	Real energy/active energy	kWh +/- kvarh +/-	kWh + kvarh +	kWh + kvarh +
• tariff meter			•	•
• Operating hours	•	•	•	•
<b>Analysis</b>	Harmonics analysis	Up to the 61st harmonic		
<b>Outputs</b>	• pulse output		•	•
<b>Inputs</b>	• input		•	•
<b>Communication modules (optional)</b>				
RS-485 (BUS/MODBUS)	Optional RS-485 interface	Optional RS-485 interface	Integrated RS-485 interface	
PROFIBUS 1.5 Mbps	Optional PROFIBUS interface	Optional PROFIBUS interface		
PROFIBUS 12 Mbps	Optional PROFIBUS interface	Optional PROFIBUS interface		
Ethernet	Optional Ethernet interface	Optional Ethernet interface		
with integrated web server				
RS-485/Ethernet gateway	Optional RS-485/Ethernet gateway	Optional RS-485/Ethernet gateway		
with integrated web server				
<b>Special function modules (optional)</b>				
Memory (512 kbyte)	Optional memory module	Optional memory module		
2 digital inputs/outputs	Optional digital I/O module	Optional digital I/O module		
2 analog outputs	Optional analog I/O module	Optional analog I/O module		
Temperature module	Optional temperature module	Optional temperature module		



# PACT current transformers – Extremely versatile

PACT current transformers offer a complete product range for the conversion of alternating currents up to 4000 A to secondary currents of 1 A and 5 A. Depending on the demands, bus-bar, plug-in, and winding current transformers are available.

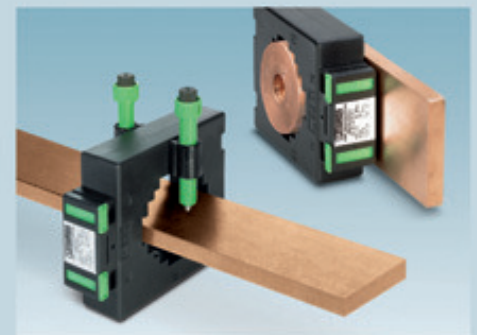
PACT current transformers are available in different transformation ratios, accuracy classes, and rated powers – in 3300 versions, for your current measurement requirements.

## The advantages:

- Considerable time savings thanks to tool-free mounting with the quick-action transformer mechanism
- Extra safety – safe isolation according to EN 50178
- Variable mounting thanks to flexible fixing options
- Peak loads reliably detected with a thermal continuous rated current at 120% of the primary nominal current

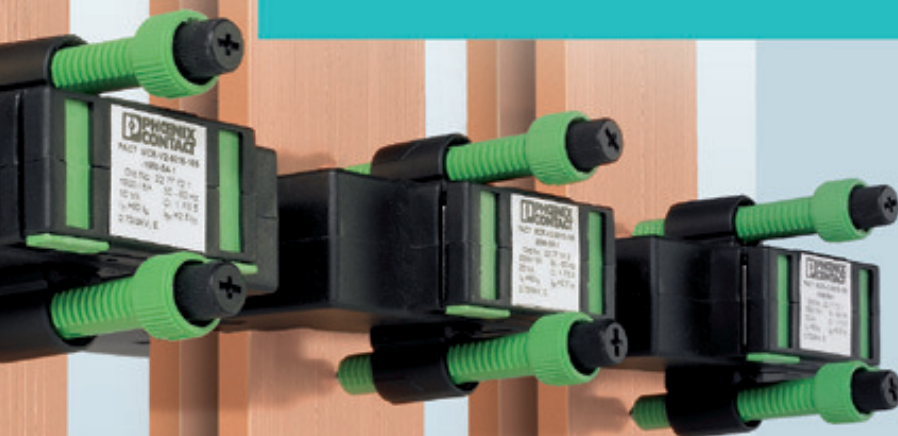
## Space and time savings

The current transformers with tool-less quick-action mechanism offer secure and precise positioning. You can even mount the transformer in areas where a screwdriver does not fit.



## Variable mounting options and space-saving design

You can install PACT current transformers vertically or horizontally. If you are short of space, simply mount the transformer vertically against the power rail. This saves space, for example, when measuring branch outlets of the main supplying rail.





## Extra safety across the entire system application

### Safe isolation according to EN 50178

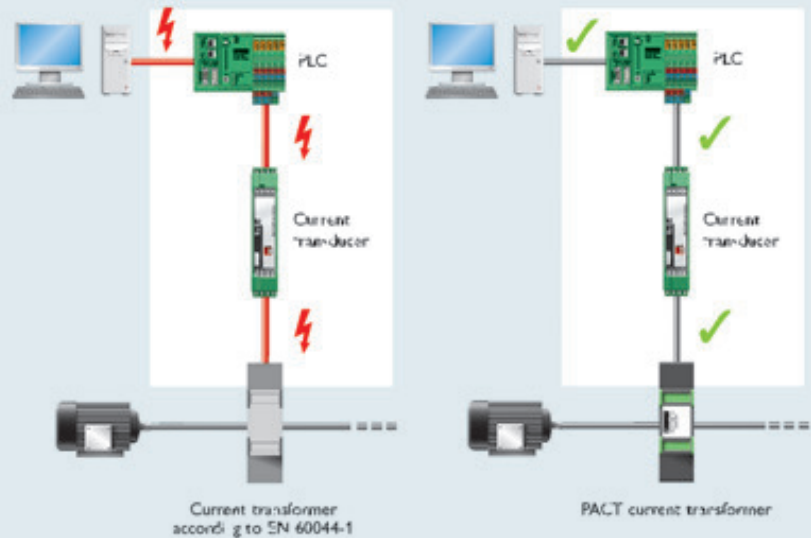
PACT current transformers offer "safe isolation" in accordance with the EN 50178 standard. This applies to "electronic equipment for use in power installations."

The EN 50178 standard varies in terms of safety from the standard transformer one, EN 60044:

- Greater air and creepage distances
- Higher test voltage

PACT current transformers ensure that:

- No sparkover can occur on the transformer secondary side
- Human life is protected inside and outside of the control cabinet.



### Operating voltage comparison

	EN 60044-1 (Transformer standard)	EN 50178 (for power installations)	
Rated insulation voltages (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	
Impulse withstand voltage for transformer testing			
	at 277 V (L-N)	31 V	41 V
	at 1000 V (L-N)	31 V	121 V (PACT)

EN 50178 stipulates distinctly higher impulse withstand voltages for transformer testing. These requirements are no longer met under testing according to EN 60044 at a rated insulation voltage of 480 V (L-L).

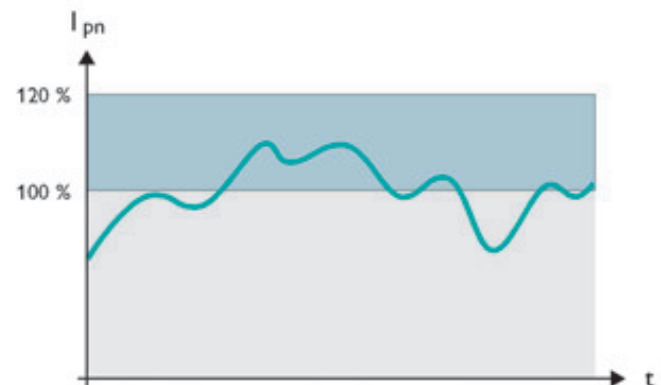
PACT current transformers have significantly greater air and creepage distances and are individually tested at 12 kV. This thereby ensures increased safety.

In the EN 50178 transformer standard, the specified voltage corresponds to the phase/neutral conductor, which means that in this case the standard 720 V transformer's rated insulation voltage is only 416 V (L-N). PACT current transformers up to 1000 V (L-N) to be used in system applications.

### Safely detecting current peaks

PACT current transformers allow you to safely detect current peaks greater than the rated nominal current strength – without incurring any damage. This is due to the fact that current transformers have been designed for a continuous nominal current of 120% of the primary rated current strength.

That means a PACT current transformer with a specified rated power of 10 VA actually offers a rated current 1.2 times greater, or 14.4 VA – and this is on a continual basis.

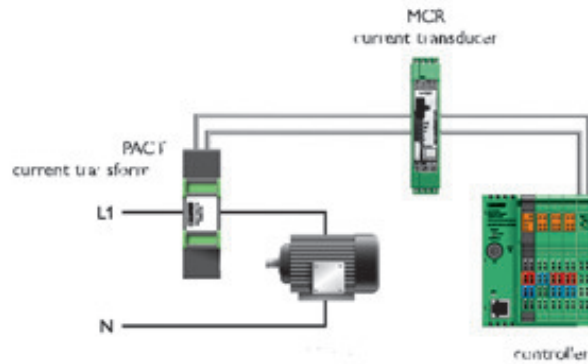


PACT current transformers also safely detect higher current peaks.

## Examples of use: PACT current transformers

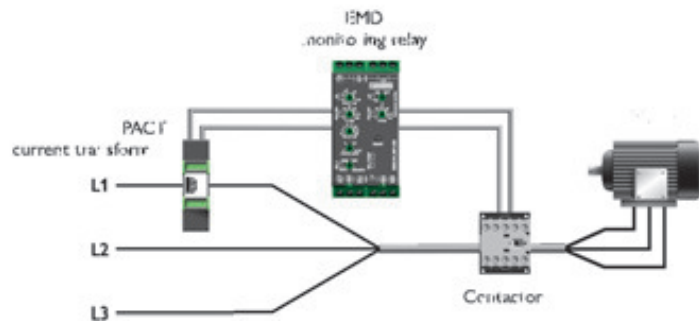
### Generating standard signals

The PACT current transformer reduces the input current to 1 A AC or 5 A AC. For example, a downstream current transducer generates a 4 ... 20 mA signal from this secondary current for further processing.



### Load monitoring

When combined with a PACT current transformer, a real power monitoring relay can even monitor the load of larger motors.



### Motor manager

The CONTACTRON EMM motor manager protects the motor and system against critical overload and underload states.

- Integrated full motor protection
- Saves the cost of sensors
- Protects high-grade system parts



### Monitoring relays

EMD monitoring relays offer a cost-effective monitoring option for numerous machine and system parameters, such as:

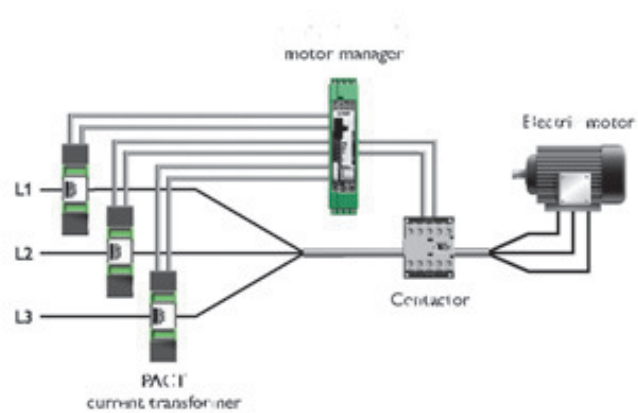
- Current and voltage
- Phase parameters
- Power factor and real power
- Motor winding temperature
- Levels



## Examples of use: PACT current transformers

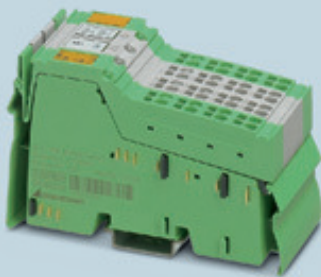
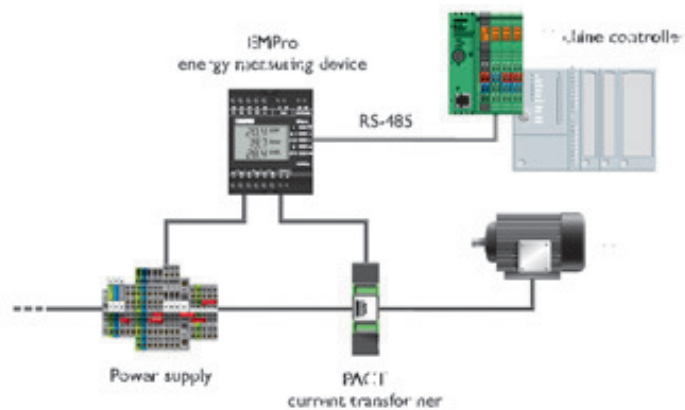
### Motor management

PACT current transformers also enable use of load relays with motor management, even at higher currents.



### Energy measuring technology

The wide product range of PACT current transformers enables the widest range of applications in energy measuring technology. The downstream EMpro energy measuring devices can be used to record and display characteristic data directly in the control cabinet and then transfer it to the PLC.



### Power measurement terminal

The inline power measurement terminal IB IL PM 3P N TT PAC is used to analyze AC networks and can be found, for example, in distribution systems for measuring current, voltage, and power, as well as those used to identify distortion and harmonics.

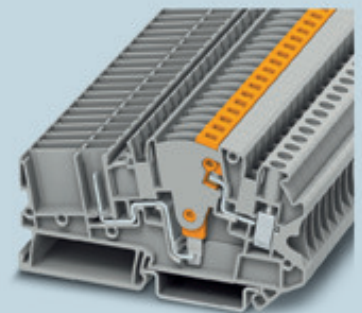
- Supports 5 A AC direct connection
- Measurement of the neutral conductor current



### Compact controller

The modularly extendable class 100 ILC compact controllers are able to log operating states and energy data.

- Freely programmable application in PC WORX
- Comprehensive function libraries for direct SQL communication



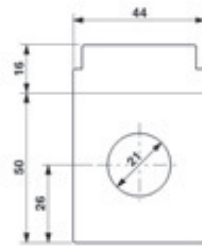
### Test disconnect terminal blocks

The compact disconnect terminal blocks in the CLIPLINE complete system safely protect your current transformers against damage. The patented, user-friendly plug offers an automatic, leading short circuit.

## Product overview: PACT current transformers



50 ... 500 A



Type	Order No.	PACT MCR-V1-21-11
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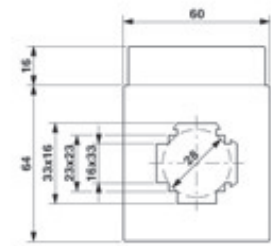
Technical data	
Circular conductor dimensions	Ø 22
Rail dimensions (n axis mm)	22.5 x 7.5
Secondary current I <sub>sc</sub>	1 A / 5 A
Accuracy class	C05 = 0.5 C10 = 1

Primary rated current and rated power		
	I	S
I : I A/KI.: 0.5	500 A / 250 A	100 VA / 50 VA
I : I A/KI.: 1	500 A / 250 A	100 VA / 50 VA
I : 5 A/KI.: 0.5	250 A / 125 A	50 VA / 25 VA
I : 5 A/KI.: 1	250 A / 125 A	50 VA / 25 VA

Calibratable version	Order No.	PACT MCR-V1C-21-11
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L10
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L65



50 ... 750 A



Type	Order No.	PACT MCR-V2-3015-60
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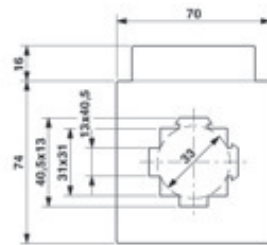
Technical data	
Circular conductor dimensions	Ø 22
Rail dimensions (n axis mm)	22.5 x 7.5
Secondary current I <sub>sc</sub>	1 A / 5 A
Accuracy class	C05 = 0.5 C10 = 1

Primary rated current and rated power		
	I	S
I : I A/KI.: 0.5	750 A / 375 A	150 VA / 75 VA
I : I A/KI.: 1	750 A / 375 A	150 VA / 75 VA
I : 5 A/KI.: 0.5	375 A / 187.5 A	75 VA / 37.5 VA
I : 5 A/KI.: 1	375 A / 187.5 A	75 VA / 37.5 VA

Calibratable version	Order No.	PACT MCR-V2C-3015-60
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L10
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L65



75 ... 1000 A



Type	Order No.	PACT MCR V2 1012 70
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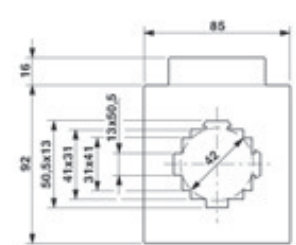
Technical data	
Circular conductor dimensions	Ø 22
Rail dimensions (n axis mm)	22.5 x 7.5
Secondary current I <sub>sc</sub>	1 A / 5 A
Accuracy class	C05 = 0.5 C10 = 1

Primary rated current and rated power		
	I	S
I : I A/KI.: 0.5	1000 A / 500 A	200 VA / 100 VA
I : I A/KI.: 1	1000 A / 500 A	200 VA / 100 VA
I : 5 A/KI.: 0.5	500 A / 250 A	100 VA / 50 VA
I : 5 A/KI.: 1	500 A / 250 A	100 VA / 50 VA

Calibratable version	Order No.	PACT MCR V2C 1012 70
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L10
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L65



100 ... 1500 A



Type	Order No.	PACT MCR V2 5012 85
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Technical data	
Circular conductor dimensions	Ø 22
Rail dimensions (n axis mm)	22.5 x 7.5
Secondary current I <sub>sc</sub>	1 A / 5 A
Accuracy class	C05 = 0.5 C10 = 1

Primary rated current and rated power		
	I	S
I : I A/KI.: 0.5	1500 A / 750 A	300 VA / 150 VA
I : I A/KI.: 1	1500 A / 750 A	300 VA / 150 VA
I : 5 A/KI.: 0.5	750 A / 375 A	150 VA / 75 VA
I : 5 A/KI.: 1	750 A / 375 A	150 VA / 75 VA

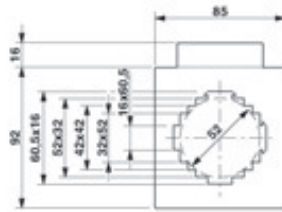
Calibratable version	Order No.	PACT MCR V2C 5012 85
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L10
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L65



## Product overview: PACT current transformers



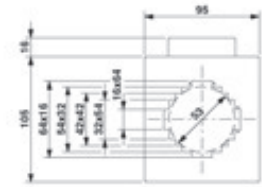
200 ... 1600 A



Type	Order No.	PACT I MCR V2 6015-85	
<b>Technical data</b>			
Circular conductor dimensions	Ø 16 mm		
Rail dimensions (n x in µm)	60.5 x 16 mm		
Secondary current I <sub>sc</sub>	1 A / 5 A		
Accuracy class	C05 = 0.5 C10 = 1		
<b>Primary rated current and rated power</b>			
	I <sub>pn</sub>	S	
I : I A/KI : 0.5	200 A / 100 A	10 VA / 5 VA	
I : I A/KI : 1	400 A / 200 A	10 VA / 5 VA	
I : 5 A/KI : 0.5	200 A / 100 A	5 VA / 2.5 VA	
I : 5 A/KI : 1	400 A / 200 A	5 VA / 2.5 VA	
Calibratable version	Order No.	PACT MCR V2C 6015-85	
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L10	
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L65	



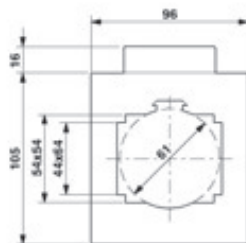
200 ... 2500 A



Type	Order No.	PACT I MCR V2 6315-95	
<b>Technical data</b>			
Circular conductor dimensions	Ø 16 mm		
Rail dimensions (n x in µm)	64 x 16 mm		
Secondary current I <sub>sc</sub>	1 A / 5 A		
Accuracy class	C05 = 0.5 C10 = 1		
<b>Primary rated current and rated power</b>			
	I <sub>pn</sub>	S	
I : I A/KI : 0.5	200 A / 100 A	10 VA / 5 VA	
I : I A/KI : 1	400 A / 200 A	10 VA / 5 VA	
I : 5 A/KI : 0.5	200 A / 100 A	5 VA / 2.5 VA	
I : 5 A/KI : 1	400 A / 200 A	5 VA / 2.5 VA	
Calibratable version	Order No.	PACT MCR V2C 6315-95	
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L10	
Quick-action mechanism	Order No.	PACT FAST-MNT-W16-L65	



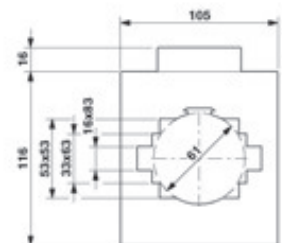
200 ... 2000 A



Type	Order No.	PACT MCR V2 6010 96	
<b>Technical data</b>			
Circular conductor dimensions	Ø 16 mm		
Rail dimensions (n x in µm)	54 x 54 mm		
Secondary current I <sub>sc</sub>	1 A / 5 A		
Accuracy class	C05 = 0.5 C10 = 1		
<b>Primary rated current and rated power</b>			
	I <sub>pn</sub>	S	
I : I A/KI : 0.5	200 A / 100 A	10 VA / 5 VA	
I : I A/KI : 1	400 A / 200 A	10 VA / 5 VA	
I : 5 A/KI : 0.5	200 A / 100 A	5 VA / 2.5 VA	
I : 5 A/KI : 1	400 A / 200 A	5 VA / 2.5 VA	
Calibratable version	Order No.	PACT I MCR V2C 6010 96	



400 ... 2500 A

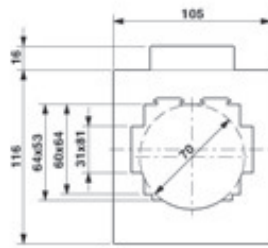


Type	Order No.	PACT MCR V2 8015 105	
<b>Technical data</b>			
Circular conductor dimensions	Ø 16 mm		
Rail dimensions (n x in µm)	63 x 53 mm		
Secondary current I <sub>sc</sub>	1 A / 5 A		
Accuracy class	C05 = 0.5 C10 = 1		
<b>Primary rated current and rated power</b>			
	I <sub>pn</sub>	S	
I : I A/KI : 0.5	400 A / 200 A	10 VA / 5 VA	
I : I A/KI : 1	800 A / 400 A	10 VA / 5 VA	
I : 5 A/KI : 0.5	400 A / 200 A	5 VA / 2.5 VA	
I : 5 A/KI : 1	800 A / 400 A	5 VA / 2.5 VA	
Calibratable version	Order No.	PACT I MCR V2C 8015 105	

## Product overview: PACT current transformers



500 ... 2000 A



Type	Order No	PACT MCR-V2-10020-105
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### Technical data

Circular conductor dimensions	Ø 64 mm
Rail dimensions (n axis mm)	80 x 64
Secondary current $I_n$	1 A / 5 A
Accuracy class	C05 = 0.5 C10 = 1

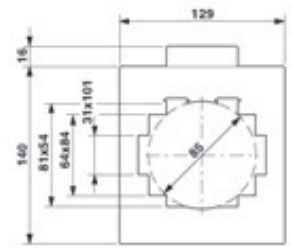
### Primary rated current and rated power

	I	S
I : I A/KI: 0.5	500 A / 1000 A	100 VA / 200 VA
I : I A/KI: 1	1000 A / 2000 A	200 VA / 400 VA
I : 5 A/KI: 0.5	1000 A / 2000 A	200 VA / 400 VA
I : 5 A/KI: 1	2000 A / 4000 A	400 VA / 800 VA

Calibratable version	Order No	PACT MCR-V2C-10020-105
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400 ... 4000 A



Type	Order No	PACT MCR-V2-10020-129
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### Technical data

Circular conductor dimensions	Ø 81 mm
Rail dimensions (n axis mm)	64 x 84
Secondary current $I_n$	1 A / 5 A
Accuracy class	C05 = 0.5 C10 = 1

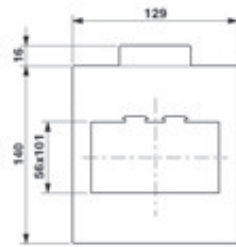
### Primary rated current and rated power

	I	S
I : I A/KI: 0.5	400 A / 800 A	100 VA / 200 VA
I : I A/KI: 1	800 A / 1600 A	200 VA / 400 VA
I : 5 A/KI: 0.5	800 A / 1600 A	200 VA / 400 VA
I : 5 A/KI: 1	1600 A / 3200 A	400 VA / 800 VA

Calibratable version	Order No	PACT MCR-V2C-10020-129
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400 ... 4000 A



Type	Order No	PACT MCR V2 10036 129
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### Technical data

Circular conductor dimensions	Ø 66 mm
Rail dimensions (n axis mm)	66 x 101
Secondary current $I_n$	1 A / 5 A
Accuracy class	C05 = 0.5 C10 = 1

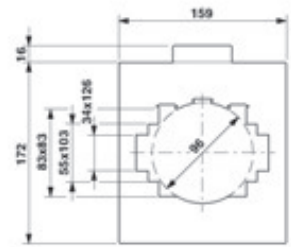
### Primary rated current and rated power

	I	S
I : I A/KI: 0.5	400 A / 800 A	100 VA / 200 VA
I : I A/KI: 1	800 A / 1600 A	200 VA / 400 VA
I : 5 A/KI: 0.5	800 A / 1600 A	200 VA / 400 VA
I : 5 A/KI: 1	1600 A / 3200 A	400 VA / 800 VA

Calibratable version	Order No	PACT MCR V2C 10036 129
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400 ... 4000 A



Type	Order No	PACT MCR V2 12020 159
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### Technical data

Circular conductor dimensions	Ø 83 mm
Rail dimensions (n axis mm)	55 x 103
Secondary current $I_n$	1 A / 5 A
Accuracy class	C05 = 0.5 C10 = 1

### Primary rated current and rated power

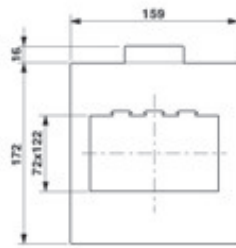
	I	S
I : I A/KI: 0.5	400 A / 800 A	100 VA / 200 VA
I : I A/KI: 1	800 A / 1600 A	200 VA / 400 VA
I : 5 A/KI: 0.5	800 A / 1600 A	200 VA / 400 VA
I : 5 A/KI: 1	1600 A / 3200 A	400 VA / 800 VA



## Product overview: PACT current transformers



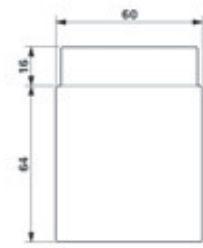
400 ... 4000 A



Type	Order No.	PACT MCR-V2-120-10-159	
<b>Technical data</b>			
Circular conductor dimensions			
Rail dimensions (n axis μm)			
Secondary current $I_{sc}$	1 A / 5 A		
Accuracy class	C05 = 0.5 C10 = 1		
<b>Primary rated current and rated power</b>			
	I	S	
I : I A/KI : 0.5	1000 A / 500 VA	1000 A / 500 VA	
I : I A/KI : 1	1000 A / 500 VA	1000 A / 500 VA	
I : 5 A/KI : 0.5	1000 A / 500 VA	1000 A / 500 VA	
I : 5 A/KI : 1	1000 A / 500 VA	1000 A / 500 VA	



1 ... 40 A



Type	Order No.	PACT MCR-V3-60	
<b>Technical data</b>			
Circular conductor dimensions			
Rail dimensions (n axis μm)			
Secondary current $I_{sc}$	1 A / 5 A		
Accuracy class	C05 = 0.5 C10 = 1		
<b>Primary rated current and rated power</b>			
	I	S	
I : I A/KI : 0.5	1000 A / 500 VA	1000 A / 500 VA	
I : I A/KI : 1	1000 A / 500 VA	1000 A / 500 VA	
I : 5 A/KI : 0.5	1000 A / 500 VA	1000 A / 500 VA	
I : 5 A/KI : 1	1000 A / 500 VA	1000 A / 500 VA	

## Accessories



**Secondary terminal cover**  
to increase air and creepage distances when installed horizontally

PACT MCR-ETC-60	227515
PACT MCR-LTC-75	227514



**Copper sleeves**  
for establishing a conductive connection for horizontal assembly

PACT MCR-CB-12-12	227518
PACT MCR-CB-28-12	227519
PACT MCR-CB-21-12	227517
PACT MCR-CB-21-18	227516



**Adapters**  
for mounting on DIN rails

PACT MCR-RA	227513
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**Insulating caps**  
for mounting screws

PACT MCR-ICAP	227512
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**Quick-action mechanisms**  
The distance between the top edge of the power rail and the retaining bracket varies according to the current transformer housing and the power rail material. Select between the two lengths based on the above information.

W = Width of holding latch  
L = Length of fixing pins

PACT FAST-MNT-W13-L65	227520
W: 13 mm, L: 65 mm; for:	
227515, 227514, 227518, 227519, 227517, 227516	

PACT FAST-MNT-W16-L65	227521
W: 16 mm, L: 65 mm; for:	
227515, 227514, 227518, 227519, 227517, 227516	

PACT FAST-MNT-W13-L40	227522
W: 13 mm, L: 40 mm; for:	
227515, 227514, 227518, 227519, 227517, 227516	

PACT FAST-MNT-W16-L40	227523
W: 16 mm, L: 40 mm; for:	
227515, 227514, 227518, 227519, 227517, 227516	

# AC/DC current transducers – The universal current measurement

MCR current transducers allow you to measure direct and alternating currents of all curve shapes. Choose between adjustable devices for precise imaging of small measurement ranges up to 55 A or compact devices with graded measuring ranges to measure high currents up to 600 A.

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



#### The advantages:

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

#### Flexible signal conditioning

Current transducers up to  
55 A AC/DC



#### The advantages:

- Quick basic configuration via DIP switches
- Advanced configuration and diagnostic options via software
- Optimum mapping of the measurement 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

Measurement and control current transducers in the range of 0 ... 11 A and 0 ... 55 A operate in accordance with the true r.m.s. measurement principle. They therefore process any curve shapes and do not rely on form factors.

If desired, can be delivered configured to your data ex works.

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



**For DC, AC, and distorted currents**  
0 ... 11 A  
programmable and configurable



**For DC, AC, and distorted currents**  
0 ... 55 A  
programmable and configurable

Configurable, with switching output	Order No	MCR-S-1-5-UI-SW-DCI	<a href="#">View product</a>	MCR-S-10-50-UI-SW-DCI	<a href="#">View product</a>
Standard product, with switching output	Order No	MCR-S-1-5-UI-SW-DCI-NC	<a href="#">View product</a>	MCR-S10-50-UI-SW-DCI-NC	<a href="#">View product</a>
Configurable, without switching output	Order No	MCR-S-1-5-UI-DCI	<a href="#">View product</a>	MCR-S-10-50-UI-DCI	<a href="#">View product</a>
Standard product, without switching output	Order No	MCR-S-1-5-UI-DCI-NC	<a href="#">View product</a>	MCR-S10-50-UI-DCI-NC	<a href="#">View product</a>

Technical data					
<b>Current measurement</b>	0 ... 11 A		0 ... 55 A		
	(programmable, configurable)		(programmable, configurable)		
<b>Frequency range</b>	0 ... 100 Hz		0 ... 100 Hz		
<b>Connection method</b>	Screw connection		Push-through connection, Ø 10.5 mm		
<b>Output signal (current output)</b>	0 ... 100 mA		0 ... 100 mA		
<b>Output signal (voltage output)</b>	0 ... 5 V		0 ... 5 V		
<b>Supply voltage U<sub>s</sub></b>	5 V		5 V		
<b>Transmission error, maximum</b>	< 0.5%		< 0.5%		
	(of nominal range value under nominal conditions)		(of nominal range value under nominal conditions)		
<b>Ambient temperature range</b>	-20 ... 60°C		-20°C ... 60°C		

Measurement and control current transducers in the range of 0 ... 300 A and 0 ... 600 A operate in accordance with the true r.m.s. measurement principle. They therefore process any curve shapes and do not rely on form factors.

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



**For DC, AC, and distorted currents**  
0 ... 300 A  
Voltage output



**For DC, AC, and distorted currents**  
0 ... 600 A  
Current output

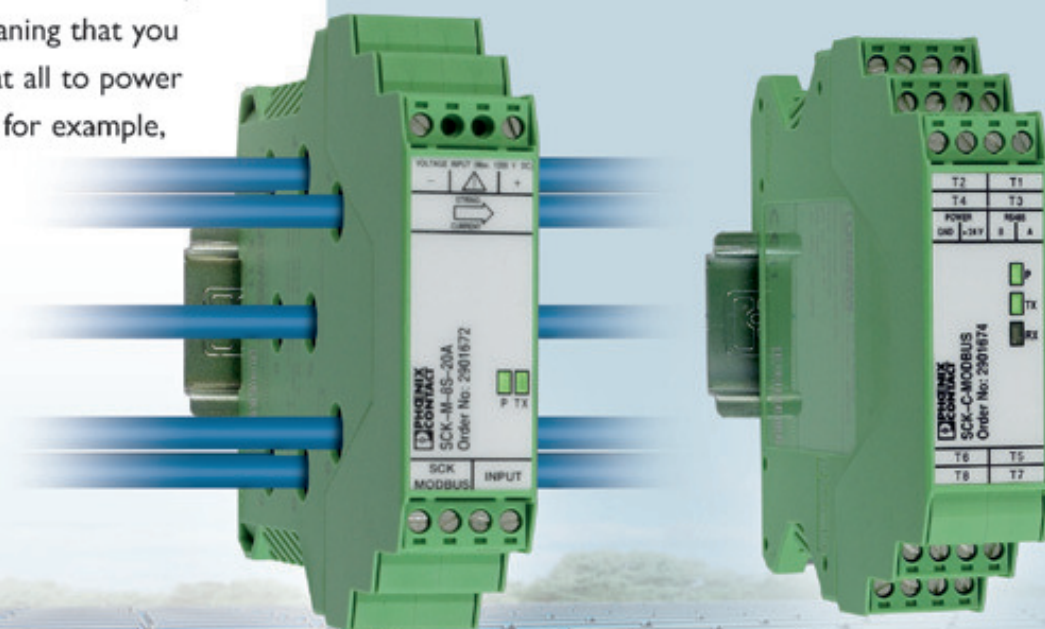
input current range: 0 ... 100 A	Order No	MCR-SL-CUC-100-U	<a href="#">View product</a>	MCR-SL-CUC-100-I	<a href="#">View product</a>
input current range: 0 ... 200 A	Order No	MCR-SL-CUC-200-U	<a href="#">View product</a>	MCR-SL-CUC-200-I	<a href="#">View product</a>
input current range: 0 ... 300 A	Order No	MCR-SL-CUC-300-U	<a href="#">View product</a>	MCR-SL-CUC-300-I	<a href="#">View product</a>
input current range: 0 ... 400 A	Order No			MCR-SL-CUC-400-I	<a href="#">View product</a>
input current range: 0 ... 500 A	Order No			MCR-SL-CUC-500-I	<a href="#">View product</a>
input current range: 0 ... 600 A	Order No			MCR-SL-CUC-600-I	<a href="#">View product</a>

Technical data					
<b>Current measurement</b>	0 ... 300 A		0 ... 600 A		
<b>Frequency range</b>	0 ... 100 Hz		0 ... 100 Hz		
<b>Connection method</b>	Cable fit, Ø 32 mm		Cable fit, Ø 32 mm		
<b>Output signal</b>	0 ... 5 V		0 ... 100 mA		
<b>Supply voltage U<sub>s</sub></b>	5 V		5 V		
<b>Transmission error, maximum</b>	< ±1% (of final value)		< ±1% (of final value)		
<b>Ambient temperature range</b>	-40 ... 65°C		-40 ... 65°C		

# DC current transducers – SOLARCHECK PV string monitoring

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

SOLARCHECK provides you with reliable  
information about the performance of your  
photovoltaic system, meaning that you  
can respond in no time at all to power  
losses of individual lines, for example,  
from contamination  
or damage.



## The advantages:

- Low costs and wiring effort, as additional power supply units are not required in the device terminal box
- Easy and safe current measurement without interrupting cables thanks to Hall sensors
- Space-saving installation with compact design
- Easy integration into monitoring systems through Modbus RTU communication
- Monitoring of remote indication contacts with additional digital input
- Performance determination possible due to voltage measurement of up to 1200 V



## Product overview: SOLARCHECK PV string monitoring

SOLARCHECK PV string monitoring consists of two components:

- Use this measuring module to determine your PV system's characteristic data and forward this to the communication module.
- The communication module collects the values from up to eight measuring modules and is available to your central higher-level control system as a Modbus RTU slave.



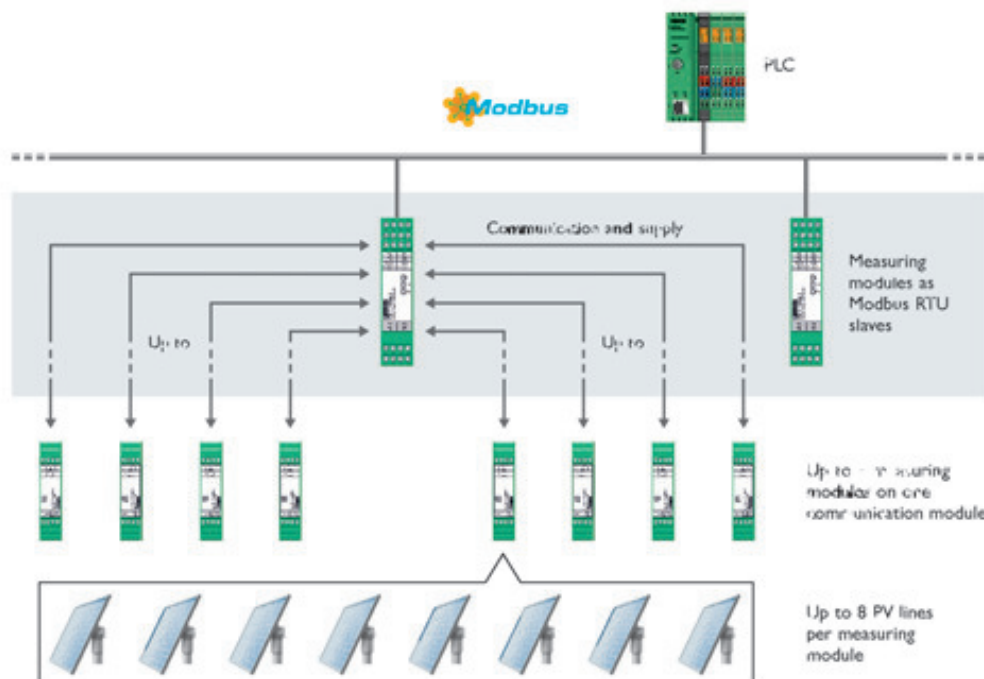
**Measuring module**  
0 ... 20 A/0 ... 1700 V



**RS-485 communication module (Modbus RTU)**

Type	Order No.	SCK-M-8S-20A2901672	SCK-C-MODBUS2901674
<b>Technical data</b>			
Current measurement		0 ... 20 A	0 ... 20 A
Voltage measurement		0 ... 1700 V	0 ... 1700 V
Connection method		Push-through connection, Ø 9.5 mm	
Serial interface		Modbus RTU	
Serial transmission speed		9.6 kbps	
Supply voltage $U_s$		Via SCK-C-MODBUS communication module	
Current consumption		Max. 100 mA	
Transmission error, maximum		< 1% (of nominal range value under nominal conditions)	
Ambient temperature range		-20 ... 70°C	

## Easy integration into monitoring systems



The measuring module allows you 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. Its 2-wire communication cable simultaneously serves as the measuring modules' power supply. This means that you can supply up to eight measuring modules without an additional power supply unit.

The communication module is integrated into an existing network as a Modbus RTU device.

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

MCR current transducers also allow you to measure distorted alternating currents and convert them to standard analog signals. These come in two product ranges: Adjustable with a variable supply concept or with foldable Rogowski sensors for easy installation and upgrades.

**Easy to install**  
Current transducers  
up to 200 A

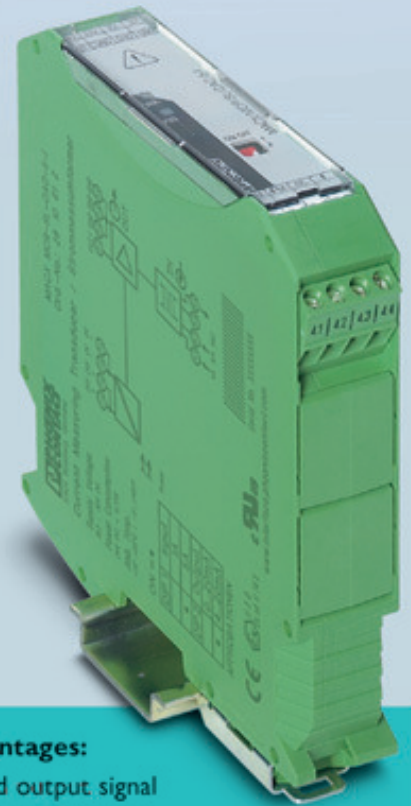
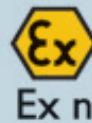


#### The advantages:

- Uninterruptible installation with foldable sensor
- Current measurement without shunt – thanks to the Rogowski sensor
- Easy wiring thanks to plug-in connection terminal blocks
- Mounting on the DIN rail or on the mounting plate

#### An adjustable and flexible supply

Current transducers  
up to 12 A



#### The advantages:

- Input and output signal setting via DIP switch
- Can be used worldwide with wide-range input
- 24 volt power supply via DIN rail connector
- Operating state diagnostics via front LED
- Protection against malfunctions thanks to three-way electrical isolation



## Product overview: MCR current transducers for alternating currents

Measurement and control current transducers in the range of 0 ... 5 A and 0 ... 12 A operate in accordance with the true r.m.s. measurement principle. They therefore process any curve shapes and do not rely on form factors.

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



For sinusoidal alternating currents in the range of 0 ... 5 A/0 ... 12 A (configurable)



For sinusoidal and non-sinusoidal alternating currents in the range of 0 ... 200 A, with voltage output (...-U), with current output, loop-powered (...I-LP)

Type	Order No.	MACX MCR-SL-CAC-5-I	MCR-SL-S-100-U
Type	Order No.	MACX MCR-SL-CAC-5-I-UP	MCR-SL-S-100-I-LP
Type	Order No.	MACX MCR-SL-CAC-12-I-UP	MCR-SL-S-200-U
Type	Order No.		MCR-SL-S-200-I-LP

Technical data			
<b>Current measurement</b>		0 ... 5 A/0 ... 12 A (configurable, ...-I and ...-I-UP)	0 ... 50/150/100/1 ... 200 A (0 ... 10% U) and ...-U/100 I LP
		0 ... 5 A/0 ... 12 A (configurable, ...-I2-UP)	0 ... 100/150/100/1 ... 200 A (0 ... 10% U) and ...-U/200 I LP
<b>Frequency range</b>		0 ... 100 Hz	0 ... 100 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 ... 1 V
<b>Supply voltage U<sub>B</sub></b>		19.2 ... 25.3 V AC/DC (...-I-UP versions)	19.2 ... 25.3 V AC/DC
<b>Transmission error, maximum</b>		< 0.5% (of nominal range value under nominal conditions)	< 1% (of final value)
<b>Ambient temperature range</b>		-20 ... 65°C	-20 ... 60°C

The current transducer for sinusoidal alternating currents within the range of 0 ... 1 A/0 ... 5 A

- Loop-powered
- 1 A AC and 5 A AC measuring ranges, reconnectable

The current protector converts sinusoidal alternating currents of up to 16 A AC to binary switching signals.

- Freely selectable switching point
- Relay PDI 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



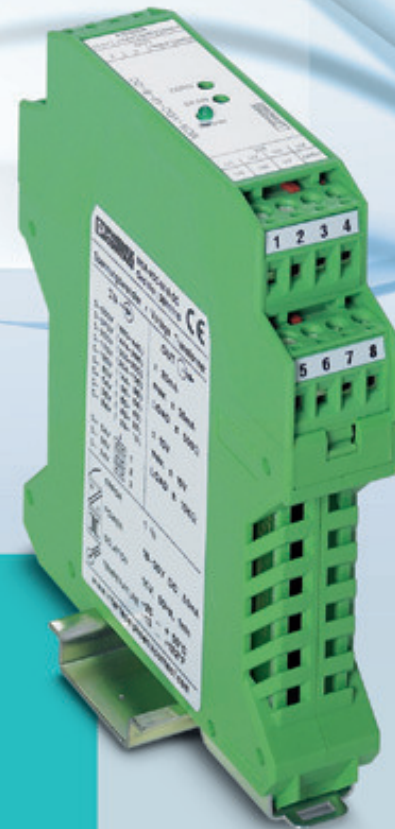
Current protector for sinusoidal alternating currents 0 ... 16 A AC

Type	Order No.	MCR-SLP-1-5-UI-0	MCR-SL-S-16-SP-21
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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>		0 ... 100 Hz	0 ... 100 Hz
<b>Connection method</b>		Screw connection	Push-through connection, Ø 4.2 mm
<b>Output signal</b>		0 ... 20 mA/4 ... 20 mA (configurable)	Relay output: 1 PDT
<b>Response delay</b>		Typically 0.1 ... 10 s (adjustable using a potentiometer)	
<b>Supply voltage U<sub>B</sub></b>		Loop-powered	
<b>Transmission error, maximum</b>		< 0.5% (of final value)	
<b>Ambient temperature range</b>		-25 ... 65°C	-25 ... 60°C

# Voltage transducers

MCR voltage transducers can be used to measure direct and alternating currents in several signal ranges and convert them to standard analog signals.



## The advantages

- Bidirectional output signals
- Precise imaging of the measurement with graded voltage ranges
- ZERO/SPAN adjustment  $\pm 20\%$
- High operational reliability thanks to 3-way electrical isolation

## Product overview: MCR voltage transducers



For DC voltages  
0 ...  $\pm 660$  V DC



For sinusoidal AC voltages  
0 ... 440 V AC

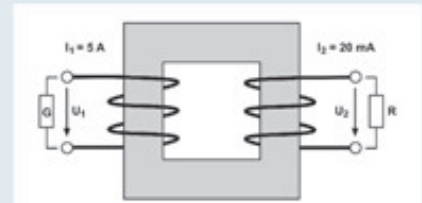
Type	Order No.	MCR-VDC-UI-B-DC	MCR-VAC-UI-O-DC
<b>Technical data</b>			
Voltage measurement/resistance	3	0 ... $\pm 660$ V DC	0 ... 440 V AC
Resistance		100 $\Omega$ ... 100 k $\Omega$	100 $\Omega$ ... 100 k $\Omega$
ZERO/SPAN adjustment		$\pm 20$ 20%	$\pm 20$ 20%
Frequency range		0 ... 100 Hz	0 ... 100 Hz
Output signal		0 ... 5 V DC	0 ... 5 V DC
Supply voltage $U_s$		12 V DC	12 V DC
Transmission error, maximum		< 1% (of fms' value)	< 1.5% (of fms' value)
Ambient temperature range		-25 ... 50°C	-25 ... 60°C

# Basics of current measurement

## Measurement of root mean square (r.m.s.) values according to the transformer principle

According to Faraday's law of induction, a magnetic flux which changes over time produces an induced voltage on the terminals of a coil. A circuit arrangement consisting of two electrically isolated but

magnetically coupled circuits is known as a transformer. This is one of the easiest and most commonly used methods of current transfer.

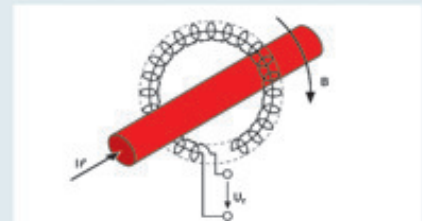


Measurement of root mean square (r.m.s.) values according to the transformer principle

## True r.m.s. (TRMS) value measurement according to the Rogowski principle

The Rogowski principle is a special method used to measure sinusoidal and non-sinusoidal alternating currents in a transformer. A non-ferrous induction coil (air-core coil), known as the Rogowski coil,

measures the magnetic voltage along a closed circumference around a current-conducting wire. The output signal of the Rogowski coil is then conditioned so as to obtain an exact replica of the primary current.

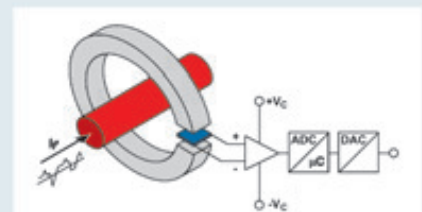


True r.m.s. (TRMS) value measurement according to the Rogowski principle

## True r.m.s. (TRMS) value measurement with a Hall sensor

The magnetic flux generated by the primary current  $I_p$  is concentrated in the magnetic circuit and measured in the air gap using a

Hall sensor. The output signal of the Hall sensor is then conditioned so that an exact replica of the primary current is obtained.



True r.m.s. (TRMS) value measurement with a Hall sensor

## Mean-value generation

### True root mean square value

The true r.m.s. value of an AC current corresponds to the steady-state value that results from the instantaneous values of this current. This steady-state value generates the same thermal work in an ohmic resistor as a DC current of identical magnitude.

The term "true r.m.s. value" also means that distorted, direct and pulsating currents may also be measured. Here, the measuring transducer is comparable with any curve shape.

For a sinusoidal alternating current this means:

$$I_{\text{rms}} = \frac{I}{\sqrt{2}} \quad U_{\text{rms}} = \frac{U}{\sqrt{2}}$$

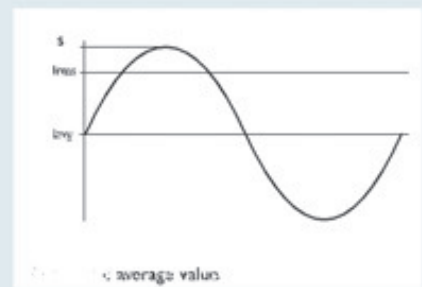
### Arithmetic average value

The arithmetic average value is used to measure direct currents or filter a DC component out from a pulsating current. Applying the arithmetic average value to a symmetrical alternating current would result in a measured value of "0."

The arithmetic average value enables direct currents to be made available at the output in the form of standard analog signals. The polarity can be evaluated by means of a bipolar output signal.

For a 230 V/50 Hz power supply, this results in the following with regard to the voltage levels:

$$\begin{aligned} U_{\text{rms}} &= 230 \text{ V} \\ U_{\text{avg}} &= 325 \text{ V} \\ U_{\text{avg}} &= 0 \text{ V} \end{aligned}$$



Arithmetic average values



Further information on the products presented here and on the world of solutions from Phoenix Contact can be found at [www.phoenixcontact.net/catalog](http://www.phoenixcontact.net/catalog)



Or contact us directly.



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INTERFACE



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