CURRENT AND ENERGY MEASUREMENT TECHNOLOGY

TRANSPARENCY PAYS BACK

WE INNOVATE!

CURRENT MEASUREMENT AND ANALYSIS

The Product Portfolio for Energy Monitoring and Conservation

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Rogowski Coils, 855 Series
Convert AC currents up to 2000 A.

Signal Conditioner for Rogowski Coils, 789 Series
Measures AC currents up to 2000 A via three Rogowski coils. The signal conditioner converts in-phase voltage signals into 100 mA AC current signals, which are transmitted to the WAGO-I/O-SYSTEM 750.

WAGO-I/O-SYSTEM 750
3-Phase Power Measurement Modules
Measure voltage and current, as well as power and energy consumption in three-phase networks.

***JUMPFLEX*® Current Signal Conditioners,**
857 and 2857 Series
Measure and convert DC/AC currents into standard analog signals (e.g., 0–10 V, 4–20 mA).

Intelligent Current Sensors, 789 Series
Monitor AC/DC currents up to 140 A.
Data transmission is performed via MODBUS communication (RS-485).

Current Transformers, 855 Series
Convert AC currents.

- Plug-In Current Transformers with CAGE CLAMP®

- Plug-In Current Transformers with *picoMAX*® Pluggable Connector

- Split-Core Current Transformers

TRANSPARENCY PAYS BACK

WAGO Provides End-to-End Solutions for Current and Energy

Energy Management Always Pays Off

- Manufacturing companies will benefit from the following advantages in 2015:
  - Reduced electricity and eco taxes as revenue peak adjustment.
  - Exemption from the "German Renewable Energy Act" levy (EEG apportionment) for energy-intensive companies that invest more than 14 % of their gross value in energy.
- Transparency
- Energy cost reduction
- Lowered company greenhouse gas emissions and carbon footprint

From Evaluation to Visualization

Coordinated products for energy data management create maximum transparency – and maximum cost savings. WAGO provides the right product for each of these process stages.

Measuring – Systematically recording energy consumption

Anywhere high currents are measured and processed, make WAGO's 855 Series Plug-In Current Transformers your first choice. If existing systems should be retrofitted, simply use 855 Series Rogowski Coils to avoid disassembling cables or interrupting processes.

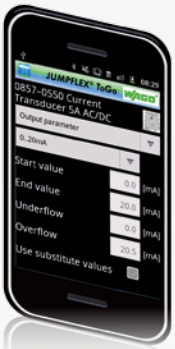
Measurement Technology

JUMPFLEX®
Signal Conditioners

Evaluating

Visualization & Configuration

JUMPFLEX®-ToGo
Configuration App



WAGO-I/O-*CHECK*

Evaluating – Identifying and planning energy use

Three different models of 3-Phase Power Measurement Modules are available for evaluating actual energy consumption using the WAGO-I/O-SYSTEM 750. Depending on the application or customer preference, the energy data can also be converted to an analog standard signal using the 857 and 2857 Series *JUMPFLEX®* Current and Rogowski Signal Conditioners.

Visualizing and Configuring – Energy characteristics per DIN EN ISO 50001

WAGO offers the free *JUMPFLEX®*-ToGo Configuration App for smartphones and tablets, in addition to PC-based software. WAGO-I/O-SYSTEM 750 configuration occurs via WAGO-I/O-*CHECK*, an easy-to-use Windows application for operating and displaying nodes.

POWER AND ENERGY MEASUREMENT

Using 3-Phase Power Measurement Modules

We reduce your energy costs!

The WAGO-I/O-SYSTEM 750 offers a comprehensive range of perfectly tuned solutions for your energy measurement applications. WAGO's 3-Phase Power Measurement Modules measure and process all relevant variables in a three-phase supply network. They provide system operators with increased insight into energy consumption by specific machines and systems, as well as the ability to perform comprehensive network analysis.

We protect your machines!

Additionally, metrics allow the operator to optimize the supply to a drive or machine, protecting the system from damage and failure. To achieve this, WAGO's 3-Phase Power Measurement modules can be easily integrated into existing systems for intelligent and economical machine protection.

- **Measuring machine and system energy consumption values**
- **Measuring and processing all relevant measured variables**
- **Comprehensive network analysis**
- **Connection to the WAGO-I/O-SYSTEM: fieldbus-independent, compact and flexible**

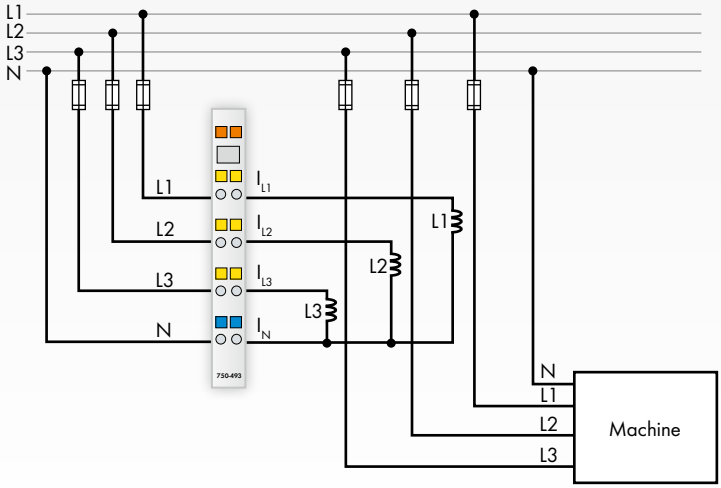
	750-493	750-494	750-495
Energy consumption	✓	✓	✓
Voltage	3~ 480 V	3~ 480 V	3~ 480 V/ 690 V
Current	1 A (750-493) 5 A (750-493/000-001)	1 A (750-494) 5 A (750-494/000-001)	1 A (750-495) 5 A (750-495/000-001) Rogowski coil (750-495/000-002)
Active energy/power	✓	✓	✓
Phase position	✓	✓	✓
Reactive power/energy	via function block	✓	✓
Apparent power/energy	via function block	✓	✓
Rotary field detection		✓	✓
Power factor	(✓)	✓	✓
Frequency measurement	✓	✓	✓
Four-quadrant operation (inductive, capacitive, consumer, generator)		✓	✓
Harmonic analysis (up to the 41st harmonic)		✓	✓
N-conductor measurement			✓
Extended temperature range		✓	
Housing width	12 mm	12 mm	24 mm

POWER AND ENERGY MEASUREMENT

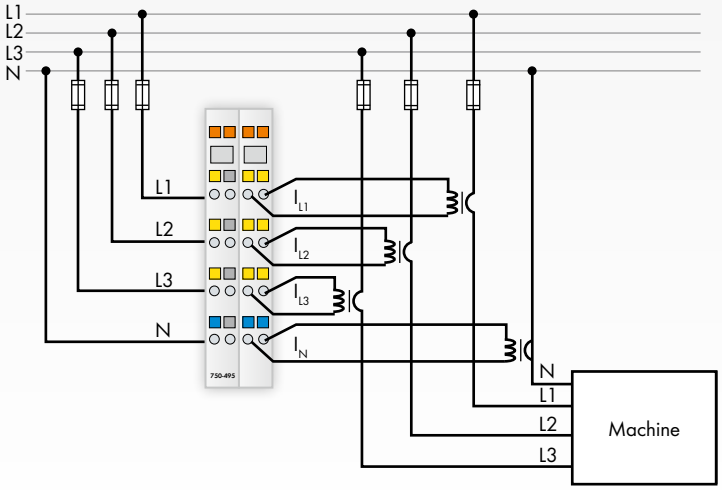
Using 3-Phase Power Measurement Modules

General Configurations

Power and energy measurement of a machine in a 480 VAC mains network via 750-493, 750-494 modules:



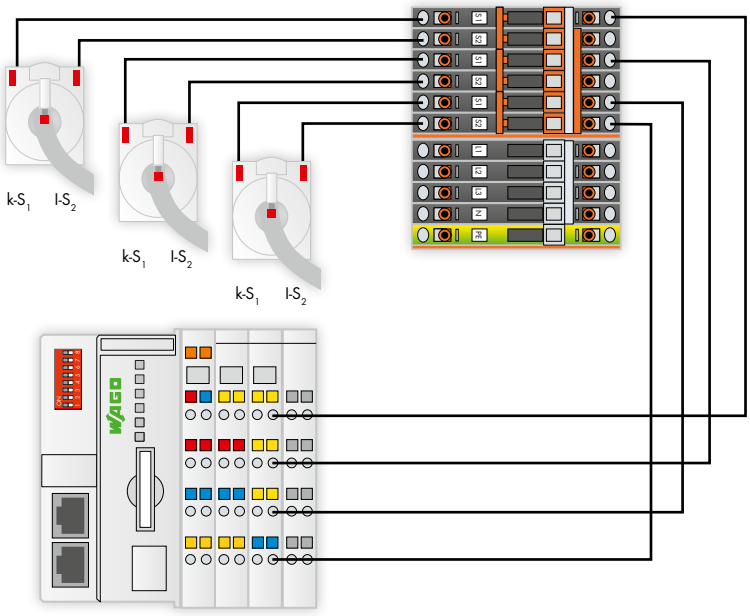
Power, energy and N-conductor measurement of a machine in a 480/690 VAC mains network via 750-495 module:



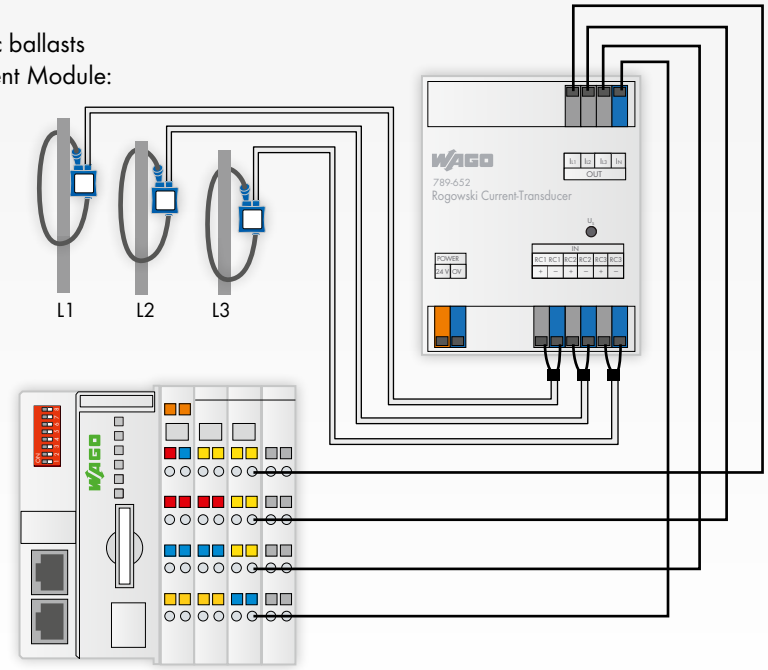
Applications

Connecting current transformers
to the 3-Phase Power Measurement Modules:

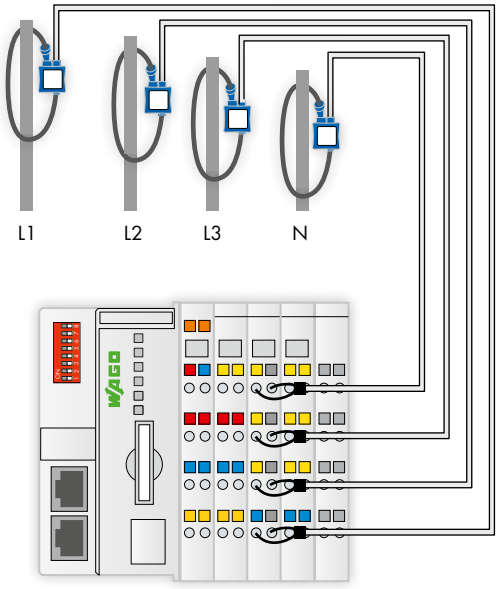
2007-8873
Terminal block assembly for current transformers



Connecting Rogowski coils with electronic ballasts
to a 750-494 3-Phase Power Measurement Module:



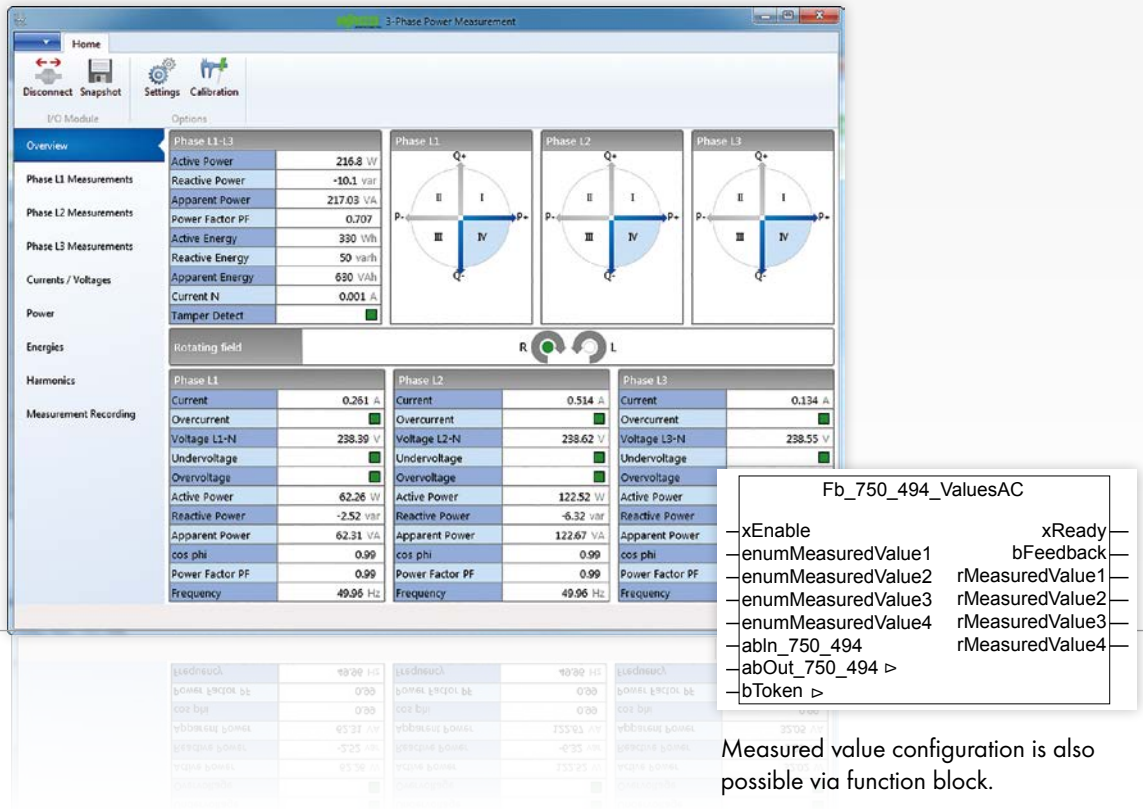
Connecting Rogowski coils directly
to a 750-495/000-002 3-Phase Power Measurement Module:



POWER AND ENERGY MEASUREMENT

Comprehensive Network Analysis via WAGO-I/O-*CHECK*

Three phases' measured value overview:

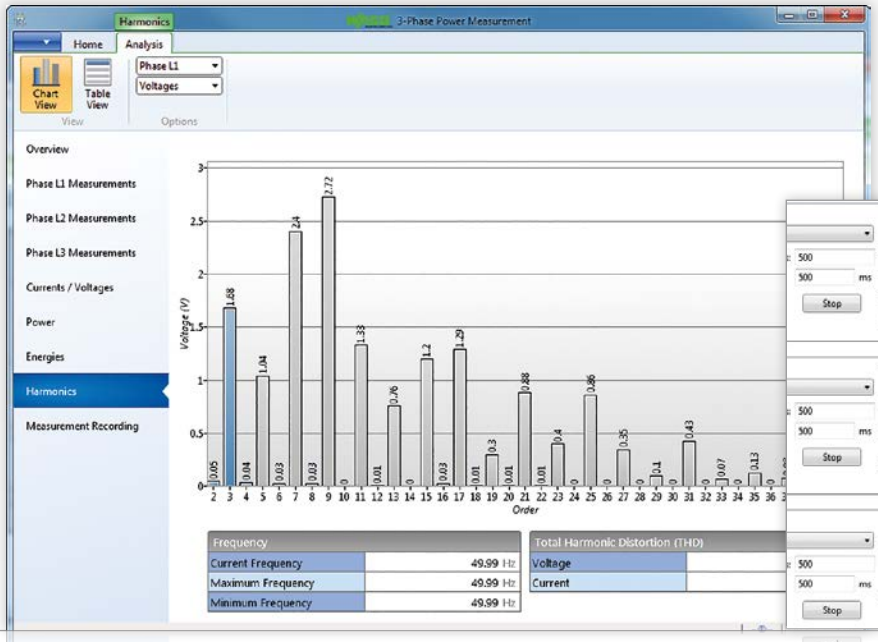


Measured value configuration is also possible via function block.

Configuration and visualization of measured values:

- **Graphical display of bus nodes**
- **Clear display of all measured values**
- **Extensive power measurement module settings**
- **Integrated diagnostic indication**
- **Graphical 4-square representation**

Harmonic diagram:



Measured value chart:

- **Historical display of measured values**
- **Recording and exporting measured values (chart recorder function)**
- **Switchable harmonic view**

Configuring and visualizing measured values is also possible directly from the controller via function block.

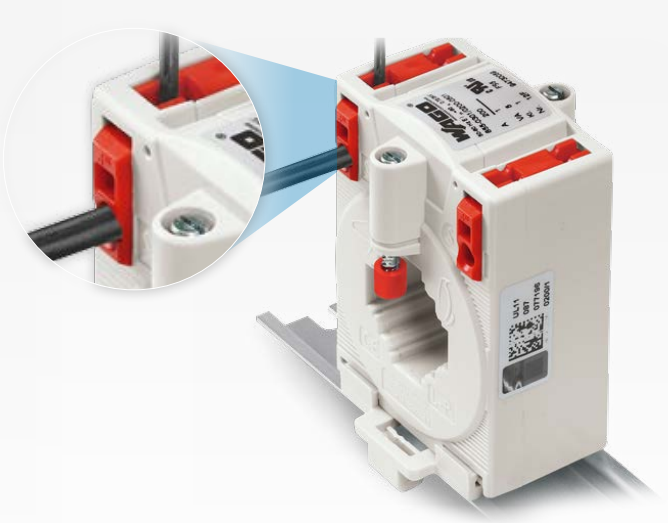
PLUG-IN CURRENT TRANSFORMERS

855 Series with CAGE CLAMP® Connection Technology

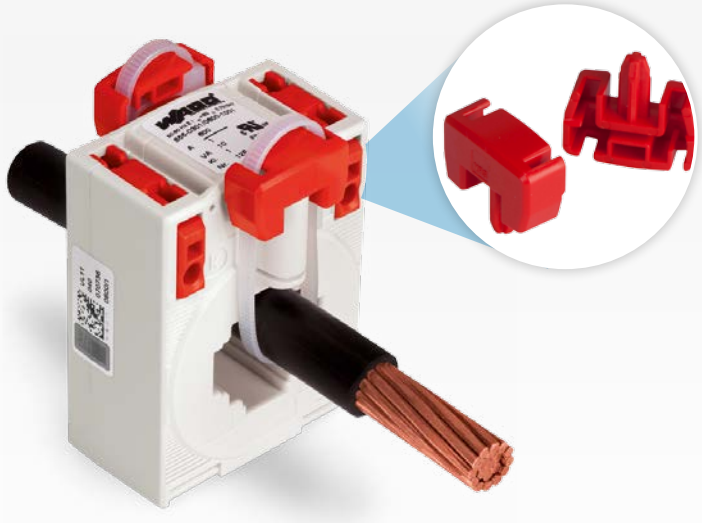
Plug-in current transformers are ideal anywhere high currents are measured and processed. WAGO's 855 Series Current Transformers convert primary rated currents into electrically isolated secondary currents of 1 A or 5 A. They can be used in temperatures ranging from -5 to +50 °C and may be permanently loaded with up to 120 % of the nominal current. The 855 Series' UL-recognized components are suitable for 230 V, 400 V and 690 V low-voltage applications. The plug-in current transformers are inductive, single-conductor current transformers. The devices' key feature is the screwless, shock- and vibration-resistant CAGE CLAMP® connection technology for conductors ranging from 0.08 mm^2 to 4 mm^2 (28–12 AWG). The 855 Series' plastic housing is extremely robust and can be mounted in four different ways on: round cables, copper current bars, mounting plates and – depending on the version – carrier rails.

- **Continuous overload of 120 % the nominal primary current**
- **Secondary currents of 1 A or 5 A**
- **Screwless CAGE-CLAMP® connection technology**
- **Tool-free installation via quick-mount kit**
- **Low-voltage current transformer for max. operating voltages up to 1.2 kV**
- **UL certified (Certificate No.: E356480)**

WAGO Plug-in Current Transformers – Time-Saving Installation



CAGE CLAMP® connection



Quick-Mount Kit

Mounting on round cable

Mounting on carrier rail via Carrier Rail Adapter adapter

Quick-Mount Kit

Mounting on copper current bar

Secured to mounting plate

Conductor termination

PLUG-IN CURRENT TRANSFORMERS

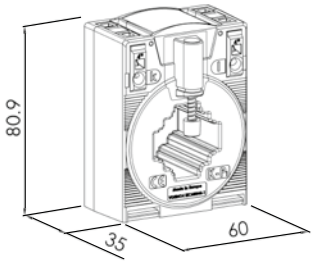
855 Series with CAGE CLAMP® Connection Technology

03

855-03xx/xxxx-xxxx

Rail 1: 30 x 10 mm
Rail 2: 25 x 12 mm
Rail 3: 20 x 20 mm

Round cable: 26 mm

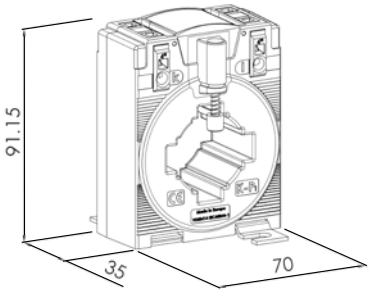


04

855-04xx/xxxx-xxxx

Rail 1: 40 x 10 mm
Rail 2: 30 x 15 mm

Round cable: 32 mm

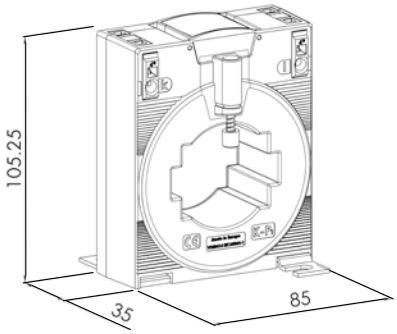


05

855-05xx/xxxx-xxxx

Rail 1: 50 x 12 mm
Rail 2: 40 x 30 mm

Round cable: 44 mm

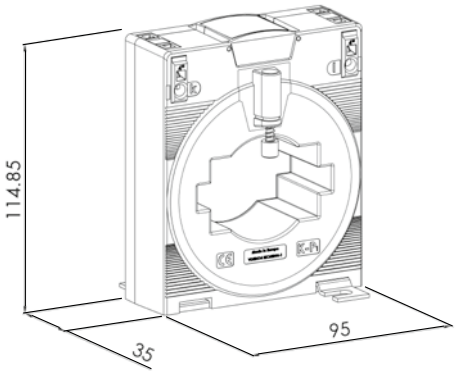


06

855-06xx/xxxx-xxxx

Rail 1: 63 x 10 mm
Rail 2: 50 x 30 mm

Round cable: 44 mm

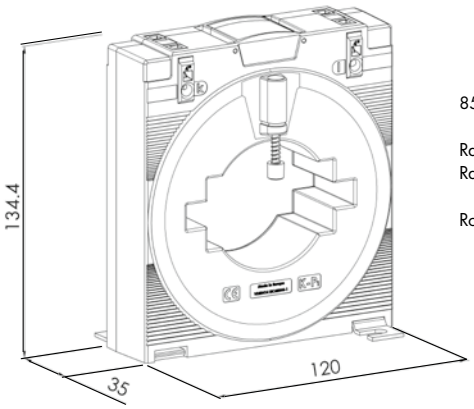


08

855-08xx/xxxx-xxxx

Rail 1: 80 x 10 mm
Rail 2: 60 x 30 mm

Round cable: 55 mm

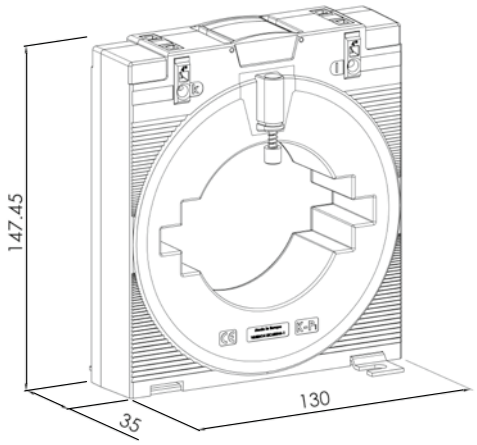


10

855-10xx/xxxx-xxxx

Rail 1: 100 x 10 mm
Rail 2: 80 x 30 mm

Round cable: 70 mm



Item Number		
855-9900		Carrier Rail Adapter for Plug-In Current Transformers (for 855-3xx/xxxx-xxxx and 855-4xx/xxxx-xxxx)
855-9910		Quick-Mount Kit (2 pieces including cable tie)

	Item Number	Primary Rated Current	Secondary Rated Current	Rated Power	Accuracy Class
03	855-0301/0050-0103	50	1	1.25	3
	855-0305/0050-0103	50	5	1.25	3
	855-0301/0060-0101	60	1	1.25	1
	855-0305/0060-0101	60	5	1.25	1
	855-0301/0075-0201	75	1	2.5	1
	855-0305/0075-0201	75	5	2.5	1
	855-0301/0100-0201	100	1	2.5	1
	855-0305/0100-0201	100	5	2.5	1
	855-0301/0150-0501	150	1	5	1
	855-0305/0150-0501	150	5	5	1
	855-0301/0200-0501	200	1	5	1
	855-0305/0200-0501	200	5	5	1
	855-0301/0250-0501	250	1	5	1
	855-0305/0250-0501	250	5	5	1
	855-0301/0400-1001	400	1	10	1
	855-0305/0400-1001	400	5	10	1
	855-0301/0600-1001	600	1	10	1
	855-0305/0600-1001	600	5	10	1
04	855-0405/0250-0501	250	5	5	1
	855-0401/0400-0501	400	1	5	1
	855-0405/0400-0501	400	5	5	1
	855-0401/0600-0501	600	1	5	1
05	855-0505/0400-1001	400	5	10	1
	855-0505/0600-1001	600	5	10	1
	855-0505/0800-1001	800	5	10	1
	855-0501/1000-1001	1000	1	10	1
	855-0505/1000-1001	1000	5	10	1
06	855-0605/1500-0501	1500	5	5	1
	855-0601/1500-0501	1500	1	5	1
08	855-0805/2000-1001	2000	5	10	1
	855-0801/2000-1001	2000	1	10	1
10	855-1005/2500-1001	2500	5	10	1
	855-1001/2500-1001	2500	1	10	1

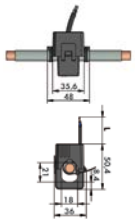
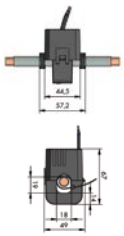
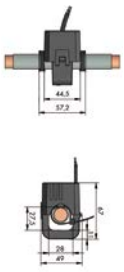
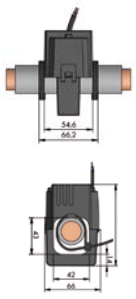
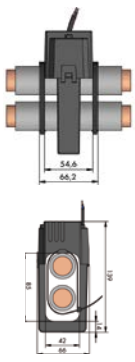
SPLIT-CORE CURRENT TRANSFORMERS

855 Series – Retrofit Existing Systems

WAGO's compact Split-Core Current Transformers are ideal for retrofitting applications in existing systems. They are particularly well suited to applications that do not require current path interruption. The transformer's accuracy permits extremely precise current measurements. The Split-Core Current Transformers are capable of supplying the specified rated power at the end of the secondary cable. All transformers are supplied with color-coded cables. Two UV-resistant cable ties for reliable and easy mounting are also included.

Simple termination!

Quick and easy mounting!

	Item Number	Primary Rated Current	Secondary Rated Current	Rated Power	Accuracy Class	Cable Length
Ø 18 mm		855-3001/0060-0003	60 A	1 A	0.2 VA	3	3 m
		855-3001/0100-0003	100 A	1 A	0.2 VA	3	3 m
		855-3001/0200-0001	200 A	1 A	0.2 VA	1	3 m
		855-3001/0250-0001	250 A	1 A	0.2 VA	1	3 m
Ø 18 mm		855-4001/0100-0001	100 A	1 A	0.2 VA	1	3 m
		855-4001/0150-0001	150 A	1 A	0.2 VA	1	3 m
		855-4005/0150-0101	150 A	5 A	1 VA	1	0.5 m
		855-4001/0200-0001	200 A	1 A	0.2 VA	0.5	3 m
Ø 28 mm		855-4101/0200-0001	200 A	1 A	0.2 VA	1	3 m
		855-4101/0250-0001	250 A	1 A	0.2 VA	1	3 m
		855-4105/0250-0101	250 A	5 A	1 VA	1	0.5 m
		855-4101/0400-0001	400 A	1 A	0.2 VA	1	3 m
		855-4105/0400-0101	400 A	5 A	1 VA	1	0.5 m
Ø 42 mm		855-5001/0250-0001	250 A	1 A	0.5 VA	1	5 m
		855-5001/0400-0000	400 A	1 A	0.5 VA	0.5	5 m
		855-5005/0400-0001	400 A	5 A	0.5 VA	1	3 m
		855-5001/0600-0000	600 A	1 A	0.5 VA	0.5	5 m
		855-5005/0600-0000	600 A	5 A	0.5 VA	0.5	3 m
		855-5001/1000-0000	1000 A	1 A	0.5 VA	0.5	5 m
		855-5005/1000-0000	1000 A	5 A	0.5 VA	0.5	3 m
2 x Ø 42 mm		855-5101/1000-0000	1000 A	1 A	0.5 VA	0.5	5 m
		855-5105/1000-0000	1000 A	5 A	0.5 VA	0.5	3 m

PLUG-IN CURRENT TRANSFORMERS

855 Series with *picoMAX*® Pluggable Connector

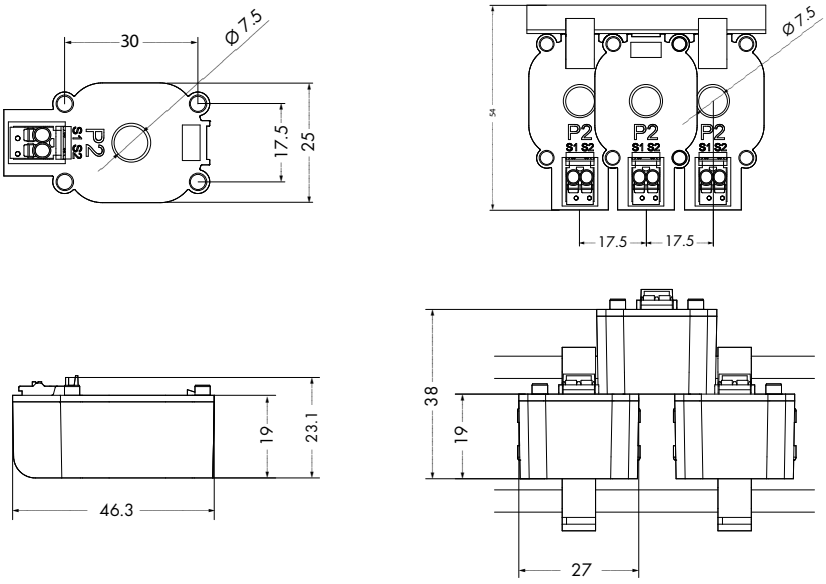
Today, extensive current measurements are required in many systems. The space available for measurement is typically very limited, with relatively low values being measured. At the same time, measurements must be performed with sufficient accuracy (at least class 1). WAGO's extremely compact current transformer was specifically designed for connection to digital measurement systems. Its compact design is well suited to use in a 3-phase power circuit breaker featuring 17.5 mm phase spacing. The current transformer carries a *picoMAX*® connector for easily wiring secondary conductors.

- **First current transformer with a *picoMAX*® pluggable connector**
- **Also suitable for space-restricted applications**
- **Ideal for circuit breakers with 17.5 mm phase spacing**
- **Mount on DIN-rail or panels via Carrier Rail Adapter**
- **Convert 64 A or 35 A into 1 A**
- **Accuracy class 1**
- **Maximum operating voltages up to 0.72 kV**

Simple termination!

Quick and easy mounting!

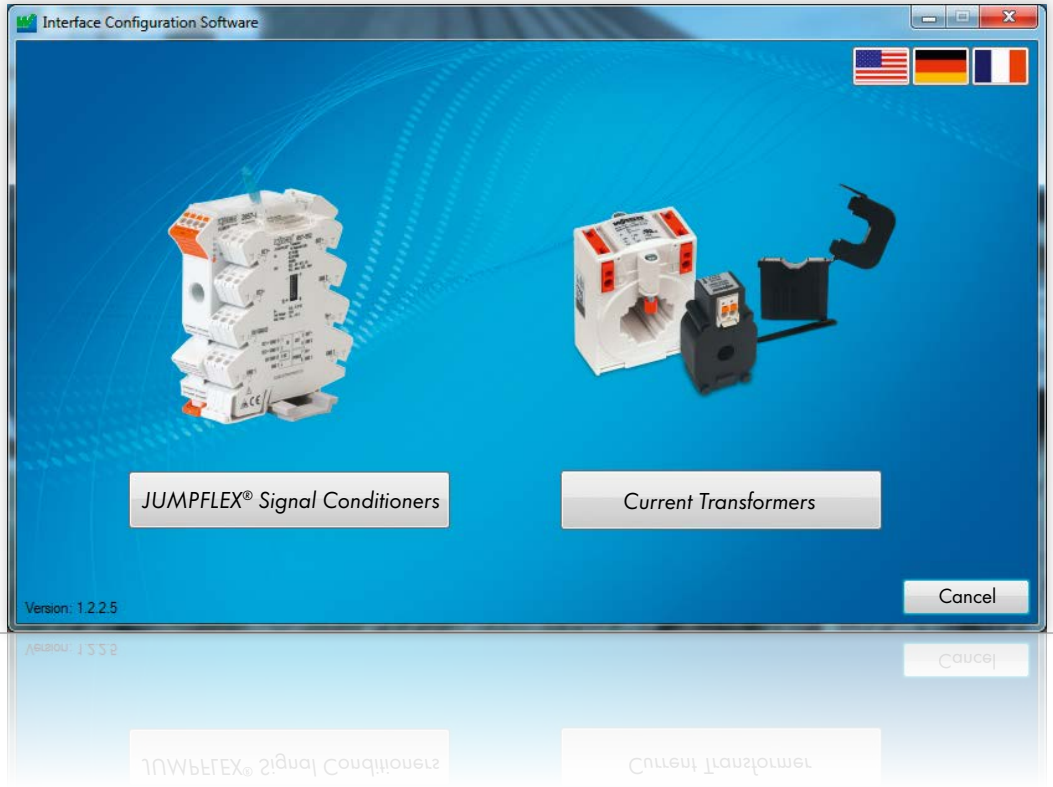
Dimensions:



Item No.	Primary Rated Current	Secondary Rated Current	Rated Power	Accuracy Class
855-2701/0035-0001	35 A	1 A	0.2 VA	1
855-2701/0064-0001	64 A	1 A	0.2 VA	1
855-9927	Carrier Rail Adapter			

CALCULATING CONDUCTOR LENGTH FOR

WAGO Interface Configuration Software



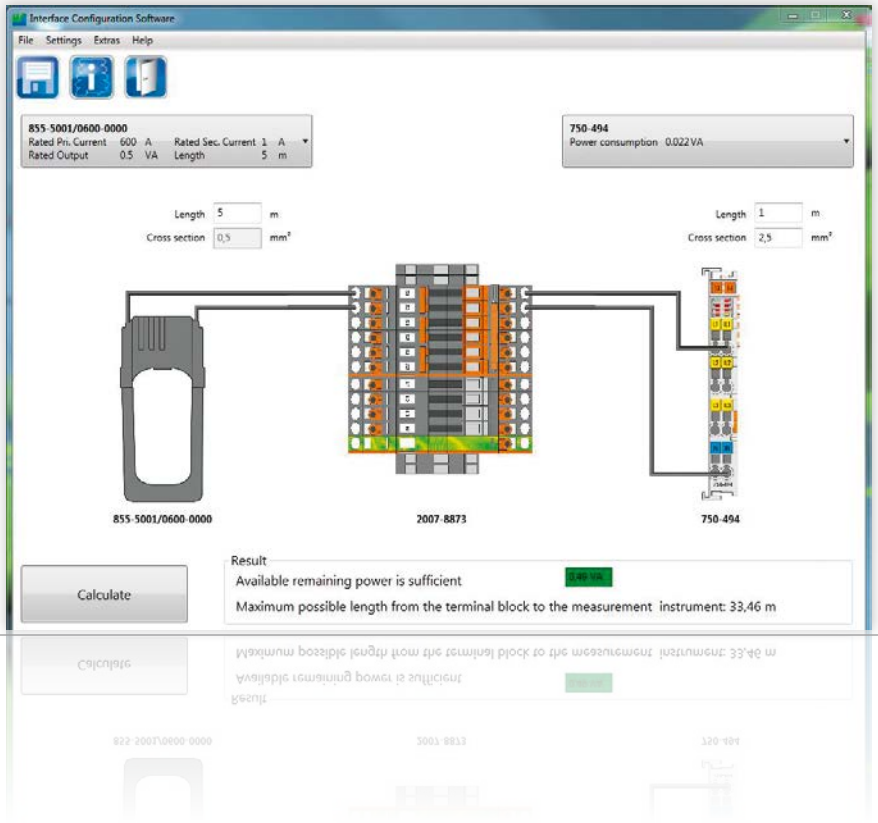
WAGO has expanded its interface configuration tool to include a conductor length calculator.
Calculating conductor length is quick and easy, with the information being provided for system documentation. All current transformers and power measurement modules can be selected via convenient drop-down menu.

Current transformer power requirements:

Both power losses from the measurement conductors and from connected devices must be considered when determining actual power requirements. To determine actual power requirements, both the power requirements of the connected measurement devices and the power losses from the measurement conductors connected to the transformer's secondary circuit must be taken into account.

CURRENT TRANSFORMERS

Screenshot of conductor length calculation
using the Interface Configuration Software



Power calculation of copper conductors between measurement device and current transformer:

$$P_V = \frac{I_S^2 \times 2 \times l}{A_{CU} \times 56} \text{ VA}$$

I_S = Secondary rated measuring current strength [A]
l = Simple conductor length in m
A_{CU} = Conductor cross-section in mm²
P_V = Conductor power loss

Note: When using a common three-phase current return conductor, the values for P_V are halved.

Example:

A 1 amp or 5 amp current transformer is used, with an ammeter on the secondary circuit, and there is a distance of 10 m between the transformer and the measuring device.

Current transformer 1 A

$$P_V = \frac{1^2 \times 2 \times 10}{1.5 \times 56} \text{ VA} = 0.24 \text{ VA}$$

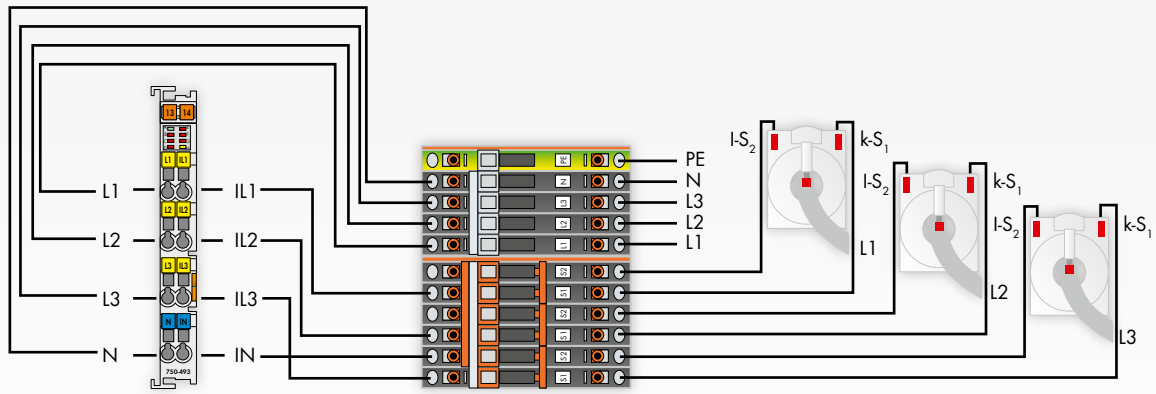
Current transformer 5 A

$$P_V = \frac{5^2 \times 2 \times 10}{1.5 \times 56} = 5.96 \text{ VA}$$

Free software download: www.wago.com

TERMINAL BLOCK ASSEMBLY FOR CURR

For Fast and Easy Connections

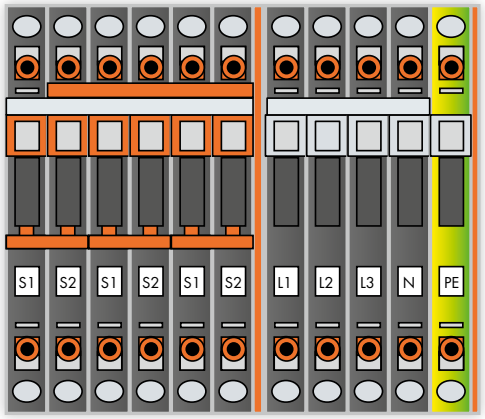


3-Phase Power Measurement Module 750 Series

Terminal Block Assembly for Current and Voltage Transformers 2007 Series

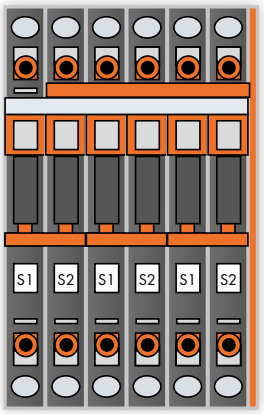
Current Transformers 855 Series

Pre-assembled terminal block assembly for easy connection and short-circuiting of current transformers, suitable for **750-493** and **750-494** 3-Phase Power Measurement Modules



2007-8873

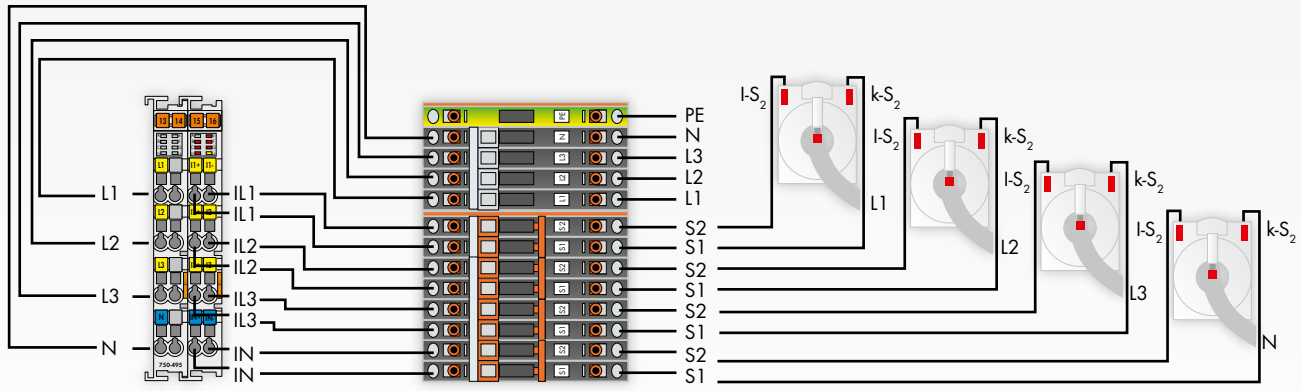
Connection option for current and voltage, including 'Y' point jumper



2007-8875

Connection option for current, including 'Y' point jumper

RENT AND VOLTAGE TRANSFORMERS

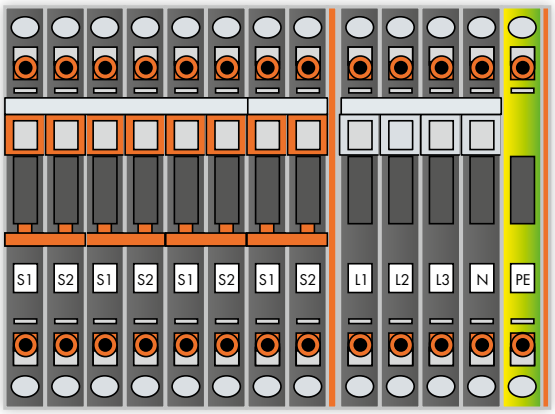


3-Phase Power Measurement Module 750 Series

Terminal Block Assembly for Current and Voltage Transformers 2007 Series

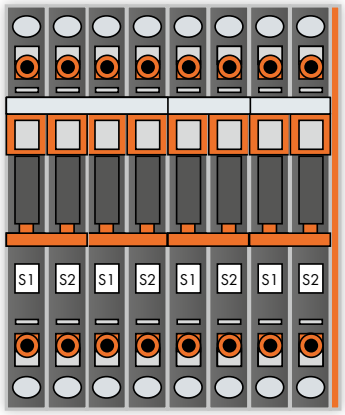
Current Transformers 855 Series

Pre-assembled terminal block assembly for easy connection and short-circuiting of current transformers, suitable for **750-495** 3-Phase Power Measurement Modules



2007-8874

Connection option for current and voltage



2007-8877

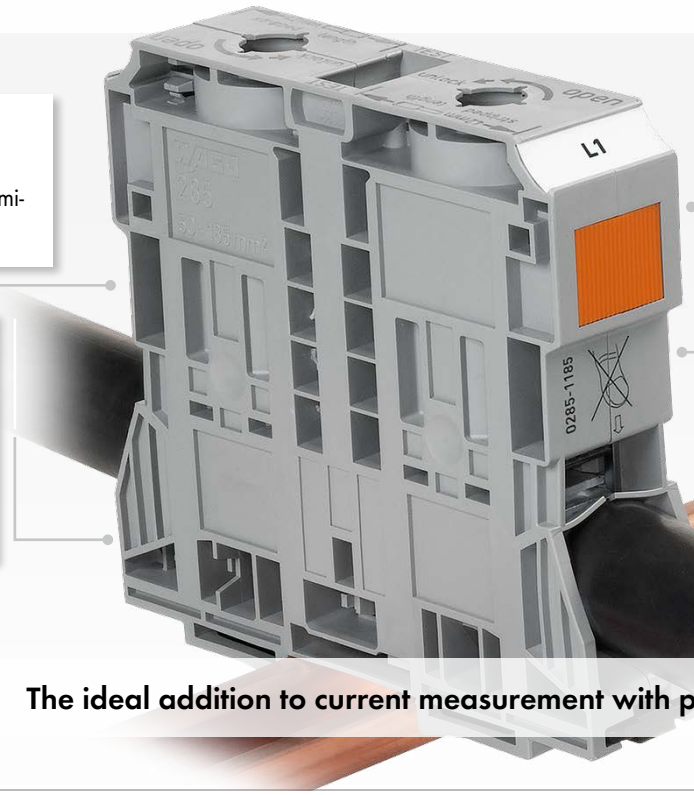
Connection option for current

HIGH-CURRENT, DIN-RAIL TERMINAL BLOCKS

For Conductors up to 185 mm² (350 kcmil)

Fast termination:
- Eliminate time-consuming preparation – no ring terminals or ferrules required.

Easy termination:
- Side-entry design
- Orange locking tab keeps the clamp open for hands-free wiring

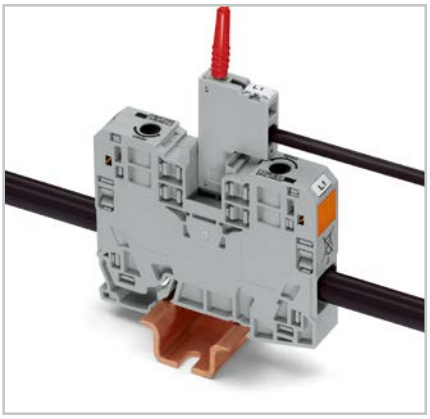


Always reliable:
- Optimum clamping force – independent of operator skill

Suitable for all applications:
- Meet the most stringent requirements, including those specified for railway and marine applications.
- Heat- and cold-resistant, even under the heaviest of loads.

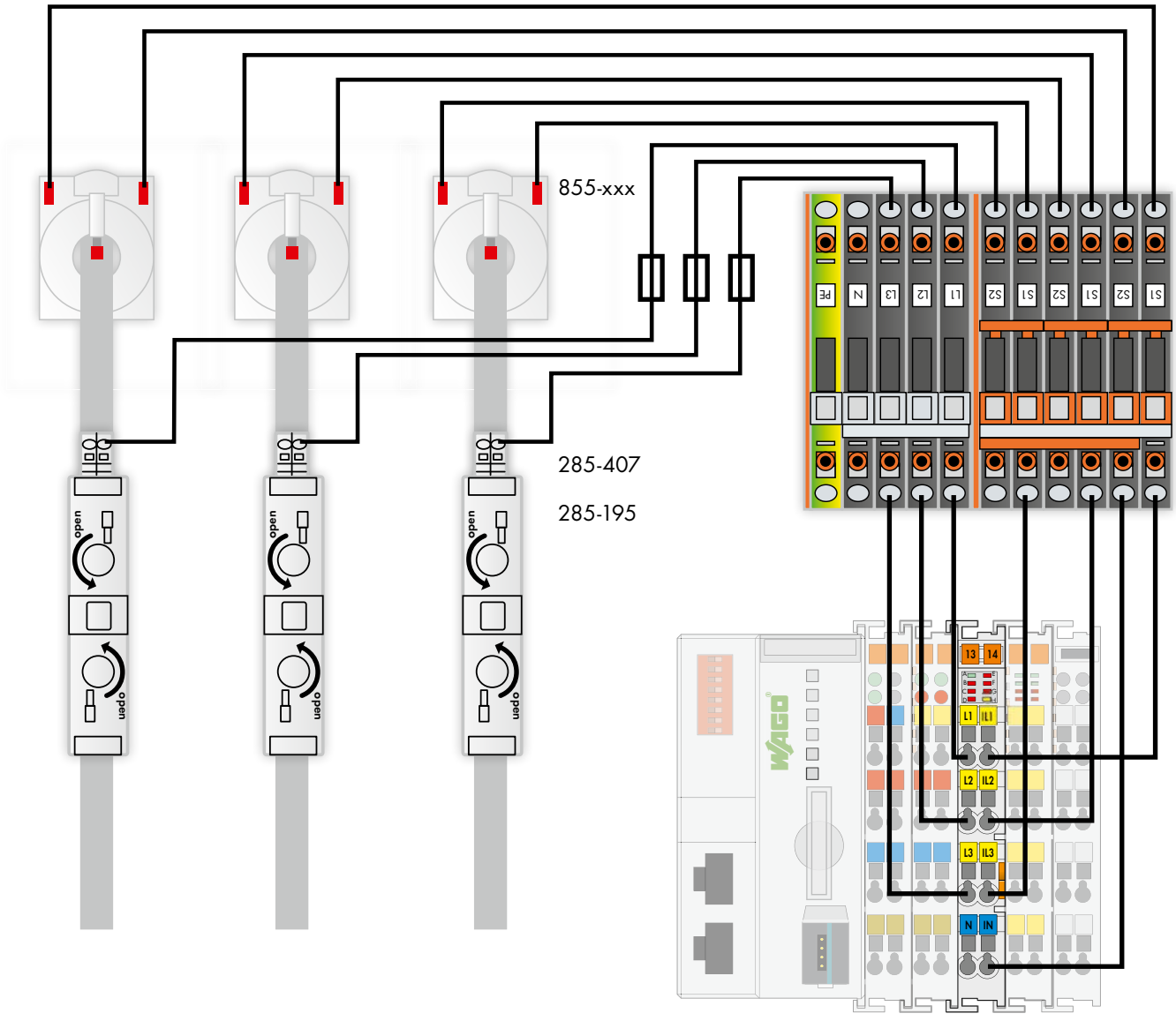
The ideal addition to current measurement with plug-in transformers

	Item No. 285 Series			
Description	**35 mm² 2 AWG**	**50 mm² 2/0 AWG**	**95 mm² 4/0 AWG**	**185 mm² 350 kcmil**
Conductor sizes	6–35 mm²	10–50 mm²	25–95 mm²	50–185 mm² (ground acc. to standard max. 120 mm²)
	10–2 AWG	8–2/0 AWG	4–4/0 AWG	0 AWG–350 kcmil
Nominal current I_N	125 A	150 A	232 A	353 A
Rated voltage	1000 V	1000 V	1000 V	1000 V AC/DC 1500 VDC
Through terminal block ●	285-135	285-150	285-195	285-1185
Through terminal block ●	285-134	285-154	285-194	285-1184
Ground conductor terminal block ◐	285-137	285-157	285-197	285-1187
Adjacent jumper	285-435	285-450	285-495	285-1171
Step-down jumper (for TOBJOP® S, 10/16 mm²)	285-430	-	-	-
Power tap	285-427	285-447	285-407	pending
Three phase set (without DIN-rail and marking accessories)	285-139	285-159	285-199	285-1169
Warning cover	285-420	285-440	285-170	285-1177
Shock protector	285-421	285-441	285-169	285-1178
Marking strips (roll)	2009-110	2009-110	2009-110	2009-110
Marker carrier	285-442	285-442	285-442	-
WMB Inline markers (roll)	2009-115	2009-115	2009-115	2009-115
WMB Multi marking system (for 5–5.2 mm)	793-5501	793-5501	793-5501	793-5501



The power tap is inserted into the jumper contact slot. It can be fitted with a strain relief plate and features a built-in test point for 2 mm Ø test plugs.

Power tap provides safe and easy power distribution to additional loads. Insert the unwired tap before actuating the spring clamping unit for termination.



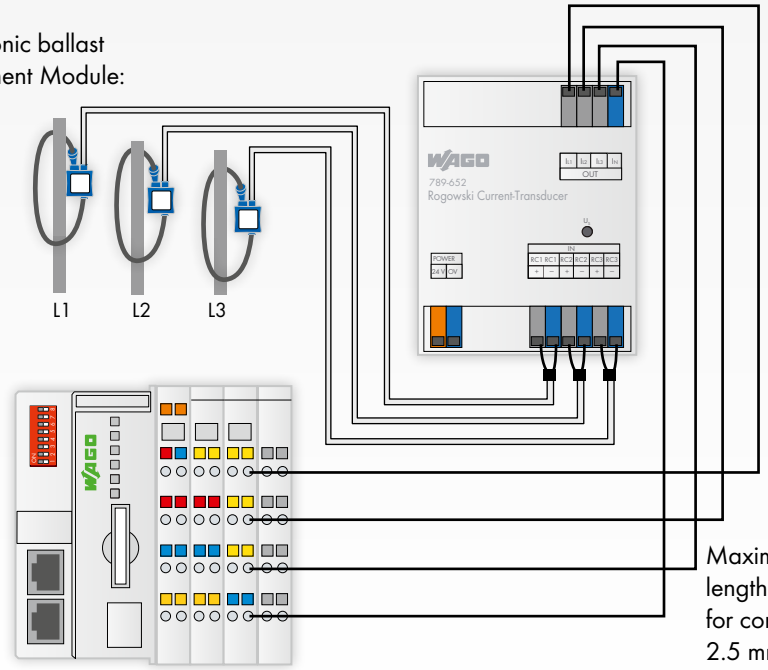
SIGNAL CONDITIONER FOR ROGOWSKI

The Rogowski Current Signal Conditioner records 5–2000 A AC currents in a three-phase system. The magnetic field generated around each conductor is detected via three non-contact Rogowski coils and provided as a proportional voltage signal to the signal conditioner. This signal conditioner adjusts the phase for each of the three voltage signals, converting them into 100 mA AC current signals, which are then transmitted to the 3-Phase Power Measurement Modules. Easy installation of Rogowski coils also allows existing systems to be retrofitted without process interruption.

- **Records AC currents up to 2000 A**
- **Provides in-phase conversion of the three voltage signals**
- **Converts Rogowski signals into 3 x 100 mA**

COILS

Connecting Rogowski coils with an electronic ballast to the 750-494 3-Phase Power Measurement Module:



Maximum cable length up to 20 m for conductors up to 2.5 mm² (14 AWG)

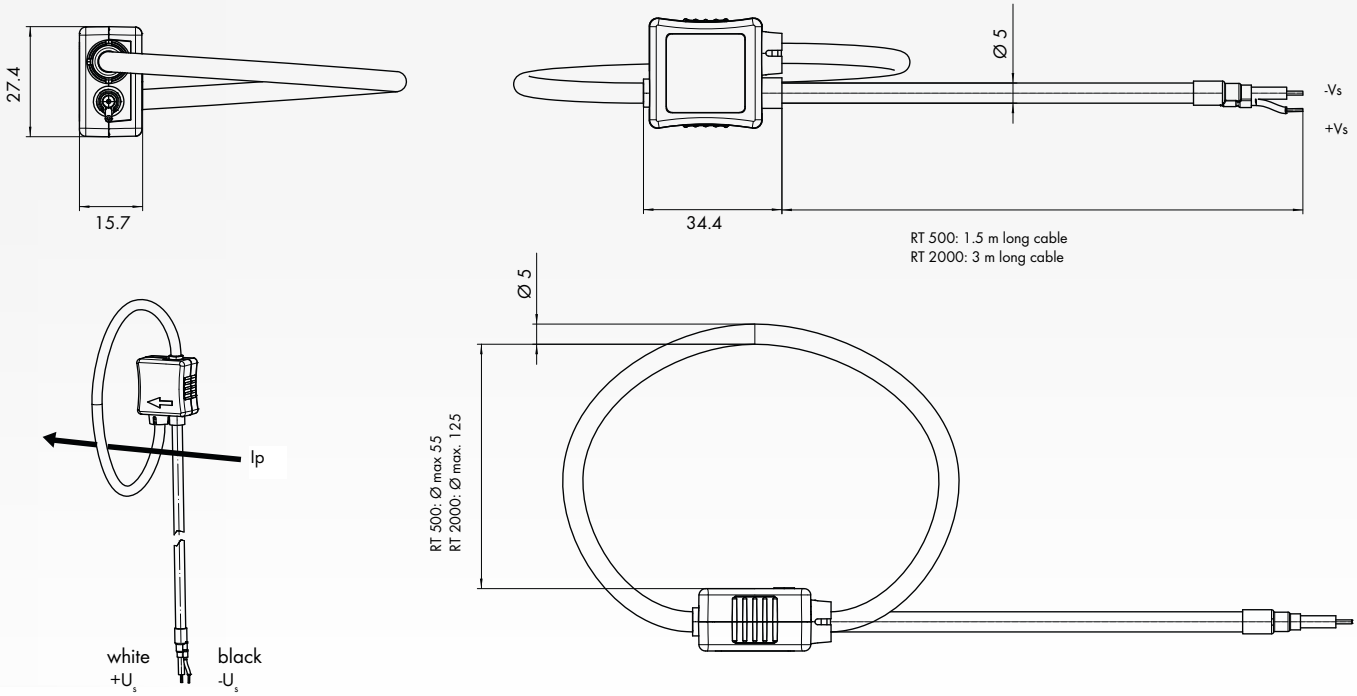
Item Number		Input signal	Output signal	Overcurrent	Sensitivity
789-652		3 x RT 500 (500 A)	3 x 100 mA AC	750 A	10.05 mV; 50 Hz, sinusoidal
789-654		3 x RT 2000 (2,000 A)		3000 A	10.05 mV; 50 Hz, sinusoidal
750-494		see page 7			
855-9100/500-000		see pages 28–29			
855-9300/500-000					
855-9100/2000-000					
855-9300/2000-000					

ROGOWSKI COILS

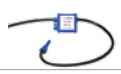
855 Series – Retrofit Existing Systems

Function: The Rogowski coil is a closed-air coil with a non-magnetic split core. The coil is placed around a conductor or current bar. The magnetic field produced by the AC current flowing through the conductor induces an output voltage in the coil. This measurement procedure provides galvanic isolation between the primary circuit (power) and secondary circuit (measurement).

- **Allows existing systems to be retrofitted without process interruption**
- **Reduced footprint – ideal for measuring high currents**
- **Existing function blocks can be used in CODESYS**
- **Integration into the WAGO-I/O-SYSTEM via signal conditioner for Rogowski coils**
- **UL certified**

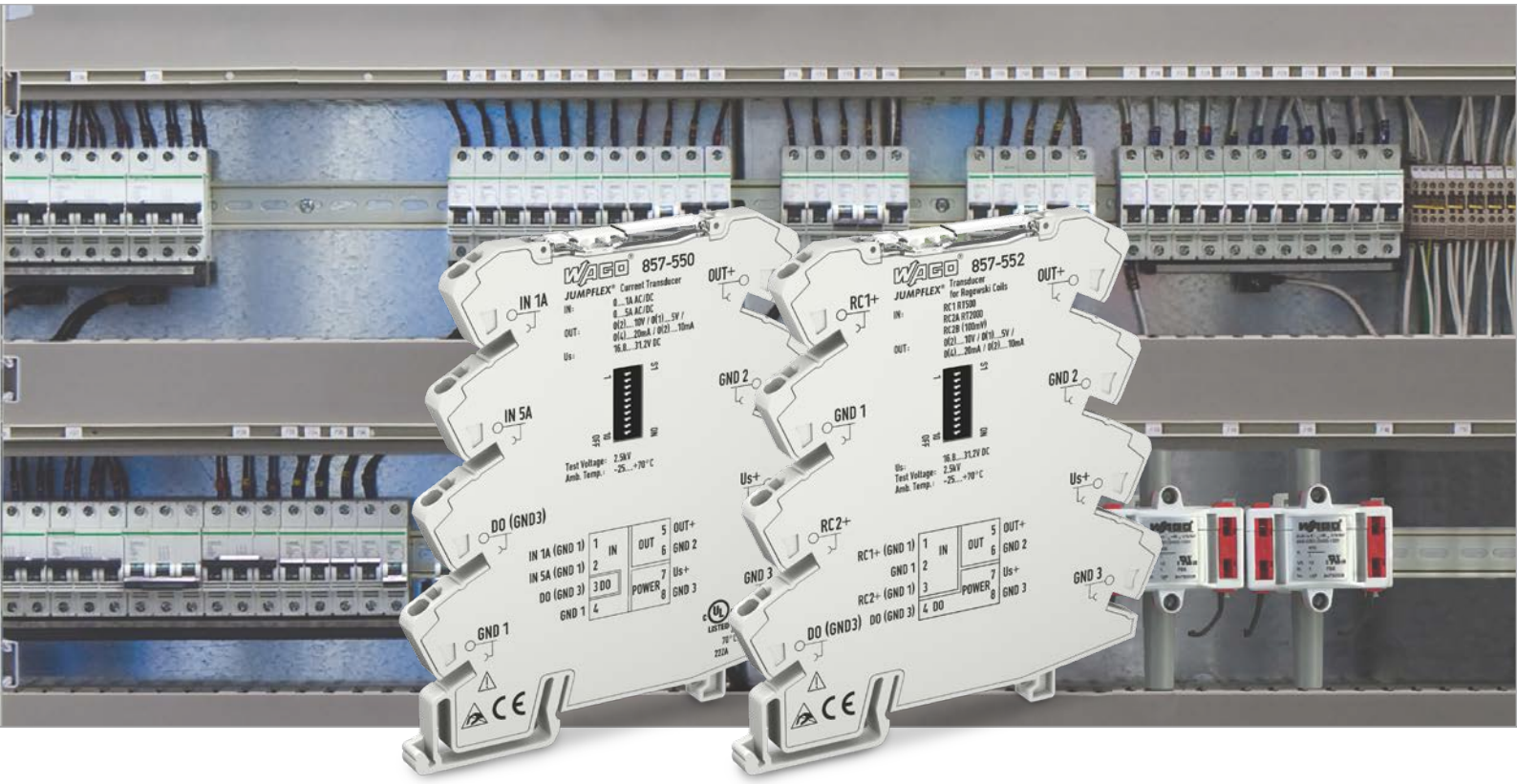


Rogowski Coils – Time-Saving Installation

Item Number		Input	Output	Description
855-9100/500-000		500 A	10.05 mV	RT 500: 1.5 m long cable
855-9300/500-000				RT 500, 3 m long cable
855-9100/2000-000		2000 A	40.2 mV	RT 2000, 1.5 m long cable
855-9300/2000-000				RT 2000: 3 m long cable

JUMPFLEX® CURRENT SIGNAL CONDITI

857 Series



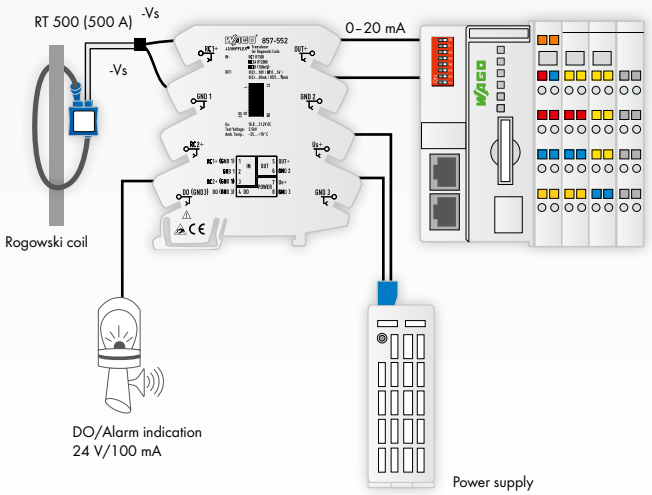
The 857-550 Current Signal Conditioner measures both 0–1 A and 0–5 A AC/DC currents, converting the input signal to an analog standard signal at the output (e.g., 4–20 mA).

The 857-552 Rogowski Signal Conditioner records RMS values from alternating currents via a Rogowski coil, converting the input signal into an analog standard signal at the output (e.g., 4–20 mA).

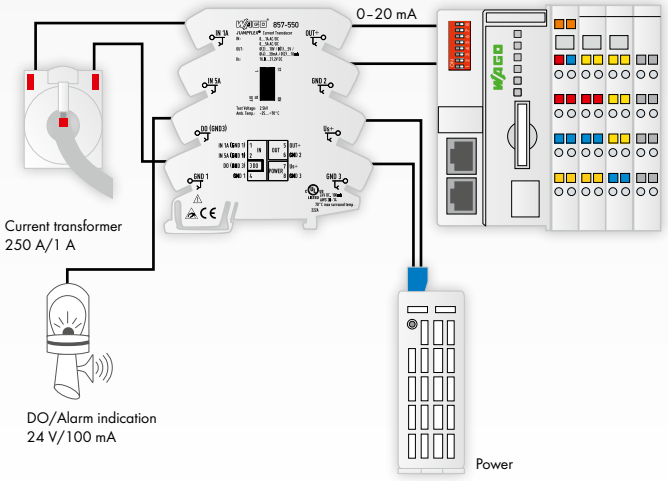
Current Signal Conditioner	857-550	857-552
Input signal	0–1 A AC/DC 0–5 A AC/DC	Rogowski coils 500 A/2000 A
Frequency range	16–400 Hz	16–1000 Hz
Output signal	Voltage: 0–5 V, 1–5 V, 0–10 V, 2–10 V Current: 0–10 mA, 2–10 mA, 0–20 mA, 4–20 mA	
Digital Output (DO)	24 VDC/100 mA	
Load impedance	Current ≤ 600 Ω, Voltage ≥ 2000 Ω	Current ≤ 600 Ω, Voltage ≥ 1000 Ω
Supply voltage	24 VDC	

ONERS

Rogowski Signal Conditioner 857-552



Current Signal Conditioner 857-550



- Multiple configuration options: DIP switch, PC configuration tool and smartphone app
- Digital switching output (configurable switching thresholds)
- Configurable output signal
- Supports different Rogowski coil types*
- True RMS measurement (TRMS) or arithmetic mean value**
- No current bar interruption required during Rogowski coil installation*
- Calibrated measurement range switching
- Indication of measurement range overflow/wire break in the measuring equipment
- Safe 3-way isolation with 2.5 kV test voltage acc. to EN 61140

*only 857-552 **only 857-550

JUMPFLEX® CURRENT SIGNAL CONDITI

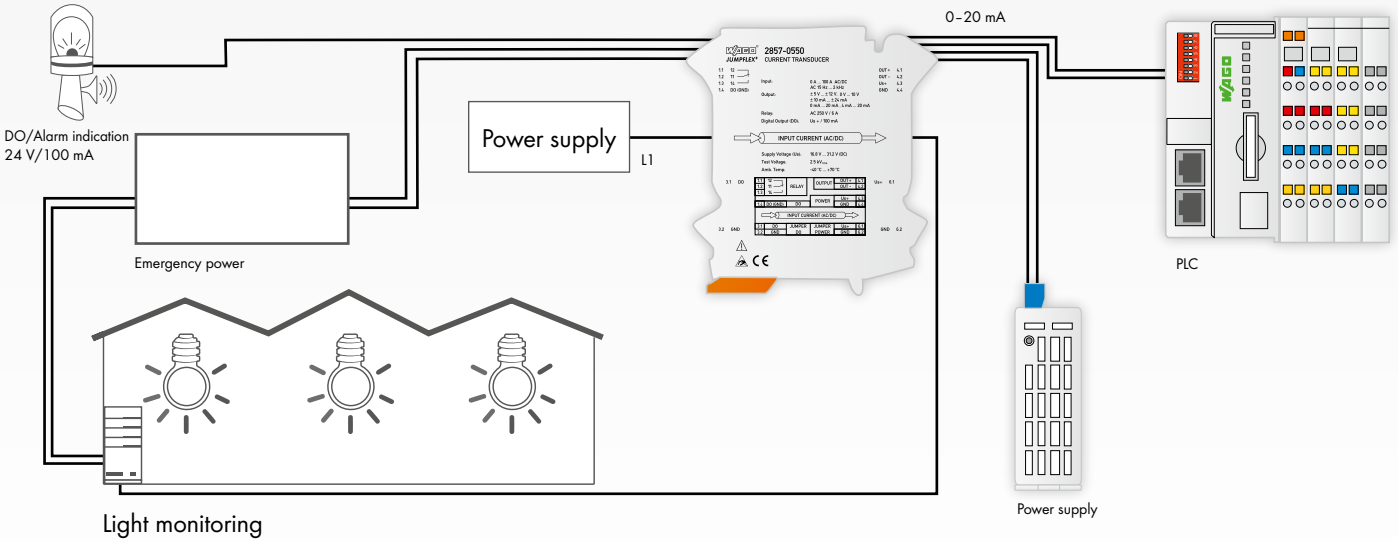
2857 Series

WAGO's 2857-0550 Current Signal Conditioner measures, isolates and converts AC/DC currents in the process, sewage, power technology and mechanical engineering industries. These signal conditioners provide immunity to external interferences (e.g., differential signals, floating grounds or rise in potential for measurement signals), as well as overcurrent monitoring. WAGO's signal conditioner is ideal for current measurement and overcurrent detection, while simultaneously isolating field signals to the central control system for further signal processing. Measured values can be optimally displayed and settings performed using WAGO's 2857-0900 Configuration Display.

- **Multiple configuration options: DIP switch, PC configuration tool, smartphone app and configuration display**
- **Digital switching output and changeover contact relay output with 6 A**
- **True RMS measurement (TRMS) and arithmetic mean value**
- **Calibrated measurement range switching**
- **Measuring range overflow indication**

ONERS

Application example:



Current Signal Conditioner	2857-550
Input signal	AC/DC 100 A
Frequency range	15–2000 Hz
Output signal	Current: ± 10 mA; 0–10 mA; 2–10 mA; ± 20 mA; 0–20 mA; 4–20 mA Voltage: ± 5 V; 0 –5 V; 1–5 V; ± 10 V; 0–10 V; 2–10 V
Digital output	24 VDC/100 mA
Relay output	1 changeover contact (1u) 250 VAC/6 A
Load impedance	Current < 600 Ω Voltage > 1000 Ω
Nominal supply voltage	24 VDC

JUMPFLEX® CONFIGURATION

857 and 2857 Series

Configuration Software Interface — DIP Switch Alternative

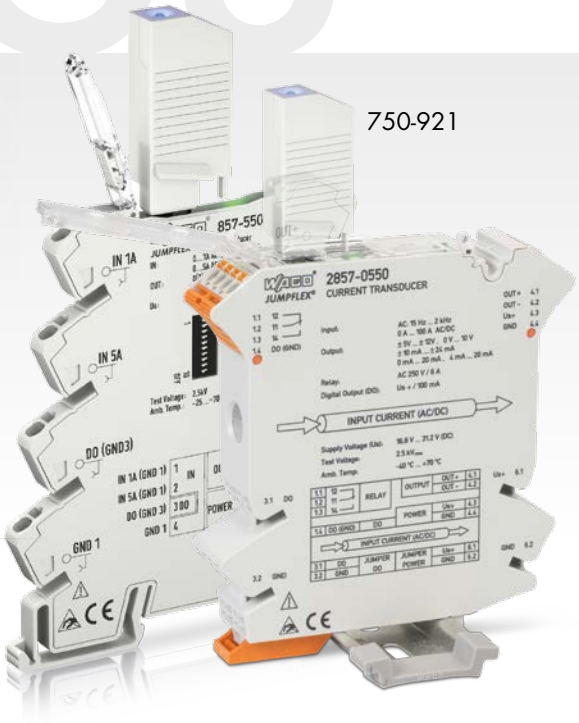
Download from Google Play

Software features:

- **Simulation of input and output parameters**
- **Automatic module detection**
- **Configuration and visualization of process values**
- **Parameterization of the digital switch output (threshold functionality)**
- **Communication via WAGO 750-923 USB Service Cable or WAGO 750-921 *Bluetooth*® Adapter**

Free software download: www.wago.com

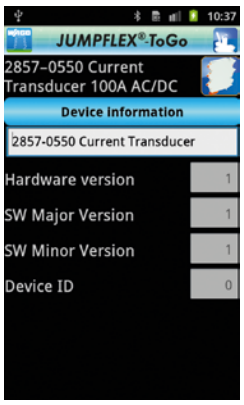
(Android smartphone)



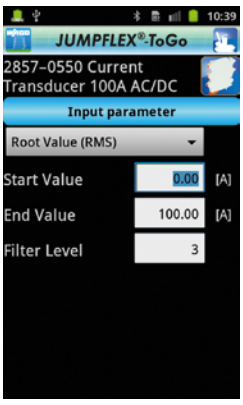
JUMPFLEX®-ToGo Configuration App — DIP Switch Alternative

The free "*JUMPFLEX*® ToGo" app brings the power of PC-based configuration software to your mobile device. Configure 857 Series Signal Conditioners' input and output parameters via finger swipe on your Android-based smartphone or tablet.

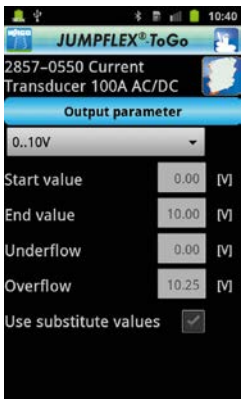
JUMPFLEX®-ToGo conveniently displays both configuration data and actual measured values. WAGO's 750-921 *Bluetooth*® Adapter communicates between your smartphone and the signal conditioner.



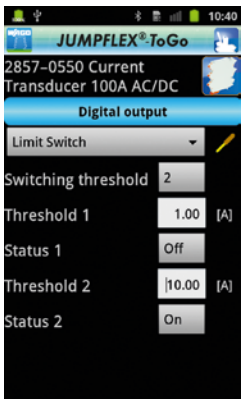
Device Information



Input Parameter



Output Parameter



Digital Output

Actual Value

JUMPFLEX® CONFIGURATION

2857 Series

Flexibility at its Finest!

A removable display can be easily and quickly attached to the housing. This unique feature carries an innovative capacitive touch control panel for intuitively configuring devices.
The multicolor display changes between orange, red, green or white depending on the device's current status.
Integrated capabilities, such as the copy function, can transmit stored configuration data from one device to another of the same type.
Passwords for protecting configured data may be assigned to prevent unauthorized access or changes.

Configuration Display
2857-0900

Suitable for 12.5 and 22.5 mm wide housings

Key touch panel features:

- **Easy to attach**
- **Touch functionality via control panel**
- **Automatic module detection**
- **Configuration and visualization of process values**
- **Copy configuration data from device to device**

INTELLIGENT CURRENT SENSORS

Monitor Solar Plants via MODBUS Communication

Addressing

Status indicator

289-965
RJ-45 Interface Module for
Current Sensor Modules

Intelligent current sensors monitor solar plants or inverters for DC measurements within a large current measurement range.

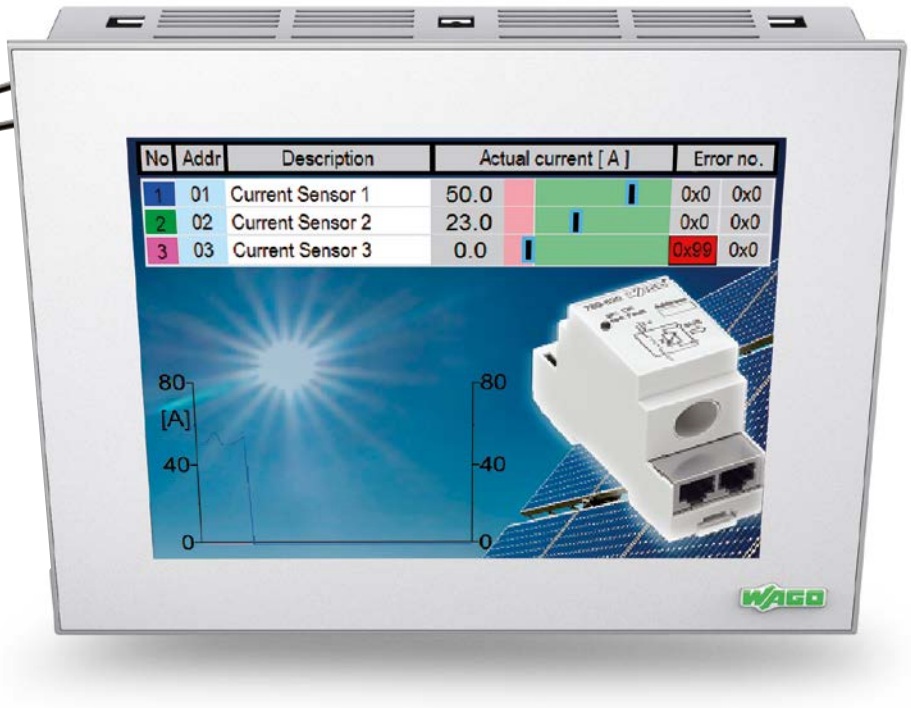
	789-620	789-621	789-622
			
Measurement range	0–80 ADC	0 –140 ADC	0–50 A_{eff}
Transmission error	≤ 0.5 % of upper range value		
Power supply	12–34 V (via RJ-45)		
Feedthrough	15 mm (for electrical lines)		
Interface	RS-485		
Protocol	MODBUS over serial line		
Addressing	1–32		
Max. bus length	≤ 1200 m		

Connection to a WAGO *PERSPECTO*® Control Panel

RS-485 Serial Interface

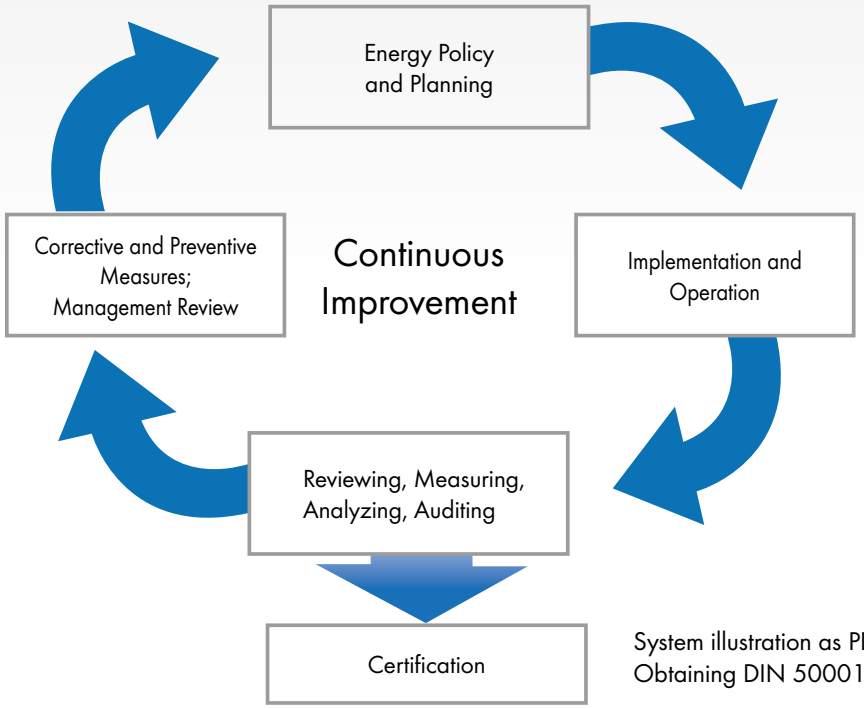
Power Supply

E.g., 787-1002
EPSITRON® COMPACT Power



ENERGY MANAGEMENT SYSTEM

DIN EN ISO 50001



System illustration as PDCA cycle acc. to ISO 50001:
Obtaining DIN 50001 certification

For certification, energy management systems must meet standardized requirements. While required actions vary from company-to-company, the goal is the same: reducing energy costs, greenhouse gases and other environmental impacts.

To be certified according to DIN 50001, a company/organization must ...

... introduce and document an energy management system in accordance with DIN 50001,

... define and document, as well as implement and maintain the application range and the limits of its energy management system,

... determine and document how it fulfills the requirements of DIN 50001 with a view toward consistently improving energy efficiency.

For certification, the three following pillars are required:

Energy Team
Energy management representative + team
Established by top management (defining responsibilities)

Energy Policy
Appropriate to the nature and extent of energy consumed

- Commitment to continuous improvement
- Availability of required information and resources
- Compliance with legal and other requirements (defining objectives)

Energy planning

- Determination and evaluation of both past and current energy use/consumption
- Estimation of future energy use/consumption
- Identification of major energy consumers, prioritization of potential improvements (from preliminary to detailed)

SYSTEM IMPLEMENTATION

WAGO's Energy Management System

ZERTIFIKAT ◆ CERTIFICATE ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

ZERTIFIKAT

Die Zertifizierungsstelle
der TÜV SÜD Management Service GmbH
bescheinigt, dass das Unternehmen

WAGO Kontakttechnik GmbH
(nach Schweizer Recht) & Co. KG
Hansastraße 27 • D-32423 Minden
Waldstraße 1 • D-99706 Sondershausen

für den Geltungsbereich

ELECTRICAL INTERCONNECTIONS
Entwicklung, Produktion von Klemmen, Klemmleisten und Steckverbindern mit Federklemmtechnik für die Elektrotechnik und Elektronik sowie Vertrieb am Standort Minden

AUTOMATION
Entwicklung, Produktion von Komponenten & Subsystemen für die Automatisierung von Maschinen, Anlagen und Gebäuden auf der Basis von Feldbussystemen, steckbaren und schienenmontierbaren Interface Bausteinen sowie Vertrieb am Standort Minden

ein Energiemanagementsystem
eingeführt hat und anwendet.

Durch ein Audit, Bericht-Nr. 70024958
wurde der Nachweis erbracht, dass die Forderungen der

ISO 50001:2011

erfüllt sind. Dieses Zertifikat ist gültig bis 2015-12-13
Zertifikat-Registrier-Nr. 12 340 16077 TMS

München, 2012-12-14

TÜV SÜD Management Service GmbH • Zertifizierungsstelle • Ridlerstraße 65 • 80339 München • Germany

In 2012, WAGO was one of the very first companies to be certified!

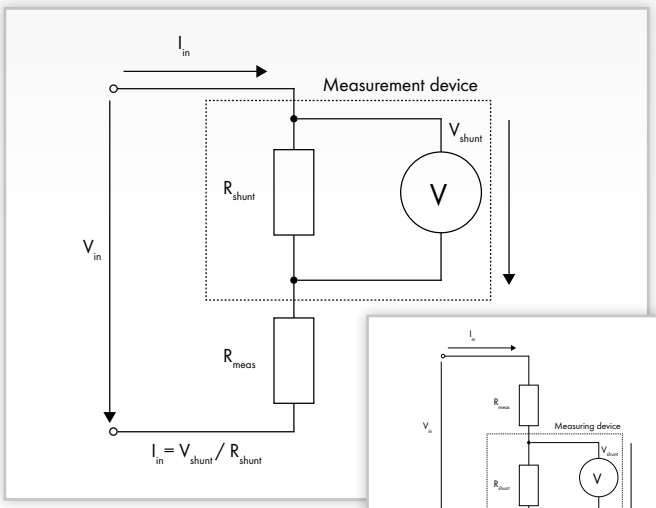
"Energy management" is not just corporate jargon at WAGO; instead, we live it by actively conserving resources and protecting the environment.
All organizational and technical measures serve the goal of using as little energy as possible in the construction and operation of every WAGO facility worldwide. Here, environmental stewardship has been a long-standing cornerstone of our company policy. In 2012, WAGO successfully passed the DIN EN ISO 50001 energy management certification, making it the heart of our day-to-day operations worldwide.

To achieve such efficiency, we rely heavily on the following pillars:

- Systematic installation and evaluation of energy meters
- Expansion of software-supported power data management
- Formation of figures and comparative values (accounting for variables such as production performance or the weather's impact on heating and ventilation)
- Organization-wide cooperation between Facility Maintenance and other areas – especially Production and Maintenance, as well as Purchasing and Controlling
- Systematic energetic evaluation when purchasing machines, systems or new and upgraded facilities
- Implementation of internal audits
- Staff education and training on energy issues

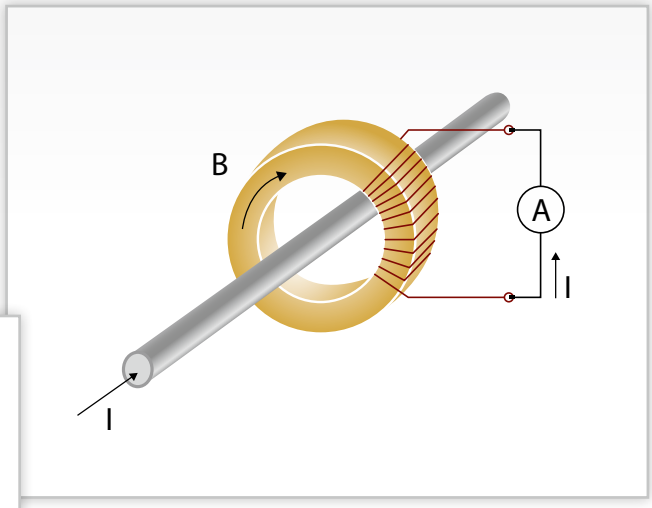
Certification according to DIN EN ISO 50001 is provided from various agencies. Since the idea of sustainability and resource conservation has always been part of our company mission, WAGO was one of the first companies to be certified in 2012 – just six months after the internal process was started.

MEASUREMENT METHODS



High-Side Method

Low-Side Method



Transformer Principle

Shunt Measurement (AC/DC)

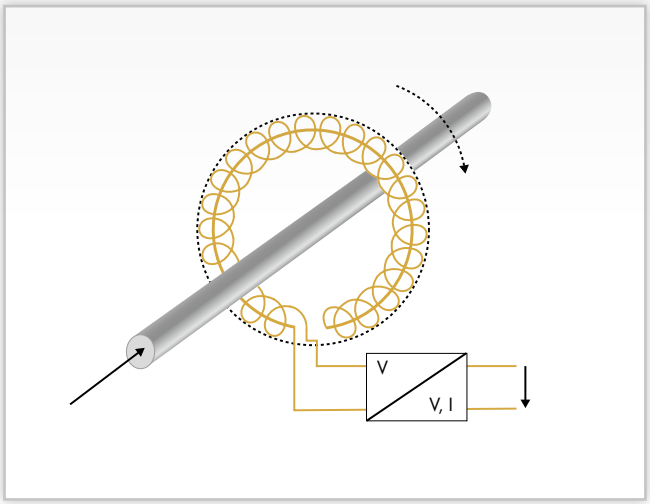
Current measurement is performed using a low-ohm resistor (shunt), which is connected in parallel to a voltmeter. The current is proportional to the current measured at the shunt resistor, I = V/R.

The shunt can be located upstream or downstream of the load (high-side/low-side method). WAGO products are equipped for both methods, giving users the freedom to decide where the conductor section should be disconnected. In addition to DC and AC currents, shunt measurements are also suitable for measuring superimposed signals (DC + AC). Accuracies of 0.1 % and greater can be achieved. WAGO's 855 Series Plug-In Current Transformers with a predefined division ratio can be used to expand the measurement range for pure AC measurements.

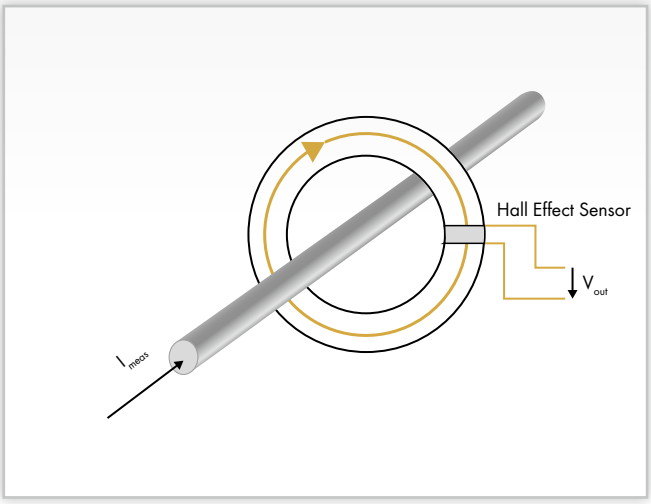
Shunt Measurement in Combination with Plug-In Current Transformer (AC)

Plug-In Current Transformers are used at higher measurement currents. They function based on the transformer principle and expand the range of an existing measurement system (usually a shunt transformer). The number of secondary windings mirrors the fixed setting of the division ratio. The electrically isolated output AC is proportional and in phase with the input AC. The measuring error typically lies below 1 %.

Measuring Method:	Advantages:
Shunt	• Very high accuracy • Suitable for DC and AC currents
Shunt + Current Transformer	• Suitable for higher AC currents • Potential-free measurement
Hall Effect	• Potential-free measurement • For higher currents • DC and AC versions



Rogowski Coil



Hall Effect Sensor

Rogowski Coil (AC)

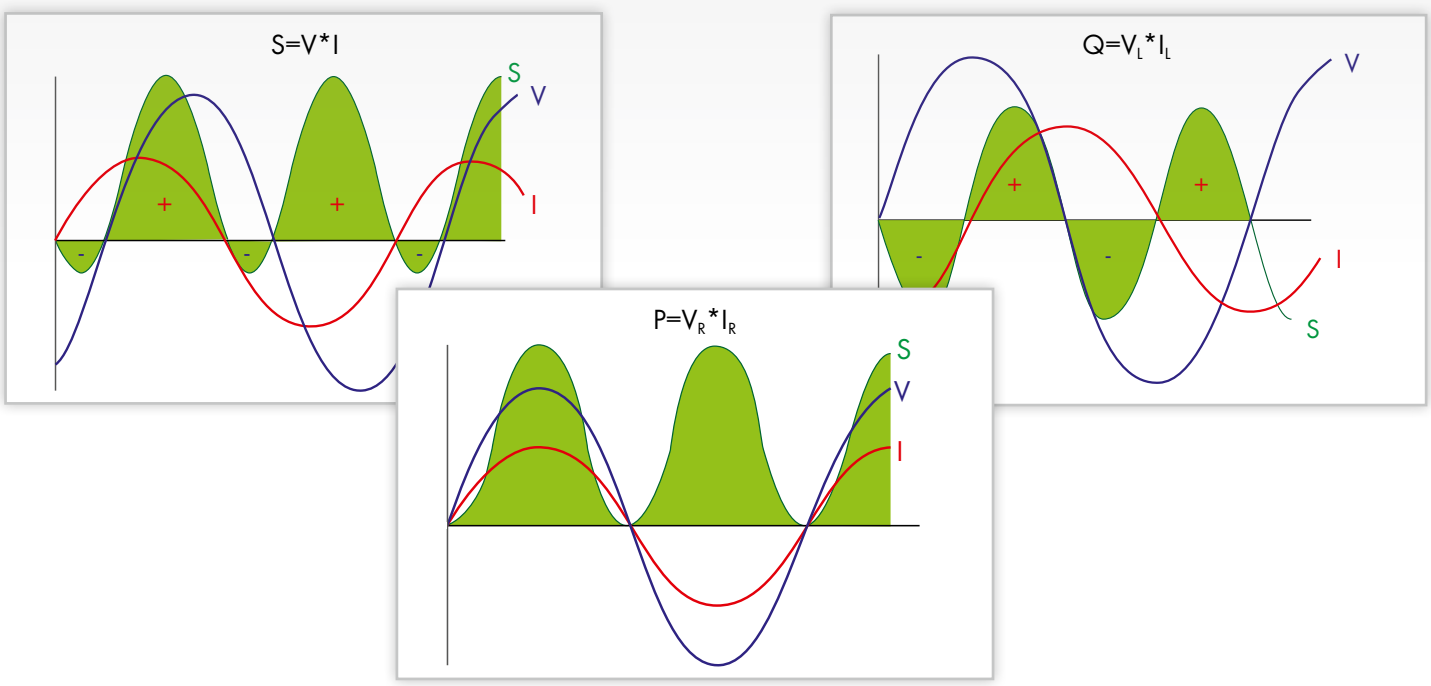
A closed-air coil (i.e., coil without iron core) is applied around the conductor that will be measured. The AC current flowing through the conductor induces a proportional voltage in the Rogowski coil. The output voltage is amplified and conditioned. A measurement error of less than 2 % and a response threshold of only a few amps guarantee straightforward measurement of high to very high AC currents.

	Application Areas:
	• Integration into control and regulation systems • Process and energy technology
	• Installations and systems technology • Network monitoring and analysis
	• PV systems and general energy technology • Control processing of several individual systems

Hall Effect Sensor (AC/DC)

A soft-magnetic core is wrapped around the conductor. The core has a small air gap in which the Hall effect sensor is located. A magnetic flux is generated in the ring-shaped core by the current flowing through the conductor. The magnetic flux also flows through the Hall effect sensor, which outputs a voltage signal proportional to the current measured. This signal is prepared and forwarded for processing. Using the Hall method, different signals (AC/DC) and measuring ranges can be mapped, depending on the design. Measurement accuracy lies between 0.5 % and 1 %.

GLOSSARY



Apparent Power S

Apparent power (S) is the total power of a transmission network. It is composed of active power (P) and reactive power (Q). Positive apparent power, which is in the interest of the consumer, means that the power is drawn from the grid. Negative apparent power, however, means that power is fed back into the grid.

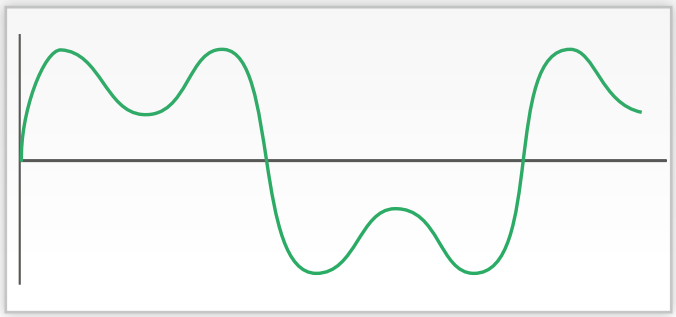
Active Power P

The active power (P) is the power actually consumed. It has no phase shift between current and voltage and relates to a resistive load. For an alternating voltage, the active power results from the multiplication of the RMS values for current and voltage.

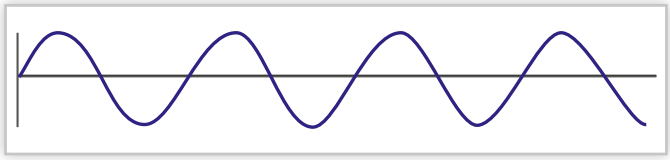
Reactive Power Q

Reactive power (Q) refers to a load on the power grid, which acts against the power flowing from the producer to the consumer. Reactive power is the product of voltage and current flowing through a reactance. Reactive power is generated by any device that is connected to an AC grid. All electrical equipment generates an electromagnetic field when voltage is applied. The magnetic field is constantly being built up and then dismantled by the alternating voltage. The energy created when the field is being dismantled is fed back into the power grid, increasing resistance to the current flow.

Fundamental frequency (50 Hz)



Addition creates a non-sinusoidal wave form



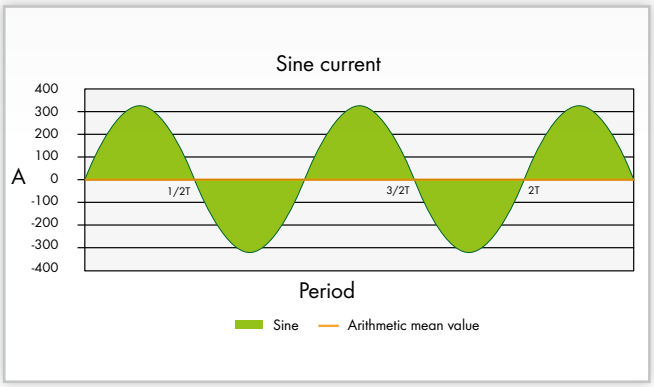
Third harmonic (150 Hz)

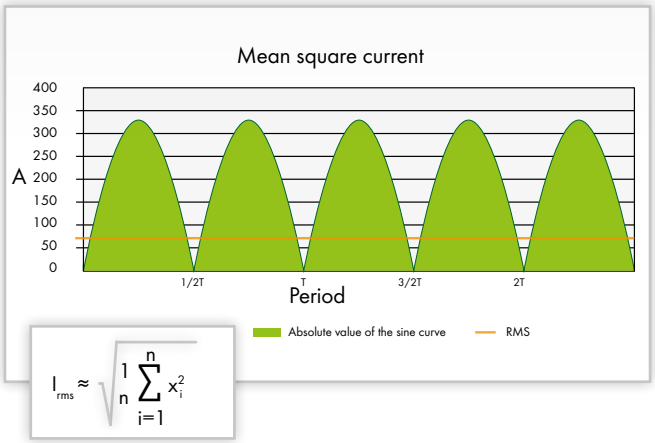
Harmonics

Harmonics are currents having frequencies that are multiples of the 50 Hz fundamental frequency. The harmonic degree is defined as the relationship between harmonic and fundamental frequency.
Harmonics are created by devices with non-linear characteristic curves (e.g., transformers, rectifiers, televisions, computers, halogen lighting). The non-sinusoidal currents of these devices result in a voltage drop in the network impedance, which distorts the network nominal voltage and affects operation.
The impacts of harmonics contamination include: failure of protective devices, thermal overload and premature aging of electrical equipment, loss of mechanical stability, performance loss, measurement errors, higher noise level, hard drive failures, system crashes, operational breakdowns and more.

If many devices are operated within a network that generates the third harmonic, it may result in a very high current load of the neutral conductor. Neutral conductor currents caused by harmonics in TN-C power networks travel within the entire equipotential bonding system via water/heating pipes, grounding systems, shields of data lines, video lines and communication systems. This can lead to increased corrosion or pitting in piping systems.
Therefore, continuous harmonics and neutral conductor analysis are required for guaranteeing both power supply and overvoltage protection, as well as fire safety.

GLOSSARY





Arithmetic Mean Value

The arithmetic mean value (also average) is the sum of all measured values detected divided by the number of measured values.

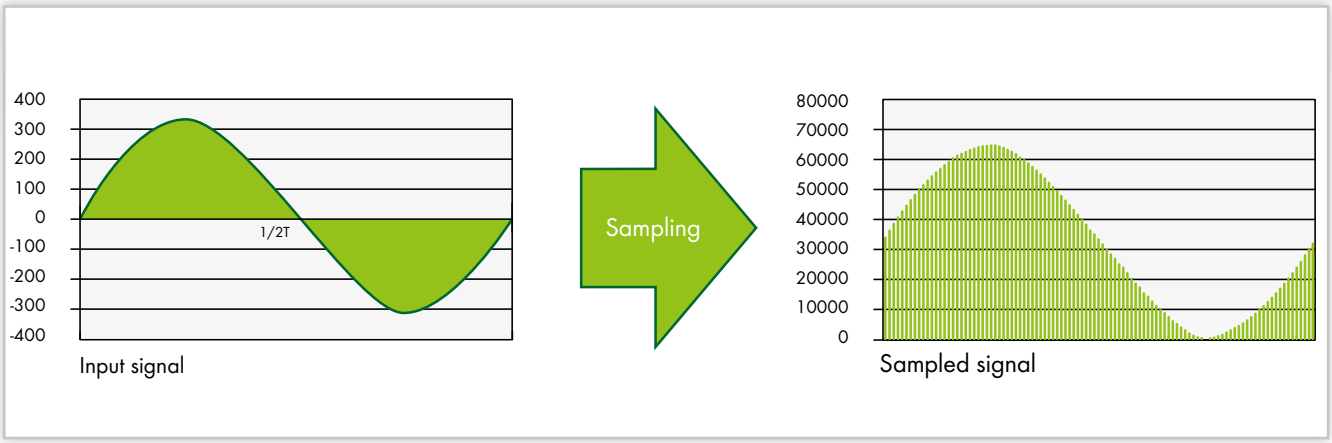
For periodic variables (e.g., sine waves), the arithmetic mean is zero. For this reason, it is not meaningful for use with periodic variables, or it only provides information about a possibly present constant. For DC variables, the arithmetic mean value corresponds to the average measured value viewed over time.

Mean Square Value

The mean square value – RMS (root-mean-square), also the TRMS (true root-mean-square) – is the square root of the quotient of the sum of squares for the measured values and number of measured values (square root of the average of the measured value).

In electrical engineering, the effective value of a periodic quantity corresponds to the effective value of the DC variable. It is characteristic of the power transformed in the consumer.

The RMS and TRMS terms are frequently differentiated. This is based on historical context, so that newer measuring procedures are preferred over form factor-based methods. In principle, WAGO measures according to the TRMS method. However, no special differentiation is made, as both terms describe the same mathematical equation, and one merely indicates the specific accuracy of the measurement.



Digital Processing

During digital processing, the signal is sampled in defined, very short time intervals (digitized). The sampled values are processed and, e.g., converted into an analog standard signal.

Digital processes are becoming increasingly common, since high reproducibility and signal-authentic mapping can be guaranteed due to high sampling rates. In addition, further processing or transmission of the digitized information is easier, less susceptible to interference and more flexible, due to the software.

Analog Processing

During analog processing, the input signal is fed directly to a processing unit and prepared according to a fixed transfer function. The processing occurs using an operational amplifier (OpAmp) and a few passive components.

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