

Data Sheet

696.D.101.02

Digital Multifunctional Power Meters with Rogowski Coils and LCD Display

WPM 209 RGW WPM 309 RGW





Application

The digital **Weigel Power Meters** have been designed to display the electrical parameters in low voltage systems. The meters are suitable for use in 3-phase 3-wire or 3-phase 4-wire systems.

WPM 209/309 RGW are equipped with inputs for *Rogowski coils* and are suitable for measurement, display, and data recording, as well as networking via RS485 or Ethernet.

The use of Rogowski coils for current measurement grants a quick and save installation.

The following base types are available:

- WPM 209 RGW RS485 for clamping to DIN rails with RS485
- WPM 209 RGW LAN for clamping to DIN rails with Ethernet
- WPM 309 RGW RS485 for switch gear panels with RS485
- WPM 309 RGW LAN for switch gear panels with Ethernet

The panel meters display the electrical parameters in the system: voltages phase to neutral and phase to phase, currents of the 3 phases, neutral current; active power, reactive power, apparent power and power factor of the 3 phases and in total; frequency; phase sequence; active energy and reactive energy in 4 quadrants (imported/exported, inductive/capacitive); unbalance of powers and energies; maximum values of voltages, currents, powers, and power factor; minimum values of the powers; demand and maximum demand of the currents and powers; harmonics of current and voltage up to the 15th harmonics as well as total harmonic distortion (THD). Various ratings are displayed at the same time and can be selected by pressing front-side buttons.

Using the integrated RS485 or Ethernet interface, all measured ratings and the events can be read out and settings can be made. Software for read out and configuration is available via download from www.weigel-messgeraete.de

WPM 209 RGW RS485 provides a digital output which can be configured as a pulse output or an alarm output.

WPM 309 RGW (both variants) provides two digital outputs which can be configured as a pulse outputs or an alarm outputs, as well as a digital input for demand value synchronization.

For **WPM 309 RGW RS485**, an analogous output 0/4 ... 20 mA for a configurable measuring value is optionally available.

Using the front - side buttons, the voltage and current transformer ratios, the system type and communication parameters can be set and the energy counters and demand values can be reset.

Functional Principle

WPM 209/309 RGW is a microprocessor-controlled digital measuring device for measuring, calculating, and indicating electrical ratings.

The meter has 3 voltage inputs and 3 current inputs for Rogowski coils to enable simultaneous evaluation of voltage, current and power for all three phases.

General Technical Data

operating voltage	300 V (rated voltage phase to zero)
measurement category	CAT III
pollution level	2

Case WPM 209 RGW

case details	projecting case clamping to TH 35 DIN rail according to DIN EN 60 715
material of case	plastics, gray
terminals	screw-terminals
wire cross-section	1.5 6 mm ² voltage and current inputs 0.14 2.5 mm ² auxiliary supply, RS 485 and digital output

enclosure code	IP 51 front of case (when mounted in switchboard with min. IP 51) IP 20 terminals
dimensions WxHxL	72 mm x 90 mm x 65 mm
weight	approx. 0.44 kg
Case WPM 309 RGW	
case details	suitable to be mounted in switch gear panels
material of case	plastics, black
panel fixing	plastic clips
terminals	screw-terminals
wire-cross section	max. 2.5 mm ² voltage and current inputs max. 1.5 mm ² auxiliary supply, RS 485 and digital output
enclosure code	IP 54 front of case (when mounted in switchboard with min. IP 54) IP 20 terminals
dimensions WxHxL	96 mm x 96 mm x 39 mm
weight	approx. 0.31 kg

Electrical Data

system type	3-phase 3-wire or 3-phase 4-wire system, unbalanced loads
rated voltage	230/400 V
voltage range	10/17 285/495 V (WPM 209 RGW) 20/35 300/519 V (WPM 309 RGW)
input impedance	>1,3 MΩ
minimum voltage for FFT calculations	20/35 V when directly connected (multiplied with VT ratio when connected via VT)
VT ratio	adjustable
rated current	500; 4,000; 20,000 A adjustable
current connection	via Rogowski coils
initial current	0.3 A at rated current 500 A 1 A at rated current 4,000 A 10 A at rated current 20,000 A
minimum current for FFT calculations	70 A at rated current 500 A 400 A at rated current 4,000 A 1,500 A at rated current 20,000 A
rated frequency	50/60 Hz
frequency range	45 65 Hz

Auxiliary Supply

auxiliary voltage WPM 209 RGW 85 ... 265 V AC WPM 309 RGW LAN 85 ... 265 V AC WPM 309 RGW RS485 230 V AC ±15%, 115 V AC ±15% on request power consumption WPM 209 RGW LAN 4.5 VA WPM 209 RGW RS485 1.6 VA WPM 309 RGW LAN 5.8 VA WPM 309 RGW RS485 2.7 VA frequency 50/60 Hz

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Measuring Units and Recordings

Measuring units		Phases	Recordings
voltages	U	L-L and L-N, Σ	min./mean/max. ¹)
currents	I	L1, L2, L3, Ν, Σ	min./mean/max. ¹)
active powers	Р	L1, L2, L3, Σ	min./mean/max. ¹)
reactive powers	Q	L1, L2, L3, Σ	min./mean/max. ¹)
apparent powers	S	L1, L2, L3, Σ	min./mean/max. ¹)
power factor	PF	L1, L2, L3, Σ	min./mean/max. ¹)
cos phi +ind/–cap	DPF	L1, L2, L3	min./mean/max. ¹)
TANGENT	TAN	L1, L2, L3, Σ	min./mean/max. ¹)
frequency	F	L1	min./mean/max. ¹)
phase sequence	Ph		
Harmonics			
voltages harmonics		L-L and L-N	min./mean/max. ¹)
currents harmonics		L1, L2, L3, N	min./mean/max. ¹)
THD voltages		L-L and L-N	min./mean/max. ¹)
THD currents		L1, L2, L3, N	min./mean/max. ¹)
Demand values			
current demands		L1, L2, L3, N, Σ	
active power demands		L1, L2, L3, Σ	
unbalanced active power	er dem	ands	
reactive power demand	s	L1, L2, L3, Σ	
unbalanced reactive po	wer de	emands	
apparent power deman	ds	L1, L2, L3, Σ	
unbalanced apparent pe	ower d	emands	
Maximum values			
max. voltages	U	L-L and L-N, Σ	
max. currents	I	L1, L2, L3, N, Σ	
max. active powers	Р	L1, L2, L3, Σ	
max. reactive powers	Q	L1, L2, L3, Σ	
max. apparent powers	S	L1, L2, L3, Σ	
max. power factor	PF	L1, L2, L3, Σ	
max. cos phi +ind/-cap	DPF	L1, L2, L3	
max. TANGENT	TAN	L1, L2, L3, Σ	
max. THD voltages		L-L and L-N	
max. THD currents		L1, L2, L3, N	
max. current demands		L1, L2, L3, Ν, Σ	
max. active power dem	ands	L1, L2, L3, Σ	
max. reactive power de	m.	L1, L2, L3, Σ	
max. apparent power de	em.	L1, L2, L3, Σ	
Minimum values			
min. active power	Р	L1, L2, L3, Σ	
min. reactive power	Q	L1, L2, L3, Σ	
min. apparent power	S	L1, L2, L3, Σ	
Counters			
active energy imported and exported	Ρ	L1, L2, L3, Σ	energy counter ²)
unbalanced active ener	gy		energy counter ²)
reactive energy inductive and capacitive	Q ;	L1, L2, L3, Σ	energy counter ²)
unbalanced reactive en	ergy		energy counter ²)
apparent energy imported and exported	S	L1, L2, L3, Σ	energy counter ²)
unbalanced apparent energy energy counter ²)			
operating hours	h		
measuring hours	h		

¹) Up to 24 measuring units can be programmed for recording.
 ²) Measuring units for energy counters (fixed)

4 Quadrants Measurement



Display

display	LCD display, with backlight (when pressing a button)
display size	43 mm x 29 mm (WPM 209 RGW) 78 mm x 61 mm (WPM 309 RGW)
indication	3 rows, 4 digits, symbols
operating elements	4 buttons

Accuracy

voltages	0.2% at 10% 100% of full-scale value
currents	0.4% at 5% 100% of full-scale value
currents harmonics	2% ±2 digits
powers	$0.5\% \pm 0,1\%$ of full-scale value (power factor = 1)
frequency	0.1% ±1 digit at 45 65 Hz
active energy	class 1 according to IEC/EN 62053–21
reactive energy	class 2 according to IEC/EN 62053–23

Environmental

operating temperature range	–25 +55°C
storage/transport temperature range	–25 +75°C
relative humidity	max. 80% non-condensing
vibration strength	±0.075 mm 50 Hz

Digital Outputs

WPM 209 RGW RS485		
type	1 opto coupler open-collector (passive)	
WPM 309 RGW RS485	/LAN	
type	2 NPN or PNP opto coupler open-collector (passive)	
maximum values	max. 27 V DC, 27 mA	
output unit	energy adjustable or alarm	
pulse length (when pulse output)	50±2 ms	
max. delay (when alarm output)	max. 1 s	

Digital Input

WPM 309 RGW RS485/LAN

type	optically isolated
voltage range	80 265 V AC/DC
input unit	demand value synchronization

Analog Output (on request)

WPM 309 RGW RS485 1AO

type		optically isolated (active)
output current	IA	load independent DC current
rated current	I _{AN}	0/4 20 mA programmable
load range	R _A	0 500 Ω

RS485 Interface

WPM 209/309 RGW RS485

type	RS485
protocol	MODBUS RTU/ASCII
baud rate	300 57600 baud
address	1 247
RT A 1200 B	RS485-USB-



Ethernet Interface (LAN)

WPM 209/309 RGW LAN

protocol speed

Standards

EN 55011	Industrial, scientific and medical equipment – Radio–frequency disturbance characteristics – Limits and methods of measurement
IEC 61000-4	Electromagnetic compatibility (EMC) – Testing and measurement techniques –
-2	Part 4–2: Electrostatic discharge immunity test.
-3	Part 4–3: Radiated, radio–frequency, electromagnetic field immunity test
-4	Part 4–4: Electrical fast transient/burst immunity test

10/100 Mbit/s

HTTP, NTP, DHCP, MODBUS TCP

-5	5	Part 4–5: Surge immunity test
-6	6	Part 4–6: Immunity to conducted disturbances, induced by radio-frequency fields
-1	11	Part 4–11: Voltage dips, short interruptions and voltage variations immunity tests
EN 61000-6-2		Electromagnetic compatibility (EMC) – Part 6–2: Generic standards – Immunity for industrial environments
EN 61010		Safety requirements for electrical equipment for measurement, control, and laboratory use –
	-1	Part 1: General requirements
	-2-030	Part 2–030: Particular requirements for equip- ment having testing or measuring circuits
EN 61326-1		Electrical measuring, control, and laboratory devices – EMC requirements – Part 1: General requirements

Terminals



auxiliary supply U_H

digital input DI

2 digital outputs DO1/DO2

nputs

Ethernet

Т.	WPM 209 RGW RS485	WPM 209 RGW LAN
1	RS485 GND	-
2	RS485 –	-
3	RS485 +	-
4	digital –	-
5	digital+	-
6	U _H L1	U _H L1
7	U _H N	U _H N

WPM 309 RGW RS485 Т.

U_H L1

1

- 2 NC
- 3 U_H N digital input -/~
- 4 5 NC
- 6 digital input +/~
- RS485 GND 7
- RS485 8
- 9 RS485 +
- 10 analog output +
- analog output GND 11
- 12 digital output NPN 1 + / PNP GND
- digital output NPN 2 + / PNP 1 -13
- digital output NPN GND / PNP 2 -14

WPM 309 RGW LAN Т. 1

- U_H L1
- 2 NC
- 3 U_H N
- digital input -/~ 4
- 5 NC 6 digital input +/~
- 12 digital output NPN 1 + / PNP GND
- 13 digital output NPN 2 + / PNP 1 -
- digital output NPN GND / PNP 2 -14

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Digital Multifunctional Power Meters with Rogowski Coils and LCD Display

Connections

4-phase 3-wire system



3-phase 3-wire system

1-phase AC system

Dimensions









dimensions in mm

Rogowski Coils WRC 100

Application

The **WRC 100** Rogowski coils can be simply attached around a current carrying conductor and fixed by a bayonet connector. A precise winding technique garantees position independance to a great extent and high linearity.

Functional principle

Rogowski coils have a toroidal winding, in in which a voltage is induced proportional to the current of the embraced conductor.



The output voltage is amplified and analyzed by the measuring device. As the coils do not have a magnetic core, there is no saturation and a wide frequency range is covered.

Mechanical data

range

WRC 100 coil length inner diameter	030 30 cm 10 cm	045 45 cm 14 cm	070 70 cm 22 cm	090 90 cm 29 cm
coil diameter	8,3 ±0,2 m	m		
connector	bayonet			
weigth	150 500 g			
outer material	thermoplas	tics accordir	ng to UL94-	V 0
connections	2x 0.15 mm	n ² + shieldin	g	
cable length	300 cm (sta	andard)		
enclosure code	IP67			
Electrical data				
output signal	100 mV / 1	kA bei 50 H	z	
coil resistance	70 900 Ω	2		
positioning error	better than	±1% (with 1	5 mm cable	diameter)
frequency range	40 Hz 20) kHz		
operating voltage	1000 V _{eff} C 600 V _{eff} CA	AT III T IV		
pollution level	2			
test voltage	7400 V _{eff} / $^{-1}$	1 min		
Environmental				
operating temperature range	-30 +80°	°C		
storage temperature	-40 +80°	°C		

Ordering Information

Multifunctional Power Meter with Rogowski coils and LCD display WPM 209 RGW KIT 30 RS485 for clamping to DIN rails with 3 Rogowski coils WRC 100 030 and LCD display with RS485 interface and digital output

WPM 209 RGW KIT 30 LAN for clamping to DIN rails with 3 Rogowski coils WRC 100 030 and LCD display with Ethernet interface

WPM 309 RGW KIT 30 RS485¹) for switch gear panels with 3 Rogowski coils WRC 100 030 and LCD display with RS485 interface, 2 digital outputs, and 1 digital input

WPM 309 RGW KIT 30 RS485 $(1AO^1)^2$) for switch gear panels with 3 Rogowski coils WRC 100 030 and LCD display with RS485 interface, 2 digital outputs, and 1 digital input as well as analog output

WPM 309 RGW KIT 30 LAN¹) for switch gear panels with 3 Rogowski coils WRC 100 030 and LCD display with Ethernet interface, 2 digital outputs, and 1 digital input

 $^{1})$ digital outputs NPN (standard) or PNP (optional) – please state $^{2})$ on request

WRC 100	Rogowski coils
030	30 cm length (standard)
045	45 cm length (on request)
070	70 cm length (on request)
090	90 cm length (on request)

Ordering Example

WPM 209 RGW KIT 30 RS485 Multifunctional Power Meter for clamping to DIN rails with 3 Rogowski coils WRC 100 030 and LCD display with RS485 interface and digital output

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