

ANALOGUE POWER METERS

ACTIVE, REACTIVE, APPARENT POWER METERS AND POWER FACTOR METERS WITH EXCHANGABLE SCALES

EQ 0207 / 2207 / 0107 / 2107 & YQ 0207 / 2207 / 0107 / 2107

- MEASUREMENTS OF ACTIVE OR REACTIVE ENERGY OR APPARENT POWER (EQ) OR POWER FACTOR (YQ).
- SINGLE OR THREE PHASE, 3 OR 4 WIRE, BALANCED OR UNBALANCED CONNECTION.
- STANDARD 96 X 96 DIN CASE (EQ X207, YQ X207) OR STANDARD 144 X 144 DIN CASE (EQ X107, YQ X107).
- PROTECTIVE COVER FOR TERMINAL.
- USB SERVICE PORT.

FEATURES

- Measurements of active or reactive or apparent power (EQ) or power factor (YQ).
- Single or three phase, 3 or 4 wire, balanced or unbalanced connection.
- Standard 96 X 96 DIN case (EQ x207, YQ x207) or standard 144 x 144 DIN case (EQ x107, YQ x207).
- Exchangeable scale.
- Frequency range from 16 Hz to 400 Hz.
- Automatic range of nominal current (max. 12.5 A).
- Protective cover for terminal.
- USB service port.

DESCRIPTION

The meter is intended for measuring power and power factor in single-phase or three-phase electrical power network. The meter measure according to the principle of fast sampling of voltage and current signals. A built-in microprocessor calculates power and power factor from the measured signals.

USE

The meter is intended for measuring power of single-phase or three-phase electric distribution system.

SHIP VERSION

Special “ship version” are delivered for building into ships. These are mechanically resistive instruments which correspond to the rules of construction of seagoing ships (Bureau Veritas certified).

COMPLIANCE WITH STANDARDS

Standard EN	Description
61010-1	<i>Safety requirements for electrical equipment for measurement, control and laboratory use.</i>
60529	<i>Degrees of protection provided by enclosures (IP code).</i>
62051-1	<i>Direct acting indicating analogue electrical measuring instruments and their accesories.</i>
61326	<i>Electrical equipment for measurement, control and laboratory use – EMC requirements.</i>

* – *Partial compliance*

DESCRIPTION OF PROPERTIES

Measurands

Measurements of momentary active, reactive, apparent power and power factor.

Analogue pointer

Two types of pointers are available EQ 0x07 and YQ 0x07 have 90° analogue pointer. EQ 2x07 and YQ 0x07 have 240° analogue pointer.

End scale value

The end scale value is determined as follows:

The power to be measured by the instrument can be calculated by using one of the formula below:

Power system	Active	Reactive	Apparent
Single-phase	$U I \cos\phi$	$U I \sin\phi$	$U I$
3-phase 3-wire	$\sqrt{3} U I \cos\phi$	$\sqrt{3} U I \sin\phi$	$\sqrt{3} U I$
3-phase 4-wire	$3 U I \cos\phi$	$3 U I \sin\phi$	$3 U I$

Power factor is calculated from active and apparent power U in equations is the phase voltage in single-phase system, line voltage in three-phase 3-wire system, and phase voltage in three-phase 4-wire systems.

According to the calculated value, one of the following standard end scale values and their decade are chosen:

1 – 1.2 – 1.5 – 2 – 2.5 – 3 – 4 – 5 – 6 – 7.5 – 8

Supply

Power supply connection of the meter is adaptive. Meter can be supplied internally from voltage measuring inputs or externally via separate connector.

USB service communication (option)

Meter can be equipped with service port with mini USB connector that can be used for setting. This port is not galvanic separated and for this reason, BEFORE USE INPUT VOLTAGE AND POWER SUPPLY ON THE METER MUST BE DISCONNECTED.

Communication via service port is time limited.

TECHNICAL DATA

Inputs

Input signals	Current	Voltage
Nominal frequency range	$\pm 0.2\%$	EN 61557-12
Measuring frequency range	$\pm 0.2\%$	EN 61557-12
Nominal value (I_N, U_N)	$\pm 0.5\%$	EN 61557-12
Maximal value	$\pm 0.5\%$	EN 61557-12
Consumption	Cl. 0.5S	EN 62053-22

Supply

Power supply	AC
Nominal voltage AC	57.7 / 63.5 / 100 / 110 / 230 / 400 V
Nominal frequency	40 Hz – 65 Hz
Nominal voltage DC	–
Consumption	< 1.5 VA

Safety:

Protection:

protection class II
600 V rms, installation category II
300 V rms installation category III

Pollution degree 2
 In compliance with EN 61010-1

Enclosure material

PC/ABS
 Incombustibility – self-extinguishability, complying with **UL 94 V-0**

Enclosure protection:

IP 52 (IP 00 for terminals)
 In compliance with **EN 60529**

Cutting for installation:

$92^{+0,8}$ mm
 $138^{+0,1}$ mm

Converter mass:

max. 600 g

Mechanical

Dimensions

144 × 144 × 100 mm
 (CT 101.5 mm)

Mounting

Panel mounting 144 × 144 mm

Required

137 × 137 mm

mounting hole

Enclosure material

PC / ABS

Flammability

Acc. to UL 94 V-0

Weight

550 g

Enclosure material

PC / ABS

Acc. to UL 94 V-0

Ambient conditions:

Temperature range of operation: -10 °C ... 60 °C
 Storage temperature -40 °C to +70 °C
 Average annual humidity $\leq 75\%$ r.h. (no condensation)

Reference conditions:

Ambient temperature: -10 °C ... 23 ... 55 °C
 Voltage input: + / - 20% U_n
 Current input: 0 ... 100 % I_n
 Active / reactive power factor: $\cos\phi=1 / \sin\phi=1$
 Waveform: Sinus

Accuracy

Measurand	Accuracy
Active or reactive or apparent power	1.5

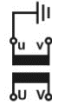
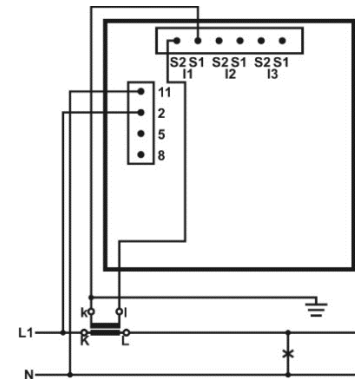
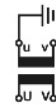
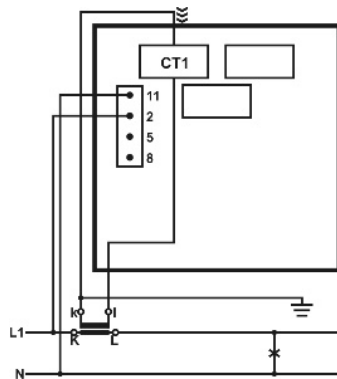
CONNECTION

Voltage inputs can be connected either directly to low-voltage network or via a high-voltage transformer to high-voltage network.

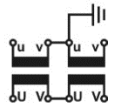
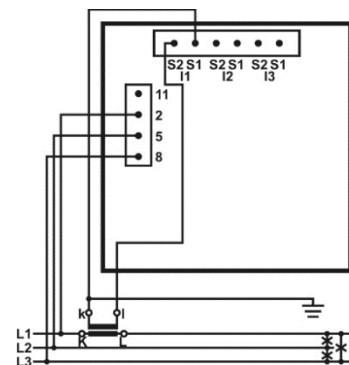
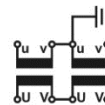
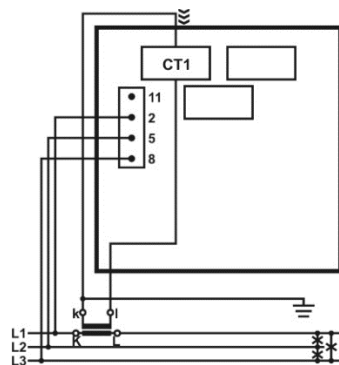
Current inputs shall be connected to network via a corresponding current transformer.

System / connection Through-hole connection assignment Terminal connection assignment

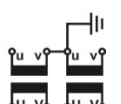
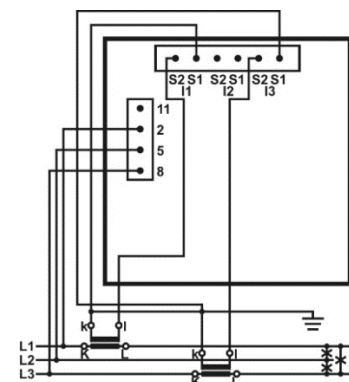
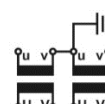
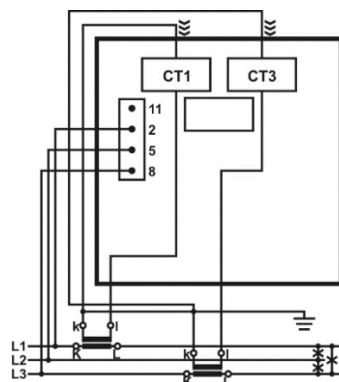
1b (1W1b)
Single-phase connection



3b
Three-wire, balanced load



3u
Three-wire, unbalanced load.

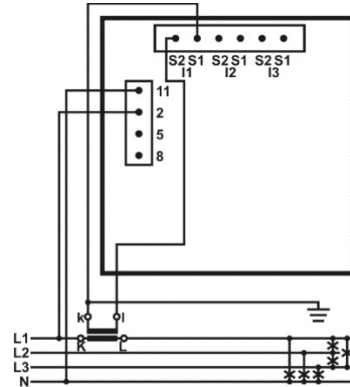
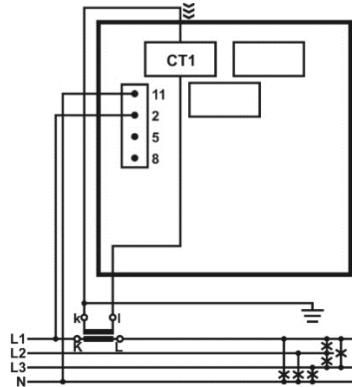


System / connection

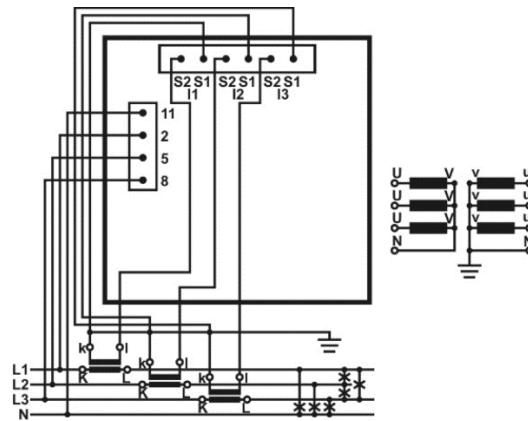
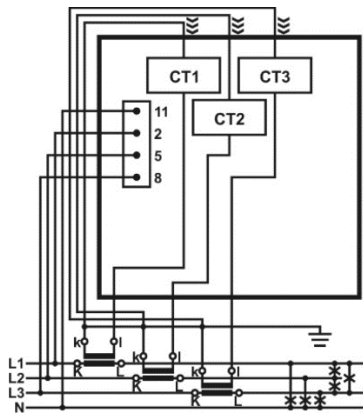
Through-hole connection assignment

Terminal connection assignment

4b
Four wire, balanced load



4u
Four wire, unbalanced load.



CONNECTION TABLE

Function		Terminals	
Measuring input:	AC current	IL1	CT1
		IL2	CT2
		IL3	CT3
	AC voltage	UL1	2
		UL2	5
		UL3	8
		N	11
Auxiliary power supply:	AC (L)	13	
	AC (N)	14	

Communication terminals

Communication		Terminals
USB service port	USB Min-B type	-

Terminals

Connection	Max. conductor cross-sections
Voltage inputs (4)	$\leq 2.5 \text{ mm}^2$; one conductor
Current inputs (3)	$\leq \varnothing \text{ mm}$; one conductor with insulation
Power supply (2)	$\leq 2.5 \text{ mm}^2$; one conductor

DATA FOR ORDERING

The following data shall be stated:

 Type of a meter
 Connection
 VT and CT ratio
 Voltage range
 Type of power supply
 Scale data
 Special option

EQ xx07 general ordering code

When ordering the meter, all required specifications shall be stated in compliance with the ordering code:

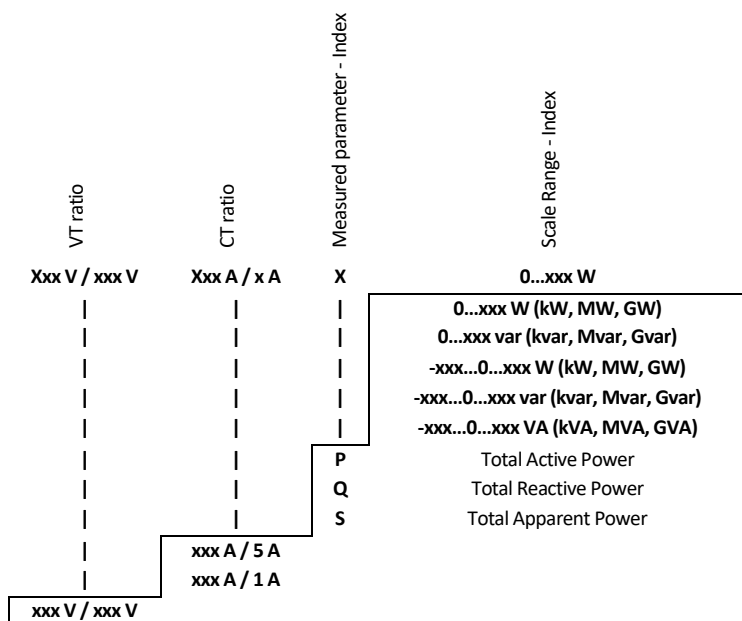
Device Type	Class	Zero position	Connection	Nominal voltage	Nominal current	Frequency range	Auxiliary supply	Current Connection	Service Comm.	Finish	Window	Dial	Index Type	Zero Adjuster Colour	Protection Cover
EQ x207	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
															Y Yes*
															N No
														S Black*	
														W White	
															Not available if Finish is P, G, R or V
													S	Single Scale*	
													D	Double Scale	
													S	Standard with Scale*	
													N	Bianco Dial	
													X	No Dial	
													A	Clear Glass*	
													B	Clear Glass + Red Adj. Index	
													L	Anti-Glare Glass	
													D	Anti-Glare + Red Adj. Index	
													A	Standard*	
													H	HVE (Tropical Seal)	
													M	Inc. Mech. Resistance	
													S	Ship Ver.	
													P	IP54	
													G	HVE + IP54	
													R	Ship Ver. + IP54	
													T	Ship Ver. + HVE	
													V	Ship Ver. + HVE + IP54	
													N	Without*	
													M	Mini USB	
													T	Through Hole Transformer*	
													C	Screw Terminal Connector	
							X								Internal L1-N
							Y								Internal L1-L2
							A								E 57,7 V
							B								E 63,5 V
							C								E 100 V
							D								E 110 V
							E								E 230 V
							F								E 400 V
							J								E 440 V
							S								50 Hz*
							T								60 Hz
							R								45...65 Hz
							1A								1A
							5A								5A

			57P 57,7 V L-N \	100L 100 V L-L \	57V7 57,7/100 V \
			63P 63,5 V L-N	110L 110 V L-L	63V5 63,5/110 V
			66P 66,4 V L-N	115L 115 V L-L	66V4 66,4/115 V
			69P 69,3 V L-N	120L 120 V L-L	69V4 69,3/120 V
			100 100 V L-N	220L 220 V L-L	110V 110/190 V
			115 115 V L-N	225L 225 V L-L	120V 120/208 V
			127 127 V L-N 1B	230L 230 V L-L	127V 127/220 V
			130 130 V L-N Connect.	380L 380 V L-L 3B and 3U	130V 130/225 V 4B and 4u
			132 132 V L-N	400L 400 V L-L Connect	132V 132/230 V Connect
			220 220 V L-N	415L 415 V L-L	220V 220/380 V
			230 230 V L-N	440L 440 V L-L	230V 230/400 V
			240 240 V L-N	450L 450 V L-L	240V 240/415 V
			250 250 V L-N	460L 460 V L-L	254V 254/440 V
			254 254 V L-N /	470L 470 V L-L	277V 277/480 V
				480L 480 V L-L	288V 288/500 V /
				500L 500 V L-L /	
			1B Single phase		
			3B 3 phase 3 wire balanced		
			3U 3 phase 3 wire unbalanced		
			4B 3 phase 4 wire balanced		
			4U 3 phase 4 wire unbalanced		
			L 0/1*		
			C -1/0/1		
			F -0.1/0/1		
			A -0.x/0/1		
			S 1.5*		
			H 1.0		

EQ 0107	Power meter 144 mm 90°
EQ 0207	Power meter 96 mm 90°
EQ 2107	Power meter 144 mm 240°
EQ 2207	Power meter 96 mm 240°

*_Default ordering value

EQ xx07 general ordering code- configuration settings:



YQ xx07 general ordering code:

Device Type	Class	Zero position	Connection	Nominal voltage	Nominal current	Frequency range	Auxiliary supply	Current Connection	Service Comm.	Finish	Window	Dial	Index Type	Zero Adjuster Colour	Protection Cover	V/T ratio	CT ratio	Scale Base
YQ x207	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
																		A 0.5/1/0.5* B 0.3/1/0.3 C 0.3/1/0.8 D 0.8/1/0.3 X 10.1/1/0/1/0.1E Y Custom (appendix)
																		xxxA/5A xxxA/1A
																x		Yes* No
															Y			S Black* W White S Single Scale* D Double Scale
															N			S Standard with Scale* N Bianco Dial X No Dial
																		S Standard with Scale* N Bianco Dial X No Dial
																		A Clear Glass* B Clear Glass + Red Adj. Index L Anti-Glare Glass D Anti-Glare + Red Adj. Index
																		A Standard* H HVE (Tropical Seal) M Inc. Mech. Resistance S Ship Ver. P IP54 G HVE + IP54 R Ship Ver. + IP54 T Ship Ver. + HVE V Ship Ver. + HVE + IP54
																		N Without* M Mini USB
																		T Through Hole Transformer* C Screw Terminal Connector
																		X Internal L1-N Y Internal L1-L2
																		A E 57,7 V B E 63,5 V C E 100 V D E 110 V E E 230 V F E 400 V J E 440 V
																		S 50 Hz* T 60 Hz R 45...65 Hz
																		1A 1A 5A 5A
																		57P 57,7 V L-N \ 100L 100 V L-L \ 57V7 57,7/100 V \ 63P 63,5 V L-N 110L 110 V L-L 63V5 63,5/110 V 66P 66,4 V L-N 115L 115 V L-L 66V4 66,4/115 V 69P 69,3 V L-N 120L 120 V L-L 69V4 69,3/120 V

			100	100 V L-N	I	220L	220 V L-L	I	110V	110/190 V	I
			115	115 V L-N	I	225L	225 V L-L	I	120V	120/208 V	I
			127	127 V L-N	1B	230L	230 V L-L	I	127V	127/220 V	I
			130	130 V L-N	Connect.	380L	380 V L-L	3B and 3U	130V	130/225 V	4B and 4u
			132	132 V L-N	I	400L	400 V L-L	Connect	132V	132/230 V	Connect
			220	220 V L-N	I	415L	415 V L-L	I	220V	220/380 V	I
			230	230 V L-N	I	440L	440 V L-L	I	230V	230/400 V	I
			240	240 V L-N	I	450L	450 V L-L	I	240V	240/415 V	I
			250	250 V L-N	I	460L	460 V L-L	I	254V	254/440 V	I
			254	254 V L-N	/	470L	470 V L-L	I	277V	277/480 V	I
						480L	480 V L-L	I	288V	288/500 V	/
						500L	500 V L-L	/			
			1B	Single phase							
			3B	3 phase 3 wire balanced							
			3U	3 phase 3 wire unbalanced							
			4B	3 phase 4 wire balanced							
			4U	3 phase 4 wire unbalanced							
				L	0 / 1*						
			S	1.5*							
			H	1.0							

- YQ 0107** Power Factor meter 144 mm 90°
- YQ 0207** Power Factor meter 96 mm 90°
- YQ 2107** Power Factor meter 144 mm 240°
- YQ 2207** Power Factor meter 96 mm 240°

*_Default ordering

Example of ordering:

EQ 0207 meter will measure active power with 90° pointer (standard scale). It is connected directly to the three-phase 4-wire system with phase voltage 230 V_{L-N}, nominal current 5A and frequency range 50Hz. Device is powered from measuring circuit. It has no communication build in. Cut-out for panel is 96 x 96 and standard finish.

Example ordering code:

EQ 0207 S L 4U 230 V 5A S X T N A A S S S Y

EU DIRECTIVES:

- Directive **2014 / 35 / EU** on low voltage.
- Directive **2014 / 30EU** on electromagnetic compatibility.
- Directive on RoHS 2011 / 65 / EU.