

Meters

Makel has the broadest portfolio in the field of electronic electricity meters in Turkey. With its lowest return rates, high quality products, innovative unique rich features, superior customer service, Makel is the leader of the Turkish market in the field of electronic electricity meters.

Broad product portfolio

- ▶ Singlephase meters for residential and low consuming users,
- ▶ Threephase, direct and current transformer connected meters for medium-power commercial companies, offices, street lightings, big apartments and skyscrapers and such consumers
- ▶ Class 0.5 or class 1, direct connected or current transformer and/or voltage transformer connected active and reactive industrial meters for high consuming industries, hotels, Shopping malls, electricity production plants, Medium Voltage subscribers

100% test and verification

- ▶ All Makel products, from production to packaging are tested and verified 100% in 0.01 accuracy zero test system.

Compatibility to MID

All Makel meters conform European Union Measurement Instruments Directive (MID). Conformity of our meters are certified by notified bodies.

Wide LCD Screen with backlight

- ▶ Makel meters have large LCD screens. With backlight feature, even in dark environments our meters can easily be read from long distances.

Excess operating conditions

- ▶ Makel meters has protections over conformed standards. As an example, although surge tests defined as 4 kV in EN 50470-1 standards, Makel meters are applied to surge tests at 4.4 kV. Our meters are tested in 8 kV instead of 6 kV for isolation test. In regarding to EMI, Our meters are also tested under 30V/m EM field with current flowing through them. All our meters have IP54 protection class. Our meters also work between 40 and 60 Hz and operating voltage are far more than the ranges specified in standards.
- ▶ All makel meters can accurately measure between -40 and 85 degree Celsius. With this feature, they are unique in the market

Low time drift

- ▶ Makel meters are calibrated to compensate crystal frequency ppm error in production and continuously make temperature compensation while they are running.

Wide Load Profile

- ▶ Single Phase and Three pahse meters have wide load profile records up to 2 years with 15 min sampling interval.
Industrial meters, depending on number of channels and directionality reaches up to one year load profile records capacity within 15 minutes interval.

Ready for AMI/AMR systems

- ▶ All meters equipped with RS485 interfaces which provide necessary communication interfaces for AMI/AMR applications. Using Makel Wport2, NPort-ET, Eport and Pport modems and gateways, meters can be easily integrated to MAKEL USOBIM AMR system.

General View

Rich content, ergonomic LCD screen with backlight

High temperature coefficient polycarbonate body and terminal

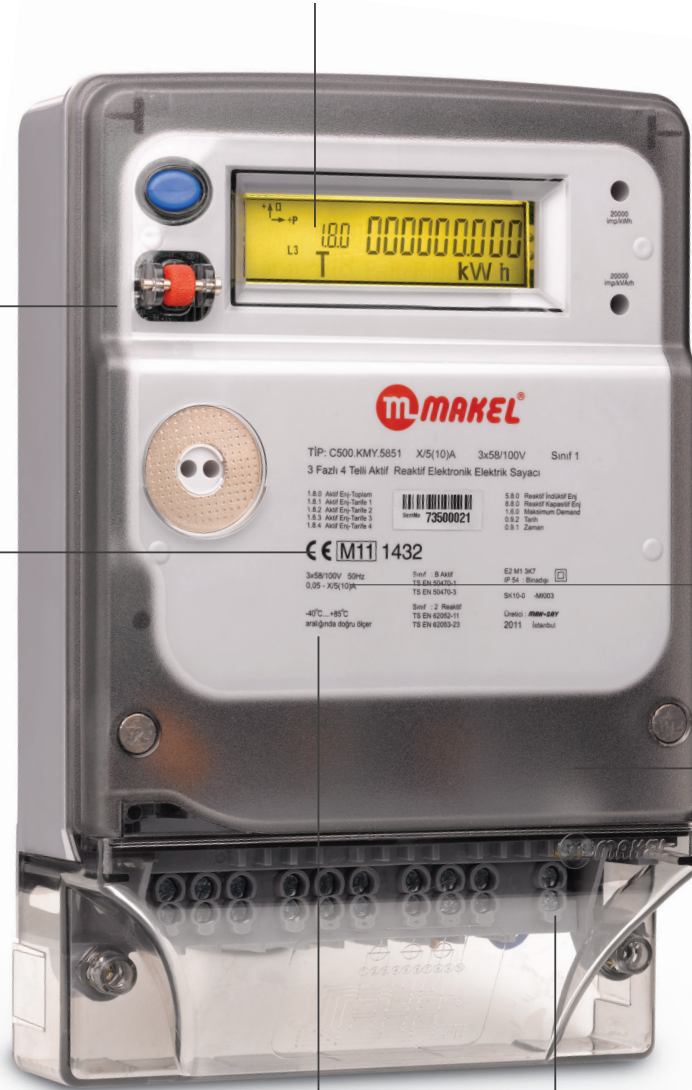
Compliant to EU MID directive

High-accuracy meters including class 0.5

Ten years battery life

Widest operating temperature range in its field (-40 °C ile +85 °C)

Improved high voltage protection over standards



Singlephase Electronic Electricity Meters



M560



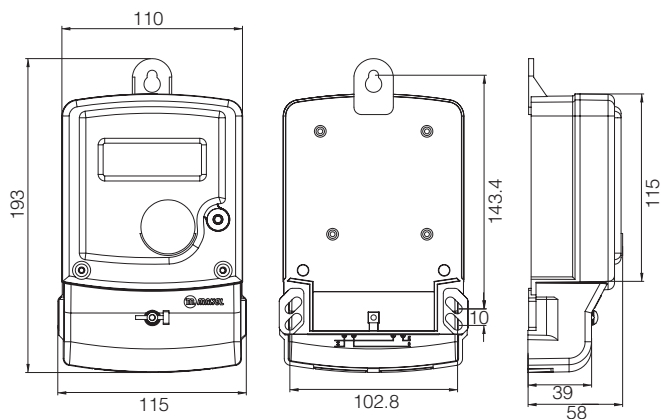
M600

You are one step ahead, with its backlit wide screen, load profile capability, very low time drift by temperature and crystal calibration

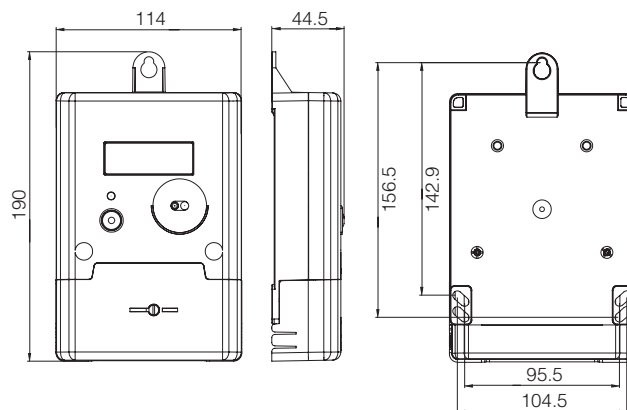
General Specifications

- ▶ Class B (1%) accuracy (EN 50470-1, EN 50470-3) when measuring active energy.
- ▶ Splits day into 8 time slices; measuring consumed energy in 4 different tariffs; weekdays, Saturday and Sunday can be programmed separately.
- ▶ Keeps information on permanent memory without the need for energy.
- ▶ Wide LCD screen showing consumed energy according to tariffs and error notices.
- ▶ Battery weakening, real time clock corruption, main cover and terminal cover intervention can be seen on LCD as flashing symbols and with their code numbers.
- ▶ 10 year lifetime lithium battery protects clock and the other information against power cut.
- ▶ Supports EN 62056-21 protocol on optic port and RS485 port for communication and programming needs.
- ▶ The information can also be read in power cut condition from LCD screen using button and via communication on optic port thanks to a secondary 10 year lifetime lithium battery.
- ▶ Keeps energy values of actual and previous 12 periods in memory.
- ▶ It has 1 hour / 30 days or optional 15 min / 2 years load profile
- ▶ Calculates demand in every 15 minutes.
- ▶ 150V-300V wide operating voltage range.
- ▶ The real time clock has 0,5sec/day precision. Temperature and crystal compensation is done to prevent real time clock's time drifts.
- ▶ Actual current and voltage can be seen on the screen.
- ▶ It is easy to read metering information even in the dark, thanks to the backlight of the LCD screen.
- ▶ An optional RS485 communication port is available for AMI/AMR applications.
- ▶ All single phase meters are MID compliant.
- ▶ Operating temperature range is between -40°C to 85°C.
- ▶ Optional Circuit Breaker Relay
- ▶ Communication icons indicates on the screen
- ▶ RS485 communication (optional)

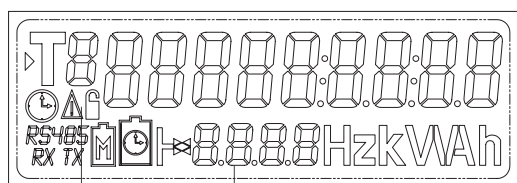
Outline Dimensions (M560)



Outline Dimensions (M600)



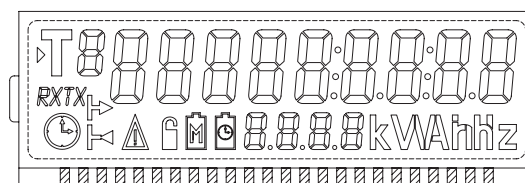
LCD Screen (M560)









Tariff codes
T, T1, T2, T3, T4

Obis codes

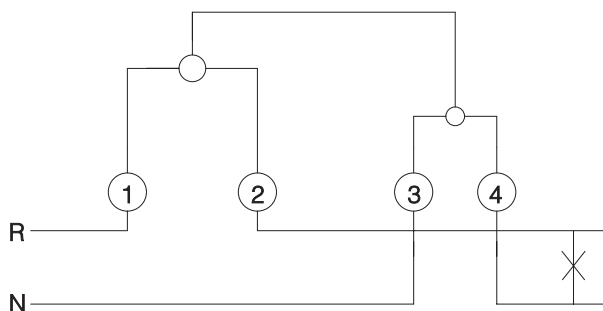
LCD Screen (M600)



Explanation of LCD Icons (M550 / M600)

	Battery low alarm
	Real time clock error alarm
	Terminal cover opened alarm
	Main cover opened alarm
	Current tariff indicator
	Maximum demand indicator

Wiring Diagram (M560/M600)

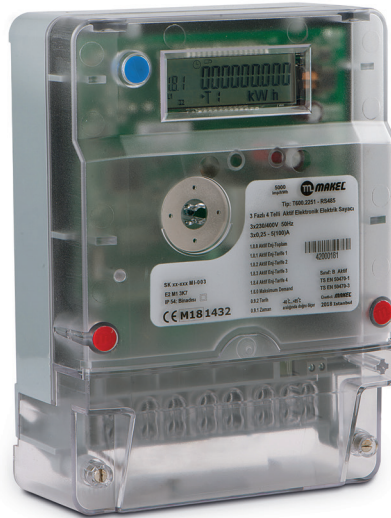


Technical Specifications

Specifications		Model No	
		M560.2251S M600.2251	M600.2251T M560.2251
Nominal Voltage		220 V or 230 V	220 V or 230 V
Operating Voltage Range		150 V~300 V	150 V~300 V
Nominal (Base) Current		5 A	5 A
Maximum Current		100 A	100 A
Minimum Current		250 mA	250 mA
Starting Current		20 mA	20 mA
Meter Constant	Active	3000, 3000, 5000 imp/kWh	5000, 3000 imp/kWh
	Reactive	-	-
Accuracy (Class)	Active	B (Class 1)	B (Class 1)
Directionality		One Way	Two-Way
Frequency		50 Hz \pm 10%	50 Hz \pm 10%
IP Protection Class		IP54	IP54
Protection Class		II	II
EMC Class		E2	E2
Mechanical Class		M1	M1
Humidity Ratio		<95%	<95%
Operating Temperature Range		-40°C~+85°C	-40°C~+85°C
Storage Temperature Range		-40°C~+85°C	-40°C~+85°C
Power Consumption in Voltage Circuit		< 2W 10 VA	< 2W 10 VA
Power Consumption in Current Circuit		< 4 VA	< 4 VA
Real Time Clock Battery (Lithium)		3,6 V	3, 6 V
Meters Voltage Battery	Voltage	1.2 Ah	1, 2 Ah
	Capacity	3 V	3 V
Battery Lifetime		195 mAh	195 mAh
Battery Lifetime		10 Years /4 years shelf life	10 Years /4 years shelf life
Real Time Clock	Sensibility	0,5 sec./day	0,5 sec./day
	Temperature and Frequency	Yes	Yes
	Calibration	Yes	Yes
Communication		-/RS485 ops	- /RS485
Optical Communication		EN 62056- 21	EN 62056-21
Load Profile	Total Record Duration	30 days (optional 2 years)	30 days (optional 2 years)
	Channel Count	1	1
	Record Interval	1 hour	1 hour
Current Line Connection		Direct	Direct
LCD Display	Digit Count	9 (6+3) digit	9 (6+3) digit
	Lifetime	10 Year	10 Year
	Backlight	Yes	Yes
Menu		Constant	Constant
Current and Voltage Display	Yes	Yes	Yes
	for each Phase	Yes	Yes
Tariff	Count	4	4
Number of Time Slices		8	8
Log Record		Yes	Yes
Circuit Breaker		100 A optional	-



T510



T600 Smart Ready



T600 Smart meter

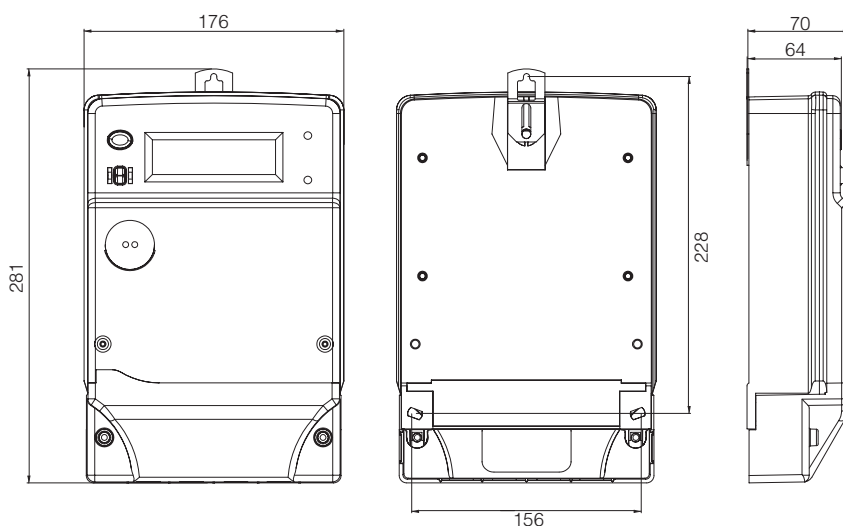
General Specifications

- ▶ Class B (1%) accuracy (TS EN 50470-1, TS EN 50470-3) when measuring active 3 phase energy.
- ▶ T600 series are smart ready meters which can be ordered with smart extension feature. It enables low initial investment in deployments of meters to be smart later with new technologies. Embedded communication modules for T600 are WPort2-IT, NPort-IT and Pport-G3-IT currently. LoRA and other technology solutions will be available in future.
- ▶ Splits day into 8 time slices; measuring consumed energy in 4 different tariffs; weekdays, Saturday and Sunday can be programmed separately.
- ▶ 10 year lifetime lithium battery protects time and date information against power cut.
- ▶ Keeps information on permanent memory for 100 years without the need for energy.
- ▶ LCD screen showing consumed energy according to tariffs and error notices.
- ▶ Battery weakening, real time clock corruption, absence of one of the phases, wrong phase sequence, reverse current direction main cover and terminal cover intervention can be seen on LCD as flashing symbols and with their code numbers.
- ▶ Supports TS EN 62056-21 protocol on optic port for communication and programming needs.
- ▶ An optional RS485 communication port is available for AMI/AMR applications.
- ▶ Daylight saving time (DST) configuration is supported.
- ▶ The information can also be read in power cut condition from LCD screen using button and via communication on optic port thanks to a secondary 10 year lifetime lithium battery.
- ▶ Keeps energy values of actual and previous 12 periods in memory.
- ▶ Maximum demand is calculated by its demand meter. Demand calculation period can be adjusted to 5, 10, 15, 30, 45 or 60 minutes.
- ▶ From 1 minute to 60 minute intermittently, up to 90 days long, 3 or 5 channels load profile.
- ▶ The meter has current transformers inside. These current transformers have lifetime accuracy guarantee and advantages like very low energy consumption and isolation from the mains
- ▶ Meters with X/5 current transformer models are available.
- ▶ Easy to read metering information even in the dark, thanks to the backlight of the LCD screen.
- ▶ All three phase meters are MID compliant.
- ▶ From 150V to 300V (3x220/380V) accurate metering.
- ▶ Operating temperature range is from -40°C to 85°C.
- ▶ Bidirectional models available.

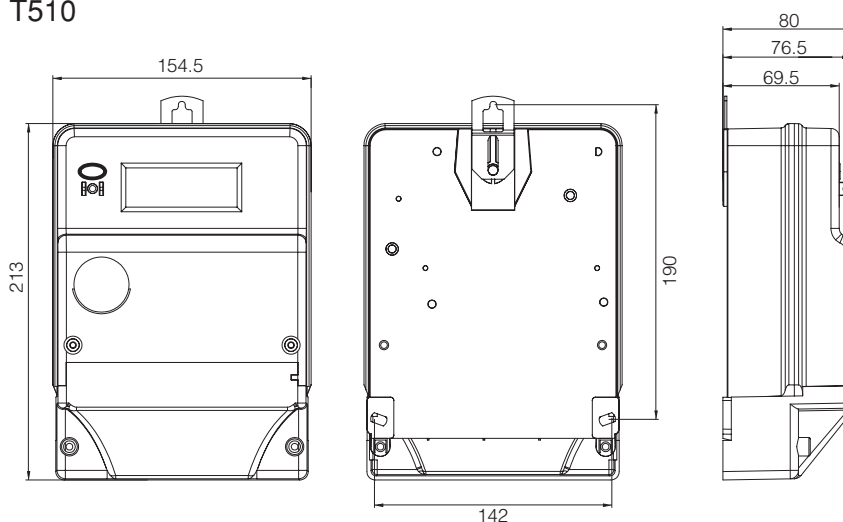
Threephase Electronic Electricity Meters

Outline Dimensions

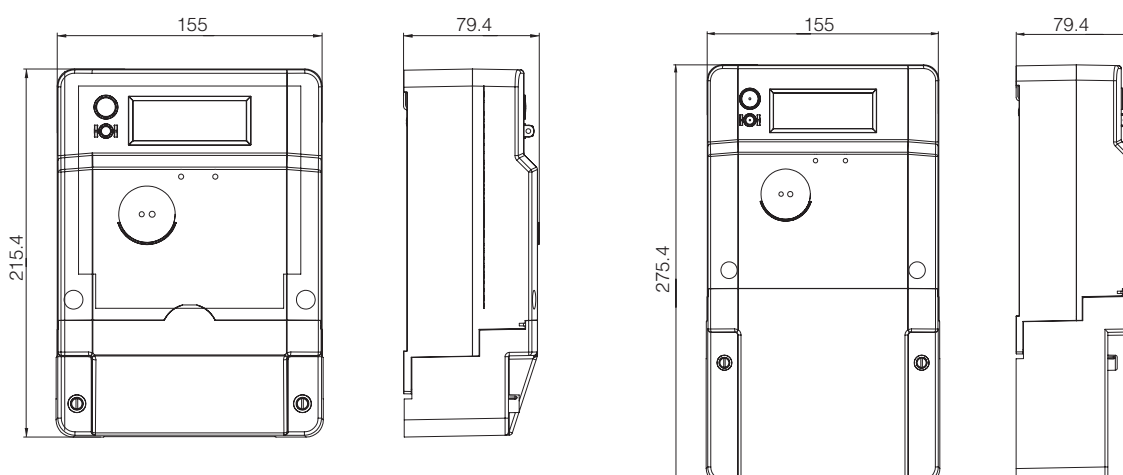
C520.K0Y / C520.K0T / C500.K0Y / C500.K0T



T510

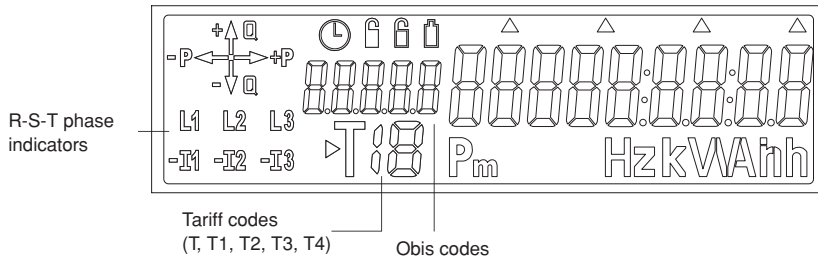


T600



LCD Screen

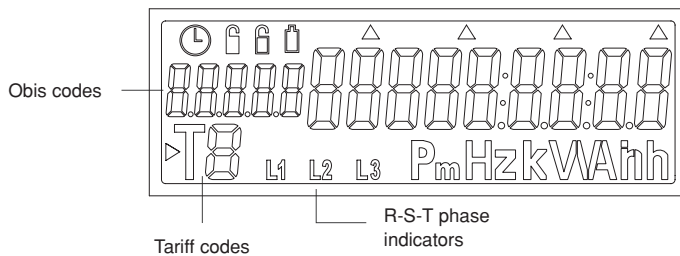
C500.KOY - C500. KOT



Coding Explanations

	Battery low alarm
	Real time clock error alarm
	Main cover opened alarm
	Terminal cover opened alarm
	Maximum demand indicator

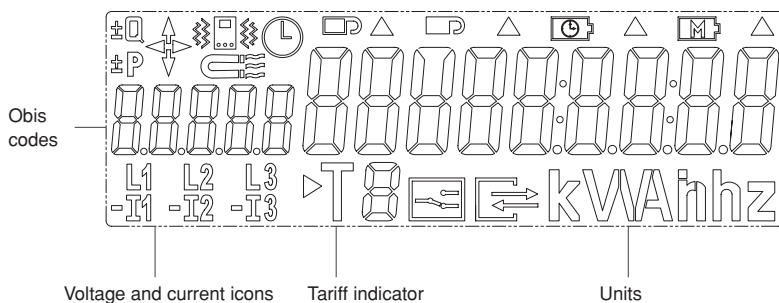
T510



Coding Explanations

	Battery low alarm
	Real time clock error alarm
	Main cover opened alarm
	Terminal cover opened alarm
	Maximum demand indicator

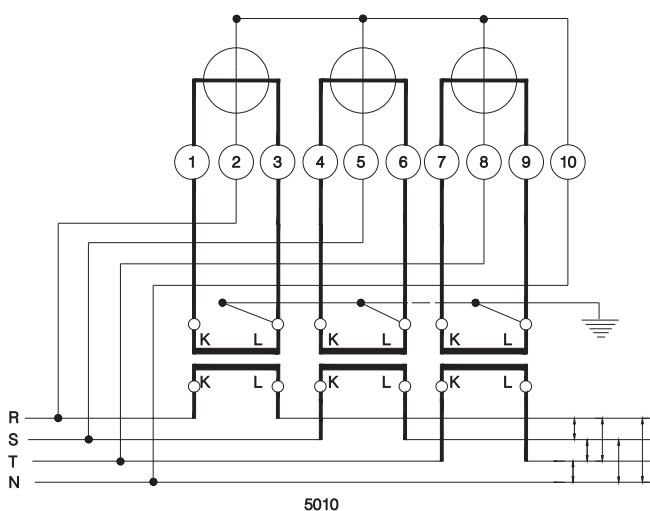
T600



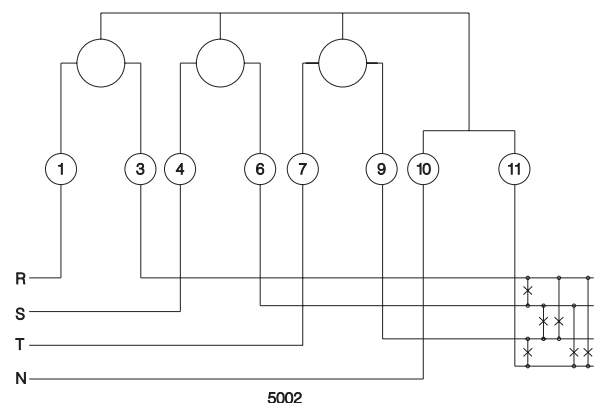
Coding Explanations

	Battery low alarm
	Real time clock error alarm
	Main cover opened alarm
	Terminal cover opened alarm
	It displays magnetic field detection

Current Transformer Connected Meters



Direct Connected Meters



Technical Specifications

Specifications		Model No		
		T510.2256 T600.2256	T510.2251 T600.2251	T510.2510
Nominal Voltage		3x220/380 V	3x220/380 V or 3x230/400V	3x220 / 380 V
Operating Voltage Range		150 V~300 V	150V~300V	150V~300V
Nominal (Base) Current		5 A	5A	X / 5 A
Maximum Current		60 A	100 A	10A
Minimum Current		250 mA	250 mA	50 mA
Starting Current		20 mA	20 mA / 20mA	10 mA
Meter Constant	Active	1000 imp/kWh	1000 imp/kWh	5000 imp/kWh
Accuracy (Class)	Active	B (Class 1)	B (Class 1)	B (Class 1)
Frequency		50 Hz \pm 10%	50 Hz \pm 20%	50 Hz \pm 20%
IP Protection Class		IP54	IP54	IP54
Protection Class		II	II	II
EMC Class		E2	E2	E2
Mechanical Class		M1	M1	M1
Humidity Ratio		<95%	<95%	<95%
Operating Temperature Range		-40°C~+85°C	-40°C ~ +85°C	-40°C ~ +85°C
Storage Temperature Range		-40°C~+85°C	-40°C ~ +85°C	-40°C ~ +85°C
Power Consumption in Voltage Circuit		< 2W 10 VA	< 2W 10 VA	< 2W 10 VA
Power Consumption in Current Circuit		< 4 VA	< 4 VA	< 4 VA
Real Time Clock Battery (Lithium)		3,6 V/1.2 Ah	3,6 V/ 1.2 Ah	3,6 V/ 1.2 Ah
Battery Lifetime		10 Years /4 Years Shelf life (Storage)	10 Years /4 Years Shelf life (Storage)	10 Years /4 Years Shelf life (Storage)
Real Time Clock	Accuracy	TS EN 61038	TS EN 61038	TS EN 61038
	Temperature and Frequency Calibration	Yes	Yes	Yes
DST Application		Yes	Yes	Yes
Communication	EN 62056-21	RS485 ops	RS485 (opt)	RS485 (opt)
Optical Communication		EN 62056- 21	EN 62056-21	EN 62056-21
Load Profile	Total Record Duration	60/2 Years	60/2 Years	60/2 Years
	Channel Count	3	3	3
	Record Interval	15 min	15 min	15 min
Current Line Connection		Direct	Direct	Current Transformer
LCD Display	Digit Count	9 (6+3) digit	9 (6+3) digit	9 (6+3) digit
	Lifetime	10 Year	10 Year	10 Year
	Backlight	-	Optional	Optional
	Menu	Constant	Constant	Constant
	Quadrant Display			
	VDEW 2.0	-	-	-
	Current and Voltage Display	Yes		
	for each Phase	Yes	-/Yes	-/Yes
Tariff	Count	4	4	4
	Holidays	Optional	-	-
Number of Time Slices		8	8	8
Season Structure		Optional	Optional	Optional
Alarm Relay		Optional	Optional	-
Magnetic Field Sensor		Optional	Optional	Optional
Harmonic Analysis		-	-	-
Circuit Breaker		Optional	Optional	-