Solenvis
experts in energy metering

Kamstrup 351
B-generation

Current transformer kWh meter 5(6)A

Accuracy class C (0.5)

Measurement in 4 quadrants

Load profile in 4 quadrants

DLMS/COSEM compliant

Measurement in up to 8 tariffs

Voltage quality measurement

Safe data logging of consumption and events

OBIS identification codes

Real time clock (RTC)

Transformer ratio up to 3000A/5A

Type approved according to:
Active positive energy
EN 50470-1, EN 50470-3

Active negative energy and reactive energy
IEC 62052-11, IEC 62053-21, IEC 62053-23

DATA SHEET

Application

Kamstrup 351B is a 3-phased current transformer electricity meter for registration of electric energy. The meter is full electronic without movable parts. Thus, shock and impact during transportation and mounting do not affect energy registration. Furthermore, measurements are correct, no matter the physical mounting direction.

Energy is determined by simultaneously measuring voltage and current. The voltage is measured by means of voltage transformers and the current is measured via current transformers.

The easily readable display scrolls automatically between readings, or readings can be changed manually by the consumer activating a push button. The required display readings as well as their order are configurable. In addition to being read from the display, data can be collected via the optical output or from the module area by means of a suitable communication module. The unique module area permits external changing of tariffs, pulse inputs and outputs, and configuration as well as connection of AMR and AMM modules.

From the factory the meter can be configured to measure both imported and exported energy. As it is constructed with three independent and galvanically separated measuring systems, the meter makes accurate measurements whether it measures on 1, 2, or 3 systems. The primary energy registration is saved in the integral data logger, which ensures good data history with its depth of 36.

The meter is fitted with a real time clock (RTC) with supercap backup.

The tariff control can change between maximum 8 tariffs. On the basis of preprogrammed timetables, the internal clock (RTC) can change the tariffs. Summer time/standard time and holidays can also affect the tariff shifts.

The meter is configurable and can be supplied from the factory with required functions. A minimum of handling during installation is thus secured. Furthermore, the meter can be configured to verification mode, among other things, which improves the resolutions of the energy indications, thereby reducing the duration of test and verification.

Kamstrup

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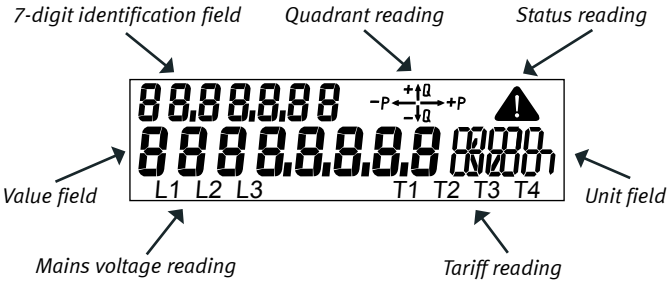
Functions

Display

The display is a liquid crystal display that makes it possible to read out the meter's registers. Available registers depend on the configuration.

The display configuration is constructed as two independent display lists: one for automatic shift function and one for manual shift function.

The display is constructed of segments as shown in the figure below.



Value field

This field is used for displaying register values.

7-digit identification field

OBIS code identification of the value in the value field.

Quadrant reading

The actual active quadrant is indicated.

Status reading

Indication of critical internal errors and magnetic influence.

Unit field

This field is used for displaying the units of registers in the value field.

Tariff reading

Displays the active tariff if tariffs are chosen.

Mains voltage reading

Indicates whether mains is connected.

The automatic shift function (scoll) changes between the selected readings in the required order every 10 secs. Historical data cannot be selected in the automatic shift function. Up to 16 readings can be selected.

Operation of the manual shift function is activated by pushing and releasing the push button. The order is optional, however, it is not possible to opt out the legal readings. Up to 40 readings can be selected.

The meter automatically returns from manual shift function to automatic scroll function two min. after the last activation of the push button.

Energy measurement

Energy is determined by simultaneously measuring voltage and current. The voltage is measured by means of voltage transformers and the current is measured via current transformers.

The meter has one current transformer per measuring system and one voltage transformer for voltage measuring; this ensures a complete galvanic separation. A switch mode supply feeds measuring circuits and main processor with voltage. Furthermore, the switch mode supply in combination with varistors and power resistors functions as an excellent transient protection.

The energy registration per measuring system is communicated to the meter's legal processor via the meter's internal bus system. After correction, the energies are summed in the main energy register.

Functions

Permanent memory

Measured and calculated data is safely stored in the memory (EEPROM). Data is stored by every change in energy register values.

Furthermore, the below mentioned values are stored at the end of a debiting period.

Debiting logger

Various	Energy registers	Power registers
Date	Active positive primary energy A+	Peak power P+max
Hour	Active negative primary energy A-	Peak power P+max Date
Hour counter	Reactive positive primary energy R+	Peak power P+max Hour
Debiting stop counter	Reactive negative primary energy R-	Accumulated peak power P+max acc
Power threshold counter (A+)	Active positive primary energy A+ Tariff 1	Peak power Q+max
Pulse input	Active positive primary energy A+ Tariff 2	Peak power Q+max Date
Current transformer ratio	Active positive primary energy A+ Tariff 3	Peak power Q+max Hour
	Active positive primary energy A+ Tariff 4	Accumulated peak power Q+max acc
	Reactive positive primary energy R+ Tariff 1	Peak power P+max Tariff 1
	Reactive positive primary energy R+ Tariff 2	Peak power P+max Tariff 1 Hour
	Reactive positive primary energy R+ Tariff 3	Peak power P+max Tariff 1 Date
	Reactive positive primary energy R+ Tariff 4	Peak power P+max Tariff 2
		Peak power P+max Tariff 2 Hour
		Peak power P+max Tariff 2 Date
		Peak power Q+max Tariff 1
		Peak power Q+max Tariff 1 Hour
		Peak power Q+max Tariff 1 Date
		Peak power Q+max Tariff 2
		Peak power Q+max Tariff 2 Hour
		Peak power Q+max Tariff 2 Date

Optical reading

To the left on the front of the electricity meter, an optical infrared sender and receiver is placed. This is constructed according to IEC 62056-21 (IEC 61107)

This optical reading can be used to read data or to configure e.g. display set-up and pulse figure.

By using METERTOOL for kWh meter, the meter's 2-display lists can be configured. Furthermore, the integration period, target date for debiting logger and debiting logging interval can be changed.

Finally, the pulse input on the meter can be scaled and tariffs can be changed.

It is not possible to change the meter's legal data without breaking the verification seal.

S0 pulse output

Emits pulses of active energy at 5000 pulses per kWh. The pulses are emitted synchronously with the LED.

The S0-output is specified according to the standard DIN 43864.

The maximum voltage, which may be connected to the S0 output, is 27 VDC (at 1 kΩ), and the maximum current, which may be drawn through the output, is 27 mA.

The pulse duration is 30 msecs.

Plug-in modules

If needed, Kamstrup 351 can be extended by a plug-in module without subsequent reverification.

The module area communicates with the electricity meter's microprocessor via an internal data bus from the module area.

This provides innumerable functional possibilities like e.g. extra pulse output, tariff modules, power supply modules and data communication via GSM/GPRS, PLC, radio or TCP/IP.

Approved measuring data

Approval	Norm
Type test according to	
– Active positive energy	EN 50470-1 EN 50470-3
– Reactive energy as well as active negative energy	IEC 62052-11 IEC 62053-21 IEC 62053-23

Approval	Norm
Terminal	DIN 43857
S0 pulse output	DIN 43864
Optical reading	IEC 62056-21 (IEC 61007)
OBIS codes	IEC 62056-61
OBIS / EDIS - codes	IEC 62056-61
Application layer in DLMS protocol	IEC 62056-53
Interface classes	IEC 62056-62
Data link layer	IEC 62056-72

Load profile

The load profile is configurable to 5, 15, 30 or 60 minutes following the integration period.
The numbers of profiles generated follow the selected energy type of the meter.

Logging depth in days:

Integration period Energy type	5 min.	15 min.	30 min.	60 min.
A+	37	110	225	450
A+/A-	26	80	160	320
A+/R+	26	80	160	320
A+/A-/R+/R-	17	50	100	200

Technical data

Measuring principle	
– Current	Single phased current measurement by current transformer
– Voltage	Single phased voltage measurement by voltage transformer
Nominal voltage Un	3x230 V ± 10 % (only for Aron meter) 3x230/400 V ± 10 %
Current Ib(Imax)	
– 251B / 351B / 451B	5(6)A
Class	Class 1 (IEC) / Class B (MID) Class 0.5 (IEC) / Class C (MID)
Nominal frequency fn	50 Hz ± 2 % or 60 Hz ± 2 %
Phase displacement	Unlimited, not for Aron meters, however
Operating temperature	-40°C - +70°C
Storage temperature	-40°C - + 85°C
Protective class	IP52
Protection class	II
Relative humidity	< 75% year's average at 21°C < 95% less than 30 days/year, at 25°C
Weight	
– 251B / 351B / 451B	Approx. 700 g
Application area	Indoors or outdoors in suitable meter cabinet

Internal consumption per phase

	251B	351B	451B
Current circuit	0.02 VA	0.02 VA	0.02 VA
Voltage circuit	0.3 W	0.3 W	0.3 W

Material	
– Cover	Transparent polycarbonate
– Base	Glass reinforced polycarbonate
Data storage	EEPROM > 10 years without voltage
Display	LCD, 7 mm-digit height (value and unit fields) LCD, 5 mm-digit height (identification readings) LCD, 3 mm-digit height (voltage and tariff readings)
Meter constant	10000 imp./kWh, 10000 imp./kvarh

Real Time Clock (RTC)

Accuracy	Typical 5 ppm at 23°C
Real time clock backup	
– Supercap life	> 10 years at normal operation
– Supercap operating hours	One week fully charged
– Charge duration	< 24 hours
S0 pulse diode	10000 imp./kWh, kvarh Pulse duration 30 ms ±10%
S0 pulse output	5000 imp./kWh Pulse duration 30 ms ±10%

Connection modules

The meter can be supplied or retrofitted with the following inputs and outputs from main circuit board by connection modules, without reverification.

Data/pulse out/pulse in	Serial RS232 communication, open collector, 300/1200 baud.
M-Bus	Remote reading via M-Bus system, both wired and wireless
Current Loop	Tariff control of 2 or 4 tariffs, via external 230 VAC.
PLC	Remote reading via power line communication.
TCP/IP	Remote reading via TCP/IP communication.
GSM/GPRS	Remote reading via GSM/GPRS communication. Supports SMS reading.
Radio	Remote reading via radio communication.

Connections

Main terminals

Size	2.5 – 10 mm² elevating connections
Screws	Ph 2 or (6x1) straight slot
Torque	2.5 – 3 Nm

Voltage outputs

Size	0.25 – 1.5 mm², 5 mm cable terminal forks
Screws	TORX Tx 10
Torque	1Nm

Transformer ratio

The transformer ratio in the Kamstrup 351B can be configured depending on the current transformer installed with the meter.

The ratio can be configured from 5/5A to 3000/5A without reverifying the meter.

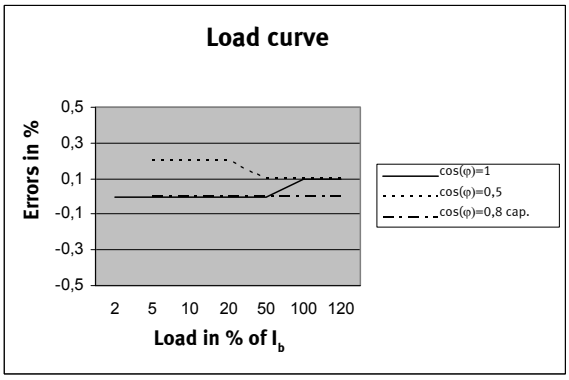
The primary energy is displayed in the display when entering the transformer ratio of the current transformer.

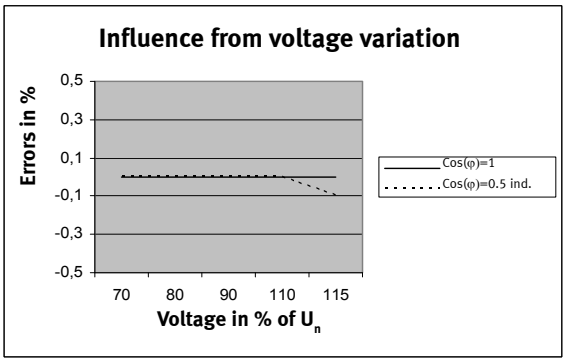
The secondary energy reading always indicates the total consumption for the energy types chosen.

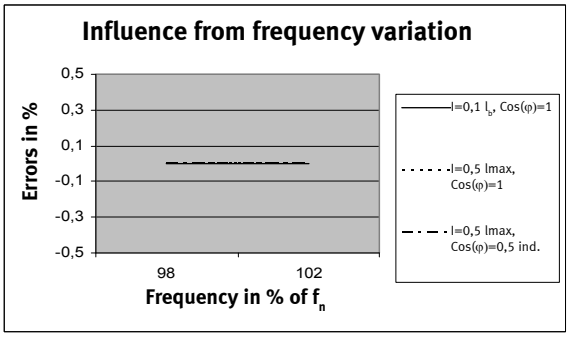
The configuration of the ratio can only be done via the module connection, which means that the utility sealing must be broken.

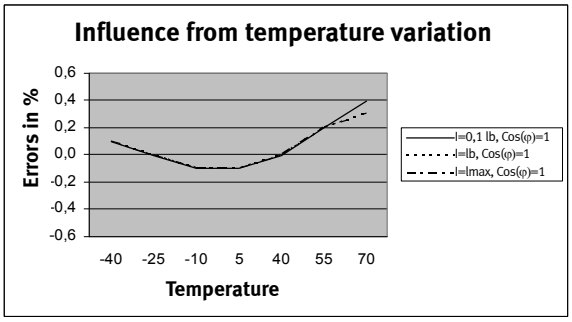
Changes in the ratio are stored in the EEPROM of the meter.

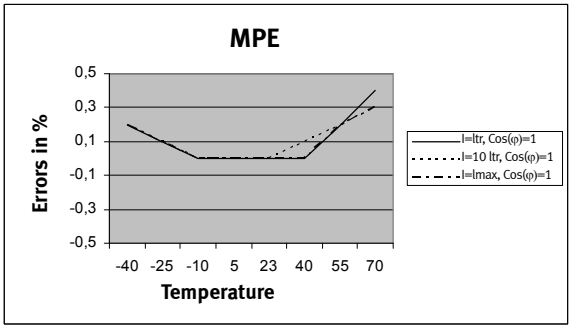
Typical accuracy charts











MPE (Maximum permissible error)

Composite error from:

– load
– voltage variation
– frequency variation
– temperature variation

Ordering details

	685-	X_1	X_2	X_3	X_4	X_5	X_6	X_7	$X_8X_9X_{10}$
X_1 Phases									
3x 230V (Aron) / 50 Hz		2							
3x 230/400V / 50Hz		3							
3x 230/400V / 60Hz		4							
X_2 Current									
In 5(6)A			5						
X_3 Class									
Class B (reactive class 2)				B					
Class C (reactive class 2)				C					
Class 1 (reactive class 2)				1					
Class 0.5 (reactive class 2)				5					
X_4 Generation									
B					B				
X_5 Energy type									
A+						1			
A+/A-						2			
A+/R+						3			
A+/A-/R+/R-						4			
X_6 Hardware option									
RTC with Supercap, DLMS and 2 W supply for module							3		
X_7 Tariff configurable									
No tariff								1	
2-tariff								2	
Configurable								3	
4-tariff								4	
$X_8X_9X_{10}$ Country code									
DK									010
RUS									025
ES									031
NO									040
LV									045
LIT									049
GB									050
A									055
CH-I									059
EST									061
CH-D									063
PL									064
CH-F									065
ISL									067
DE									070
NL									080
FIN									084
SE									090
SA									110

Configuration 1 (A-B-CCC-DD-E)

			A	B	C C C	D D	E
A Decimals in display							
7.0 Primary energy			1				
B LED configuration							
LED switched off without consumption				1			
LED switched on without consumption				2			
CCC Module, connection to module	**I/O 1**	**I/O 2**					
No module, OK	-	-			000		
S0-supply module, SK	-	Output			001		
Data/pulse module, RK	Input	Output			003		
M-bus module, MK	Input	-			005		
Tariff module, 2 tariff, 230 VAC, WK	Input	-			008		
Tariff module, 4 tariff, 230 VAC, CS, PK	Input	Input			018		
PLC module, router, ext. RTC, PO	Input	-			039		
IP101i, TCP/IP module, IK	Input	-			040		
Radio module, high power, QR	Input	-			043		
PLC Senea	Input	-			050		
GSM6i/RF, GSM7i	Input	-			053		
5A loadcontrol	Input	Output			058		
Wireless M-Bus	-	Output			064		
DD Input/output configuration	**I/O 1**	**I/O 2**	**Tariff control**				
No function	-	-	Communication			00	
4-tariff	Input	Input	Module			01	
4-tariff inverted	Input	Input	Module			02	
Pulse in/alarm in	Input	Input	Communication			03	
Pulse in/inv. alarm in	Input	Input	Communication			04	
Pulse in/A+ out	Input	Output	Communication			05	
R+ out/A+ out	Output	Output	Communication			06	
2-tariff/alarm in	Input	Input	Module			07	
2-tariff inverted/alarm in	Input	Input	Module			08	
2-tariff/alarm in inverted	Input	Input	Module			09	
2-tariff inverted/alarm inverted	Input	Input	Module			10	
2-tariff/A+ out	Input	Output	Module			11	
2-tariff inverted /A+ out	Input	Output	Module			12	
Pulse in/2-tariff	Input	Input	Module			13	
Pulse in/2-tariff inverted	Input	Input	Module			14	
Debiting pulse/--	--	--	Communication			15	
A- out/A+ out	Output	Output	Communication			16	
Load control / status	Output	Input	Communication			17	
Pulse in / Load tariff sync	Input	Output	Communication			18	
Pulse in inv / Load tariff sync	Input	Output	Communication			19	
Pulse in / Load tariff sync inv	Input	Output	Communication			20	
Pulse in inv / Load tariff sync inv	Input	Output	Communication			21	
4-tariff sync load control	Input	Output	Communication			22	
4-tariff sync load control inv.	Input	Output	Communication			23	
E Integration period							
5 min.							1
15 min.							2
30 min.							3
60 min.							4

A	Decimals displayed (locked)
B	LED configuration (locked)
CCC	Module
DD	Input/output configuration
E	Integration period

Configuration 2 (FFF-GG-HH-I)

	FFF	GG	HH	I
FFF Display configuration				
Contakt Kamstrup A/S				
GG Target date				
Externally controlled		00		
1.		01		
2.		02		
3.		03		
4.		04		
5.		05		
6.		06		
7.		07		
8.		08		
9.		09		
10.		10		
11.		11		
12.		12		
13.		13		
14.		14		
15.		15		
16.		16		
17.		17		
18.		18		
19.		19		
20.		20		
21.		21		
22.		22		
23.		23		
24.		24		
25.		25		
26.		26		
27.		27		
28.		28		
HH Debiting logging interval				
None (externally controlled)			00	
Monthly			01	
Every second month, January			02	
Every second month, February			03	
Every third month, January			04	
Every third month, February			05	
Every third month, March			06	
Half-yearly, January			07	
Half-yearly, February			08	
Half-yearly, March			09	
Half-yearly, April			10	
Half-yearly, May			11	
Half-yearly, June			12	
Yearly, January			13	
Yearly, February			14	
Yearly, March			15	
Yearly, April			16	
Yearly, May			17	
Yearly, June			18	
Yearly, July			19	
Yearly, August			20	
Yearly, September			21	
Yearly, October			22	
Yearly, November			23	
Yearly, December			24	
I Pulse output length/Alarm input				
30 msec pulse output length, no alarm				1
30 msec pulse output length, alarm				2
80 msec pulse output length, no alarm				3
80 msec pulse output length, alarm				4

FFF Display configuration –
Contact Kamstrup A/S for further information

GG Target date

HH Debiting logging interval

I Pulse output length/Alarm input

Configuration 3 (JJ-K-LL-M-NN)

	J J	K	L L	M	N N
JJ Disconnect set-up					
None	00				
K Not available					
None		0			
LL GMT					
0 London			00		
1 DK, DE, FR, ES, NO, SE			01		
2 FI			02		
3			03		
4			04		
5			05		
6			06		
7			07		
8			08		
9			09		
10			10		
11			11		
12			12		
-11			13		
-10			14		
-9			15		
-8			16		
-7			17		
-6			18		
-5			19		
-4			20		
-3			21		
-2			22		
-1			23		
M Pulse output (module port)					
None				0	
Pulses for secondary energy				1	
Pulses for primary energy				2	
NN Unit pulse input					
None					00
kWh					01
m³					02
L					03

JJ	Disconnect set-up
K	Not available
LL	GMT
M	Pulse output (module port)
NN	Unit pulse input

Configuration 4 (OOO-PPP-QQ)

	O	O	O	P	P	P	Q	Q
OOO Tariff control table								
Contact Kamstrup A/S		XXX						
PPP Summer/normal time table								
None					000			
001 EU					001			
QQ Load profile, based on:								
Primary energy								01
Secondary energy								02

OOO Tariff control table/ Table for Sundays and public holidays

PPP Summer/normal time table

QQ Load profile, based on:

Configuration 5 (RRR-SSS-T-U)

	R R R	S S S	T	U
RRR Not available				
None	000			
SSS Transformer ratio				
5A / 5A		001		
10A / 5A		002		
15A / 5A		003		
20A / 5A		004		
25A / 5A		005		
30A / 5A		006		
35A / 5A		007		
40A / 5A		008		
45A / 5A		009		
50A / 5A		010		
100A / 5A		020		
200A / 5A		040		
300A /5A		060		
400A / 5A		080		
500A / 5A		100		
1000A / 5A		200		
1500A / 5A		300		
2000A / 5A		400		
2500A / 5A		500		
3000A / 5A		600		
T Transformer ratio (configurable or locked)				
Configurable			1	
Locked			2	
U Debiting logger 2, based on:				
Daily values				1
Weekly values				2
Monthly values				3

RRR Not available

SSS Transformer ratio

T Transformer ratio (configurable or locked)

U Debitinglogger 2, based on:

Installation

Connect the meter in accordance with the installation diagram on the meter's type label.

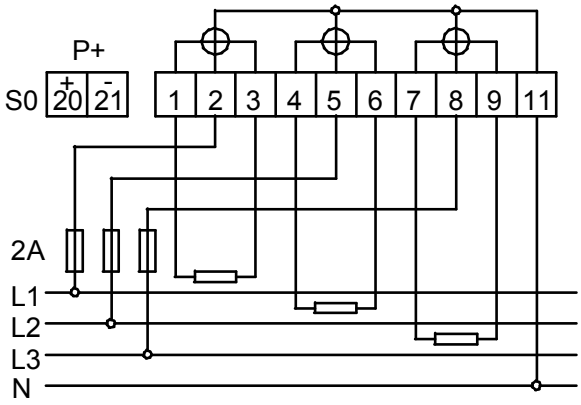
Depending on the configuration, a fixed value will be displayed, or the display will change automatically between selected indications every 10 seconds.

It is possible to change the display reading manually by activating the push button on the meter. The available readings will depend on the meter's configuration.

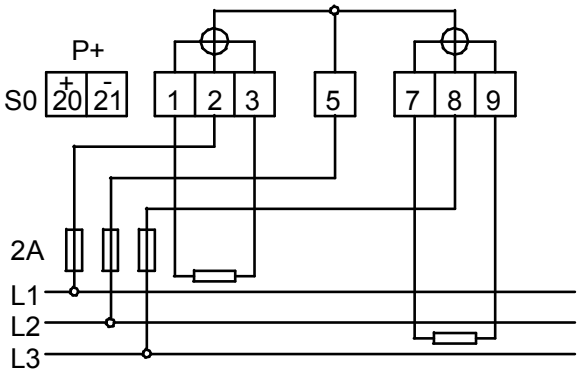
Connection diagrams

The valid connection diagram appears from the type label on the front of the meter.

3-phase, 4-wire



3-phase, 3-wire (Aron)



Guidelines for safety and installation

The meter shall only be used for measuring electrical energy and shall operate within the specified values only.

The meter must be switched off when working on it. It can be highly dangerous to touch the meter parts when the meter is switched on.

Therefore, the relevant security must be removed and kept in a place where it cannot be inserted in the meter by unauthorized persons.

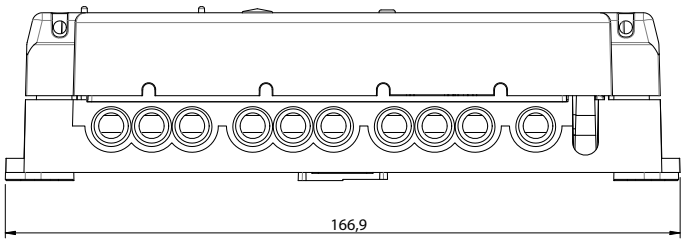
Current local standards, guidelines, regulations and instructions must be observed. Only authorized personnel is permitted to install electricity meters.

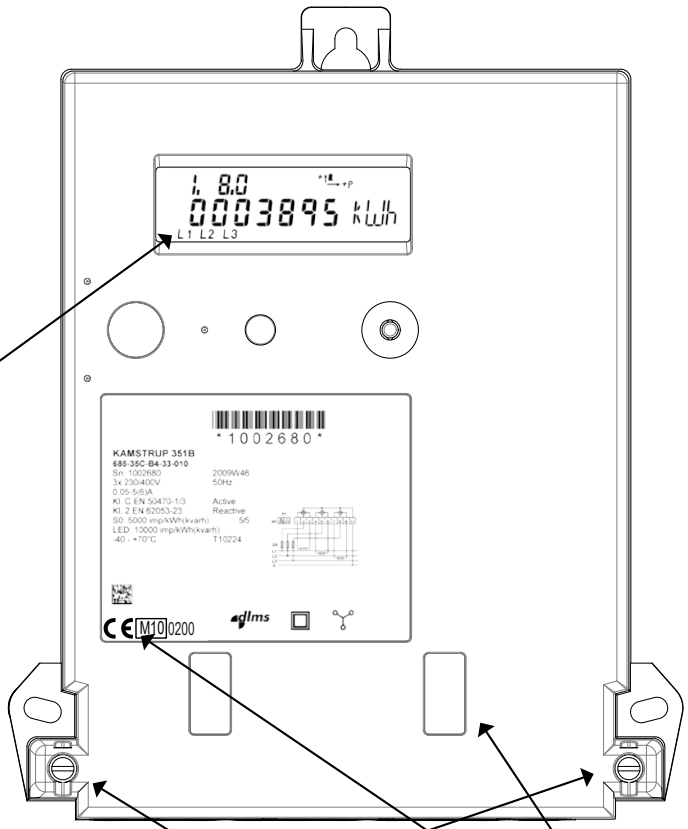
Meters for direct connection must be protected against short circuit by a security in accordance with the maximum current stated on the meter ≤ 10A.

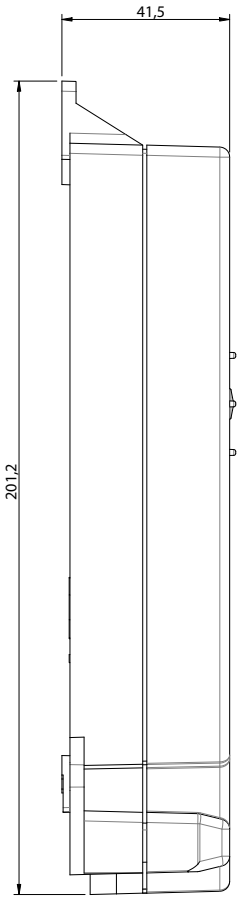
The meter constant LED flashes proportionally to the consumed active energy.

Only authorized personnel must break the utility sealing.

Sealing







Phase indication

Lights individually when power is on the phase.

The electricity meter's connection terminals can be sealed in the usual way through the sealing screws and the meter's top cover.

The electricity meter is provided with verification sealings from the factory, which are visible through the top cover.

Accessories

Modules	Letter ID	Article No.
S0-supply module	SK	68 50 001
Data/pulse module, relay output	RK	68 50 003
M-Bus module	MK	68 50 005
Tariff module, 2 tariffs, 230 VAC	WK	68 50 008
Tariff module, 4 tariffs, 230 VAC, current loop	PK	68 50 018
PLC module, router, external RTC	PO	68 50 039
IP101i, TCP/IP module	IK	68 50 040
Radio module, router, high power	QR	68 50 043
PLC Senea	PP	68 50 050
GSM6i/RF, GSM7i		68 50 053
5A load control module		68 50 058
Wireless M-Bus		68 50 064
Software		
Configuration software, METERTOOL for kWh meter		68 99 570
Various		
Long terminal cover 60 mm		30 26 226
Extra long terminal cover 100 mm		30 26 323
Optical reading head with 9-pole-t Dsub connector		66 99 102
Optical reading head with USB connector		66 99 099
DIN rail mounting		68 30 007
Extension for the top mounting ring		68 30 010