Electricity meters IEC/MID

Industrial and commercial

ZMD310AR/CR

E650 Series 4

Technical data

Building on its tradition of industrial meters, Landis+Gyr has developed the E650 Series 4, the latest generation of ZMD300 meters. These meters feature a new hardware platform, combining modern technology with proven functions.

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Revision history

Version	Date	Comments
a	11.09.2017	Updated to Series 4 based on Series 3 document D000030105: Added maximum current data. Updated measurement accuracy. Added power consumption data. Added product safety information. Added extension board 421x. Deleted extension board 046x. Added input, output, extension board and additional power supply information.
b	20.08.2021	Added indoor use only statement. Updated contact address.

Design

E650 is the most proven platform for industrial and commercial meters with more than 2 million meters installed in over 80 countries.

E650 is the result of a century Landis+Gyr experience in metering field combined with high quality requirements.

Range

E650 meters are the answer to a wide range of specific needs: from the reliable commercial meter to the complex measuring device with comprehensive additional functionality for sophisticated data acquisition and flexible tariff control at large industrial customers.

Application

E650 direct connected meter offer the extensive voltage and current settings to connect to low voltage power distribution systems.

Covering most of the energy measurement and calculation use cases, E650 meters record active and reactive energy consumption in all three-phase four-wire and three-phase three-wire networks with powerful recording capabilities.

For instance, 32 energy rate registers can be combined in many different ways through 17 measured quantities, per quadrants or per phases. Those registers can be controlled by various sources (Control inputs, time switch or communication signals). 24 maximum demand rate registers and 2 lowest power factor registers with time stamp are available as well.

8 operating time registers settable with various control signals could be used in various situations from fraud tentatives up to operation follow up.

All registers can be stored in stored value profiles that allows the storage of 84 values for one year with a weekly reset.

One out of 2 load profiles available can be used to record energy registers, last average demand, average power factor for billing purposes in the case of dynamic tariffs, for instance, with an integration period programmable according to real needs.

E650 has various options to detect fraud attempts from energy calculation modes up to hardware options as DC – strong field detection or integrated terminal cover detection switch with time stamped records in the event logbook and optional local signalisalisation over a special LED or arrows on the LCD display.

In the Time of Use part the utility can define up to 12 different week/season tables, 100 special days and 12 day tables that are controlled by 16 time switch control signals. Programmable passive tables and emergency settings allow to manage unexpected or future situations without any additional workload.

A comprehensive logbook offers the possibility to record more than 70 different events with time stamp in a circular table of 500 events.

E650 can be used for network monitoring with key average measurement RMS recordings (U, I, P, Q, PF, THD).

Up to 26 channels can be recorded in a second load profile with a different integration period programmable from 1 minute up to 60 minutes which allows an excellent network monitoring.

Most power quality events (over-/undervoltages, power failures) are logged in the event logs with number of event, timestamp and phase allowing an easy calculation of SAIDI (System Average Interruption Duration Index) parameters. Up to 30 events for power failures can be recorded in a dedicated event log.

All information (stored data profile, load profiles, logbook, dedicated event log) are stored in non-volatile memory, which prevents any losses of critical data information.

Through a control table, it is possible to combine various signal sources to control signals with Boolean operators.

E650 is able to achieve simple automatism without any additional components.

Such control capabilities could be used not only to control registers but outputs locally or remotely as well.

E650 have extended digitals input and outputs (static and relays) from 3 inputs/2 outputs as basis combined with a variety of option boards offering different capabilities.

Modular communication

Type AR/CR meters can be equipped with one of the following interface boards for data transmission: RS232, RS422, RS485 or CS.

The E650 can be easily connected through RS485 interface with a data concentrator as DC450.

Installation support

An indication of phase voltages, phase angles, rotating field and energy direction supports the installation.

Summary of the main features

	ZMD300
Measured quantities	
Energy (quadrants, phases, direction, reverse stop)	17 [1)]
Summation channels (virtual or digital input)	2 [1)]
Losses (OLA, NLA)	2 [1)]
Losses (I^2, U^2)	2 [1)]
Active energy harmonic distortion	2 [1)]
Rotating field direction	●
Energy and demand registers	
Energy rates	32
Total energy	27
Demand rates	24
Power factor (combimeters only)	2
Last average and current demand	2x10
Memory depth per value (84 values selectable)	53
Other registers	
Operating time	8
Diagnostic registers	41
Tariff module	
Season tables	12
Week tables	12
Day tables	12
Special days (set 26 years ahead)	100
Time of use control signals	16
Emergency settings	●
Active/passive time tables	●
Control table – 7 different control sources combinations to control 16 control signals	
Communication and digital inputs, TOU, voltage, power factor, demand, current monitoring, status, missing voltages	●
Load profiles (integration period from 1 up to 60 minutes)	
Independent load profiles	2 (1 optional)
Maximum number of captured channels	26
Data information storage (stored data profile, 2 load profiles, event log, dedicated event logs)	
Non-volatile memory (Flash memory)	●

[1)] Value recordable in dedicated load profile from 1 up to 60 minutes (typical 15 minutes).

	ZMD300
Instantaneous values	
Voltage phase-neutral	● [2]
Current	(I1, I2, I3, IN) [2]
Frequency	● [2]
Phase angles	● [2]
Active power (+/-)	(P1, P2, P3, P total) [2]
Reactive power (+/-)	(Q1, Q2, Q3, Q total) [2]
Power factor	PF1, 2, 3, (PF total) [1]
TTHD of active power	Sum [2]
TTHD of phase voltage	(Phase 1, 2, 3) [2]
TTHD of phase current	(Phase 1, 2, 3) [2]
TTHD of voltage	Sum [2]
TTHD of current	Sum [2]
Measurements monitoring with thresholds and records in event log	
Over-/undervoltage phase-neutral	●
Overcurrent (phase and neutral)	●
Event logs	
Maximum number of entries time stamped (s)	1000
Dedicated event log with snapshot	
Maximum number of entries time stamped (s)	30

[1] Value recordable in dedicated load profile from 1 up to 60 minutes (typical 15 minutes).

[2] Value recordable in another load profile from 1 up to 60 minutes (typical 1 minute).

E650 Series 4 ZMD300AR/CR – Technical Data

General

Voltage

Nominal voltage U_n	
	3 x 110/190 to 133/230 V
	3 x 220/380 to 240/415 V
Voltage range	80 to 115%

Frequency

Nominal frequency f_n	50 or 60 Hz
Tolerance	± 2%

IEC-specific data

Current

Base current I_b	selectable: 5, 10, 20 or 40 A
Maximum current I_{max}	
Metrological	selectable: 40, 60, 80,100 or 120 A
Overload	120 A
Short-circuit current <10ms	5000 A

Measurement accuracy

ZMD310xR	
Active energy, to IEC 62053-21	class 1
Reactive energy, to IEC 62053-24	class 1

Measurement behaviour

Starting current	
According to IEC	0.4% I_b
Typical	0.3% I_b

The start-up of the meter is controlled by the starting power and not by the starting current.

Starting power in M-circuit	single-phase

Nominal voltage x starting current

MID-specific data

Current (for class B)

Minimum current I_{min}	0.25, 0.5, 0.75, 1.0 A
Transitional current I_{tr}	0.5, 1.0, 1.5, 2.0 A
Maximum current I_{max}	60, 80, 100, 120 A

Measurement accuracy

	to EN 50470-3
ZMD310xR	class B

Measurement behaviour

Starting current I_{st}	
Class B: I_{st}	0.02, 0.04, 0.06, 0.08 A

General

Operating behaviour

Voltage failure (power-down)	
Bridging time	0.5 s
Data storage	after another 0.2 s
Switch off	after approx. 2.5 s
Voltage restoration (power-up)	
Function standby 3 phases	after 2 s
Function standby 1 phase	after 5 s
Detection of energy direction and phase voltage	after 2 to 3 s

Power consumption

Power consumption per phase in voltage circuit	
Without auxiliary supply	
3 x 110/190 to 133/230 V	0.7 W 1.5 VA
3 x 220/380 to 240/415 V	0.9 W 2.1 VA
Power consumption per phase in current circuit	
Phase current	10 A
Active power (typical)	0.03 W

Environmental influences

Temperature range	to IEC 62052-11
Metrological	–40 °C to +70 °C
Storage	–40 °C to +85 °C
Temperature coefficient	
Range	–40 °C to +70 °C
Average value (typical)	± 0.012% per K
at cosφ=1 (from 0.05 I_b to I_{max})	± 0.02% per K
at cosφ=0.5 (from 0.1 I_b to I_{max})	± 0.03% per K
Ingress protection	to IEC 60529
	IP 52 (without breakouts)
	This meter is intended for indoor use only.

Electromagnetic compatibility

Electrostatic discharges	to IEC 61000-4-2
Air discharge	15 kV
Contact discharge	8 kV

Electromagnetic RF fields	to IEC 61000-4-3
80 MHz to 2 GHz	10 and 30 V/m

Radio interference suppression according to IEC/CISPR 22	class B

Fast transient burst test	to IEC 61000-4-4
Current and voltage circuits under load according to IEC 62053-21/23	4 kV
Auxiliary circuits > 40 V	2 kV

Surge test	to IEC 61000-4-5
Current and voltage circuits	4 kV
Auxiliary circuits > 40 V	1 kV

Immunity to conducted disturbances	IEC 61000-4-6
150 kHz to 80 MHz	10 V

Immunity to conducted disturbances according to CENELEC TR 50579	2 to 150 kHz

Insulation strength

Insulation strength	4 kV at 50 Hz during 1 min.

Impulse voltage 1.2/50 µs	to IEC 62052-11
Current and voltage circuits	8 kV
Auxiliary circuits	6 kV

Protection class II to IEC 62052-11	⧈

Product safety

Normal environmental conditions	IEC 62052-31
Overvoltage category	III
Pollution degree	2
Max. operating altitude	2000 m
Utilisation category	UC3

Calendar clock

Calendar type	Gregorian or Persian (Jalaali)

Accuracy	< 5 ppm

Backup time (power reserve) meter	
With supercapacitor	> 20 days
Charging time for max. backup time	300 h
With battery (optional)	10 years
Battery type	CR-P2
Battery temperature range	–40 °C to +55 °C

Display

Characteristics	
Type	LCD (liquid crystal display)
Digit size in value field	8 mm
Number of digits in value field	up to 8
Digit size in index field	6 mm
Number of digits in index field	up to 8

Inputs (passive)

HLV, reinforced insulation by optocoupler	
Number on base meter	3
Number on extension board 420x	4
Number on extension board 240x	2
Control voltage U_S	100 to 240 V_{AC}
Range	80 to 115 %
Input current	< 0.8 mA at 230 V_{AC}

SELV, reinforced insulation by optocoupler	
Number on extension board 326x	3
Control voltage U_S	12 to 24 V_{DC}
Range	80 to 115 %
Input current	< 1.5 mA at 24 V_{DC}

Inputs (active)

SELV, reinforced insulation by optocoupler	
Active inputs, external closing contact required for activation (no control voltage necessary)	
Number on extension board 421x	4
Open circuit voltage (contact open)	< 5 V
Short-circuit current (contact closed)	< 5 mA
Max. contact resistance	< 500 Ohm

Outputs (solid-state relay)

HLV or SELV, reinforced insulation by solid-state relay	
Voltage	12 to 240 $V_{AC/DC}$
Max. current for each output	100 mA_{RMS}
Max. switching frequency (pulse length 20 ms)	25 Hz
Contact resistance (typical)	13–18 Ohm

Base meter	
Number	2
Max. current all outputs together	200 mA $_{RMS}$
Derating above 45 °C ambient	0.8 mA / °C

Extension board 420x	
Number	2
Max. current all outputs together	200 mA $_{RMS}$
Derating above 45 °C ambient	0.8 mA / °C

Extension board 240x	
Number	4
Max. current all outputs together	200 mA $_{RMS}$
Derating above 45 °C ambient	0.8 mA / °C

Extension board 060x	
Number	6
Max. current all outputs together	200 mA $_{RMS}$
Derating above 45 °C ambient	0.8 mA / °C

Extension board 045x	
Number	4
Max. current all outputs together	200 mA $_{RMS}$
Derating above 45 °C ambient	0.8 mA / °C

Extension board 047x	
Number	4
Max. current all outputs together	200 mA $_{RMS}$
Derating above 45 °C ambient	0.8 mA / °C

Mechanical relay

HLV, reinforced insulation, intended to control auxiliary devices	
Number on extension board 326x	2
Number on extension board 421x	2
Max. voltage	250 V_{AC}
Max. current for each relay	8 A
Max. current all relays together	8 A
Max. operations with cosφ ~1	100 000
Contact resistance (typical)	10 mOhm
Withstand across open contact	1000 V_{AC}
Withstand between contacts	1500 V_{AC}

Outputs (optical)

Optical test outputs	active and reactive energy
Type	red LED
Number	2
Meter constant	selectable

Communication interface

Optical interface	to IEC 62056-21
Type	serial, asynchronous, half-duplex
Max. transmission rate	9600 bps
Protocols	IEC 62056-21 and DLMS

RS232 interface	to DIN 61393 / DIN 66259
Type	serial, asymmetric, asynchr., bidirectional
Operating mode	transparent
Nominal voltage	±9 V_{DC}
Maximum voltage	±15 V_{DC}
Minimum voltage	±5 V_{DC}
Max. transmission rate	9600 bps
Protocols	IEC 62056-21 and DLMS
Max. conductor length depending on environment and connecting cable	30 m
Insulation resistance to meter	4 kV_{AC}/50 Hz, 1 min
Creep distance	≥ 6.3 mm

RS485 interface	to ISO-8482
Type	serial, symmetrical, half-duplex
Nominal voltage range	–7 to +12 V_{DC}
Binary 1 state	difference voltage < –0.2 V
Binary 0 state	difference voltage > 0.2 V
Max. transmission rate	9600 bps
Max. number of devices	32
Protocols	IEC 62056-21 and DLMS
Max. conductor length depending on environment and connecting cable	≤ 1000 m
Insulation resistance to meter	4 kV_{AC}/50 Hz, 1 min
Creep distance	≥ 6.3 mm

CS interface	to IEC 62056-21 / DIN 66258
Type	serial, bidirectional, current interface
Nominal voltage without load	24 V_{DC}
Max. voltage without load	30 V_{DC}
Binary 1 state	10–30 mA
Binary 0 state	≤ 2 mA
Max. transmission rate	9600 bps
Protocols	IEC 62056-21 and DLMS
Insulation resistance to meter	4 kV_{AC}/50 Hz, 1 min
Creep distance	≥ 6.3 mm

RS422 interface	to ISO-8482
Type	serial, symmetric, asynchronous, bidirectional
Nominal voltage range	–3 to +3 V_{DC}
Binary 1 state	difference voltage < –0.2 V
Binary 0 state	difference voltage > 0.2 V
Max. transmission rate	9600 bps
Max. number of devices	10
Protocols	IEC 62056-21 and DLMS
Max. conductor length depending on environment and connecting cable	1000 m
Insulation resistance to meter	4 kV_{AC}/50 Hz, 1 min
Creep distance	≥ 6.3 mm

Additional power supply (optional)

On extension board 045x	
HLV, reinforced insulation	
Nominal voltage range	100 to 240 $V_{AC/DC}$
Tolerance	80 to 115% U_n
Frequency	50 or 60 Hz

VIN = 80 V	
Max. power consumption [1)]	1.8 W / 3.2 VA
Max. current	40 mA

VIN = 276 V	
Max. power consumption [1)]	2.1 W / 5.3 VA
Max. current	20 mA

On extension board 047x	
SELV, reinforced insulation	
Nominal voltage range	12 to 48 V_{DC}
Tolerance	80 to 115% U_n
Max. power consumption [1]	1.7 W
Max. current (V_{IN} = 9.6 V)	170 mA

On extension board 326x	
SELV, reinforced insulation	
Nominal voltage range	12 to 24 V_{DC}
Tolerance	80 to 115% U_n
Max. power consumption [1]	1.7 W
Max. current (V_{IN} = 9.6 V)	170 mA

[1] Power consumption without mains supply. If auxiliary and mains supply are available, the consumption is shared arbitrarily.

Weight and dimensions

Weight	approx. 1.5 kg

External dimensions	
Width	177 mm
Height (with short terminal cover)	244 mm
Height (with standard terminal cover)	281.5 mm
Height (with extended hook)	305.5 mm
Depth	75 mm

Suspension triangle	
Height (with extended hook)	230 mm
Height (suspension eyelet open)	206 mm
Height (suspension eyelet covered)	190 mm
Width	150 mm

Terminal cover	
Short	no free space
Standard (opaque, transparent)	40 mm free space
Long (opaque, transparent)	60 mm free space
GSM	60 mm free space
ZxB type 80 mm	80 mm free space
ZxB type 110 mm	110 mm free space
ADP2 adapter	

Housing material

Polycarbonate, partly glass-fibre reinforced

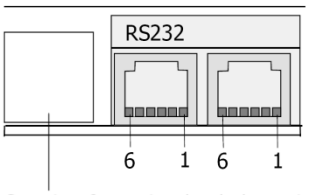
Environmental protection

RoHS compliant design

Connections

Phase connections	
Type	screw type terminals
Diameter for I_{max} ≤ 80 A	8.5 mm
Diameter for I_{max} > 80 A	9.5 mm
Min. conductor cross-section	10 mm^2
Max. cross-section cable	35 mm^2 (up to 120 A)
Max. cross-section strand	25 mm^2 (up to 80 A)
Screw head	Pozidriv Combi No. 2
Screw dimensions	M6 x 14
Screw head diameter	≤ 6.6 mm
Tightening torque (min…max)	3…5 Nm

RS232 interface	on interface board c1
Type	RJ 12

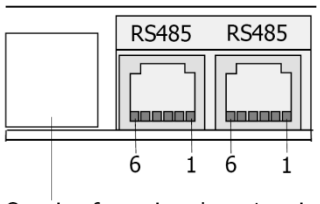


Pin allocation RS232:
1 not used
2 TxD
3 GND
4 not used
5 RxD
6 not used

Opening for spring-loaded terminal
(not fitted on type c1 interface board)

The two RJ12 jacks of the RS232-interface are internally looped. However, only one of them is connected (point-to-point connection).

RS485 interface	on interface board c2
Type	RJ 12

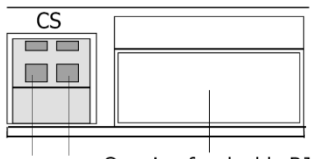


Pin allocation RS485:
1 GND
2 UP (Data a)
3 UN (Data b)
4 UN (Data b)
5 UP (Data a)
6 GND

Opening for spring clamp terminal
(not fitted on type c2 interface board)

The two RJ12 jacks of the RS485 interface are looped internally to permit connection of several meters.

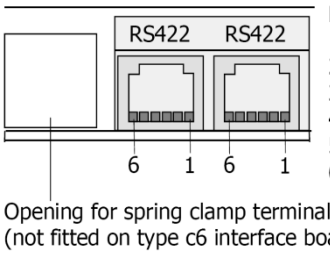
CS interface	on interface board c3
Type	screw type terminals



Opening for double RJ12 jack
(not fitted on type c3 interface board)

RS422 interface on interface board c6

Type RJ 12



Pin allocation RS422:
1 GND
2 UP (Data a)
3 UN (Data b)
4 UN (Data z)
5 UP (Data y)
6 GND

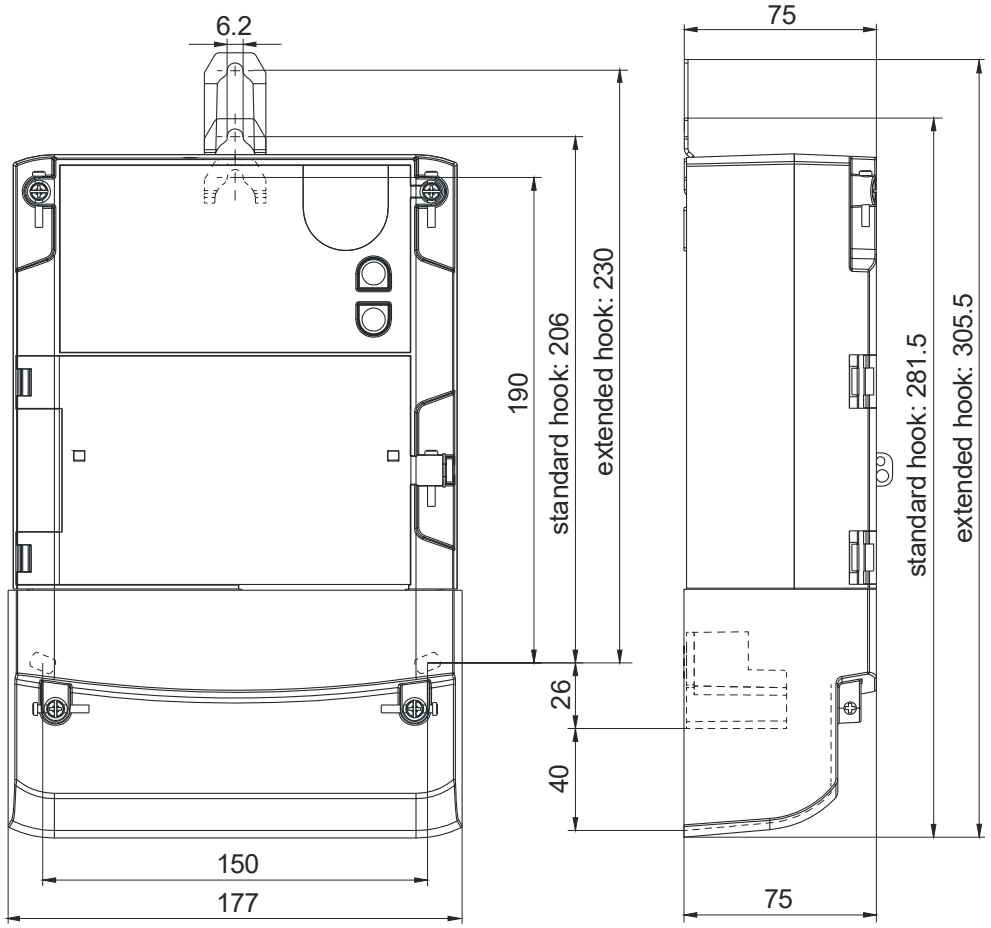
The two RJ12 jacks of the RS422-interface are looped internally to permit a connection of several meters.

Other connections

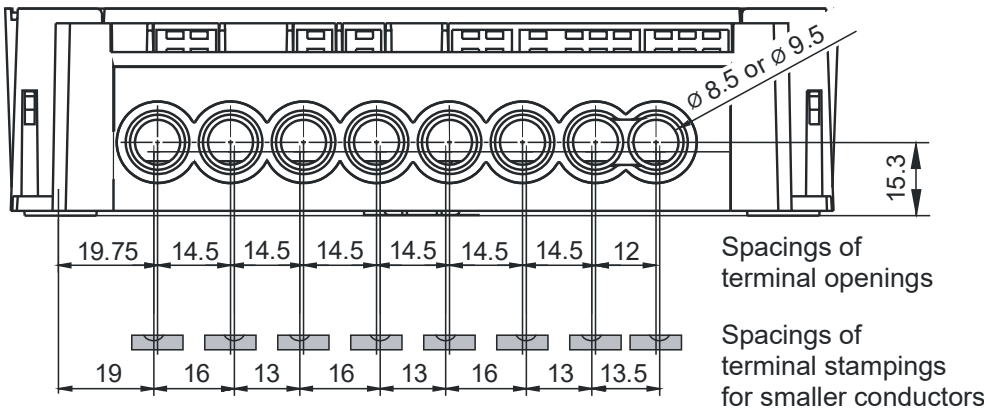
Type screwless spring-type terminal

Max. current of voltage outputs 1 A

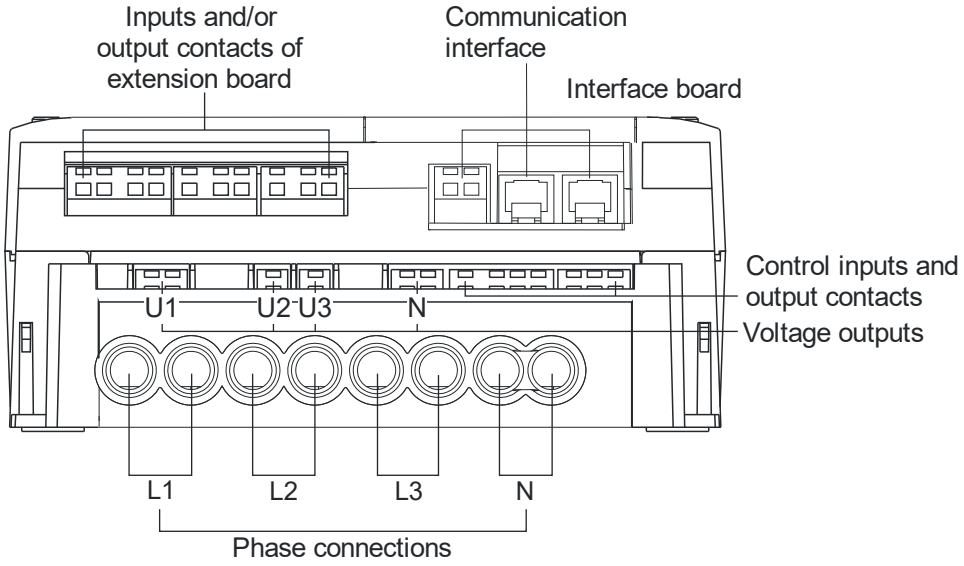
Meter dimensions (standard terminal cover)



Terminal dimensions



Terminal layout



Type designation **ZMD 3 10 C R 44 4207 .c1 S4**

Network type

ZFD 3-phase 3-wire network (F-circuit)
ZMD 3-phase 4-wire network (M-circuit)

Connection type

3 Direct connection

Accuracy class

10 Active energy class 1 (IEC), B (MID)
05 Active energy class 0.5 S (IEC), C (MID)

Measured quantities

C Active and reactive energy
A Active energy

Construction

R With integrated interface

Tariffication

21 Energy rates, external rate control via control inputs
24 Energy rates, internal rate control via time switch (additionally possible via control inputs)
41 Energy and demand rates, external rate control via control inputs
44 Energy and demand rates, internal rate control via time switch (additionally possible via control inputs)

All versions with 3 control inputs and 2 output contacts

Additional functions

000x No extension board
060x 6 outputs
240x 2 control inputs, 4 outputs
420x 4 control inputs, 2 outputs
421x 4 active inputs, 2 relay outputs 8 A
326x 3 control inputs, 2 relay outputs, auxiliary power supply 12 to 24 V_{DC}
045x 4 outputs, auxiliary power supply 100 to 240 V_{AC}/V_{DC}
047x 4 outputs, auxiliary power supply 12 to 48 V_{DC}

xxx0 No additional functions
xxx7 Load profile

Integrated interface (R types only), Series 4

c1 RS232 interface
c2 RS485 interface
c3 CS interface
c6 RS422 interface

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