Electricity Meters IEC/MID

Industrial and Commercial

ZMD402AT/CT, ZFD402AT/CT

E650 Series 4

Technical Data

Building on its tradition of industrial meters, Landis+Gyr has developed the E650 Series 4, the latest generation of ZxD400 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 D000030718: 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.

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 offers high flexibility to connect to different power system distributions from low up to high voltage levels thanks to various voltage and current settings.

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 max 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 AT/CT type meters are equipped with modular communication units which provide the right choice for the best data channel at all times. Plug & Play modules also offer you full freedom of choice for deployment of new communication technologies.

Installation support

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

Summary of the main features

	ZMD400	ZFD400
Measured quantities		
Energy (quadrants, ph, 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).

	ZMD400	ZFD400
Instantaneous values		
Voltage phase-neutral or phase-ground	● [2]	–
Voltage phase-phase	–	● [2] (U1-2, U2-3 only)
Current	(I1, I2, I3, IN) [2]	(I1, I3) [2]
Frequency	● [2]	● [2]
Phase angles	● [2]	–
Active power (+/-)	(P1, P2, P3, P total) [2]	P total [2]
Reactive power (+/-)	(Q1, Q2, Q3, Q total) [2]	Q total [2]
Power factor	PF1, 2, 3, (PF total) [1]	PF total [2]
TTHD of active power	Sum [2]	Sum [2]
TTHD of phase voltage	(Phase 1, 2, 3) [2]	(Phase 1, 3) [2]
TTHD of phase current	(Phase 1, 2, 3) [2]	(Phase 1, 3) [2]
TTHD of voltage	Sum [2]	Sum [2]
TTHD of current	Sum [2]	Sum [2]
Measurements monitoring with thresholds and records in event log		
Over-/undervoltage phase-neutral	●	–
Over-/undervoltage phase-phase	–	●
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	
Primary or secondary values	●	
SMS alarm capabilities		
Alarm numbers of digital inputs	1 max.	
Alarms on event (SMS)	●	

[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 ZxD402AT/CT – Technical Data

General

Voltage

Nominal voltage U_n ZMD402xT
3 x 58/100 to 69/120 V
3 x 110/190 to 133/230 V
3 x 220/380 to 240/415 V
Extended operating voltage range
3 x 58/100 to 240/415 V

Nominal Voltage U_n ZFD402xT
3 x 100 to 120 V
3 x 220 to 240 V
Extended operating voltage range
3 x 100 to 415 V (mid-point earthed)

Voltage range	80 to 115%

Frequency

Nominal frequency f_n	50 or 60 Hz
Tolerance	± 2%

IEC-specific data

Current

Nominal current I_n	0.3 A, 1 A, 2 A, 5 A, 5||1 A

Maximum current I_{max}	
Metrological for I_n = 0.3 A	1.2 A
Metrological for I_n = 1 A	1.2 A, 2 A, 6 A, 10 A
Metrological for I_n = 5 A	6 A, 10 A
Metrological for I_n = 5||1 A	6 A
Overload for I_n = 0.3 A, 1 A, 5 A, 5||1 A	12 A
Overload for I_n = 20 A	20 A

Short-circuit current	0.5 s with 20 x I_{max}

Measurement accuracy

ZxD402xT	
Active energy, to IEC 62053-22	class 0.2 S
Reactive energy, to IEC 62053-24	class 0.5 S

Measurement behaviour

Starting current ZxD402xT	
According to IEC	0.1% I_n
Typical	0.07% I_n
5||1 A	as 1 A meter

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	

Starting power in F-circuit	all phases
Nominal voltage x starting current x √3	

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 communication unit, without auxiliary supply	
3 x 58/100 to 69/120 V	0.4 W 0.7 VA
3 x 110/190 to 133/230 V	0.5 W 1.0 VA
3 x 220/380 to 240/415 V	0.7 W 1.7 VA
3 x 58/100 to 240/415 V	0.7 W 1.7 VA

Total power consumption in voltage circuit	
Without communication unit, without auxiliary supply	
3 x 100 to 120 V	1.0 W 2.1 VA
3 x 220 to 240 V	1.2 W 3.0 VA
3 x 100 to 415 V	1.9 W 5.4 VA

Power consumption per phase in voltage circuit	
With communication unit, without auxiliary supply	
3 x 58/100 to 69/120 V	1.8 W 2.7 VA
3 x 110/190 to 133/230 V	1.8 W 3.5 VA
3 x 220/380 to 240/415 V	1.9 W 4.1 VA
3 x 58/100 to 240/415 V	1.9 W 4.1 VA

Total power consumption in voltage circuit	
With communication unit, without auxiliary supply	
3 x 100 to 120 V	5.4 W 5.4 VA
3 x 220 to 240 V	5.4 W 10.5 VA
3 x 100 to 415 V	5.8 W 12.3 VA

Power consumption per phase in current circuit			
Phase current	1 A	5 A	10 A
Active power (typical)	5 mW	0.125 W	0.5 W
Apparent power (typical)	5 mVA	0.125 VA	0.5 VA

Environmental influences

Temperature range	to IEC 62052-11
Metrological	–10 °C to +45 °C
Operation limit	–25 °C to +55 °C
Storage	–40 °C to +85 °C

Temperature coefficient	
Range	–10 °C to +45 °C
Average value (typical)	± 0.008% per K
at cosφ=1 (from 0.05 I_b to I_{max})	± 0.01% per K
at cosφ=0.5 (from 0.1 I_b to I_{max})	± 0.02% per K

Ingress protection to IEC 60529	IP51

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

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

Communication units
Exchangeable communication units for various applications.

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)]	5.6 W / 8.4 VA
Max. current	105 mA

VIN = 276 V	
Max. power consumption [1)]	5.6 W / 12.4 VA
Max. current	45 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)]	5.2 W
Max. current (V_{IN} = 9.6 V)	530 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)]	5.2 W
Max. current (V_{IN} = 9.6 V)	530 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

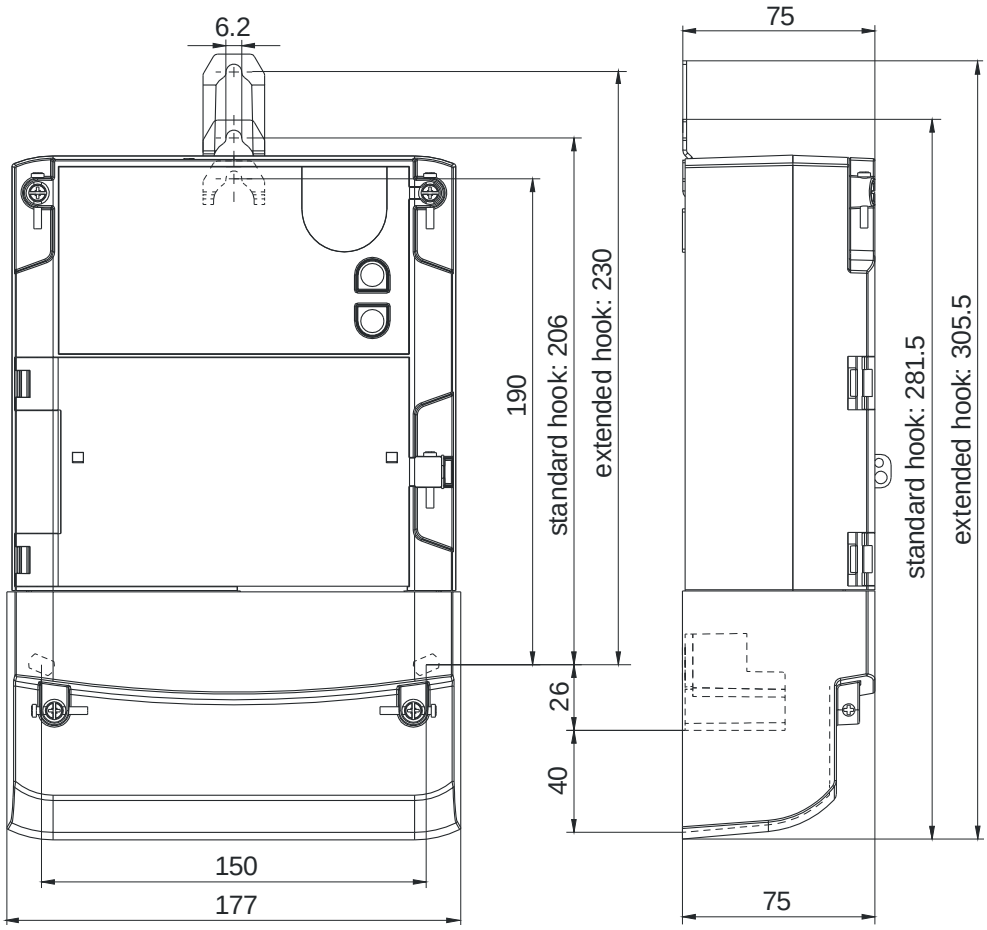
RoHS compliant design

Connections

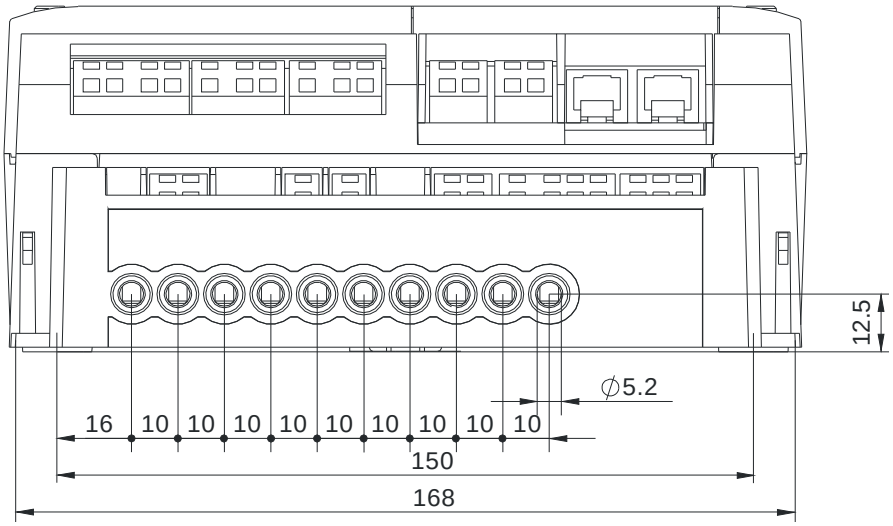
Phase connections	
Type	screw type terminals
Diameter	5.2 mm
Recommended conductor cross-section	1.5 to 6 mm^2
Screw head	Pozidrive Combi No. 2
Screw dimensions	M4 x 8
Screw head diameter	≤ 5.8 mm
Tightening torque (min…max)	1.0…1.7 Nm

Other connections	
Type	screwless spring-type terminal
Max. current of voltage outputs	1 A

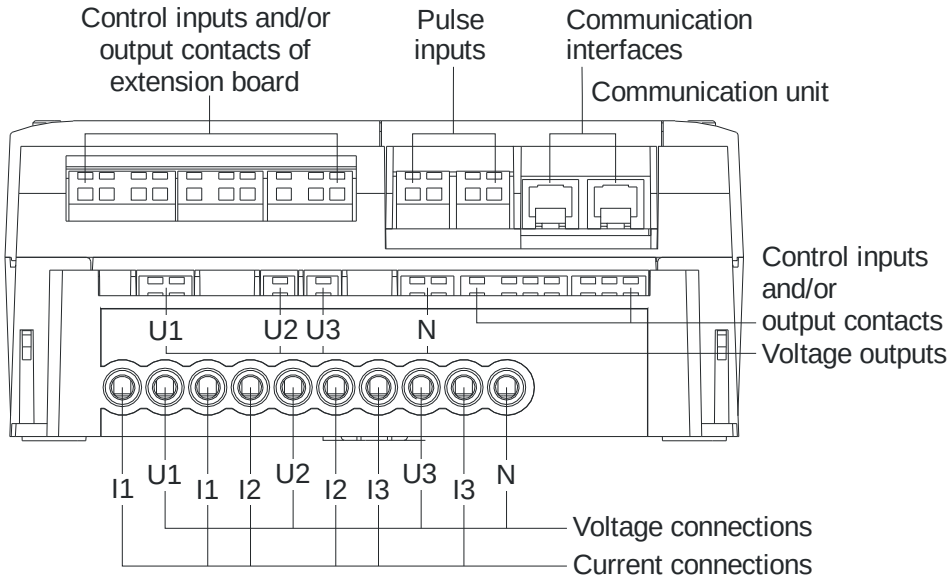
Meter dimensions (standard terminal cover)



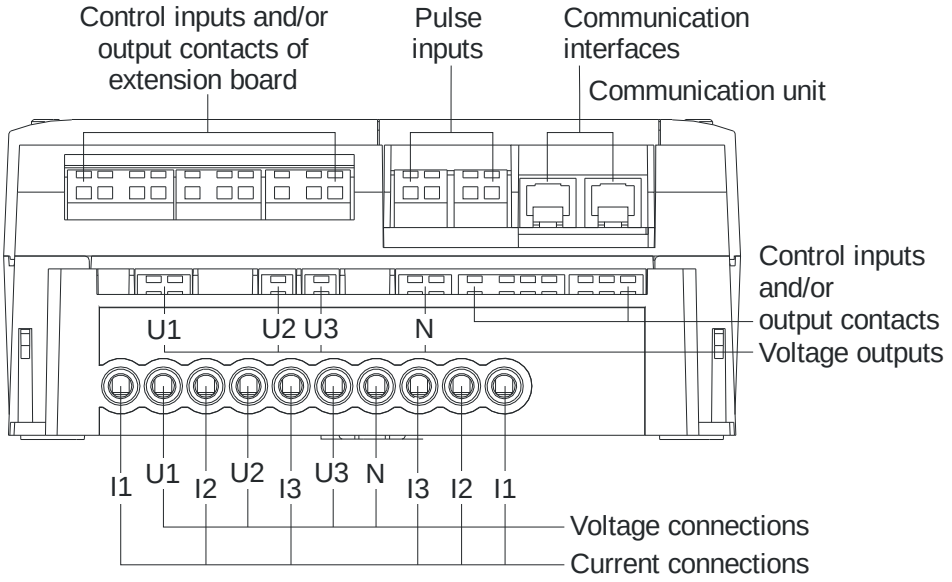
Terminal dimensions



Terminal layout according to DIN



Symmetrical terminal layout (optional, ZMD402 only)



Type designation **ZMD 4 02 C T 44 4207 S4**

Network type

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

Connection type

4 Transformer operated

Accuracy class

02 Active energy class 0.2 S (IEC)

Measured quantities

C Active and reactive energy
A Active energy

Construction

T With exchangeable communication units

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 8A
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
xxx2 DC magnet detection
xxx7 Load profile
xxx9 DC magnet detection and load profile (integrated terminal cover switch option only available in this configuration)

Series 4

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manage energy better