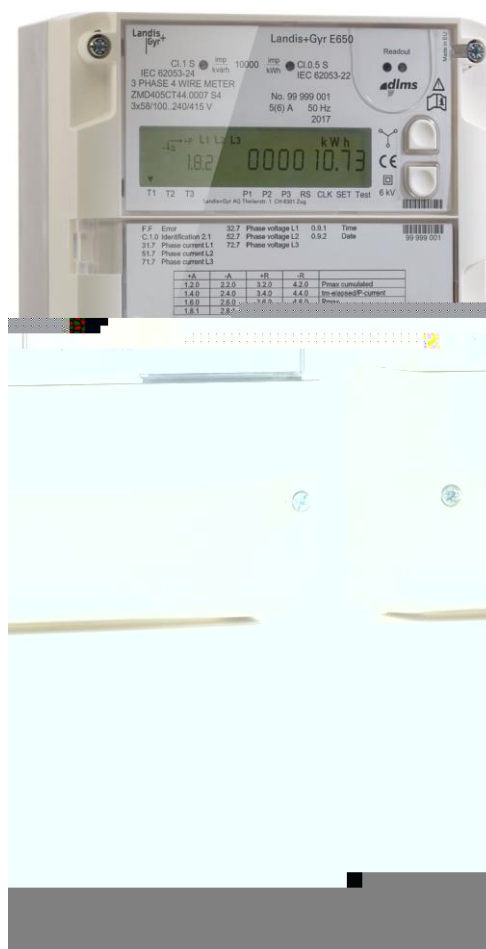


ZMD405AT/CT, ZFD405AT/CT, ZMD410AT/CT, ZFD410AT/CT

## 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.

Date: 11.09.2017

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## Revision history

| Version | Date       | Comments  |
|---------|------------|---|
| a       | 11.09.2017 | Updated to Series 4 based on Series 3 document D000030106:<br>Added maximum current data.<br>Updated measurement accuracy.<br>Added power consumption data.<br>Added product safety information.<br>Added extension board 421x.<br>Deleted extension board 046x.<br>Added input, output, extension board and additional power supply information. |

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## 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 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 signalisation 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 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 |
|--|------------------|--------|
| <b>Measured quantities</b>   |                  |        |
| Energy (quadrants, ph, direction, reverse stop)  | 17 <sup>1)</sup> |        |
| Summation channels (virtual or digital input)  | 2 <sup>1)</sup>  |        |
| Losses (OLA, NLA)  | 2 <sup>1)</sup>  |        |
| Losses ( $I^2$ , $U^2$ )   | 2 <sup>1)</sup>  |        |
| Active energy harmonic distortion  | 2 <sup>1)</sup>  |        |
| Rotating field direction   | •                |        |
| <b>Energy and demand registers</b>   |                  |        |
| 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               |        |
| <b>Other registers</b>   |                  |        |
| Operating time   | 8                |        |
| Diagnostic registers   | 41               |        |
| <b>Tariff module</b>   |                  |        |
| 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   | •                |        |
| <b>Control table – 7 different control sources combinations to control 16 control signals</b>                      |                  |        |
| Communication and digital inputs, TOU; voltage, power factor, demand, current monitoring, status, missing voltages | •                |        |
| <b>Load profiles (integration period from 1 up to 60 minutes)</b>  |                  |        |
| Independent load profiles  | 2 (1 optional)   |        |
| Maximum number of captured channels  | 26               |        |
| <b>Data information storage (stored data profile, 2 load profiles, event log, dedicated event logs)</b>            |                  |        |
| Non-volatile memory (Flash memory)   | •                |        |

<sup>1)</sup> Value recordable in dedicated load profile from 1 up to 60 minutes (typical 15 minutes).

|                                       | ZMD400                              | ZFD400                            |
|---------------------------------------|-------------------------------------|-----------------------------------|
| <b>Instantaneous values</b>           |                                     |                                   |
| Voltage phase-neutral or phase-ground | ● <sup>2)</sup>                     | –                                 |
| Voltage phase-phase                   | –                                   | ● <sup>2)</sup> (U1-2, U2-3 only) |
| Current                               | (I1, I2, I3, IN) <sup>2)</sup>      | (I1, I3) <sup>2)</sup>            |
| Frequency                             | ● <sup>2)</sup>                     | ● <sup>2)</sup>                   |
| Phase angles                          | ● <sup>2)</sup>                     | –                                 |
| Active power (+/-)                    | (P1, P2, P3, P total) <sup>2)</sup> | P total <sup>2)</sup>             |
| Reactive power (+/-)                  | (Q1, Q2, Q3, Q total) <sup>2)</sup> | Q total <sup>2)</sup>             |
| Power factor                          | PF1, 2, 3, (PF total) <sup>1)</sup> | PF total <sup>2)</sup>            |
| TTHD of active power                  | Sum <sup>2)</sup>                   | Sum <sup>2)</sup>                 |

## E650 Series 4 ZxD400AT/CT – Technical Data

### General

#### Voltage

|                                  |  |
|----------------------------------|--|
| Nominal voltage $U_n$ ZMD400xT   | 3 x 58/100 to 69/120 V<br>3 x 110/190 to 133/230 V<br>3 x 220/380 to 240/415 V |
| Extended operating voltage range | 3 x 58/100 to 240/415 V  |

#### Nominal Voltage $U_n$ ZFD400xT

|                                  |                                      |
|----------------------------------|--------------------------------------|
|                                  | 3 x 100 to 120 V<br>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               | $\pm 2\%$   |

### IEC-specific data

#### Current

|                       |                       |
|-----------------------|-----------------------|
| Nominal current $I_n$ | 1 A, 2 A, 5 A, 5  1 A |
|-----------------------|-----------------------|

#### Maximum current $I_{max}$

|  |                       |
|--|-----------------------|
| Metrological for $I_n = 1$ A               | 1.2 A, 2 A, 6 A, 10 A |
| Metrological for $I_n = 2$ A               | 4 A                   |
| Metrological for $I_n = 5$ A               | 6 A, 10 A             |
| Metrological for $I_n = 5  1$ A            | 6 A                   |
| Overload for $I_n = 1$ A, 2 A, 5 A, 5  1 A | 12 A                  |
| Overload for $I_n = 20$ A                  | 20 A                  |

|                       |                                |
|-----------------------|--------------------------------|
| Short-circuit current | 0.5 s with $20 \times I_{max}$ |
|-----------------------|--------------------------------|

#### Measurement accuracy

|                                  |             |
|----------------------------------|-------------|
| ZxD405xT                         |             |
| Active energy, to IEC 62053-22   | class 0.5 S |
| Reactive energy, to IEC 62053-24 | class 1 S   |

|                                  |           |
|----------------------------------|-----------|
| ZxD410xT                         |           |
| Active energy, to IEC 62053-21   | class 1   |
| Reactive energy, to IEC 62053-24 | class 1 S |

### Measurement behaviour

|                           |              |
|---------------------------|--------------|
| Starting current ZxD405xT |              |
| According to IEC          | 0.1% $I_n$   |
| Typical                   | 0.07% $I_n$  |
| 5  1 A                    | as 1 A meter |

|                           |              |
|---------------------------|--------------|
| Starting current ZxD410xT |              |
| According to IEC          | 0.2% $I_n$   |
| Typical                   | 0.14% $I_n$  |
| 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 $\sqrt{3}$ |            |

### MID-specific data

#### Current (for classes B and C)

|                     |              |
|---------------------|--------------|
| Rated current $I_n$ | 1.0 A, 5.0 A |
|---------------------|--------------|

|                           |                |
|---------------------------|----------------|
| Minimum current $I_{min}$ | 0.01 A, 0.05 A |
|---------------------------|----------------|

|                               |                |
|-------------------------------|----------------|
| Transitional current $I_{tr}$ | 0.05 A, 0.25 A |
|-------------------------------|----------------|

|                           |               |
|---------------------------|---------------|
| Maximum current $I_{max}$ | 2.0 A, 10.0 A |
|---------------------------|---------------|

|                      |                 |
|----------------------|-----------------|
| Measurement accuracy | to EN 50470-3   |
| ZxD400xT             | classes B and C |

### Measurement behaviour

|                           |                  |
|---------------------------|------------------|
| Starting current $I_{st}$ |                  |
| Class B: $I_{st}$         | 0.002 A, 0.01 A  |
| Class C: $I_{st}$         | 0.001 A, 0.005 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 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      | -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 $\cos\varphi=1$ (from 0.05 $I_b$ to $I_{max}$ )  | ± 0.02% per K    |
| at $\cos\varphi=0.5$ (from 0.1 $I_b$ to $I_{max}$ ) | ± 0.03% 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    | IEC 61000-4-4 |
| Current and voltage circuits | 4 kV          |
| Auxiliary circuits > 40 V    | 2 kV          |

|                              |               |
|------------------------------|---------------|
| Surge test                   | 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 $\mu$ s | to IEC 62052-11 |
| Current and voltage circuits   | 8 kV            |
| Auxiliary circuits             | 6 kV            |

|                     |  |
|---------------------|--|
| Protection class II | to IEC 62052-11 <input type="checkbox"/> |
|---------------------|--|

## 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                      |





**On extension board 047x**

|  |                           |
|--|---------------------------|
| SELV, reinforced insulation            |                           |
| Nominal voltage range                  | 12 to 48 V <sub>DC</sub>  |
| Tolerance                              | 80 to 115% U <sub>n</sub> |
| Max. power consumption <sup>1)</sup>   | 5.2 W                     |
| Max. current (V <sub>IN</sub> = 9.6 V) | 530 mA                    |

**On extension board 326x**

|  |                           |
|--|---------------------------|
| SELV, reinforced insulation            |                           |
| Nominal voltage range                  | 12 to 24 V <sub>DC</sub>  |
| Tolerance                              | 80 to 115% U <sub>n</sub> |
| Max. power consumption <sup>1)</sup>   | 5.2 W                     |
| Max. current (V <sub>IN</sub> = 9.6 V) | 530 mA                    |

<sup>1)</sup> 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

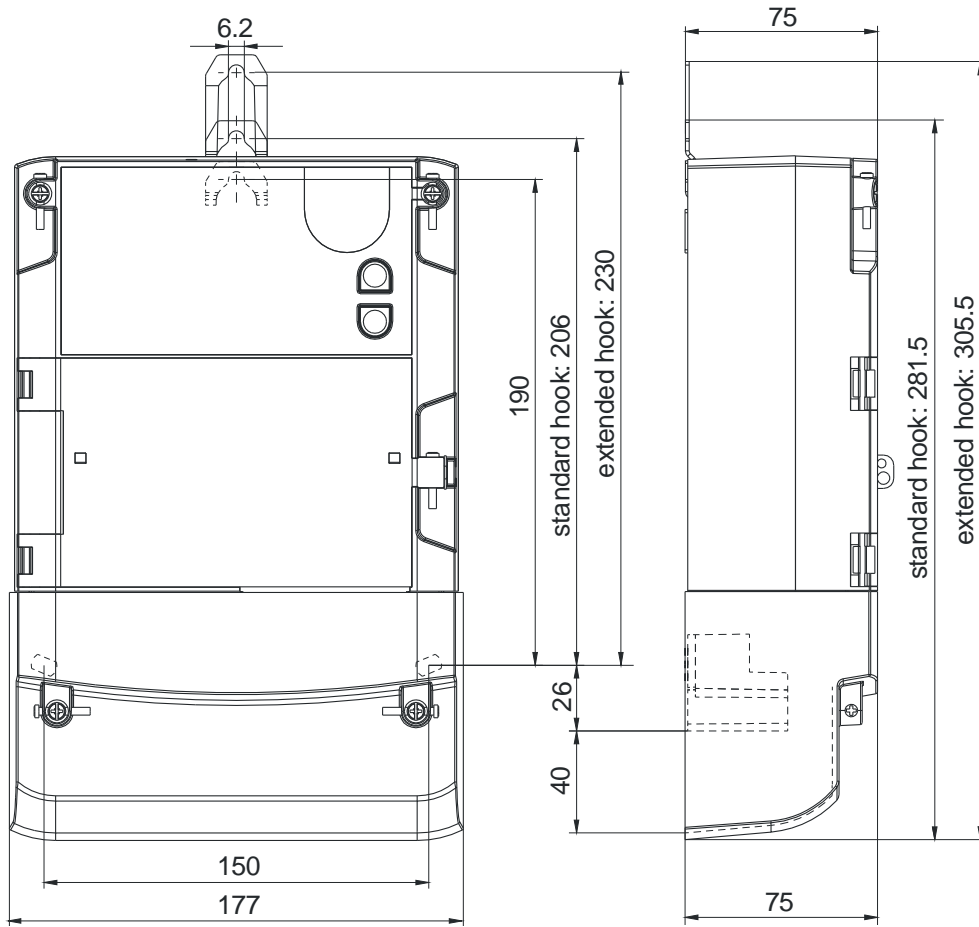
**Connections****Phase connections**

|                                     |                          |
|-------------------------------------|--------------------------|
| Type                                | screw type terminals     |
| Diameter                            | 5.2 mm                   |
| Recommended conductor cross-section | 1.5 to 6 mm <sup>2</sup> |
| 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             |

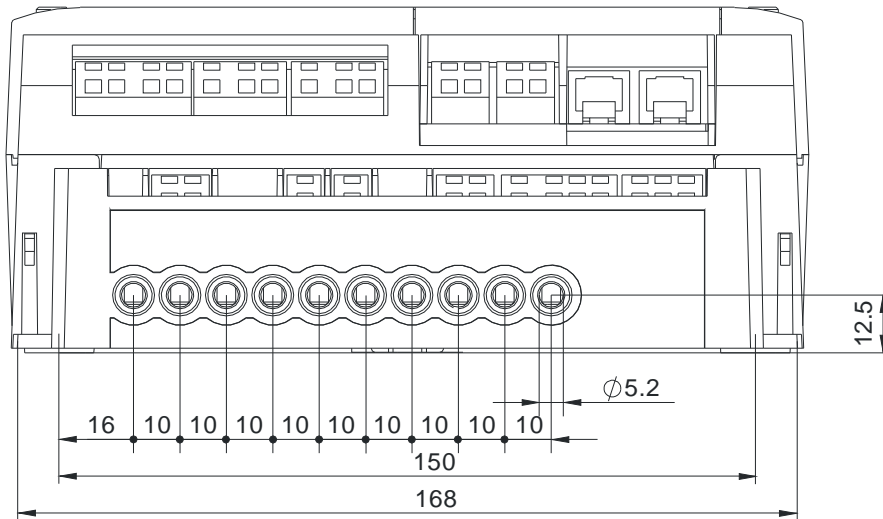
**Other connections**

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

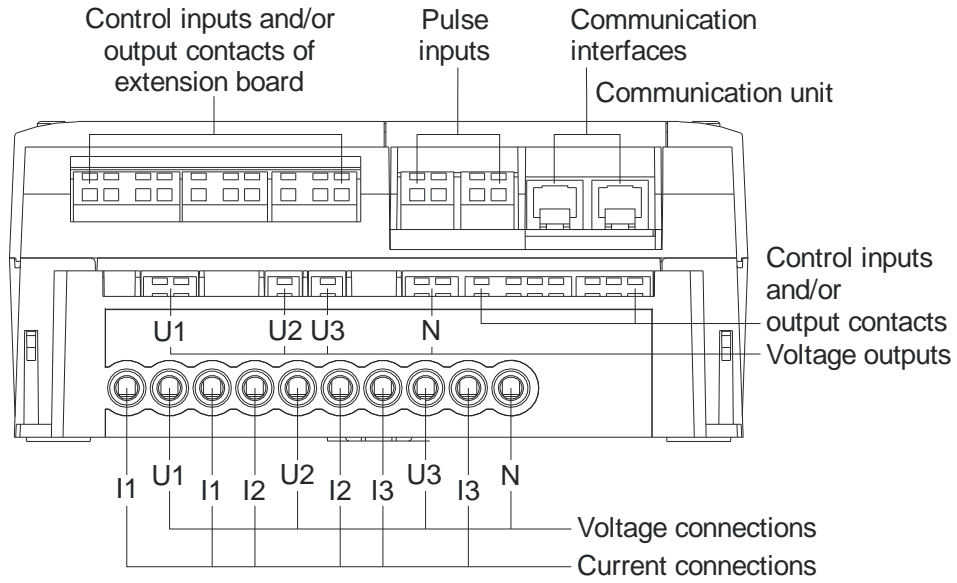
Meter dimensions (standard terminal cover)



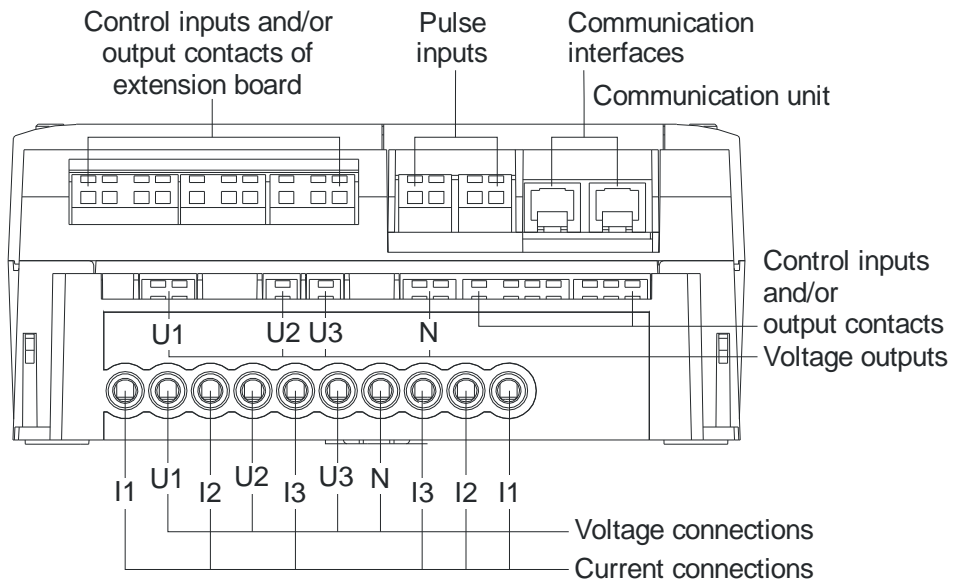
Terminal dimensions



Terminal layout according to DIN



Symmetrical terminal layout (optional, ZMD400 only)



| Type designation            |   | ZMD  | 4 | 10 | C | T | 44 | 4207 | S4 |  |
|-----------------------------|---|--|---|----|---|---|----|------|----|--|
| <b>Network type</b>         |   |  |   |    |   |   |    |      |    |  |
| ZFD                         | 3-phase 3-wire network (F-circuit)  |  |   |    |   |   |    |      |    |  |
| ZMD                         | 3-phase 4-wire network (M-circuit)  |  |   |    |   |   |    |      |    |  |
| <b>Connection type</b>      |   |  |   |    |   |   |    |      |    |  |
| 4                           | Transformer operated  |  |   |    |   |   |    |      |    |  |
| <b>Accuracy class</b>       |   |  |   |    |   |   |    |      |    |  |
| 10                          | Active energy class 1 (IEC), B (MID)  |  |   |    |   |   |    |      |    |  |
| 05                          | Active energy class 0.5 S (IEC), C (MID)  |  |   |    |   |   |    |      |    |  |
| <b>Measured quantities</b>  |   |  |   |    |   |   |    |      |    |  |
| C                           | Active and reactive energy  |  |   |    |   |   |    |      |    |  |
| A                           | Active energy   |  |   |    |   |   |    |      |    |  |
| <b>Construction</b>         |   |  |   |    |   |   |    |      |    |  |
| T                           | With exchangeable communication units   |  |   |    |   |   |    |      |    |  |
| <b>Tariffication</b>        |   |  |   |    |   |   |    |      |    |  |
| 21                          | Energy rates, external rate control via control inputs  |  |   |    |   |   |    |      |    |  |
| 24                          | Energy rates, internal rate control via time switch<br>(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<br>(additionally possible via control inputs)        |  |   |    |   |   |    |      |    |  |
|                             |   | All versions with 3 control inputs and 2 output contacts |   |    |   |   |    |      |    |  |
| <b>Additional functions</b> |   |  |   |    |   |   |    |      |    |  |
| 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 <sub>DC</sub>                                  |  |   |    |   |   |    |      |    |  |
| 045x                        | 4 outputs, auxiliary power supply 100 to 240 V <sub>AC</sub> /V <sub>DC</sub>                                       |  |   |    |   |   |    |      |    |  |
| 047x                        | 4 outputs, auxiliary power supply 12 to 48 V <sub>DC</sub>  |  |   |    |   |   |    |      |    |  |
| 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) |  |   |    |   |   |    |      |    |  |
| <b>Series 4</b>             |   |  |   |    |   |   |    |      |    |  |



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manage energy better