

Energy Meter D650

Manual

Revision history

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|---------|---------|--|
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General information

Copyright

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Disclaimer

Weidmüller accepts no responsibility for errors or deficiencies within this manual, and makes no commitment to keep the contents of this functional description up to date.

Comments on the manual

We welcome your comments. If anything in this manual seems unclear, please let us know by sending an e-mail to: info@weidmueller.com

Meaning of symbols

This manual uses the following pictograms:



Dangerous voltage!

Risk to life or serious injury. Before commencing work on the system and the device, they must first be de-energised.



Please note!

Please pay attention to the documentation. This symbol is intended to warn you of potential dangers, which could occur during installation, commissioning and use.



Note!



Ground wire connection

Inspection on receipt

Inspection on receipt

Fault free and safe use of this device requires appropriate transport, proper storage, erection and assembly as well as careful operation and maintenance. If it can be assumed that safe operation is no longer possible, the device must be immediately taken out of service and secured against being accidentally started up.

The device must be unpacked and packed with the usual care, without the use of force and only using suitable tools. The devices must be visually inspected for perfect mechanical condition. Please also note and follow the installation instructions enclosed with the device.

It can be assumed that safe operation is no longer possible if the device, e.g.

- has visible damage,
- no longer works, despite intact mains power supply,
- has been exposed to unfavourable conditions (e.g. storage outside the permissible climatic limits without adjustment to the ambient climate, condensation, or similar) for a lengthy period or was exposed to unfavourable effects or loads during transport (e.g. fall from a large height even if there is no visible external damage, or similar).

Please check the scope of supply for completeness before you start installing the device.



All screw-type terminals belonging to the scope of supply are plugged into the device.



The installation and start-up instructions also describe options which do not belong to the scope of supply.



All supplied options and design versions are described on the delivery note.

Scope of supply

| Quantity | Description |
|----------|-------------------------------------|
| 1 | Energy Meter D650 |
| 1 | Quick guide |
| 1 | Screw-type terminal, plug-in, 2 pin |
| 1 | Screw-type terminal, plug-in, 3 pin |
| 1 | Screw-type terminal, plug-in, 5 pin |
| 1 | Screw-type terminal, plug-in, 6 pin |

The programming software is available online at <http://wmqr.eu/242549>.

Notes on use

Please read these operating instructions and all other publications which have to be used to work with this product (in particular for installation, operation or maintenance).

Note and follow all safety instructions as well as any warnings. If you do not follow the instructions, personal injuries and/or damage to the product could be the result.




Any unauthorised change or use of this device which extends beyond the given mechanical, electrical or other operating limits can cause personal injuries and/or damage to the product.

Any such unauthorised change is "misuse" and/or "negligence" under the product's warranty and therefore excludes the warranty for cover of possible resulting injuries or damage.

This device may be solely operated and maintained by skilled persons.

Skilled persons are people who, on the basis of their relevant training and experience, are capable of identifying risks and avoiding possible hazards which operation or maintenance of the device can cause.

When using the device, any additional legal and safety regulations required for the respective use must be observed.

| | |
|---|---|
|  | Important! If the device is not operated according to the instruction manual, protection is no longer ensured and the device can cause hazards. |
|  | Conductors made of individual wires must be fitted with wire end ferrules. |
|  | Only pluggable screw terminals with the same number of poles (pins) and of the same type may be plugged together. |

Product Description

Intended use

The Energy Meter D650 is intended to be used for the measurement and calculation of electrical variables such as voltage, current, energy, work, harmonic components, etc. in building installations, at distribution boards, circuit-breakers and busbar trunking systems.

Measuring-circuit voltages and currents must originate from the same system.

The Energy Meter D650 is permanently installed in control cabinets or small distribution boards. It can be installed in any position.

The measurement results can be displayed, stored and read out via serial interfaces and further processed.

The voltage measurement inputs are designed for measurements in low-voltage systems in which rated voltages up to 300 V conductor to earth and surge voltages of overvoltage category III can occur.

The current measurement inputs of the Energy Meter D650 are connected via external $\dots/1A$ or $\dots/5A$ current transformers.

Measurement in medium and high-voltage systems takes place with current and voltage transformers. Special safety requirements must be complied, which are not dealt with in any greater detail here.

The Energy Meter D650 fulfils the test requirements for use in industrial areas.

Mains failure detection

The mains failure detection takes place via the voltage measurement inputs. The selection of voltage measurement inputs can be configured using the ecoExplorer go software.

Mains failure stored energy time

The Energy Meter D650 bridges the following mains failures at the auxiliary voltage input:

| | |
|--------------------|------------|
| Mains voltage | 230 V AC |
| Stored energy time | max. 80 ms |

Energy Meter D650 features

Measurement

- Measurement in IT, TN and TT systems,
- 4 voltage measurement inputs
- 4 current measurement inputs,
- Continuous scanning of the voltage and current measurement inputs,
- Energy measurement, measurement uncertainty class 0.5 for ..5A current transformers,
- Energy measurement, measurement uncertainty class 1 for ..1A current transformers,
- Registers more than 800 measured values (readings),
- Fourier analysis 1st to 40th harmonic component for U, I, P (consumption/supply) and Q (inductive/capacitive),
- 2 digital inputs,
- 2 digital outputs,
- Temperature measurement input,
- LC display, backlight (optional),
- 2 keys,
- RS485 (modbus RTU),
- RS232,
- Operating temperature range -10...+55 °C,
- Mounting on top hat rails 35 mm,
- Suitable for installation in distribution boards,
- Suitable for measurements in networks with frequency inverters.

Methods of measurement

The Energy Meter D650 measures continuously and calculates all effective values over a 200 ms interval.

Operating concept

You can program the Energy Meter D650 and call up measured values in several ways.

- **Directly** at the device using 2 keys and the display. You can change the values in the parameter list (see Appendix) and call up the measured values from the measured value displays.
- Via the **ecoExplorer go** programming software.
- Via the RS485 with the **modbus** protocol. You can change and call up data with the help of the modbus address list.

Operation of the Energy Meter D650 via the integrated display and the two keys only is described in these operating instructions. The ecoExplorer go programming software and the homepage have their own documentation.



Use the **parameter list** in the appendix to these instructions for programming at the Energy Meter D650 and the **modbus address list** for programming via a serial interface.

ecoExplorer go programming software

The Energy Meter D650 can be programmed and read out using the ecoExplorer go programming software. This requires a PC to be connected to the Energy Meter D650 via a serial interface.

ecoExplorer go software features

- Programming the Energy Meter D650
- Configuring recordings
- Reading out recordings.
- Storing data in a database
- Graphic display of measured values
- Programming customer-specific applications.

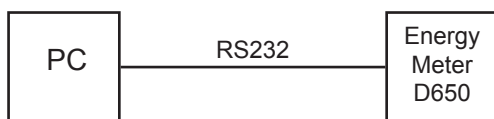


Fig.: Connection of a Energy Meter D650 to a PC via an RS232 cable.

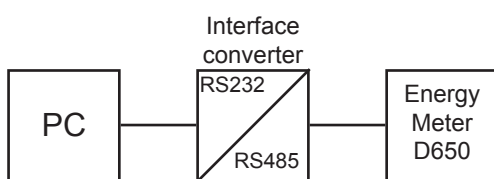


Fig.: Connection of a Energy Meter D650 to a PC via an interface converter.

Three-phase 4-wire systems

The Energy Meter D650 can be used in three-phase 4 conductor systems (TN, TT system) (50 Hz, 60 Hz) with earthed PEN conductor. The bodies of the electrical system are earthed. The conductor to neutral conductor voltage may not exceed 300 V AC.

The Energy Meter D650 is only suitable for environments in which the impulse voltage withstand level of 4 kV (overvoltage category III) is not exceeded.

| U_{L-N} / U_{L-L} | |
|---------------------|------------------------------|
| 66V / 115V | |
| 120V / 208V | |
| 127V / 220V | |
| 220V / 380V | |
| 230V / 400V | |
| 240V / 415V | |
| 260V / 440V | |
| 277V / 480V | |
| | Maximum system rated voltage |

Fig.: Table of rated voltages of the grid suitable for the voltage inputs.

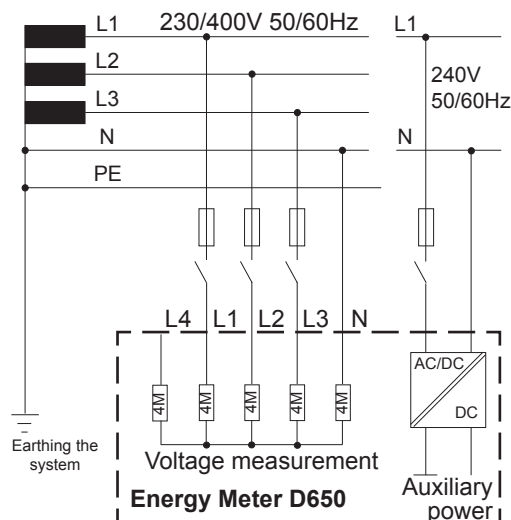


Fig.: Block diagram, Energy Meter D650 in TN system.

Three-phase 3-wire systems

The Energy Meter D650 can be used in unearthed three-phase 3 wire systems (IT system). The conductor to conductor voltage may not exceed 480 V AC (50 Hz, 60 Hz).

The Energy Meter D650 is only suitable for environments in which the impulse voltage withstand level of 4 kV (overvoltage category III) is not exceeded.

In the IT system the neutral point (star point) of the voltage generator is not earthed. The bodies of the electrical system are earthed. Earthing via high-resistance impedance is allowed. IT systems are only allowed in certain systems with their own transformer or generator.

| U _{L-L} | |
|------------------|------------------------------|
| 66V | |
| 115V | |
| 120V | |
| 127V | |
| 200V | |
| 230V | |
| 240V | |
| 260V | |
| 277V | |
| 347V | |
| 380V | |
| 400V | |
| 415V | |
| 440V | |
| 480V | Maximum system rated voltage |

Fig.: Table of rated voltages of the grid suitable for the voltage inputs.

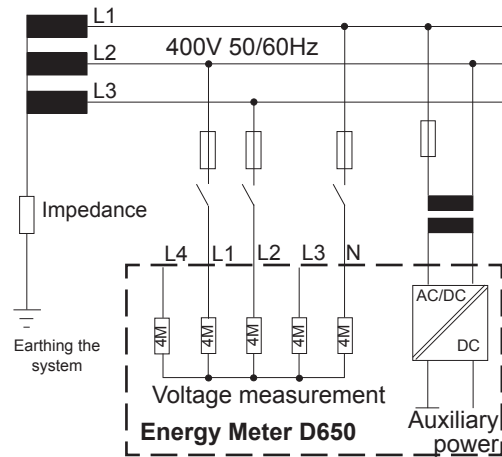


Fig.: Block diagram, Energy Meter D650 in IT system without N.

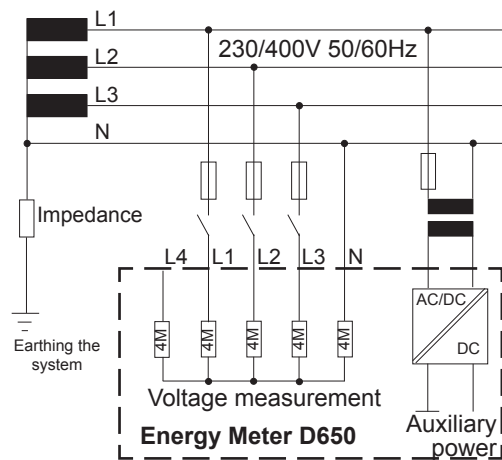


Fig.: Block diagram, Energy Meter D650 in IT system with N.

Use

The Energy Meter D650 has a display, keys 1 and 2 and the Service key to make it easier to install and start up the Energy Meter D650 without a PC.

Important parameters such as current transformers and device address are included in the parameter list (see appendix) and can be directly programmed at the device.

A differentiation is made between operation with the

- display mode and
- programming mode.

Key functions

Press the key "briefly":

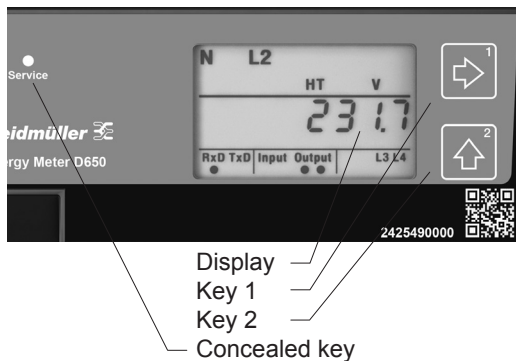
- page forwards
- Digit/value +1

Press the key for "long time":

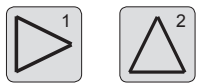
- page backwards
- Digit/value -1

Simultaneously press both keys for around 1 second and keep them pressed:

- Switch between display mode and programming mode.



Keys 1 and 2



The Energy Meter D650 is operated using keys 1 and 2.

Concealed key (service)

The service key is intended for use by instructed service employees only.

Display mode

After the power supply is resumed the device is in Display mode. In Display mode you can use Keys 1 and 2 to page between the measured value displays.



Use Key 1 to select the phase for the measured values.



Press Key 2 to page between the measured values for current, voltage, power output, etc.

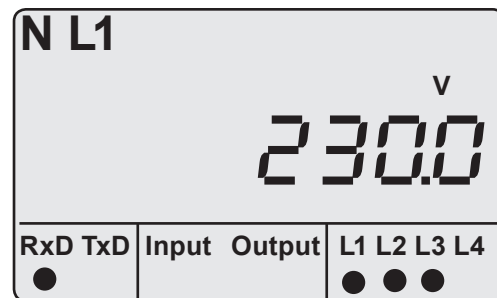


Fig.: "Display Mode" display
Displayed measured value: $U_{L1-N} = 230.0 \text{ V}$

example

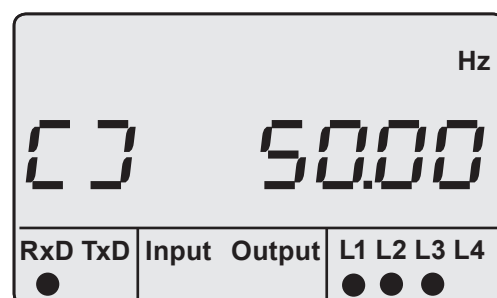


Fig.: Display example for rotating field and frequency

Programming mode

The most important settings required for operation of the Energy Meter D650 can be displayed and changed in programming mode. The parameter list in the Appendix contains the addresses for the most important settings. You can make further settings using the ecoExplorer go software included in the scope of supply.

If you simultaneously press Keys 1 and 2 for around 1 second, programming mode opens via a password query. If a display password has not been programmed, the first programming menu opens directly. Programming mode is denoted in the display by the text “PRG”. The digits of the address flash.

If you are in programming mode and have not pressed a key for approximately 60 seconds or simultaneously press Keys 1 and 2 for around 1 second, the device returns to display mode.

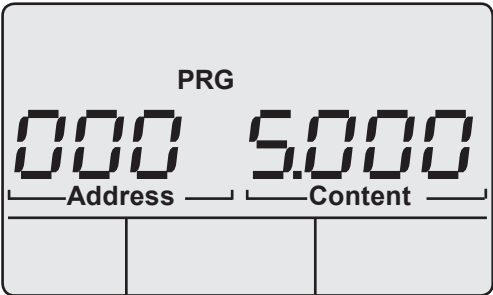


Fig.: “Programming Mode” display example, address 000 with content 5,000

Display password

You can program a 4-digit display password to make it difficult to accidentally change the programming data directly at the device. A display password is not set in the factory.

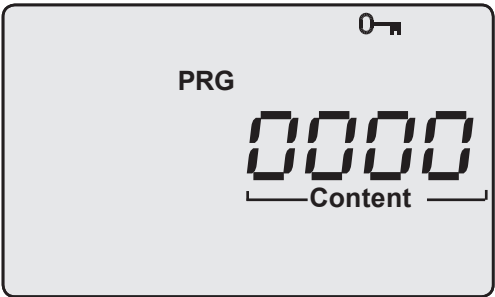


Fig.: Query window for the display password

| Address | Content |
|---------|--|
| 500 | Display password 0 = the password is not queried. |

Fig.: Section of the parameter list for password programming

Installation

Installed position

The Energy Meter D650 can be installed in control cabinets or in small distribution boards according to DIN 43880. It is mounted on a 35 mm mounting rail according to DIN EN 60715. It can be installed in any position.

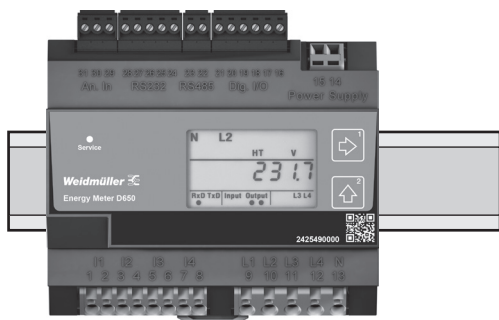


Fig.: Energy Meter D650 on mounting rail according to DIN EN 60715

Power supply voltage

A power supply voltage is required for operation of the Energy Meter D650. The type and amount of power supply voltage required is noted on the rating plate.

Before applying the power supply voltage, ensure that the voltage and frequency match the information given on the rating plate!

The connection cables for the power supply voltage must be fused with a UL listed fuse or a circuit breaker.

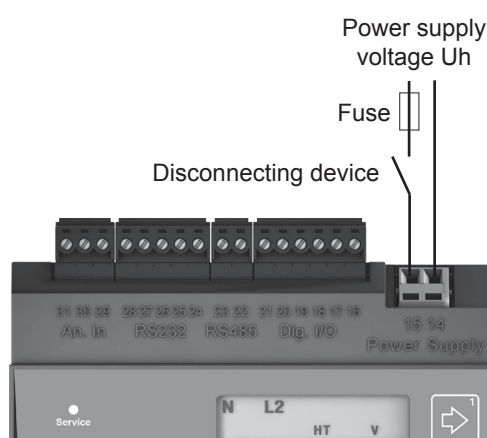


Fig.: Connection example for the power supply voltage UH



- A disconnecter or circuit-breaker must be provided for the power supply voltage in the building installation.
- The disconnecter must be installed near the device and must be easy for the user to reach.
- The switch must be labelled as a disconnecting device for this device.
- Voltages which are above the allowable voltage range can destroy the device.



Devices driven with direct current are protected against polarity reversal.



Important!

The inputs for the supply voltage are dangerous to touch!

Current measurement

The Energy Meter D650 is designed for the connection of current transformers with secondary currents of $\dots/1A$ and $\dots/5A$. Only alternating currents, not direct currents, can be measured. Each current measurement input can be permanently loaded with 6 A or for 1 second with 100 A.

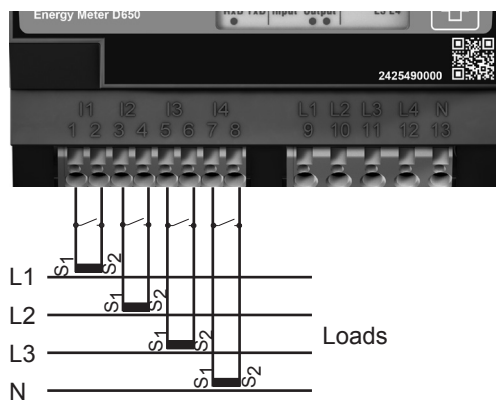


Fig.: Connection example, current measurement via current transformers

Attention!
 The current inputs are live.

Important!
 The Energy Meter D650 is not suitable for the measurement of direct voltages.

Earthing current transformers
 If a connection is provided for earthing the secondary winding, this must be connected with earth.

For the inputs L4 and I4 are no connection schemes required.

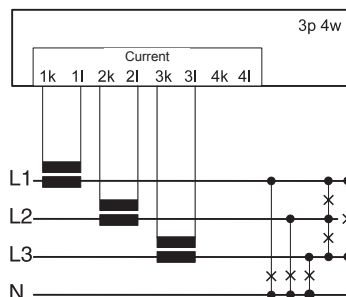


Fig.: Current measurement, connection example for connection option 0, see page xxxx)

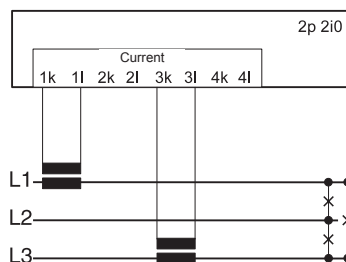


Fig.: Current measurement, connection example for connection option 1, see page xxxx)

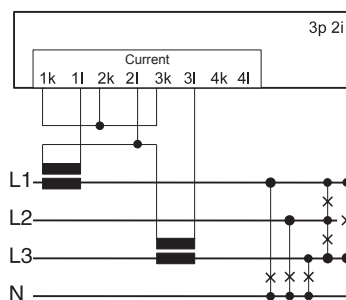


Fig.: Current measurement, connection example for connection option 0, see page xxxx)

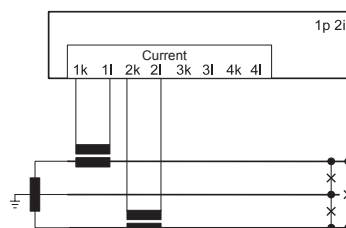


Fig.: Current measurement, connection example for connection option 0, see page xxxx)

Ammeter

If you not only want to measure the current with the Energy Meter D650 but with an ammeter also, the ammeter must be connected in series to the Energy Meter D650.

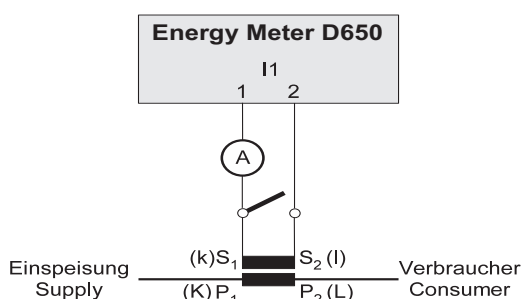


Fig.: Example, current measurement via additional ammeter



Short-circuit current transformer connections!

The secondary connections of the current transformer must be short-circuited to them first before the current supply leads to the Energy Meter D650 are disconnected!

If a testing switch is available, which automatically short circuits the current transformer's secondary leads, it is sufficient to place this in the "test" position, provided the short-circuiters have been tested first.



Open current transformer!

High hazardous live voltage peaks can occur at current transformers which are operated open on the secondary side!

The winding insulation in "safe open current transformers" is dimensioned so that the current transformers can be operated open. But these current transformers are also hazardous live if they are operated open.

Summation current measurement

If the current is measured via two current transformers, the total transformation ratio of the current transformers must be programmed in the Energy Meter D650.

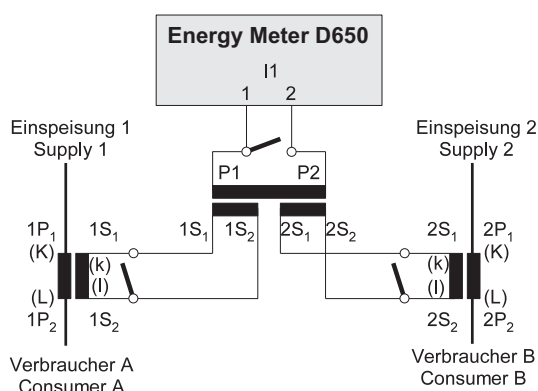


Fig.: Example, current measurement via summation current transformers

Example

The current is measured via two current transformers. Both current transformers have a transformation ratio of 1000/5A. The summation measurement is performed with a 5+5/5A summation current transformer.

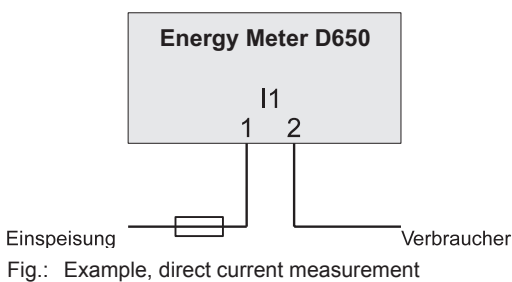
The Energy Meter D650 must then be set as follows:

| | |
|--------------------|--|
| Primary current: | $1.000\text{ A} + 1.000\text{ A} = 2.000\text{ A}$ |
| Secondary current: | 5 A |

Direct measurement

Nominal currents up to 5 A can also be measured directly with the Energy Meter D650. In this case it must be noted that each current measurement input may be loaded continuously with 6 A or for 1 second with max 100 A.

As the Energy Meter D650 does not have any integrated protection for the current measurement, this protection must be provided for during installation.



Voltage measurement

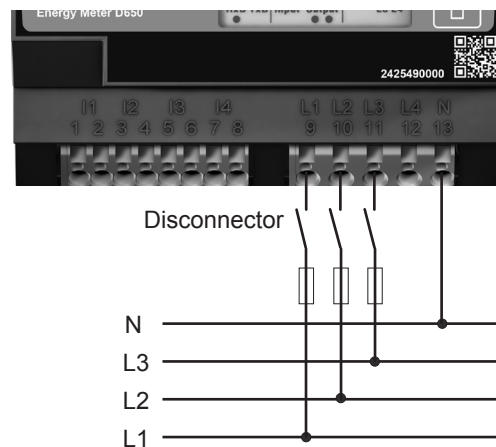
The Energy Meter D650 is designed for the measurement of alternating voltages in 300 V systems in which category III overvoltages can occur.

The Energy Meter D650 can only determine exact measured values if a measurement-current voltage greater than 10 Veff is applied to the voltage measurement input L1.

The following must be noted when selecting the instrument leads for the voltage measurement:

- The instrument leads required for the voltage measurement must be suitable for voltages up to 300 V AC to earth and 520 V AC conductor to conductor.
- Normal instrument leads must be fused by an overcurrent protective device and routed via disconnectors.
- Short-circuit proof instrument leads must be routed via disconnectors only.

Overcurrent protective devices and disconnectors must be positioned near the device and must be easy for the user to reach.



Important!

The voltage measurement inputs are hazardous live!



Important!

The Energy Meter D650 can only determine exact measured values if a measurement-current voltage greater than 10 Veff is applied to the voltage measurement input L1.



For the inputs L4 and I4 are no connection schemes required.

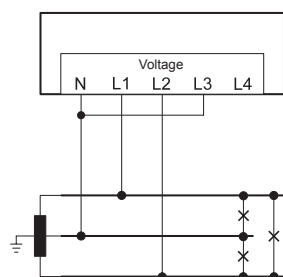
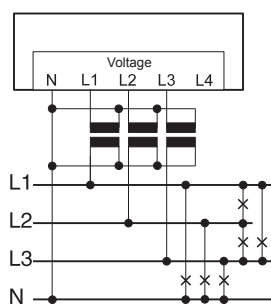
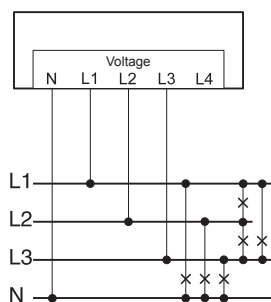


Fig.: Connection examples for voltage measurement in “three-phase 4-conductor systems”. (Connection option 0, see page xxxx)

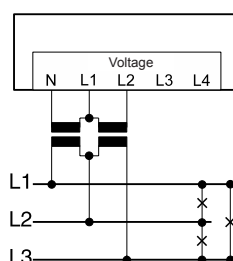
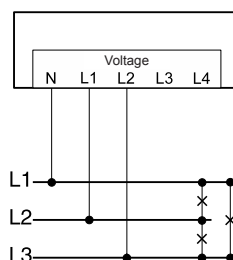


Fig.: Connection examples for voltage measurement in “three-phase 3-conductor systems”. (Connection option 1, see page xxxx)



Important!

Voltages above 300 V AC to earth must be connected via voltage transformers.



Measuring-circuit voltages and currents must originate from the same system.

Auxiliary measurement, input 4

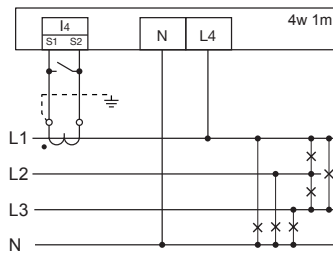


Fig.: Measurement using a three-phase 4 conductor network with symmetrical load.

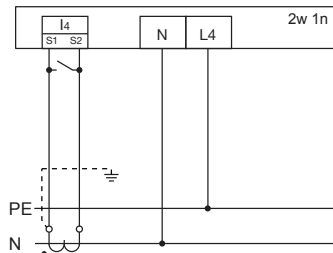


Fig.: Measurement of the voltage between N and PE. Measurement of the current in the neutral wire.

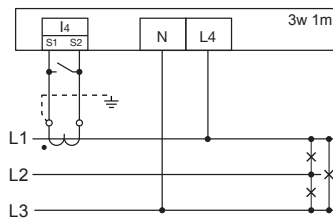


Fig.: Measurement in a three-phase 3 conductor network with symmetrical load.

| | |
|--|---|
| | In case of a three wire main measurement (input V1-V3), the auxiliary measurement (input V4) cannot be used as measuring input. |
|--|---|

| | |
|--|---|
| | For measurement with the auxiliary measurement (V4), a voltage must be connected to the baseline measurement for frequency determination. |
|--|---|

Interfaces

RS232

You can use a RS232 connection cable to connect the Energy Meter D650 to a PC.

The achievable distance between two devices with RS232 interface depends on the cable used and the baud rate. The maximum connectable cable length is 30 m.

As a guideline value, for a transmission rate of 9600 baud the distance should not exceed 15 m to 30 m.

The permissible ohmic load must be larger than 3 kohm and the capacitive load caused by the transmission cable must be smaller than 2500 pF.

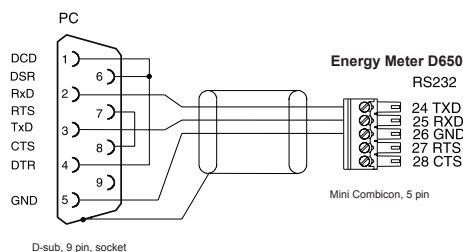


Fig.: Connector pin assignment for the PC connection cable.



Important!

RS232, RS485 and temperature measurement input are not metallically separated from each other.



All interfaces can be used simultaneously.

Shielding

A twisted-conductor and shielded cable must be provided for connections via the RS232 interface. The shielding at both ends of the cable must be connected to a large area of the housing or cabinet parts in order to achieve an adequate shielding effect.

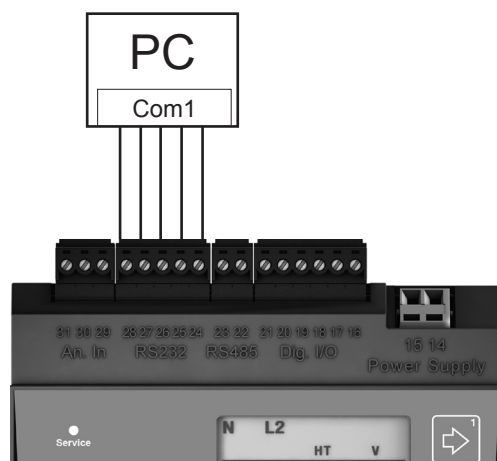


Fig.: Example, connecting a Energy Meter D650 to a PC via the RS232 interface.

RS485

Bus structure

All devices are connected in a bus structure (line). Up to 32 stations can be connected together in a segment. The cable at the start and end of a segment is terminated with resistors. If there are more than 32 stations, repeaters must be used to connect the individual segments.

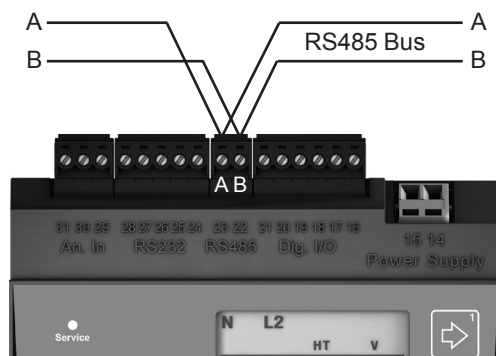
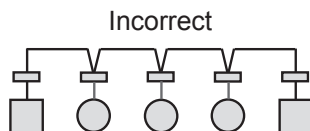
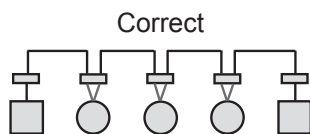





Fig.: RS485 interface, 2-pole plug contact

Terminating resistors

The cable at the start and end of a segment is terminated with resistors (120 ohm, 1/4 W).

The Energy Meter D650 does not contain any terminating resistors.



-  Terminal strip in the control cabinet.
-  Device with RS485 interface.
(Without terminating resistor)
-  Device with RS485 interface.
(With terminating resistor at the device)

Shielding

A twisted-conductor and shielded cable must be provided for connections via the RS485 interface. The shielding at both ends of the cable must be connected to a large area of the mounting plate or cabinet parts in order to achieve an adequate shielding effect.

Cable type

Recommended cable types:
Unitronic Li2YCY(TP) 2x2x0.22 (Lapp cables)
Unitronic BUS L2/FIP 1x2x0.64 (Lapp cables)

Cable length

1200 m for a baud rate of 38.4 k



Important!
RS232, RS485 and temperature measurement input are not metallically separated from each other.



For the wiring of the Modbus connection, CAT cables are not suitable. Please use the recommended cables.

Digital inputs and outputs

Digital outputs

The Energy Meter D650 has 2 transistor switching outputs. These outputs are metalically separated from the analysis electronics via optocouplers.

- The digital outputs can switch direct or alternating current load.
- The digital outputs can switch loads independant on the polarity of the feeding voltage.
- The digital outputs are not short-circuit-proof.
- Cables, which are longer but 30 m must be shielded.

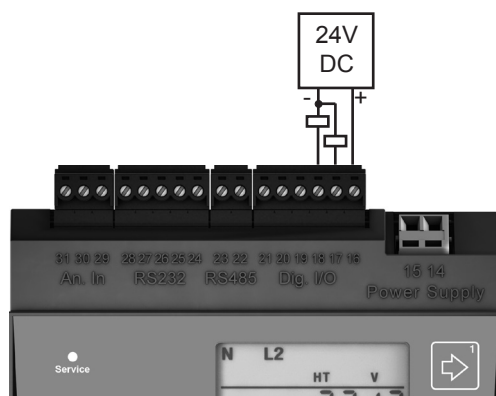


Fig.: Connection example



Attention!

The digital outputs are not short-circuit-proof.

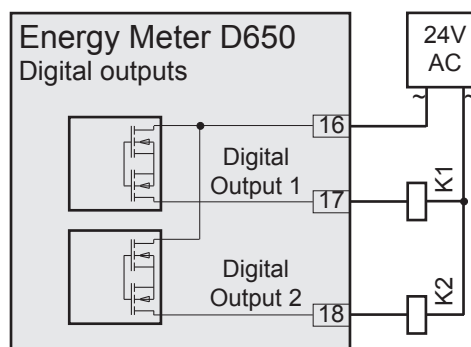


Fig.: Connection of alternating voltage relays to the digital outputs

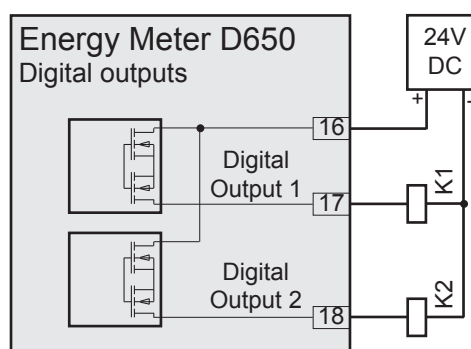


Fig.: Connection of direct current relays to the digital outputs

Digital inputs

The Energy Meter D650 has 2 digital inputs to each of which you can connect one transducer.

An input signal is detected at a digital input if a voltage of at least 10 V and maximum 28 V is applied. In this case a current of at least 1 mA and maximum 6 mA flows. Cables longer than 30 m must be laid with shielding. Please mind the polarity of the feeding voltage.

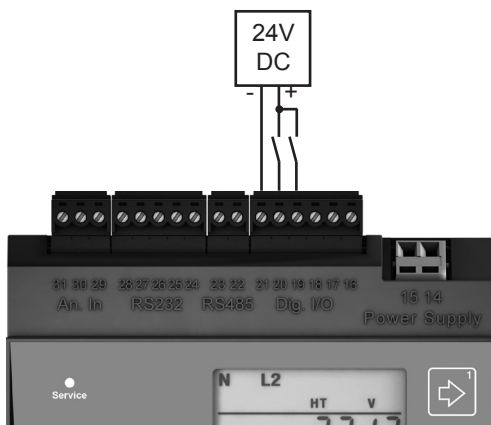


Fig.: Connection example

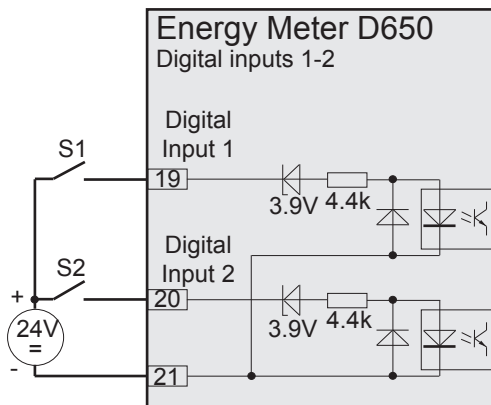


Fig.: Example for the connection of external switching contacts S1 and S2 to the digital inputs 1 and 2.



Attention!

The polarity of the feeding voltage must be respected for the digital inputs.

S0 pulse input

At each Energy Meter D650 with inputs for 24 V you can also connect S0 pulse generators according to DIN EN 62053-31. You require only one external auxiliary voltage of 20...28 V DC and one external 1.5 kohm resistor each.

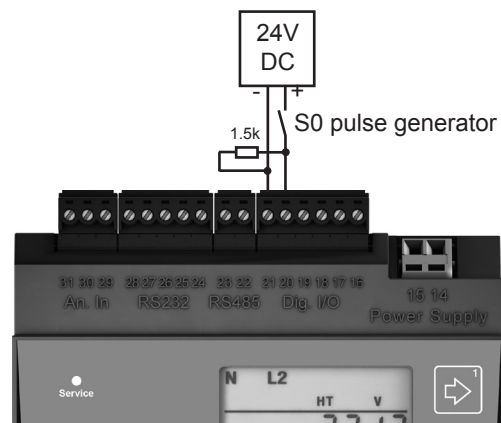


Fig.: Energy Meter D650 with inputs for 24 V. Example with S0 pulse generator.

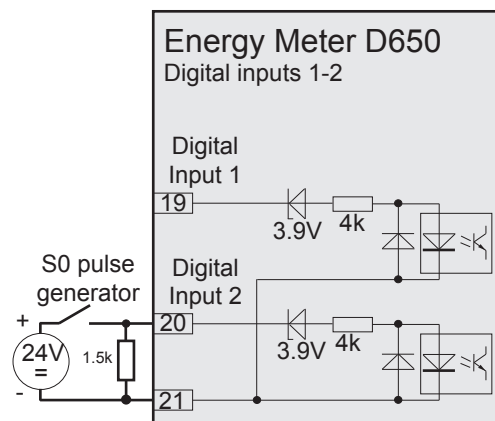


Fig.: Energy Meter D650 with inputs for 24 V. Example for connection of an S0 pulse generator at digital input 2.

Temperature measurement input

Following temperature sensors can be connected to the temperature measurement input

- KTY83
- KTY84
- PT100
- PT1000

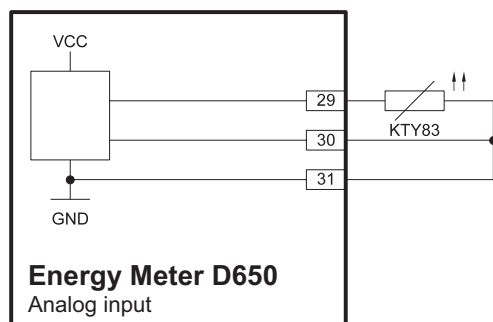
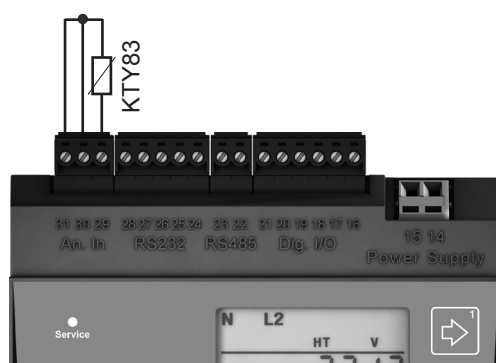


Fig.: Example, temperature measurement with a KTY83.



Use a shielded cable to connect the temperature sensor.



Important!

Profibus, RS232, RS485 and temperature measurement input are not metalically separated from each other.

Putting into service

Applying the power supply voltage

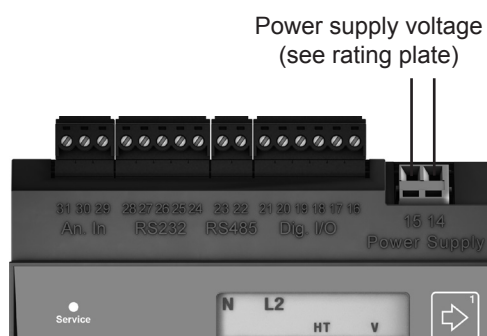
The power supply voltage level for the Energy Meter D650 is given on the rating plate. Supply voltages which do not correspond to those given on the rating plate can result in malfunctions and destruction of the device.

After applying the power supply voltage the text "Start up" appears in the display. Around 2...6 seconds later the Energy Meter D650 switches to the first measured value display.

If no display appears, check whether the power supply voltage is within the rated voltage range.



Prior to commissioning potential production dependant contents of the energy counter, min/max values and records have to be deleted.



Frequency measurement

For the frequency measurement, the measured voltage must be greater than 10 V in the voltage measuring path L1-N.

Only detected frequencies within the range 45 Hz to 65 Hz are used for measurement at the current and voltage measurement inputs.

Applying the measuring-circuit voltage

The Energy Meter D650 is suitable for the measurement of voltages of up to 300 V AC to earth and 520 V AC conductor to conductor.

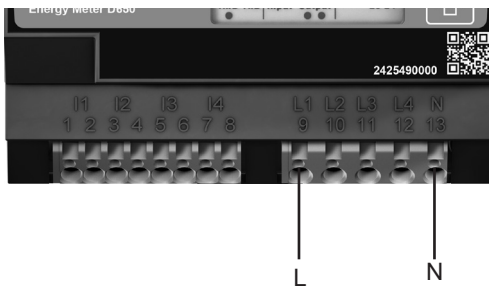
The Energy Meter D650 is not suitable for the measurement of direct voltages. Voltages above 300 V AC to earth must be connected via voltage transformers.

After connecting the measurement-current voltages, the measured values displayed by the Energy Meter D650 for the L-N and L-L voltages must correspond to those at the voltage measurement input.

If a voltage transformer factor is programmed, this must be taken into account in the comparison.

Minimum voltage

A measuring-circuit voltage greater than 10 Veff must be applied to at least one of the voltage measurement inputs. If an adequately high measuring-circuit voltage is not applied on the measuring input V1 the Energy Meter D650 cannot determine exactly the system frequency and can therefore also not take an exact measurement.



At least one phase (L) and the neutral conductor (N) must be connected to the voltage measurement input for the measurement.

Phase sequence

Check the direction of the voltage rotating field in the measured value display of the Energy Meter D650.

A "right" rotating field usually exists.

Applying the measuring-circuit current

The Energy Meter D650 is designed for the connection of $\dots/1A$ and $\dots/5A$ current transformers.

Only alternating currents, not direct currents, can be measured via the current measurement inputs.

Short-circuit all current transformer outputs except one. Compare the currents displayed by the Energy Meter D650 with the applied current.

Taking into account the current transformer transformation ratio, the current displayed by the Energy Meter D650 must correspond to the input current.

The Energy Meter D650 must display approximately zero Amperes in the short-circuited current measurement inputs.

The current transformer ratio is set to 5/5A in the factory and if necessary must be adapted to the current transformer used.

Checking the energy measurement

Short-circuit all current transformer outputs except for one and check the displayed power outputs.

The Energy Meter D650 may only display one power output in the phase with a non short-circuited current transformer input. If this is not the case, check the connection of the measuring-circuit voltage and the measuring-circuit current.

If the power output amount is correct but the sign of the power output is negative, S1(k) and S2(l) could be inverted at the current transformer or they supply active energy back into the network.

Configuration

Current transformer ratio

You can assign each of the 4 current transformer inputs its own current transformer ratio. A current transformer ratio of 5 A/5 A is programmed in the factory for all 4 current transformer inputs.

You can program current transformers with the same current transformer ratios in addresses 000 and 001. Program current transformers with different current transformer ratios in addresses 010 to 041.

A change in current transformer values in address 000 or 001 overwrites the contents of addresses 010 to 041 with the current transformer values from addresses 000 and 001.

A change in current transformer values in one of the addresses 010 to 041 deletes the current transformer values in addresses 000 and 001.

| Address | Current transformer values |
|---------|----------------------------|
| 000 | L1 L2 L3 L4 (primary) |
| 001 | L1 L2 L3 L4 (secondary) |
| 010 | L1 (primary) |
| 011 | L1 (secondary) |
| 020 | L2 (primary) |
| 021 | L2 (secondary) |
| 030 | L3 (primary) |
| 031 | L3 (secondary) |
| 040 | L4 (primary) |
| 041 | L4 (secondary) |

Fig.: Section of the parameter list for the current transformer values

Current measurement connection options

The Energy Meter D650 recognises two connection options for the current measurement.

Connection option 0


- Measurement via 3 current transformers in three-phase-4-conductor systems.
- Measurement via 2 current transformers in systems with the same load.
- Measurement in one-phase-3-conductor systems.

Connection option 1

- Measurement via 2 current transformers (Aron circuit) in three-phase 3-conductor systems.

| Address | Connection option |
|---------|---|
| 110 | 0 = Three current transformers (Default factory setting) 1 = Two current transformers (Aron circuit) |

Fig.: Section of the parameter list for the current transformer connection options

| | |
|---|--|
|  | For the inputs L4 and I4 are no connection schemes required. |
|---|--|

Voltage transformer ratio

You can assign each of the 4 voltage transformer inputs its own voltage transformer ratio.

A voltage transformer ratio of 400V/400V direct measurement is programmed in the factory for all 4 voltage transformer inputs.

You can program voltage transformers with the same voltage transformer ratios in addresses 002 and 003. Program voltage transformers with different voltage transformer ratios in addresses 012 to 043.

A change in voltage transformer values in address 002 or 003 overwrites the contents of addresses 012 to 043 with the voltage transformer values from addresses 002 and 003.

| Address | Voltage transformer values |
|---------|----------------------------|
| 002 | L1 L2 L3 L4 (primary) |
| 003 | L1 L2 L3 L4 (secondary) |
| 012 | L1 (primary) |
| 013 | L1 (secondary) |
| 022 | L2 (primary) |
| 023 | L2 (secondary) |
| 032 | L3 (primary) |
| 033 | L3 (secondary) |
| 042 | L4 (primary) |
| 043 | L4 (secondary) |

Fig.: Section of the parameter list for the voltage transformer values

Voltage measurement connection options

The Energy Meter D650 recognises two connection options for the voltage measurement.

Connection option 0


- Direct measurement of the voltage in 3-phase 4-conductor systems.
- Measurement via 3 voltage transformers in 3-phase 4-conductor systems.
- Measurement in one-phase-3-conductor systems.

Connection option 1

- Direct measurement of the voltage in three-phase 3-conductor systems.
- Measurement via 2 voltage transformers (Aron circuit) in three-phase 3-conductor systems.

| Address | Connection option |
|---------|---|
| 111 | 0 = Three-phase 4-conductor systems (default factory setting) 1 = Three-phase 3-conductor systems |

Fig.: Section of the parameter list for the voltage transformer connection options

| | |
|---|--|
|  | For the inputs L4 and I4 are no connection schemes required. |
|---|--|

Interfaces

The Energy Meter D650 has 2 serial interfaces:

- RS485
- RS232

All interfaces can be used simultaneously.

RS232

The following data must be programmed for use of the RS232 interface:

- Baud rate,
- Operating mode.

Refer to the parameter list in the appendix for the default factory setting and the setting ranges.

RS485

The following data must be programmed for use of the RS485 interface:

- Device address,
- Baud rate,
- Operating mode.

Refer to the parameter list in the Appendix for the default factory setting and the setting ranges.

| Address | Content |
|---------|---|
| 200 | Device address (1...255) valid for Modbus and Profibus 1 = default factory setting |

Recordings

2 recordings are preconfigured in the default factory setting of the Energy Meter D650. Recordings are adjusted and extended via the software ecoExplorer go.

Recording 1

The following measured values are recorded with the time base of 15 minutes:

- Voltage effective L1
- Voltage effective L2
- Voltage effective L3
- Voltage effective L4
- Voltage effective L2-L1
- Voltage effective L3-L2
- Voltage effective L1-L3
- Current effective L1
- Current effective L2
- Current effective L3
- Current effective L4
- Active Power L1
- Active Power L2
- Active Power L3
- Active Power L4
- Active Power Sum L1-L3
- Active Power Sum L1-L4
- Reactive power fundamental L1
- Reactive power fundamental L2
- Reactive power fundamental L3
- Reactive power fundamental L4
- Reactive power fundamental Sum L1-L3
- Reactive power fundamental Sum L1-L4

(The mean value, minimum value and maximum value are also recorded for each measured value.)

Recording 2

The following measured values are recorded with the time base of 1 hour:

- Consumed Active Energy L1
- Consumed Active Energy L2
- Consumed Active Energy L3
- Consumed Active Energy L4
- Consumed Active Energy Sum L1-L3
- Consumed Active Energy Sum L1-L4
- Inductive Reactive Energy L1
- Inductive Reactive Energy L2
- Inductive Reactive Energy L3
- Inductive Reactive Energy L4
- Inductive Reactive Energy Sum L1-L3
- Inductive Reactive Energy Sum L1-L4

System information

Overrange

Overranges are displayed as long as they exist and cannot be acknowledged. An overrange exists if at least one of the four voltage or current measurement inputs lies outside their specified measuring range.

If an overrange exists it is shown in the display with “EEEE”. The symbols L1, L2, L3 and L4 are used to indicate at which input the overrange has occurred. The “V” and “A” symbols indicate whether the overrange occurred in the current or in the voltage path.

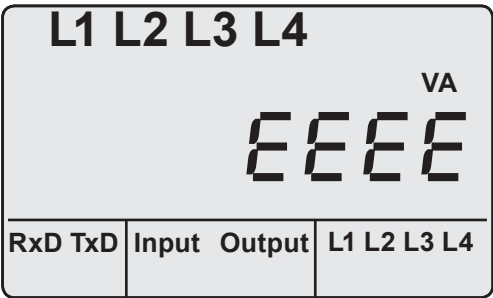


Fig.: Measured value display with overrange

Important!
Voltages and currents that lie outside the permissible measuring range can destroy the device.

Serial number

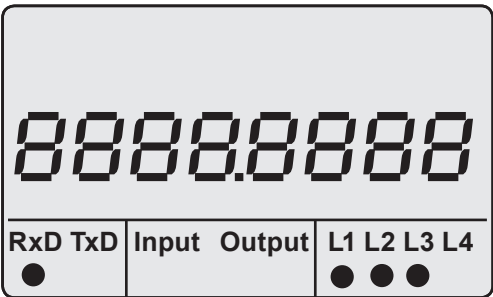


Fig.: Measured value display with serial number

Date

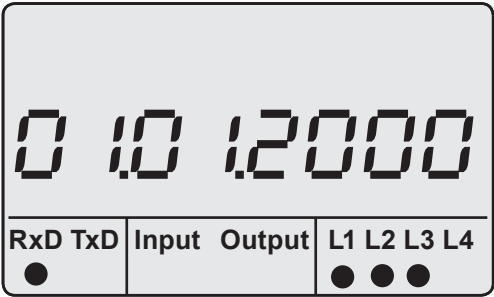


Fig.: Measured value display with date

Firmware release

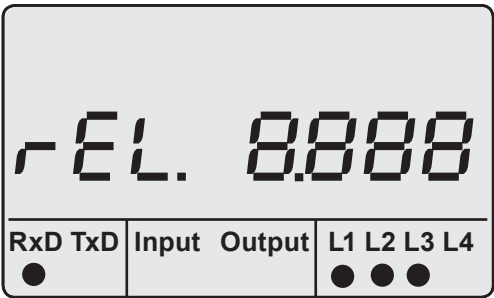


Fig.: Measured value display for the firmware release

Time

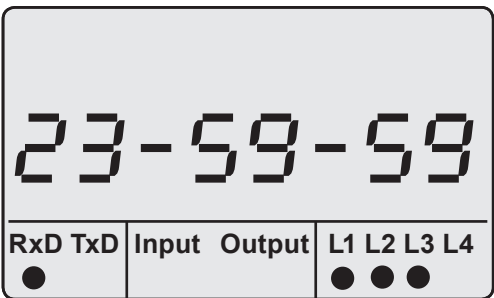


Fig.: Measured value display with time

Service and maintenance

The device is subjected to various safety checks before delivery and marked with a seal. If a device is opened, the safety checks must be repeated. A warranty will be provided for unopened devices only.

Repair and calibration

Repair work and calibration can be carried out by the manufacturer only.

Front film

The front film can be cleaned with a soft cloth and standard household cleaning agent. Do not use acids and products containing acid for cleaning.

Battery

The internal clock is provided with power from the power supply voltage. If the power supply voltage fails the clock is supplied by the battery. The clock supplies date and time information, e.g. for recordings and minimum and maximum values.

The life expectancy of the battery is at least 5 years, at a storage temperature of +45 °C. The typical life expectancy of the battery is 8 to 10 years.

The device must be opened to change the battery. If the device has been opened a renewed safety check is necessary for safe operation. A warranty will be provided for unopened devices only.

Disposal

The Energy Meter D650 can be reused or recycled as electronic scrap in accordance with the legal provisions. The permanently installed lithium battery must be disposed of separately.

Firmware update

If a firmware update has to be performed for your Energy Meter D650 you can do this with the ecoExplorer go software.

Service

Should questions arise, which are not described in this manual, please contact the manufacturer directly.

We will need the following information from you to answer any questions:

- Device name (see rating plate),
- Serial name (see rating plate),
- Software release (see measured value display),
- Measuring-circuit voltage and power supply voltage,
- Precise description of the error.

Trouble shooting

| Possible error | Cause | Remedy |
|---|---|---|
| No display. | External fusing for the power supply voltage has tripped. | Replace fuse. |
| | Device is defective. | Send device to the manufacturer for repair. |
| No current display. | Measurement voltage is not connected. | Connect the measuring-circuit voltage. |
| | Measurement current is not connected. | Connect measuring-circuit current. |
| Displayed current is too large or too small. | Current measurement in the wrong phase. | Check connection and correct if necessary. |
| | Current transformer factor is incorrectly programmed. | Read out and program the current transformer transformation ratio at the current transformer. |
| "EEEE" and "A" in the display. | The current measuring range has been exceeded. | Check the measuring-circuit current and if necessary install a suitable current transformer. |
| Displayed voltage is too small or too large. | Measurement in the wrong phase. | Check connection and correct if necessary. |
| | Voltage transformer incorrectly programmed. | Read out and program the voltage transformer transformation ratio at the voltage transformer. |
| Displayed voltage is too small. | Overrange. | Install voltage transformers. |
| | The peak voltage value at the measurement input has been exceeded by harmonic components. | Important! Ensure the measurement inputs are not overloaded. |
| "EEEE" and "V" in the display. | The voltage measuring range has been exceeded. | Check the measuring-circuit voltage and if necessary install a suitable voltage transformer. |
| "Error CF" in the display. | The calibration data could not be read out. | Send device to the manufacturer for checking with a precise description of the error. |
| Active power consumption / supply is reversed. | At least one current transformer connection is mixed up/reversed. | Check connection and correct if necessary. |
| | A current path is assigned to the wrong voltage path. | Check connection and correct if necessary. |
| Active power too small or too large. | The programmed current transformer transformation ratio is incorrect. | Read out and program the current transformer transformation ratio at the current transformer. |
| | The current path is assigned to the wrong voltage path. | Check connection and correct if necessary. |
| | The programmed voltage transformer transformation ratio is incorrect. | Read out and program the voltage transformer transformation ratio at the voltage transformer. |
| No connection with the device. | RS485 - Device address is incorrect. - Wrong protocol. - Different bus speed. - Termination missing. | - Adjust the device address. - Correct protocol. - Correct speed (baud rate). - Close bus with terminating resistor (120 ohm). |
| | RS232 - Device address is incorrect. - Wrong protocol. - Different bus speed. - The concealed key (service) was used. | - Adjust the device address. - Correct protocol. - Correct speed (baud rate). - Overwriting the address 204 with 0 |
| Despite the measures above the device does not work. | Device is defective. | Send device to the manufacturer for checking with a precise description of the error. |

Technical specifications

| General information | |
|-------------------------------|--|
| Net weight | 350 g |
| Device dimensions | approx. l = 107.5 mm, b = 90 mm, h = 82 mm (according to DIN 43871:1992) |
| Housing flammability class | UL 94V-0 |
| Installed position | any |
| Fixing/mounting | 35 mm top hat rail (according to IEC/EN 60999-1, DIN EN 50022) |
| Battery | Type VARTA CR2032, 3 V, Li-Mn |
| Backlight lifetime (optional) | 40000 h (50 % of initial brightness) |

| Ambient conditions during operation | |
|---|--|
| The Energy Meter D650 is intended for weather-protected, stationary use. The Energy Meter D650 fulfils the use conditions according to DIN IEC 60721-3-3. | |
| Operating temperature range | -10...+55 °C |
| Relative humidity | 5...95 %, (at +25 °C) without condensation |
| Degree of pollution | 2 |
| Operating altitude | 0...2000 m above sea level |
| Installed position | any |
| Ventilation | Forced ventilation is not required. |

| Transport and storage | |
|---|--------------|
| The following information applies to devices which are transported or stored in the original packaging. | |
| Free fall | 1 m |
| Temperature | -20...+70 °C |

| Power supply voltage | |
|--|---|
| The supply voltage to the Energy Meter D650 must be connected through a UL/IEC approved fuse (6 A, Char. B). | |
| Option 230 V: | |
| Nominal range | 95...240 V (45...65 Hz) or DC 135...340 V |
| Operating range | +10 % of nominal range |
| Installation overvoltage category | 300 V CAT II |
| Power consumption | max. 3,2 W / max. 9 VA |
| Option 90 V (without UL approval): | |
| Nominal range | 50...110 V (45...65 Hz) or DC 50...155 V |
| Operating range | +10 % of nominal range |
| Installation overvoltage category | 300 V CAT II |
| Power consumption | max. 3,2 W / max. 9 VA |
| Option 24 V: | |
| Nominal range | 20...50 V (45...65 Hz) or DC 20...70 V |
| Operating range | +10 % of nominal range |
| Installation overvoltage category | 150 V CAT II |
| Power consumption | max. 5 W / max. 8 VA |

| Connectable conductors | |
|--|--|
| Only one conductor may be connected per terminal connection! | |
| Solid core, multi-core, flexible core | 0.08...2.5 mm ² , AWG 28...12 |
| Pin-end connector, wire end ferrules | 1.5 mm ² , AWG 16 |

| Protection class | |
|---|---|
| Class II according to IEC 60536 (VDE 0106, Part 1), i.e. a PE terminal is not required! | |
| Protection against ingress of solid foreign bodies and water | IP20 according to EN 60529 September 2014, IEC 60529:2013 |

| Digital inputs | |
|--------------------------------|---|
| 2 digital inputs | |
| Pulse input (S0) | |
| Maximum counting frequency | 20 Hz |
| Switching input | |
| Response time (Jasic-Programm) | 200 ms |
| Input signal applied | 18...28 V DC (typically 4 mA) |
| Input signal not applied | 0...5 V DC, current less than 0.5 mA |
| Cable length | - up to 30 m unshielded - greater than 30 m shielded |

| Digital outputs | |
|---|---|
| 2 digital outputs, semi-conductor relay, not short-circuit proof. | |
| Switching voltage | max. 60 V DC, 30 V AC |
| Switching current | max. 50 mAeff AC/DC |
| Response time (Jasic program) | 200 ms |
| Output of voltage dips | 20 ms |
| Output of voltage overranges | 20 ms |
| Pulse output (operating pulses) | max. 20 Hz |
| Cable length | - up to 30 m unshielded - greater than 30 m shielded |

| Connectable conductors (digital inputs and outputs) | |
|---|--|
| Solid core, multi-core, flexible core | 0.08...1.5 mm ² |
| Pin-end connector, wire end ferrules | 1 mm ² , only one conductor may be connected per terminal connection! |

| Temperature measurement input | |
|-------------------------------|---|
| Update time | approx. 200 ms |
| Connectable sensors | PT100, PT1000, KTY83, KTY84 |
| Total burden (sensor + cable) | max. 4 kohm |
| Cable length | - up to 30 m unshielded - greater than 30 m shielded |

| Sensor type | Temperature range | Resistance range | Measurement uncertainty |
|-------------|-------------------|------------------|-------------------------|
| KTY83 | -55...+175 °C | 500...2600 Ohm | ±1.5 % rng |
| KTY84 | -40...+300 °C | 350...2600 Ohm | ±1.5 % rng |
| PT100 | -99...+500 °C | 60...180 Ohm | ±1.5 % rng |
| PT1000 | -99...+500 °C | 600...1800 Ohm | ±1.5 % rng |

rng = measuring range

Technical specifications

| Connectable conductors (temperature measurement input) | |
|--|--|
| Solid core, multi-core, flexible core | 0.08...1.5 mm ² |
| Pin-end connector, wire end ferrules | 1 mm ² , only one conductor may be connected per terminal connection! |

| Interfaces | |
|----------------------|--|
| RS232 | |
| Connection | 5 pin screw-type terminals |
| Protocol | Modbus RTU/slave |
| Transfer rate | 9.6 kbps / 19.2 kbps / 38.4 kbps / 115.2 kbps |
| RS485 | |
| Connection | 2 pin screw-type terminals |
| Protocol, modbus RTU | Modbus RTU/slave |
| Transfer rate | 9.6 kbps / 19.2 kbps / 38.4 kbps / 57.6 kbps / 115.2 kbps / 921.6 kbps |

| Measurement uncertainty | |
|--|---|
| The measurement uncertainty of the Energy Meter D650 applies to use of the following measuring ranges. The measured value must lie within the given limits. Outside these limits the measurement uncertainty is unspecified. | |
| Measured value | Measurement uncertainties |
| Voltage | ±0.2 % DIN EN 61557-12:2008 |
| Current L | ±0.2 % DIN EN 61557-12:2008 |
| Current N | ±0.6 % DIN EN 61557-12:2008 |
| Power | ±0.4 % DIN EN 61557-12:2008 |
| Harmonic components U, I | Class 1, DIN EN 61000-4-7 |
| Active energy | |
| Current transformer .../5A | Class 0.5 S (DIN EN 62053-22:2003, IEC 62053:22:2003) |
| Current transformer .../1A | Class 1 (DIN EN 62053-21:2003, IEC 62053:21:2003) |
| Reactive energy | |
| Current transformer .../5A | Class 2 (DIN EN 62053-23:2003, IEC 62053:23:2003) |
| Current transformer .../1A | Class 2 (DIN EN 62053-23:2003, IEC 62053:23:2003) |
| Frequency | ±0.01 Hz |
| Internal clock | ±1 minute/month (18...28 °C) |

The specifications apply under the following conditions:

- Annual recalibration,
- a warming up time of 10 minutes,
- an ambient temperature of 18...28 °C.

If the device is operated outside the range from 18...28 °C an additional measurement error equal to ±0.01 % of the measured value must be taken into account per °C difference.

| Measuring inputs | |
|---|------------------------------|
| Voltage measurement | |
| Three-phase 4-wire systems (L-N/L-L) | max. 277 V / 480 V |
| Three-phase 3-wire systems (L-L) | max. 480 V |
| Resolution | 0.01 V |
| Measurement range L-N | 0 ¹⁾ ...600 Vrms |
| Measurement range L-L | 0 ¹⁾ ...1000 Vrms |
| Crest-factor | 2 (referring to 480 Vrms) |
| Measurement category | 300 V CAT III |
| Specified impulse withstand voltage | 4 kV |
| Fuse protection for voltage measurement | 1...10 A |
| Impedance | 4 MOhm/phase |
| Power input | approx. 0.1 VA |
| Scanning frequency | 20 kHz/phase |
| Fundamental oscillation | 45...65 Hz |

1) The Energy Meter D650 can only detect measurement values if a voltage L-N larger than 10 Veff or a voltage L-L larger than 18 Veff is applied to at least one voltage measurement input.

| Current measurement | |
|--|--------------------------------------|
| Nominal current | 5 A |
| Rated current | 6 A |
| Fuse protection for direct measurement (without current transformer) | 6 A Char. B (approved i.a.w. UL/IEC) |
| Resolution | 1 mA |
| Measurement range | 0.001...8.5 Arms |
| Crest-factor | 2 (referring to 6 Arms) |
| Measurement category | 300 V CAT III |
| Specified impulse withstand voltage | 4 kV |
| Power input | approx. 0.2 VA (Ri = 5 mohm) |
| Overload for 1 second | 100 A (sinusoidal) |
| Scanning frequency | 20 kHz |

| Connectable conductors (voltage and current measurement) | |
|--|--|
| Only one conductor may be connected per terminal connection! | |
| Solid core, multi-core, flexible core | 0.08...4 mm ² , AWG 28...12 |
| Pin-end connector, wire end ferrules | 2.5 mm ² , AWG 14 |

Parameter list

| Address | Name | Setting range | Unit | Default setting |
|---------|--|---------------|------|-----------------|
| 000 | Current transformer, primary, L1...L4 | 0...1000000 | A | 5 |
| 001 | Current transformer, secondary, L1...L4 | 1...5 | A | 5 |
| 002 | Voltage transformer, primary, L1...L4 | 0...1000000 | V | 400 |
| 003 | Voltage transformer, secondary, L1...L4 | 1...400 | V | 400 |
| 010 | Current transformer, primary, L1 | 0...1000000 | A | 5 |
| 011 | Current transformer, secondary, L1 | 1...5 | A | 5 |
| 012 | Voltage transformer, primary, L1 | 0...1000000 | V | 400 |
| 013 | Voltage transformer, secondary, L1 | 1...400 | V | 400 |
| 020 | Current transformer, primary, L2 | 0...1000000 | A | 5 |
| 021 | Current transformer, secondary, L2 | 1...5 | A | 5 |
| 022 | Voltage transformer, primary, L2 | 0...1000000 | V | 400 |
| 023 | Voltage transformer, secondary, L2 | 1...400 | V | 400 |
| 030 | Current transformer, primary, L3 | 0...1000000 | A | 5 |
| 031 | Current transformer, secondary, L3 | 1...5 | A | 5 |
| 032 | Voltage transformer, primary, L3 | 0...1000000 | V | 400 |
| 033 | Voltage transformer, secondary, L3 | 1...400 | V | 400 |
| 040 | Current transformer, primary, L4 | 0...1000000 | A | 5 |
| 041 | Current transformer, secondary, L4 | 1...5 | A | 5 |
| 042 | Voltage transformer, primary, L4 | 0...1000000 | V | 400 |
| 043 | Voltage transformer, secondary, L4 | 1...400 | V | 400 |
| 100 | Automatically get TFTP configuration file 0 = switched off x = file number | 0...9999 | - | 0 |
| 101 | TFTP error handling 0 = In the event of an error the configuration menu appears in the Energy Meter D650. 1 = In the event of an error the does NOT switch to the configuration menu of the Energy Meter D650. | 0...1 | - | 0 |
| 110 | Current transformer circuit (L1...L3) 0 = three current transformers 1 = two current transformers (Aron circuit) | 0...1 | - | 0 |
| 111 | Voltage measurement system configuration 0 = three-phase 4-conductor system (TT, TN system) 1 = three-phase 3-conductor system (IT system) | 0...1 | - | 0 |
| 112 | Deletes all real and apparent energy meters and S0-counters (1 = delete) | 0...1 | - | 0 |
| 113 | Deletes all reactive energy meters (1 = delete) | 0...1 | - | 0 |
| 114 | Resets all minimum and maximum values (1 = reset) | 0...1 | - | 0 |
| 200 | Device address, modbus/profibus | 1...255 | | 1 |
| 201 | Baud rate, RS232 0 = 9600 Bit/s 1 = 19200 Bit/s 2 = 38400 Bit/s 3 = 57600 Bit/s 4 = 115200 Bit/s | 0...4 | | 4 |
| 202 | Baud rate, RS485 0 = 9600 Bit/s 1 = 19200 Bit/s 2 = 38400 Bit/s 3 = 57600 Bit/s 4 = 115200 Bit/s 5 = 921600 Bit/s | 0...5 | | 4 |
| 203 | RS485, mode 0 = modbus RTU/slave 1 = modbus RTU/master 2 = gateway transparent | 0...6 | | 0 |

Technical specifications

| | | | | |
|-----|--|----------|---|------|
| 204 | RS232, mode 0 = modbus RTU/slave 3 = Debug 6 = SLIP (only for internal use) | 0...6 | | 0 |
| 400 | Day | 1...31 | | xx |
| 401 | Month | 1...12 | | xx |
| 402 | Year | 1...9999 | | xxxx |
| 403 | Hour | 0...23 | | xx |
| 404 | Minute | 0...59 | | xx |
| 405 | Second | 0...59 | | xx |
| 406 | Accept date and time 1 = accept set data | 0, 1 | | 0 |
| 500 | Device password | 0...9999 | | xxxx |
| 600 | LCD, Contrast | 0...99 | - | 50 |
| 601 | LCD, Backlight, max. brightness | 0...16 | - | 10 |
| 602 | LCD, Backlight, min. brightness | 0...8 | - | 3 |
| 603 | LCD, Backlight | 0...9999 | s | 60 |

Measured value displays

You can have the following measured values shown on the display, with the default factory setting, using keys 1 and 2. The measured value names used are abbreviated and have the following meaning:

Active power demand = active power demand, imported supply
 Reactive power = reactive power, inductive
 Active power demand = active power demand, imported supply with return block

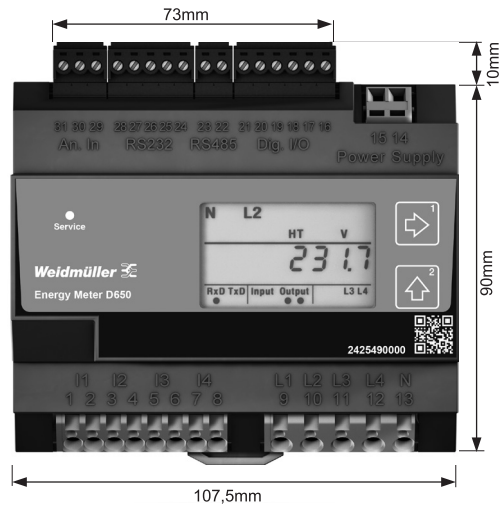
| | | | | | |
|--------------------------|-------------------------|-------------------------|-------------------------|-----------------------------|-----------------------------|
| Voltage L1-N | Voltage L2-N | Voltage L3-N | Voltage L4-N | | |
| Voltage L1-L2 | Voltage L2-L3 | Voltage L3-L1 | | | |
| Current L1 | Current L2 | Current L3 | Current L4 | | |
| Active Power demand L1 | Active Power demand L2 | Active Power demand L3 | Active Power demand L4 | Active Power demand L1..L3 | Active Power demand L1..L4 |
| Reactive Power L1 | Reactive Power L2 | Reactive Power L3 | Reactive Power L4 | Reactive Power L1..L3 | Reactive Power L1..L4 |
| Active Energy demand L1 | Active Energy demand L2 | Active Energy demand L3 | Active Energy demand L4 | Active Energy demand L1..L3 | Active Energy demand L1..L4 |
| cos(phi) L1 | cos(phi) L2 | cos(phi) L3 | cos(phi) L4 | cos(phi) L1..L3 | |
| Frequency Rotating field | Temperature input | Date | Time | Serial number | Firmware release |

Declaration of conformity

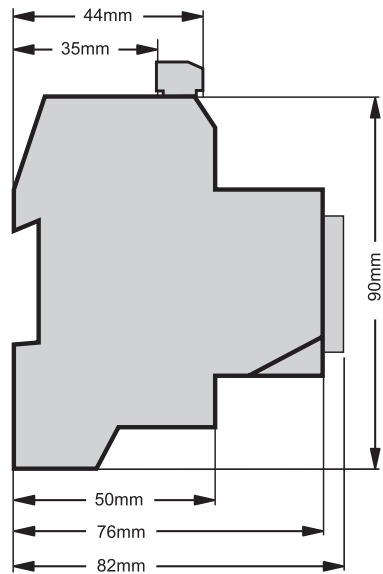
| The product fulfils the following EC Directives: | |
|--|---|
| 2004/108/EC | Electromagnetic compatibility of electrical equipment. |
| 2006/95/EC | Electrical equipment for use within certain voltage limits. |
| Considered standards: | |
| Noise immunity | |
| IEC/EN 61326-1:2013 | Class A: Industrial environment |
| IEC/EN 61000-4-2:2009 | Electrostatic discharge |
| IEC/EN 61000-4-3:2011 | Electromagnetic RF fields 80 to 2700 MHz |
| IEC/EN 61000-4-4:2013 | Burst |
| IEC/EN 61000-4-5:2007 | Surge |
| IEC/EN 61000-4-6:2009 | Conducted disturbances 0.15 to 80 MHz |
| IEC/EN 61000-4-8:2010 | Power frequency magnetic field |
| IEC/EN 61000-4-11:2005 | Voltage dips, short interrupts and voltage variations |
| Noise emission | |
| IEC/EN 61326-1:2013 | Class B: Residential environment |
| IEC/CISPR11/EN 55011:2011 | Radio disturbance field strength 30 to 1000 MHz |
| IEC/CISPR11/EN 55011:2011 | Radio disturbance voltage 0.15 to 30 MHz |
| Equipment safety | |
| IEC/EN 61010-1:2011 | Safety requirements for electrical equipment for Measurement, control and laboratory use – Part 1: General requirements |
| IEC/EN 61010-2-030:2011 | Particular requirements for testing and measuring circuits |

Dimensioned drawings

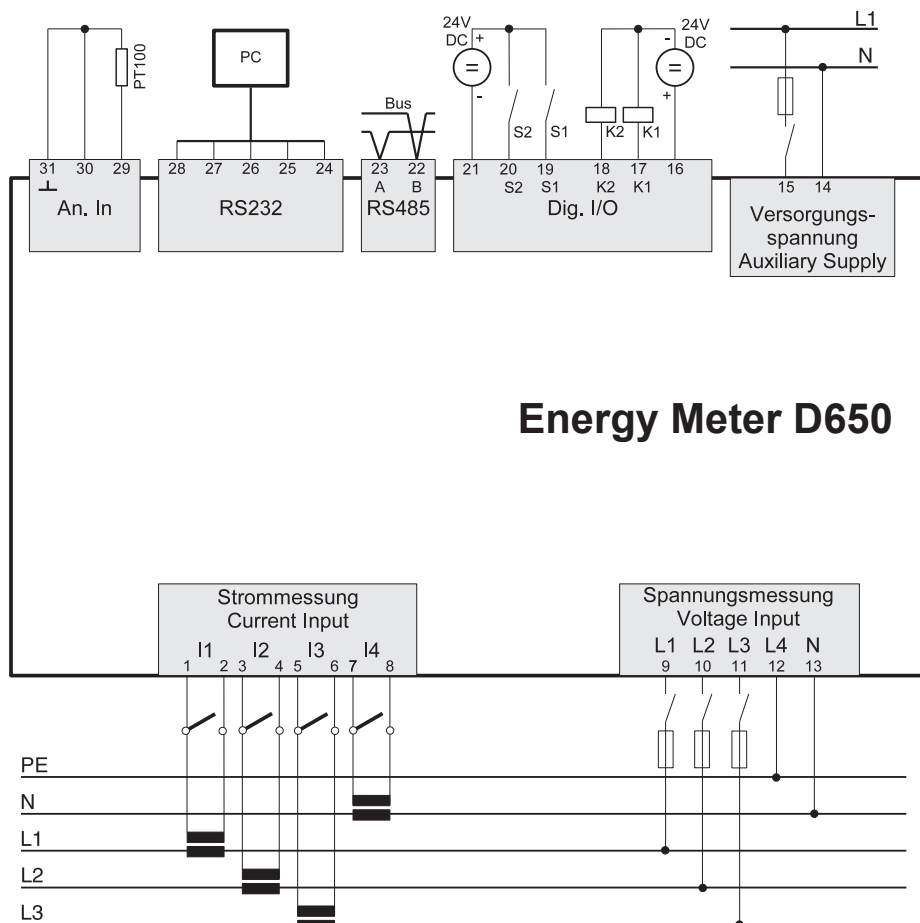
Front view



Side view



Energy Meter D650 connection example



Quick Reference Instructions

Adjusting the primary current

You have three current transformers of the same type with a current transformer ratio of 200 A / 5 A.

You would like to program the primary current with 200 A.

To do this you must enter the value 200 for the primary current in the address 000.

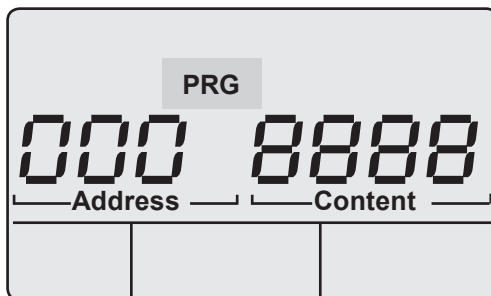
The secondary current is preset to 5 A in address 001 in the factory.

Switch to Program mode

Simultaneously press keys 1 and 2 for around one second.

The PRG symbol for programming mode appears.

The content of address 000 is displayed.



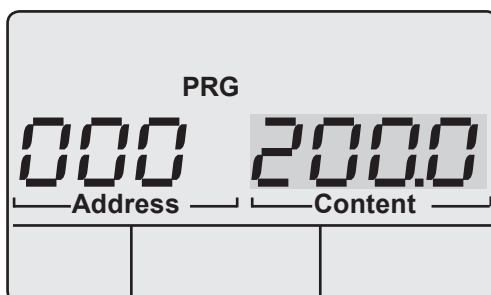
Change address

As address 000 is already displayed the address does not have to be changed.

Enter the primary current

Use Key 1 to select the digit to be changed.

Use Key 2 to change the selected digit.



Exit program mode

Simultaneously press both keys for around 1 second.

The current transformer setting is saved and the device returns to display mode.

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