NORD

Power Genius 3000

Installation Guide
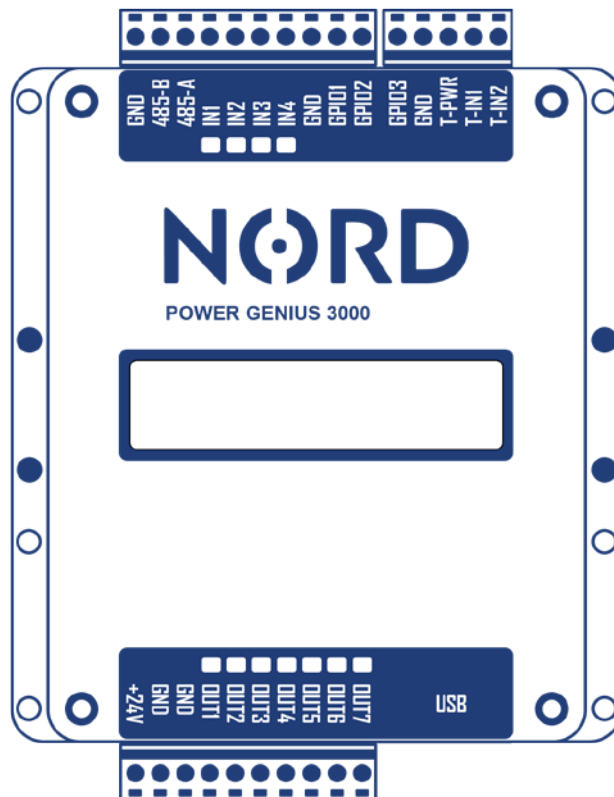
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Product description

General information

NORD Power Genius 3000 is an Energy manager of new generation for green electricity surplus.

Description of function

The device contains seven independent outputs that are controlled based on the current parameters of the photovoltaic system according to the set rules in the individual working control modes. Working modes can be combined to achieve the desired logic of appliances control.

Warning: The device is intended as a complement to photovoltaic system technologies. For proper operation, verify that your device is compatible with the Power Genius 3000.

Work modes – Output control

The work mode controls output(s) according to set criteria. It controls and regulates connected appliances (HVAC, water heater, etc.).

Regulation	Mode for regulating output rate of resistive appliances according to current value of delivery or consumption from distribution grid
Export to grid	The mode turns on output on overflow basis on excess power to the distribution grid
Battery Status	Mode turns on output based on battery status. Suitable for systems without enabled delivery of surplus to distribution grid
Timer	Timer mode for switching on outputs in defined time slots
Thermostat	Mode for turning on output when defined temperatures are reached
Input – External control	Mode for turning output on by an external signal
Input – Button	Mode for forced turning output on for a defined time interval

Package content

Power Genius 3000	Including mounting brackets on a DIN rail
Configuration cable	USB A – USB Mini B – 1 m
Manual	Quick installation manual

Optional accessories

Power supply	230 V AC – 24 V 0.63 A DC
Electromagnetic relay	24 V DC – 230 V AC 6 A / 16 A / 20 A
SSR relay	24 V DC – 230 V AC 10A /20 A / 25 A AC
Temperature sensor	Digital thermometer DS18B20 on cable

Technical data

Parameters

Dimensions	85 x 115 x 27 mm
Assembly	DIN rail, or on panel
Power supply	24 V DC / 100 mA
Operating temperature	-20 °C to +50 °C, dry environment
Inverter communicator	RS485, MODBUS RTU
4x digital input	Designed for connection of dry contacts, activation by connection to the GND terminal
7x digital output	Transistor outputs with open collector (switch GND level), max. load of one output is 100 mA / 24 V
2x temperature sensor input	Designed for DS18B20 temperature sensors
Configuration	PC application configuration, connection to PC via mini-USB cable, compatible OS: Windows 7 and above

Terminals description

Description of terminals in order from upper left to lower right.

GND, 485-B, 485-A	Data communication line with the inverter, the connection is made by terminal A to A, B to B. Do not connect the GND terminal unless otherwise stated in the inverter manual
IN1 to IN4 and GND	Digital inputs IN1 to IN4 and GND potential for their activation
GPIO1 to GPIO3	Do not connect these terminals, they are reserved for custom-made deliveries
GND, T-PWR, T-IN1 and T-IN2	GND(-) and T-PWR(+) are power supply, T-IN1 and T-IN2 data lines for DS18B20 temperature sensors
+24 V, GND, GND	Power input for device +24 V(+), GND(-). The GND terminals are connected inside the device
OUT1 to OUT7	Digital outputs/terminals connect GND levels

Compatibility

The device is compatible with selected types of photovoltaic inverters, digital electrometers. Some functions of NORD Power Genius 3000 may be, in view of technical limits of specific equipment, limited. **Updated overview and documentation to supported equipment including all instructions must be provided by your distributor.**

Equipment installation

Installation directions

- The device may only be connected to the electrical network by a properly qualified electrician
- The power supply of the device must be protected by an external fuse according to the specification in the technical parameters chapter.
- The device is not intended for an environment with a risk of fire or explosion.
- The inputs are potential-free, do not connect any other potential than from the GND terminal of the device.
- The device has transistor outputs with an open collector. They switch the level of the GND terminal of the device.
- If the outputs switch inductive load, for example an electromagnetic relay, they must be equipped with a protective diode.
- Do not disassemble the device. All repairs may be carried out ONLY by an authorized service.
- Appliances controlled by this device must contain their own protective and regulatory elements. The manufacturer does not bear responsibility for damage to property or health caused by the connected appliance.
- The manufacturer is not responsible for device malfunction caused by software and hardware changes on the side of the connected inverter or other equipment.
- The use of *Regulation* mode at specific output is possible **only with compatible SSR relay** and it serves only for **resistance loads**.

## Power supply connection diagram

To power the device use DC voltage source 24 V, min. 100 mA.
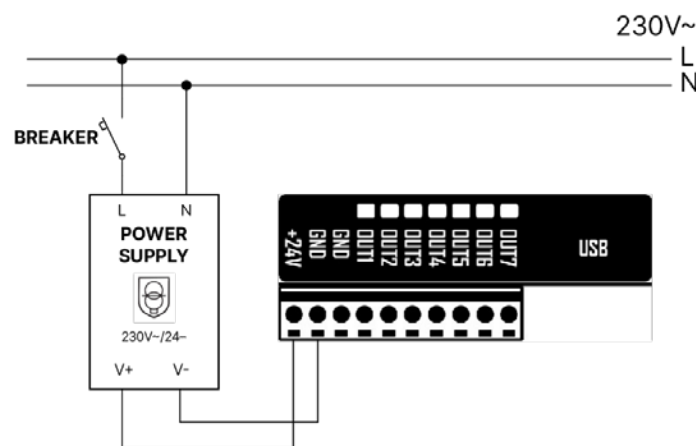
If additional devices are connected, e.g. control relays, we recommend a source of min. 500 mA.

Data communication connection diagram

Connect the device to the inverter's communication port (RS485) using a data cable. The connection is made with terminal A to A, B to B. Do not connect the GND terminal unless otherwise stated in the inverter manual. Specific procedure of connection to supported equipment is available in separate documentation to the equipment.
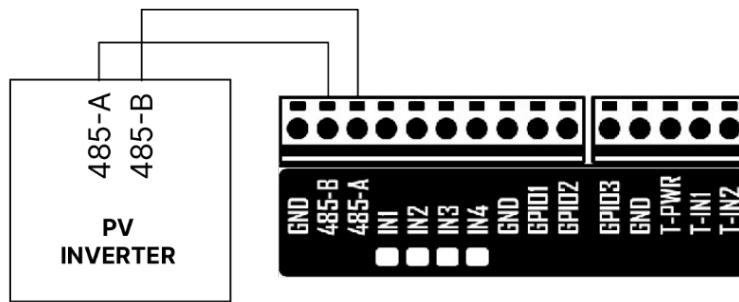
Input connection diagram

The inputs are potential-free, never connect any other potential than that from the GND section terminal of the device
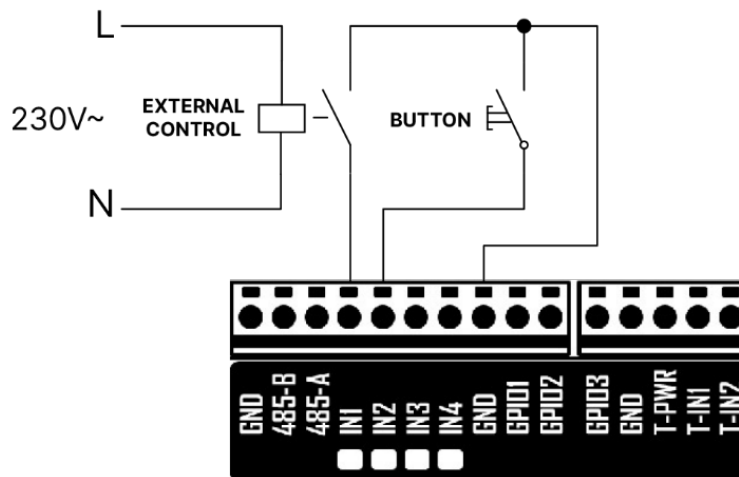
Output connection diagram

The outputs are transistor outputs, with an open collector, they switch the level of the GND terminal. To power the power switches (SSRs and electromagnetic relays), use 24 V from the source, or +24 V device input terminals. If the outputs of the device switch on an inductive load, for example an electromagnetic relay, it needs to be equipped with a protective diode. If you use **SSR relay** in *Regulation* **mode**, it is necessary to use the possibility with **zero cross**.
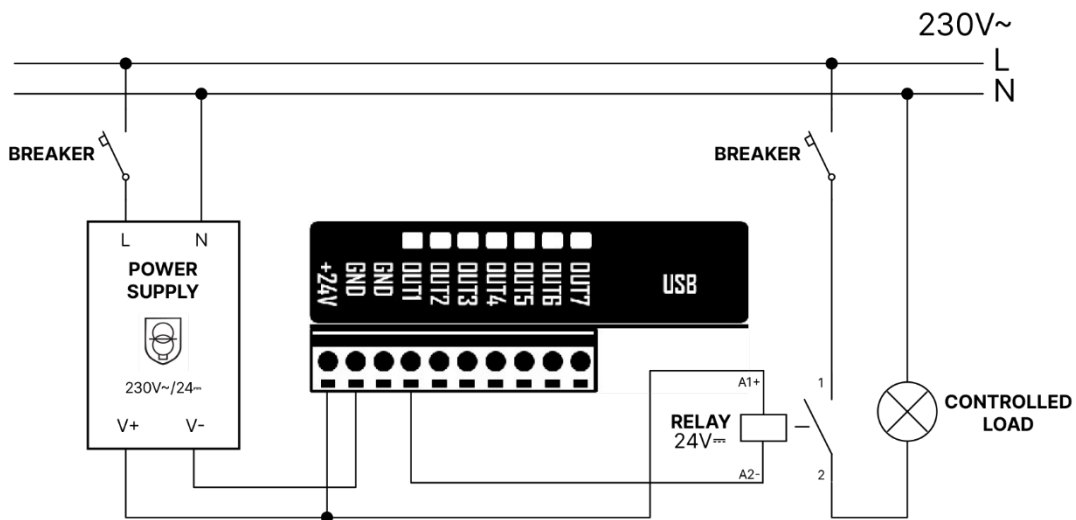
Thermometers connection diagram

Connect maximum one DS18B20 temperature sensor to each of the T-IN1 and T-IN2 inputs. The GND and T-PWR terminals are common for both sensors.
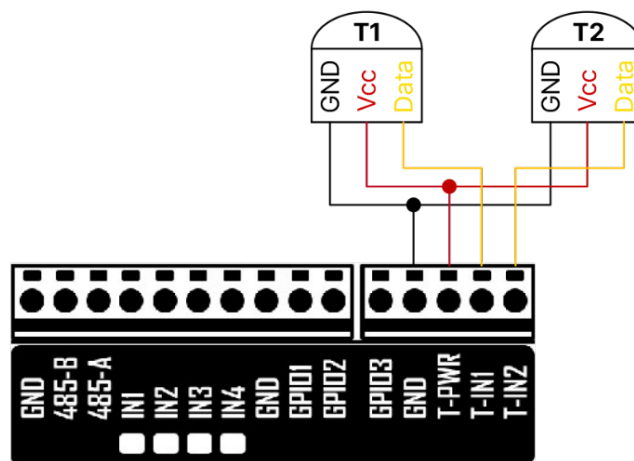
Device configuration

Configuration application

Device configuration is done in application software that can be downloaded to your computer from your **distributor's website.**

Extract the downloaded file with all subfolders in the selected directory and run the file:

NORD Power Genius 3000.exe

Download updated firmware version according to the type of connected equipment by button **Update firmware** (action tab).

Connect the device to the computer using the supplied USB cable. Check that the application shows **Connected** in bottom left-hand corner.

Click the **Read from unit** button. This will load the settings/configuration from the device into the application which will allow make changes in the settings in the app.

After completing the changes, click **Save to unit**. This will transfer the settings/configuration from the application to your device. The result of the load/save operation is displayed in the lower right-hand corner of the application.

Note: Configuration application is distributed together with all firmware files for supported equipment. In case of configuration in equipment always verify that configuration application and specific firmware are in the same version, or perform update to the new version according to the instructions above. **In case that the selected equipment** (according to used firmware) **does not support some functions of NORD Power Genius 3000 the setting in configuration software is deactivated** (the text is grey, values cannot be inserted)

Application notes

- The modified configuration changes in the application will be reflected only after the settings are transferred from the application to the device button Save to unit) until then the device works with last configuration stored.
- When loading/saving the configuration and updating the device firmware, always wait for the application to confirm the completion of the operation.
- In case of unsuccessful completion, repeat the operation.
- After the settings are saved in the device, its logic will be restarted.
- Before the device is connected in real operation, we recommend testing the behaviour of the logic with a simulator; see separate chapter below.
- Multiple control modes are enabled simultaneously for each output.
- The set value *Minimum Power-on Time* is used only by the *Export to grid and Battery Status control modes*
- If more modes *Regulation, Export to grid and Battery Status* are simultaneously enabled on the same output, the output will open when the conditions of one of these modes are met. To turn off the output, the conditions for all modes need to be met at the same time.

Main window

General tab	Information of firmware version in connected equipment NORD power Genius 3000 and basic setting.
Outputs tab	The settings for controlling individual outputs.
Simulator tab	Start and control of the inverter simulator.
Action tab	Section for saving and loading configuration & firmware update.
Information panel Inverter	Displays the current values of the inverter or simulator.
Information panel NORD Power Genius 3000	Current statuses of device inputs, outputs and sensors.

Output tabs

Output names	Name of output, can be customized.
Superior output	Indicates which output is superior to this output. This setting only applies to *Regulation Export to grid and Battery Status*. More in a separate section below.
Minimum switch-on time	If the output switches on when the conditions are met, it will not turn off before this time has elapsed, even if the conditions for turning the output off have already been met. If this time elapses and the conditions for turning off the output have not yet been met, the output remains on. This setting only applies to *Export to grid and Battery Status.*

Superior output

The superior outputs function can only be used for *Regulation*, *Export to grid and Battery Status* modes. In other modes the outputs are always independent.

If the superior output is set to *Superior output = none*, it means the output will be turned on/off whenever the conditions for turning on or off are met, regardless the other output's status.

When using the superior output functions, at least one of the outputs must always be set to *Superior output = none.* This output is then the main and the control of the other outputs depends on it.

If an output has its Superior output set, it can only be turned on when its superior output is turned on.

If the output is superior to another output (subordinate), it can only be switched off when its subordinate output is switched off.

Note: In *Regulation* mode it is considered that the output is switched on by reaching 100 % of its ration output.

Output controls – Regulation

Regulation mode regulates output of the connected appliance by SSR relay based on preset rules.

- **Increase of power:** when the value of grid power reached the preset phase, it gradually increases the connected appliance output.

- **Decrease of power:** when the grid power decreases under the value on preset phase, it gradually decreases connected appliance output.

  Both values can be set as positive or negative. During grid output is between set values of *increasing power* and *decreasing power*, the connected appliance output does not change.

- **Maximal battery consumption:** when the value is exceeded it gradually decreases the connected appliance output.

- **Minimal SOC:** in case SOC is under the preset value, the output is switched off (output = 0)

Note: Regulation can be enabled and combined with other modes. Regulation mode has the lowest priority, so when the output should be switched on by *Overflow* or *Battery status*, *Timer* etc., then the output is switched on according to the rules of these modes and *Regulation* does not interfere with them.

              Mode *Regulation* can be used also at the system without connected battery. It this case it is necessary to set *Minimal SOC* battery to 0 %.

Example 1:   Control of single-phase heater with input 2000 W connected to phase L1(R). (production **with permitted export to grid**)

Grid output to L1 (P_{L1}):
P_{L1} > +300W –> *increases output to the heater*
P_{L1} < +300 W ∧ P_{L1} > -100W –> *output does not change*
P_{L1} < -100 W –> *decreases output to the heater*

Discharging battery output (P_{disch}):
P_{disch} > 0 W –> *decreases output to the heater*

Minimal SOC of battery:
SOC < 20 % - *output is switched off (output = 0)*

Example 2: Control of single-phase heater with input 2000 W connected to phase L1.
(production **without export to grid**)

Grid output to L1 (P_{L1}):
$P_{L1} > -100$ W –> *increases output to the heater*
$P_{L1} < +100$ W $\wedge$ $P_{L1} > -100$W –> *output does not change*
$P_{L1} < -200$ W –> *decreases output to the heater*

Discharging battery output (P_{disch}):
$P_{disch} > 100$ W –> *decreases output to the heater*

Minimal SOC of battery:
SOC < 85% - *output is switched off (output = 0)*

Note: Set values serve as illustration for explanation of the function. It is not recommended setting for this type of appliance.

Output controls – Export to grid

It controls the outputs based on the power overflow to the distribution grid.

To **turn the outputs on** - **all conditions** must be met at the same time:

- **Turn on when export to grid is above:** exceeds the set value on the set phase
- **Maximum consumption from the battery:** does not exceed the set value
- **Minimum battery SOC:** exceeds the set value

To **turn the outputs off** - it is sufficient that **one of the conditions** is met:

- **Turn off when import from grid is above:** exceeds the set value at the set phase
- **Maximum consumption from the battery**: exceeds the set value
- **Minimum battery SOC**: is less than set value

Notes: SOC – State Of Charge

Mode *Overflows* can be used also at system without connected battery. It this case it is necessary to set *Minimal SOC battery* to value 0 %.

Example 1: Switching of single-phase appliance with input 2000 W connected to phase L1.
(switching only during time of sufficient surplus)

Output of grid at L1 (P_{L1}):
$P_{L1} > 2000$ W –> *output will switch on*
$P_{L1} < 2000$ W $\wedge$ $P_{L1} > 0$ W –> *condition on output does not change*
$P_{L1} < 0$ W –> *output will switch off*

Discharge battery output(P_{disch}):
$P_{disch} > 0$ W –> *output will switch off*

Minimum battery SOC:
SOC < 80 % - *output will switch off*

Example 2: Switching of three-phase appliance with input 3000 W.
Possibility of use of battery output up to 1000 W at SOC above 50%)

Output of grid at L1 (P_{summ}):
P_{summ} > 2000 W –> *output will switch on*
P_{summ} < 2000 W ∧ P_{summ} > -50 W –> *condition on output does not change*
P_{summ} < -50 W –> *output will switch off*

Discharge battery output (P_{disch}):
P_{disch} > 1000 W –> *output will switch off*

Minimum battery SOC:
SOC < 50 % - *output will switch off*

Note**:** Set values serve as illustration for explanation of the function. It is not recommended setting for this type of appliance.

Output control by – Battery SOC

To **turn the outputs on** - **all conditions** must be met at the same time:

- **Current time:** values are in the set time slot
- **Turn on above:** SOC battery exceeds the set value
- **Maximum consumption from the battery:** does not exceed set value

To **turn the outputs off** - it is sufficient that **one of the conditions** is met:

- **Current time:** time is outside the set time slot
- **Turn off below:** battery SOC is less then set value
- **Maximum consumption from the battery:** set value is exceeded

Example: Switching of appliance using part of battery capacity up to output 1000 W
(switching at production **without possibility of export to grid** using battery)

At time slot 8:00 – 18:00, output will be on up to reaching 90 % battery SOC.
Output will be on until battery discharges under 70 % SOC, or consumption from battery does not reach 1000 W

Note**:** Set values serve as illustration for explanation of the function. It is not recommended setting for this type of appliance.

Output control by – Timer

Output is controlled based on the current time.

Conditions for **enabling the output**:

- **Current time** is in the set time slot

Conditions for **turning off the output**:

- **Current time** is outside the set time slot

Output control by– Thermometer

Output is controlled based on the measured temperature from the digital temperature sensor.

To **turn the outputs on** - **all conditions** must be met at the same time:

- **Current time**: is in the set time slot
- **Measured temperature**: meets the condition for switching on

To **turn the outputs off** - it is sufficient that **one of the conditions** is met:

- **Current time**: is outside the set time slot
- **Measured temperature**: meets the condition for switching off

Output control by – Input – External control

Output is controlled based on the input status

Conditions for **turning on** the output in *External control* mode:

- **The selected input is activated** (connected to the GND terminal)

Conditions for **turning off** the output in *External control* mode:

- **The selected input is not activated** (not connected to the GND terminal)

Output control by – Input - Button

Output is controlled based on the input status.

Conditions for **turning on** the output in Button mode:

- **The selected input has been activated** (connection to the GND terminal for at least 50 ms)

Conditions for **turning off** the output in Button mode:

- **The set time has expired** ("The time when power is on")

Simulator tab

The simulator can be used to simulate any specific values of the inverter parameters to test the functionality of the set rules.

Simulator Control:

Enable simulator	Enables simulator mode. In this mode the data are not read from the inverter, the data entered by the user are used. The device responds to these data according to the logic set in the Outputs tab.
Entered values	Setting values of individual parameters.
Button – *Set values*	Sends data to the device (Simulator must be on).
Button – *Set time*	Sends data to the device (Simulator must be on).

Note: The simulator works in such a way that all logic takes place on the device side, i.e. in the same way as in real operation. The only difference is that the input data is not read from the inverter, but from the application.

The simulator can also be used without connecting the inverter (via a data line).

When using the mode *Regulation,* the output of the regulated outputs is always updated after sending the values by the button "Set values".

Action tab

The action tab contains individual buttons for managing device configurations.

Read from unit	Loads the configuration from the device into the application.
Save to unit	Saves the configuration from the application to the device.
Read from file	Loads the configuration from a file into the application.
Save to unit	Saves the configuration from the application to a file on computer.
Firmware update	Opens a browser to select file which will update the device.

Information panel - Inverter

The panel displays current values of the individual parameters from the inverter, or the switched-on simulator.

Note: The refresh interval for individual values read from the inverter is 3 s.

Information panel NORD Power Genius 3000

The panel displays the current status of individual inputs, outputs, temperature sensors, or the times of their switching and blocking.

IN1 – IN4	Input status: **green** – input activated, **red** – input not activated.
T-IN1 – T-IN2	Temperatures measured by the temperature sensors.
OUT1 – OUT7	Output status: **green** – output activated / full input in mode *Regulation*, **orange** – regulation switched on, **red** – input not activated.
OUTx ON turned on for time	Displays the time for how long the output will stay on. If the output is on and the time remains 00:01, it means that the conditions for turning off the output have not been met After the conditions are met, it will be turned off immediately. When mode *Regulation* is activated, it displays current rate of output in %.
Turn on blocking	If an output is switched on when the conditions are met, the switching on of another output is blocked for this time. The power-on blocking time is a maximum 10 seconds.
Turn off blocking	If an output is turned off when the conditions are met, another output is blocked for this time. The power-off blocking time is a maximum of 10 seconds.

Device behaviour in fault conditions

Loss of communication with inverter for more than 10s.	The display shows the information "COM ERR". Turns off the outputs assigned to *Overflows, Battery status, Timer, Thermometer* mode.
Failure or temperature sensor off for more than 10s.	Turns off the outputs assigned to the *Thermometer mode*.
Incorrect data in device configuration memory.	**The error may occur when the settings are not fully saved to the device.** Displays the information "MEM ERR" on the display. Turns off all outputs. If this error occurs for the first time, upload a new configuration again to the device, otherwise contact technical support.
The display shows no text.	**The error may occur when the firmware update is not completed.** Turns off all outputs. If this error occurs for the first time, update the firmware of the device, otherwise contact technical support.

Guarantee

- Guarantee is valid for 24 months from purchase.
- Possible guarantee claim will be enforced at the final seller based on document of purchase.
- In case that defect caused by material or production appears during guarantee period the product will be repaired or replaced free of charge.
- Guarantee does not apply to defects caused by incorrect use, changes of the product, unprofessional installation contrary to installation manual as well as defects cause by external factors such as damages caused by mechanical damage, overvoltage, water etc.
- In case of a defect beyond repair the equipment will be replaced or the purchase price will be reimbursed.
- Guarantee does not include transport or postage costs.

CE, PHS, Recycling

The manufacturer declares that this device is designed and manufactured in compliance with the harmonization legal regulations of the European Union:Directive No.: 2014/53/EU, 2014/30/EU, 2011/65/EU, if used as intended. **Declaration of Conformity can be found on the website of your distributor.**

Do not dispose of the device in regular waste, but hand it in at an electronic waste collection point.