



EN
**Photovoltaic
water heater
(PVB-10-30-80)**

Technical description,
installation, operation and
maintenance instructions,
warranty conditions

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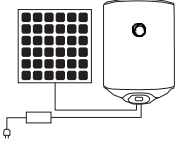
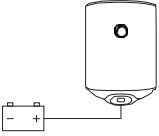
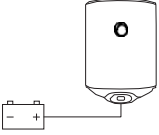
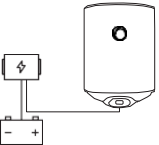
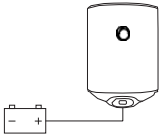
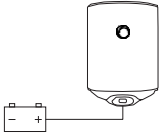
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Specifications

specifications	unit	value		
photovoltaic water heater				
product name	–	PVB-10	PVB-30	PVB-80
volume	l	9.5	29	77
max. heating power	W	550	550	550
max. current consumption	A	15.5	15.5	15.5
energy efficiency class	–	A+	A+	A+
rated pressure	MPa	0.7	0.7	0.7
IP-class	–	X1	24	24
gross weight ($\pm 3\%$)	kg	7.2	15	25
max. water temperature	°C	65	65	65
adjustable water temperature range for optional reheating	°C	10–65	10–65	10–65
integrated MPP-tracker	–	✓	✓	✓
integrated reverse polarity protection	–	✓	✓	✓
digital display	–	✓	✓	✓
prepared for external reheating and battery connection	–	✓	✓	✓
boiler made of steel with enamel coating	–	✓	✓	✓
CE-certification	–	✓	✓	✓
dimensions (length, width, height)	cm	28 x 28 x 44	40 x 40 x 60	47 x 48 x 90
water connection	–	G½ (M)	G½ (M)	G½ (M)
combined check and pressure relief valve	–	✓	✓	✓
photovoltaic input				
recommended photovoltaic power	W_p	100–300	300–600	600–1200
max. connected photovoltaic power	W_p	1500	1500	1500
max. open circuit voltage	V_{DC}	42.4	42.4	42.4
photovoltaic connector	–	MC4	MC4	MC4

Note: Only 36 cell and 60 / 120 cell photovoltaic modules to be connected to the water heater.

System modes

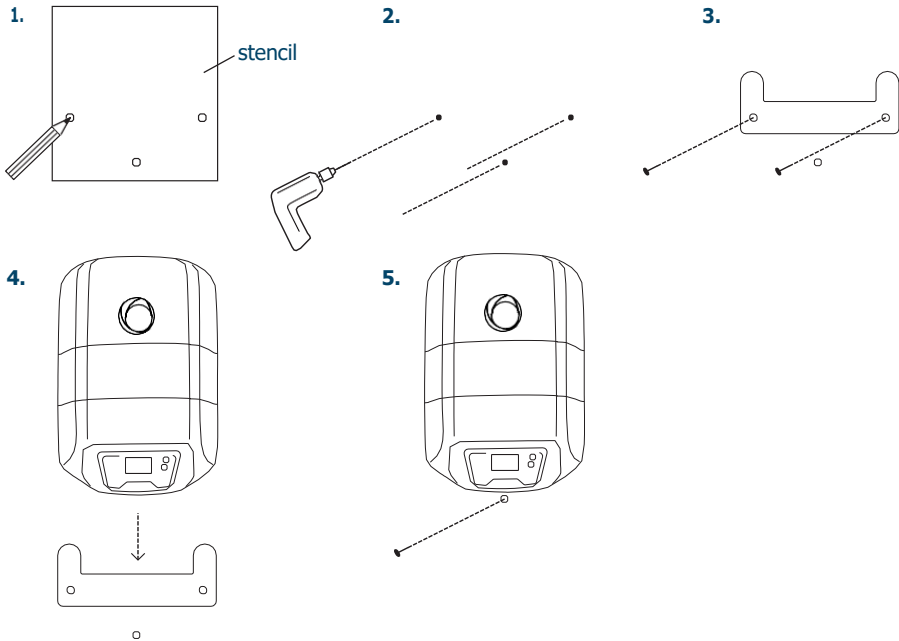
mode	picture	description	energy source
1		The boiler is primarily powered with photovoltaic current. If no solar energy is available, a power supply can optionally be used to heat the boiler to these minimum temperature.	PV module + power supply unit*
2		As soon as the connected battery reaches a voltage of 13.5 V, the excess energy is used to power the boiler. This happens while the battery is being charged.	12 V battery <i>Approved:</i> <i>LiFePO4, lead acid</i>
3		In addition to the excess control, as in mode 2, the connected battery is discharged to operate the boiler. This happens as soon as the temperature falls below the set minimum temperature. But only as long as the battery voltage does not drop below 12.4 V.	12 V battery <i>Approved:</i> <i>LiFePO4</i>
4		This mode should be selected if there is an external energy management system (e.g. solar charge controller with deep discharge protection) that releases the power for the boiler.	External energy management
5		As soon as the connected battery reaches a voltage of 27.0 V, the excess energy is used to power the boiler. This happens while the battery is being charged.	24 V battery <i>Approved:</i> <i>LiFePO4, lead acid</i>
6		In addition to the excess control, as in mode 2, the connected battery is discharged to operate the boiler. This happens as soon as the temperature falls below the set minimum temperature. But only as long as the battery voltage does not drop below 24.8 V.	24 V battery <i>Approved:</i> <i>LiFePO4</i>

*can be purchased separately.

Assembly

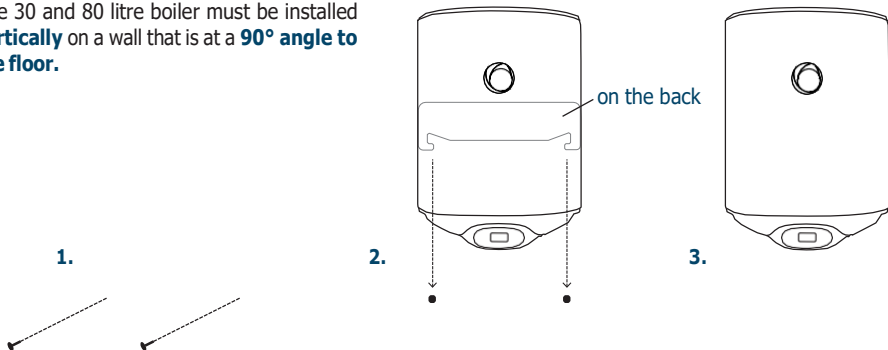
Photovoltaic water heater – PVB-10

The 10 litre boiler must be installed **vertically** on a wall that is at a **90° angle to the floor**.

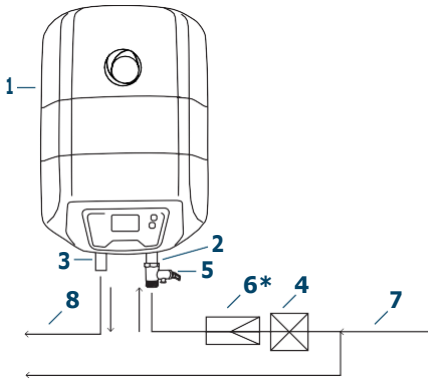


Photovoltaic water heater – PVB-30 & PVB-80

The 30 and 80 litre boiler must be installed **vertically** on a wall that is at a **90° angle to the floor**.



Connection



- 1 hot water tank
- 2 water inlet
- 3 water outlet
- 4 shut-off valve*
- 5 combined check and pressure relief valve

- 6 pressure reducing valve*
 - 7 cold water
 - 8 hot water
- *not included

* necessary if water pressure
> 0.5 MPa (5 bar)

Heating time of the water depending on the heating power

power	PVB-10	PVB-30	PVB-80
200 W	18 °C/h	6 °C/h	2 °C/h
400 W	36 °C/h	12 °C/h	4.5 °C/h
550 W	50 °C/h	16 °C/h	6 °C/h

Note

The values given in the table are intended as a guideline. The heating times depend on many factors (power, ambient air temperature, water withdrawal) and may differ from reality. The greater the connec-

ted photovoltaic power, the more the water can be heated on days with low solar radiation. The water is heated with a maximum power of 550 W, even if more photovoltaic power is available.

Further information

General warnings

Be sure to carefully read the instructions and warnings in this manual before installing and operating the water heater. The information contained in this manual is intended to familiarize you with the water heater, the rules of its correct and safe operation, and the minimum requirements for its maintenance and servicing. Furthermore, you are obliged to make this manual available to the qualified persons who will install and potentially repair the appliance. The installation of the water heater and the verification of its functionality is not within the distributors warranty obligation nor the manufacturer.

These instructions should always be kept near the appliance for future reference. Compliance with the rules here described is part of the measures for the safe use of the product and is considered part of the warranty conditions.

Safety instructions

WARNING! There is a risk of burns or scalding when using the appliance!

WARNING! Children must not play with the appliance. Cleaning and maintenance must not be carried out by children without supervision.

IMPORTANT! Be sure to fill the water heater with water before connecting it to the electrical supply! Failure to comply with the electrical connection conditions affects the safety of the appliance, whereby the water heater must not be operated.

IMPORTANT! Observe the maximum permissible pressure (see chapter: Technical data).

Further important notes

- The appliance is under pressure. During heating, expansion water may drip from the pressure relief valve.
- Operate the pressure relief valve regularly to prevent it from being stuck, e.g. due to limescale deposits.
- Install a type-tested pressure relief valve in the cold-water supply line. Note that depending on the pressure of the supply, you may also need a pressure reducing valve.
- Mount the pressure relief valve with the opening facing down.
- Mount the pressure relief valve and the drainpipe with a steady downward slope in a frost-free room.
- Dimension the drainpipe to allow the water to flow off unhindered when the pressure relief valve is fully open.
- The pressure relief valve opening must remain open to the atmosphere.
- This device contains a support battery, which is not replaceable. It is necessary for the display to function at night. A defect does not limit the basic functionality.
- This unit may be operated up to an altitude of 4000 m above sea level.

Technical data

This water heater can provide hot water from the public water supply system for several consumers. The water used for heating must comply with the requirements in the normative documents for domestic water, in particular: Chloride content up to 250 mg/l; electrical conductivity more than 100 $\mu\text{S}/\text{cm}$, pH value 6,5-8 for enameled hot water tanks. The thermal insulation consists of CFC-free poly-urethane foam.

The maximum electrical power of the water heater is 550 W. The actual power consumption of the heating element depends on the connected photovoltaic power as well as on the radiation strength provided by the sun. The water is heated to a maximum of 65°C to ensure scalding protection. Detailed information can be found in the data sheet or on the nameplate.

The water heaters are equipped with a combined check and pressure relief valve (Table 1, No. 5) to prevent overpressure during appliance operation. The water tanks are made of steel with a high-strength enamel coating and additional cathode protection provided by a magnesium anode.

Assembly

The water heater must be installed vertically, in a frost-free and dry room, close to the withdrawal point. The unit is designed for fixed wall mounting only. Make sure that the wall has sufficient load bearing capacity. When selecting a suitable installation location for the water heater, the following must be considered:

- Wall type and material,
- dimensions of the unit,
- mounting type,
- arrangement of the fastening elements for wall mounting,
- arrangement of the pipes
- and the degree of protection against water leakage.

The installation site must comply with the requirements of the electrical installation. During installation, provide sufficient distance to adjacent walls and sufficient space under the unit for the water and photovoltaic connections.

PVB-10

The hanging strip (refer to Picture 1) is fastened securely to the wall using two dowels and the screws supplied. After mounting the wall bracket, the hot water tank is hung in position. The water heater is then fixed to the wall using the third dowel and the third screw (hexagon head screw) through the

eyelet at the bottom of the housing. A drilling hole template is enclosed with the product.

PVB-30 and PVB-80

The fixing elements (e.g. 12mm stud bolts) must be secured against being pulled out of the wall. The securing elements must be designed for THREE TIMES the weight of the water heater filled with water. Shims are to be placed under the screw heads of stud bolts. A drilling hole template is printed on the product packaging.

Connection to the water supply

When connecting the device to the water supply, please observe the indicated arrows and rings around the cold and hot water pipes (supply and return pipes). The cold-water pipe features a blue ring and is marked with an arrow pointing towards the pipe. The hot water pipe is indicated by an arrow pointing out of the pipe and a red ring.

The water heater is equipped with a combined check and pressure relief valve, which is included in the product packaging and **MUST** be installed on the cold-water pipe. The arrow on the body of the valve, which indicates the direction of water flow through the valve, must be followed during this installation. The pipe connectors have male G½ threads. Schematic representations regarding the connection of the water heater are shown in pictures 1 and 2.

The water heater operates by the pressure of the water pipe. The water pressure of the water supply system should be higher than 0.1 MPa (1 bar) and lower than 0.5 MPa (5 bar). If the pressure of the water pipe exceeds 0.5 MPa, a pressure reducing valve must be installed. If additional equipment, which is not included in the standard delivery, must be used to comply with local regulations, they must be installed according to these specifications.

In case the water pipes are made of copper or other metal which differs from the metal of the water tank, as well as if connecting elements made of brass are used, non-metal fittings must be installed on the supply and return side of the water heater (dielectric fittings).

WARNING! The installation of any shut-off or non-return fittings between the pressure relief valve and the water heater, as well as blocking the side opening of the pressure relief valve and/or locking its lever is prohibited!

A drainage system to remove any water that may drip from the side opening of the pressure relief valve is recommended. The drain line must be designed with a constant downward slope in a frost-free environment and must remain open. After connecting the water heater to the water supply, fill the tank with water. The sequence of steps to be performed is:

- Fully open the hot water tap of the most distant mixing tap.
- Open the shut-off valve. (Table 1, No. 4)
- Wait until the air is released from the system and a strong jet of water flows from the mixer tap. Let the water run for about 30 seconds.
- Close the hot water tap of the mixer tap.
- Lift the small lever of the pressure relief valve (Table 1, No. 5), wait 30-60 seconds until a strong stream of water flows out of the side opening of the valve.
- Loosen the valve lever.

WARNING! If no water or only a thin stream of water flows out of the valve opening, this indicates a malfunction. A possible contamination of the water pipe might be present. The fault must be eliminated before the unit is put into operation.

WARNING! The combined check and pressure relief valve is one of the protective devices that ensure the safe operation of the water heater. The use of the water heater with a damaged or removed/unassembled combined check and pressure relief valve (safety valve) is **STRICTLY PROHIBITED!**

The pressure relief valve can also be used to drain the water from the tank if desired. In such case, proceed as follows:

- Disconnect the water heater from any live electrical wiring.

- Disconnect the cold-water inlet.

- Open the hot water tap of the mixing tap or disconnect the hot water pipe (return pipe) of the water heater.
- Lift the small lever of the pressure relief valve (Table 1, No. 5) and wait until no more water leaves the valve.

WARNING! The running water can be hot – risk of scalding. These steps do not ensure complete drainage of the water tank.

IMPORTANT! When emptying the water tank, consider all necessary precautions to avoid damage caused by the drained water.

IMPORTANT! In Denmark, Sweden, Norway and Finland, the connection of the water heater to the public water supply may only be performed using a suitable pressure reducing valve. The local regulations must be observed.

Electrical connection

WARNING! Any electrical connection may only be performed when the water heater is filled with water.

IMPORTANT! The water heater is powered by direct current. The water heater is protected against electric shock »class III« and may only be supplied with safety extra-low voltage (SELV). Only power sources recommended by the manufacturer may be connected. A faulty and/or unsuitable power supply involves a high risk and is likely to cause an accident. The connection cables of the device must be replaced if they are damaged.

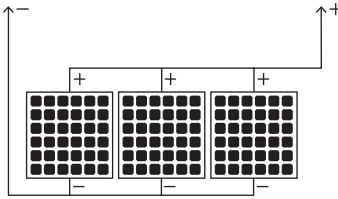
IMPORTANT! Photovoltaic modules may **ONLY** be connected in **parallel**. When connecting more than one photovoltaic module, always use a suitable connector for parallel connection. For more information, refer to the illustration »Parallel PV-Connector«. Connecting photovoltaic modules in series will damage the water heater.



Parallel PV-Connector



Pay attention to correct polarity when connecting!



Connection of PV-modules in parallel configuration only! Serial connection will damage the unit!

The electrical connection of the water heaters is performed using the factory supplied MC4 plugs. Check the functionality of the appliance after the electrical connection has been performed. When all supply connections are removed, the water heater is completely disconnected from the power sources.

Connection of PV modules

IMPORTANT! The installation and electrical parallel connection of PV modules may only be carried out by a qualified person and may not endanger third parties. When installing the photovoltaic modules, the locally prevailing rules and laws must be complied with.

IMPORTANT! Keep cables out of the way to avoid tripping over them or getting caught. There is a risk of injury. The cables must be fastened in such a way that no tensile load is applied to the connectors. Furthermore, it must be ruled out that the cables and connectors rub against surfaces and edges (e.g. in wind). The cables must not lie in water permanently.

IMPORTANT! Only photovoltaic modules with a maximum of 60 resp. 120 cells and an open-circuit voltage of 42.4 V may be connected.

- Photovoltaic modules must be connected correctly using the factory supplied MC4 plugs.

- You may connect up to five modules in parallel. Depending on the module, this corresponds to an MPP output of approximately 1500 Wp.

Dimensioning of the required photovoltaic power:

- The higher the number of hours of sunshine per day, the smaller the required PV power.
- The warmer the water taken from the pipeline, the lower the required PV power.
- Dimension the required photovoltaic power according to the months with the lowest solar radiation in which the photovoltaic water heater will be in operation.
- The greater the amount of hot water consumed per day, the larger the PV power required.

The following table serves as a guideline for dimensioning the photovoltaic power needed depending on the climatic conditions:

climatic conditions	PVB-10	PVB-30	PVB-80
countries with low sunshine e.g. Northern and Central Europe	300 W _p	600 W _p	1200 W _p
sunny countries e.g. Southern Europe and Africa	150 W _p	300 W _p	600 W _p

These values given are guidelines. Depending on the conditions prevailing on site and the specific conditions of consumption, the appropriate design of the photovoltaic output may vary from the values described.

Extension of the photovoltaic line

When extending the photovoltaic cable, the MC4 contact plugs must be properly attached to ensure functionality and safety. Basically, the PV cable should be kept as short as possible. A length recommendation depending on the connected nominal PV generator power can be found in the following table.

Connected PV power	4 mm ²	6 mm ²	10 mm ²
~325 W _p	≤ 18 m	≤ 27 m	≥ 27 m
~650 W _p	≤ 11 m	≤ 16 m	≥ 16 m
~975 W _p	≤ 9 m	≤ 13 m	≥ 13 m

Recommended cable length (there and back) for different nominal powers and cross-sections

Connection of an external power supply

IMPORTANT! Only use power supply units recommended by the manufacturer. Non-compliance will invalidate the warranty and may damage the waterheater.

External power supply units feature extended use of the photovoltaic boilers. For example, long periods of bad weather can be bridged by connected AC power supply units (model number: PSU-12, PSU-18). Furthermore, you have the option of converting surplus energy from photovoltaically charged accumulators into heat by the water heater. For detailed information, please refer to the description of the respective unit.

Operation

WARNING! This device may only be operated by a person (including children over the age of 8) with reduced physical or mental capabilities if they are supervised or have been instructed in the use of the appliance by a responsible person. Children must be supervised to prevent them from playing with the appliance under any circumstances. It is forbidden for children to clean or operate the water heater.


Operation


Switch On: Press the  - button for three seconds.



Display: The present water temperature is shown on the display.

- POWER IN: Input power of the PV modules

- VOLTAGE: Input voltage of the PV modules
- EXT SUPPLY: Connection of an external supply
- USED PV ENERGY: Total PV energy utilized

Menu Navigation: Press the  - button briefly. By pressing the button again, you jump to the next page in the menu.

Settings: Press the  - button repeatedly. This allows individual adjustments on the unit to be made. Please note: The adjustments are only active when an external energy supply is connected to the photo-voltaic water heater.

- CHANGE MIN. TEMPERATURE: Select the desired minimum temperature by pressing the  - button.
- CHANGE SYSTEM MODE: Select the desired mode by pressing the  - button. Mode 1 (PV HOME) is set as the factory default.

Quick guide: System modes

Mode 1 (PV HOME)

For the direct connection of photovoltaic modules. Plus a power supply (can be purchased separately) if desired.

Mode 2 to 6

For the connection of external energy sources such as a battery. A battery cable is needed and can be purchased separately. More detailed information can be found in the respective product description.

Switch off: Press the  - button for three seconds.

Further important notes

Leakage of water

The pressure relief valve can drip during the operation of the water heater due to the expansion of the water while heating. Ensure that the leaking water is directed to a collection container or a drain. The dripping of water does not indicate a defect. The side valve opening must not be closed under any circumstances.

The installation of a drainpipe facilitates future maintenance and servicing operations, as the water can be drained from the water heater easily.

Noise emission

Noise may be generated inside the device during the heating process, which is caused by lime deposits on the heating element. An increased formation of limescale can be observed at water temperatures above 60°C. This may cause impairment and damage to the heating elements and the water heater.

Formation of legionella

Due to the small volume of the hot water tanks, the risk of the formation of legionella in the system is almost excluded. Nevertheless, to take precautions, the following measures are recommended:

- Supply of fresh water or regular water withdrawal.
- Heating the water frequently to at least 60 °C.
- It is recommended to change the water after the appliance has not been used for more than one month.

Maintenance

Corrosion protection

Every water heater features an enameled water tank with additional corrosion protection. This corrosion protection consists of a magnesium anode (sacrificial anode). The anode is a wearing part (i.e. it wears out during normal operation of the unit). The average life span is about 3 years, which depends particularly on the operating mode of the appliance as well as the characteristics of the water to be heated. The condition of the anode should be checked at regular intervals and, if necessary, replaced by a service specialist authorized by the manufacturer or distributor.

Compliance with the deadline and the timely renewal of the anode are important conditions for efficient corrosion protection of the water tank. The examination and the renewal of the anode are not included in the warranty obligations of the manufacturer nor the dealer. To ensure the safe operation of the water heater in regions with calcareous water, it is recommended to clean the water tank regularly

from accumulated limestone. Such cleaning should be carried out at least every two years, or more frequently in regions with calcareous water. Deposits on the enamel coating do not need to be scraped off, just wiped off with a dry cotton cloth. The regular cleaning and removal of the limescale is essential to ensure the safe operation of the appliance. Whilst cleaning the anode of the enameled water tank should also be checked. These services are not part of the warranty scope and must be carried out by qualified persons. The regulations for the inspection of the anode protection and renewal of the anode, as well as the removal of the collected limestone, must be observed both during and after the expiration of the warranty period for the appliance.

Combined check and pressure relief valve

To guarantee the proper and safe operation of the water heater, regularly check the combined check and pressure relief valve for reduced permeability. For this purpose, lift the small lever and wait approx. 30-60 seconds until a strong stream of water flows out of the valve opening on the side. This check must be carried out after filling the tank with water, at 2-week intervals and after failure and restoration of the water supply. If no water or only a thin stream flows out of the valve opening, this indicates a malfunction. A possible contamination of the water pipe might be present. The fault must be eliminated before commissioning.

Cleaning


The outer casing and the plastic parts of the water heater should only be cleaned with a lightly moistened cotton cloth, free of aggressive and/or scouring agents. Do not clean the appliance with a steam cleaner. The water heater may only be put back into operation after the moisture has completely vanished.

Malfunction

In case of a malfunction during the operation of the water heater, disconnect all live wires from the appliance and contact the manufacturer or your distributor.

Environmental protection

This device is labelled by the Waste Electrical and Electronic Equipment (WEEE) directive. By ensuring

that the appliance is taken to a suitable disposal centre at the end of its service life, you will help to protect the environment and prevent negative effects on the environment and human health. The  symbol on the water heater indicates that the appliance must not be disposed of with regular household waste at the end of its life. The product must be taken to a disposal centre with special facilities for electrical or electronic equipment. The end-user must comply with local disposal regulations when disposing of the product. For more information on treatment, recovery, and recycling procedures, contact your local city office, your local waste disposal centre, or the retailer from whom you purchased the product.

Warranty

The warranty of the appliance is only valid under the following conditions:

- The unit is installed in accordance with the installation and operating instructions.
- The appliance is only used for its intended purpose and in accordance with the installation and operating instructions.

The manufacturer's warranty covers the repair of all manufacturing defects that occur during the warranty period. Only professionals authorized by the seller may carry out repairs. The warranty does not cover damage resulting from:

- Improper transport,
- improper storage,
- improper use,
- unsuitable water parameters,
- improper electrical voltage which deviates from the rated voltage,
- freezing of water,
- exceptional risks, accidents, or other force majeure,
- failure by disregarding the installation and use instructions and

- in all cases when an unauthorized person attempts to repair the appliance.

In the aforementioned cases, the damage will be repaired against payment. The guarantee does not apply to parts and components of the device that are worn out during its normal operation, nor to parts that are dismantled, to lights and signal lamps, etc., to discoloration of external surfaces, to changes in the shape, dimensions, and arrangement of parts and components that have been subjected to an impact that does not correspond to the normal conditions of use of the device. Any missed benefits, material and immaterial damages resulting from temporary inability to use the unit during the period of its repair and maintenance, are not covered by the warranty of the unit.

COMPLIANCE WITH THE REQUIREMENTS SPECIFIED IN THE MANUAL IS A PREREQUISITE FOR THE SAFE OPERATION OF THE PURCHASED PRODUCT AND IS INCLUDED IN THE TERMS OF THE WARRANTY. ANY MODIFICATIONS OR ALTERATIONS TO THE DESIGN OF THE PRODUCT MADE BY THE USER OR PERSONS AUTHORISED BY THE USER ARE STRICTLY PROHIBITED. ANY SUCH ACTS OR ATTEMPTS SHALL VOID THE WARRANTY OBLIGATIONS OF THE MANUFACTURER OR DISTRIBUTOR. THE MANUFACTURER RESERVES THE RIGHT TO MAKE STRUCTURAL CHANGES WITHOUT NOTICE, PROVIDED THAT THE SAFETY OF THE PRODUCT IS NOT AFFECTED. WHEN NECESSARY, OR IN CASE OF MISUNDERSTANDINGS IN CONNECTION REGARDING THE TRANSLATION OR TERMS USED IN THIS LANGUAGE VERSION OF THE INSTALLATION AND OPERATING INSTRUCTIONS, PLEASE USE THE GERMAN VERSION AS THE ORIGINAL AND PRIMARY VERSION.