

OPERATING MANUAL



HIGH-FREQUENCY BATTERY CHARGER

NG1 – NG3 – NG5 – NG7 – NG9

IN CHARGE OF YOUR BATTERIES

www.energicplus.com

07/2021 – V01 –
from s/n ...

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Responsible editor: TVH Parts Holding NV, Brabantstraat 15, BE-8790 Waregem

TVH is a supplier of after-market spare parts and accessories that are suitable for the maintenance and repair of OEM equipment.

BG	Bulgarian	Можете да намерите това ръководство на Вашия език чрез линка, посочен по – долу.
CS	Czech	Tento návod najdete ve svém jazyce prostřednictvím odkazu níže.
DA	Danish	Du kan finde denne vejledning på dit sprog via nedenstående link.
DE	German	Sie finden diese Bedienungsanleitung in Ihrer Sprache unter folgendem Link.
EL	Greek	Μπορείτε να βρείτε αυτό το εγχειρίδιο στη γλώσσα σας μέσω του παρακάτω συνδέσμου.
EN	English	You can find this manual in your language via below link.
ES	Spanish	Encontrarás este manual en su propio idioma a través del siguiente enlace.
ET	Estonian	Oma emakeelse juhendi leiate allolevalt lingilt.
FI	Finnish	Löydät tämän manuaalin omalla kielelläsi alla olevan linkin takaa.
FR	French	Vous trouverez ce manuel dans votre langue via le lien ci-dessous.
GA	Irish	Tá an lámhleabhar seo ar fáil i do theanga tríd an nasc thíos.
HR	Croatian	Ovaj priručnik mozete pronaci na svom jeziku putem donjeg linka.
HU	Hungarian	Ez a kézikönyv az Ön nyelvén az alábbi link alatt található.
IS	Icelandic	Hægt er að finna þessa handbók á þínu tungumáli á tenglinum hér að neðan.
IT	Italian	Cliccando sul link sottostante troverai il manuale nella tua lingua.
LT	Lithuanian	Šį vadovėlį savo kalba rasite spustelėję žemiau esančią nuorodą.
LV	Latvian	Rokasgrāmatu latviešu valodā Jūs varat atrast izmantojot zemāk esošo saiti.
MT	Maltese	Tista' s' sib dan il-manwal bil-lingwa tiegħek permezz tal-link ta' hawn taħt.
NL	Dutch	Je vindt deze handleiding in jouw taal via onderstaande link.
NO	Norwegian	Du finner denne håndboken på ditt språk via linken nedenfor.
PL	Polish	Niniejsza instrukcja obsługi dostępna jest w Twoim języku za pośrednictwem poniższego linku.
PT	Portuguese	Podemos encontrar este manual no seu idioma através do link abaixo.
RO	Romanian	Puteți găsi acest manual în limba dvs. prin link-ul de mai jos.
SK	Slovak	Manuál vo vašom jazyku môžete nájsť v priloženom vysvietenom riadku.
SL	Slovenian	Ta priročnik najdete v svojem jeziku preko spodnje povezave.
SV	Swedish	Du kan hitta denna manual på ditt språk via länken nedan.
TR	Turkish	Bu kılavuzu aşağıdaki bağlantıdan kendi dilinizde bulabilirsiniz.



www.tvh.com/highfrequencycharger_RV01

Thank you for using our product. For your safety and to ensure a correct operation, we would like to bring to your attention some aspects of this manual:

- This booklet supplies useful instructions for the correct operation and maintenance of the product. It is therefore necessary to pay the utmost attention to all of the paragraphs that illustrate the most simple and secure way to operate and use this product.
- This booklet must be considered an integral part of the machine and must be included with the deed of sale.
- Neither this publication, nor part of it, can be reproduced without written authorisation on the part of the manufacturer.
- All of the information reported herein is based on data available at the moment of printing; the manufacturer reserves the right to carry out modifications to its own products at any moment, without notice and without incurring in any sanction. It is therefore suggested to always check for possible updates.

The person responsible for the use of the product must make sure that all of the safety rules in force in the country of its use are applied, to guarantee that the equipment is used conform with the use for which it is destined and to avoid any dangerous situation for the user.

The following warning signs are used in this manual to warn you for dangers and risks:



Informative, be careful.



Warning, can lead to injury and damage if instructions aren't followed.



Danger, can lead to serious or fatal injury and serious damage if instructions aren't followed.

The following conventions are used in this manual:

For the charger without air pump:



1	Top
2	Back
3	Left
4	Bottom
5	Front
6	Right

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1. INTRODUCTION

This manual gives information about the commencement of operation, use and maintenance of your newly purchased high frequency charger. Also included in this manual are a number of safety instructions to create a safe working environment.

The high-frequency battery charger is an electronic device for professional use only, designed to charge different types of batteries, depending on the firmware installed. This depends in part on the application and the programmed software and may also be used as a power supply.

The difference with a traditional charger is that the high-frequency charger has extra parts with which the mains voltage is first converted to a much higher frequency.

This is followed by a 'traditional' transformation, but at this frequency the transformer is much smaller. This makes the high frequency charger much more compact and lighter than its traditional counterpart.

Please read the manual thoroughly and observe the safety procedures before putting the unit into operation. The operator and all persons who come into contact with the equipment should read it carefully and regularly and have access to it at all times.

Keep this manual near the equipment and in a safe place for future reference!
Contact your dealer for any further questions or concerns you may have.

We hope you will enjoy working with your high frequency charger.



If you wish to use this high frequency charger in extreme conditions such as extreme heat, extreme cold, extreme drought, etc. Please contact your dealer to discuss whether this product is suitable for the activities you wish to undertake with the high frequency charger.



The high frequency charger may be unsafe if adequate maintenance is neglected. Therefore, adequate maintenance facilities, trained personnel and procedures should be provided. Maintenance and inspection shall conform to the following practices:

1. A scheduled planned maintenance, lubrication and inspection system should be followed (see maintenance instructions chapter 7).
2. Only qualified and authorised personnel shall be permitted to maintain, repair, adjust and inspect the high frequency charger.
3. Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without the manufacturer's prior written approval. Capacity, operation and maintenance plates or decals shall be changed accordingly.
4. If modifications are made without written approval of the manufacturer, warranty will no longer apply.

Any person in charge of putting the machine into operation, the operation itself or the maintenance of the machine is urged to carefully read and observe the following instructions. Make sure that the operators of this product are familiar with the safety instructions and follow all the procedures. Neglecting these instructions can risk injury or death.

We guarantee a long period of trouble free operation if the unit is operated and maintained correctly.

2. DESCRIPTION

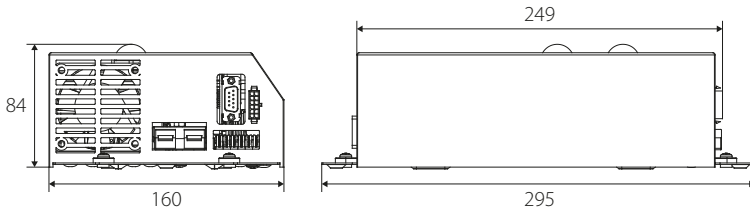
2.1. Technical data



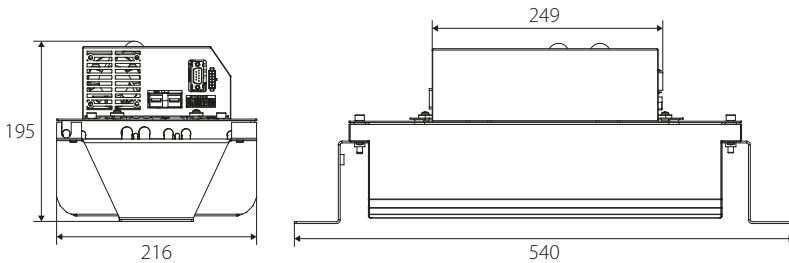
Always check the type plate for the correct information.

Type	NG1	NG3	NG5	NG7	NG9
Operating range of temperature	From -20 to 50 °C	From -20 to 50 °C	From -20 to 50 °C	From -20 to 50 °C	From -20 to 50 °C
Maximum relative humidity	90%	90%	90%	90%	90%
Switching frequency (kHz)	50 ± 5%	50 ± 5%	20 ± 5%	20 ± 5%	20 ± 5%
Frequency (Hz)	50 ÷ 60	50 ÷ 60	50 ÷ 60	50 ÷ 60	50 ÷ 60
Supply voltage (Veff)	230 ± 10%	230 ± 10%	400 ± 15%	400 ± 15%	400 ± 15%
Absorbed maximum current (Aeff)	10	22	10	14	18
Inrush current (A)	<2.7	<1.35	<2.35	<2.35	<2.35
Absorbed minimum power (W)	<5	<5	<10	<10	<10
Absorbed maximum power (kW)	1.7	3	5	7	9
Enclosure class	IP20	IP20	IP20	IP20	IP20
Weight (kg)	2.2	5.5	9	9	9
Applicable on	Lead-acid – AGM – gel – lithium-ion	Lead-acid – AGM – gel – lithium-ion	Lead-acid – AGM – gel – lithium-ion	Lead-acid – AGM – gel – lithium-ion	Lead-acid – AGM – gel – lithium-ion

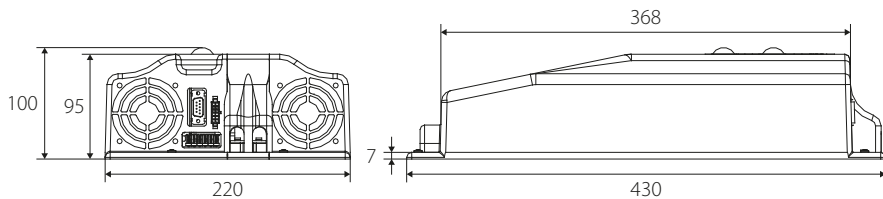
NG1 without air pump



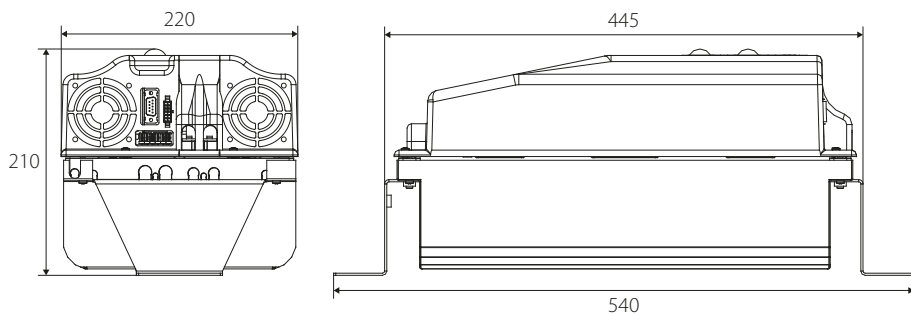
NG1 with air pump



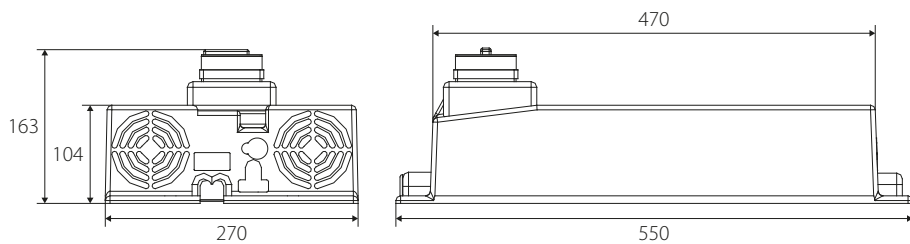
NG3 without air pump



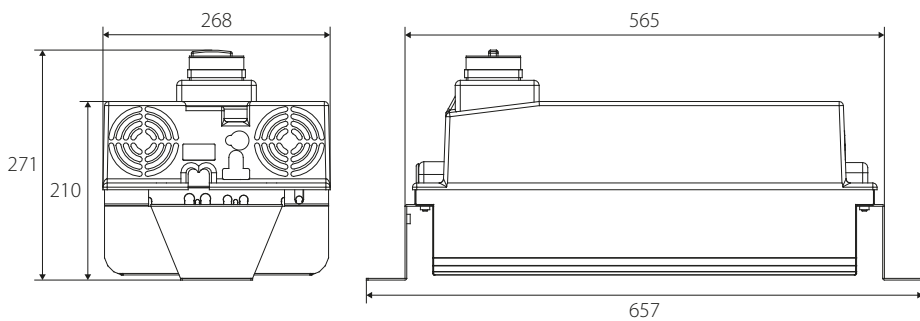
NG3 without air pump



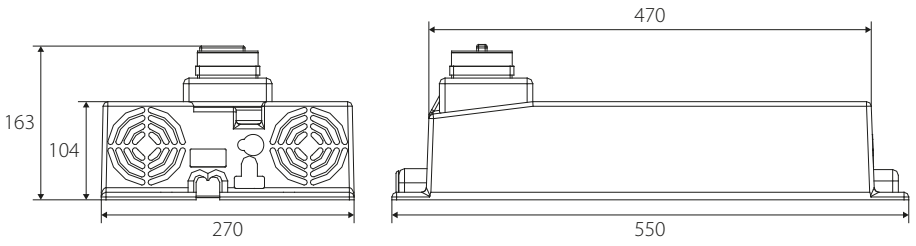
NG5 without air pump



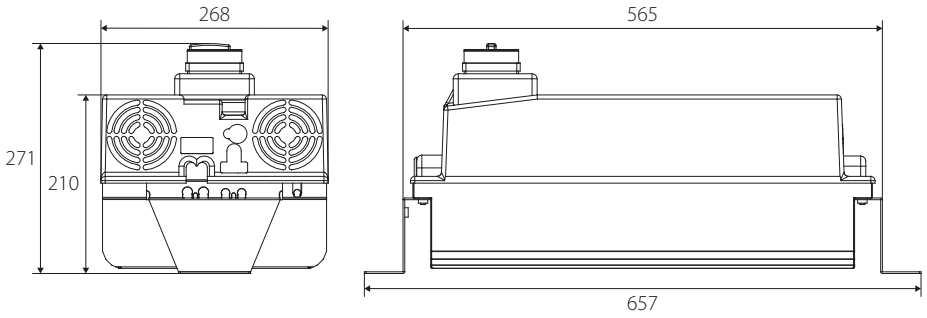
NG5 with air pump



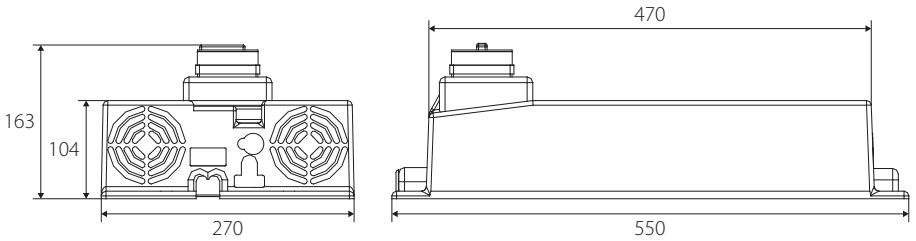
NG7 without air pump



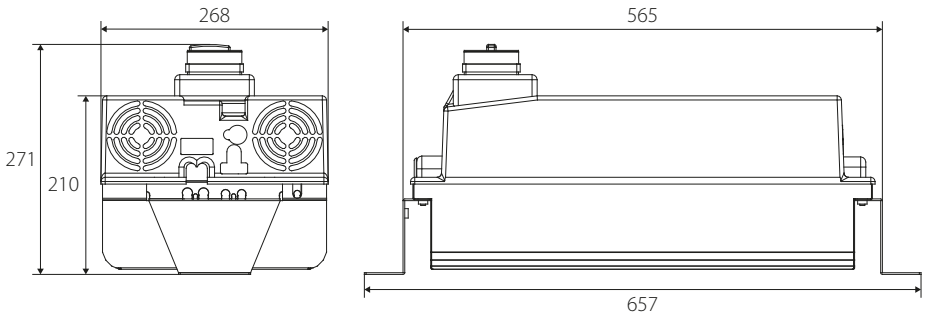
NG7 with air pump



NG9 without air pump

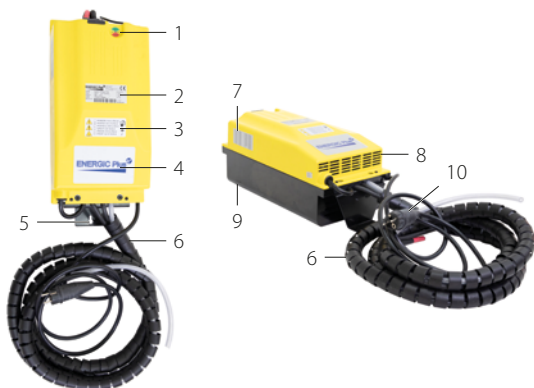


NG9 with air pump



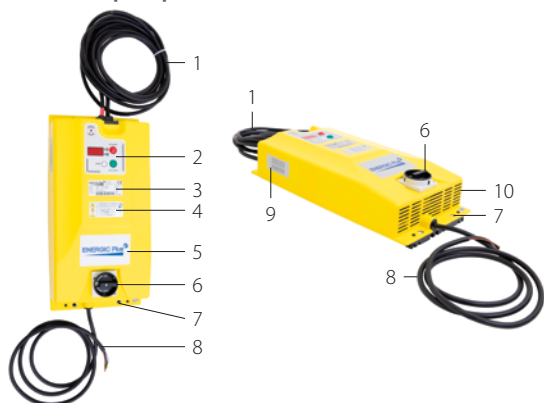
2.2. Main components of the product

With air pump



N°	Component
1	Sticker that indicates battery percentage
2	Typeplate
3	Decal with safety warnings
4	Brand
5	Drilling hole
6	Output cable
7	Indication table with the indicated amperes and charging time
8	Ventilation
9	Air pump
10	Plug

Without air pump

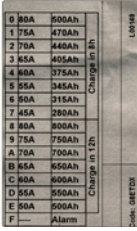



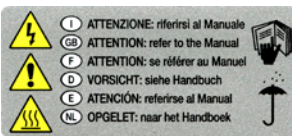


N°	Component
1	Input cable
2	Screen with push buttons
3	Type plate
4	Decal with safety warnings
5	Brand
6	On and off switch
7	Drilling holes
8	Output cable
9	Indication table with the indicated amperes and charging time
10	Ventilation

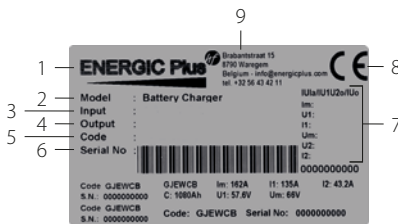
2.3. Placement of the decals

The safety and warning labels should be placed as indicated in the pictures below. See chapter 3 for the explanation of the safety warnings. If the decals are damaged or missing, replace them.



N°	Decal	Explanation	Reference
1		Indication table with the indicated amperes and charging time	166TA4354
2		Type plate	166TA5462
3		Brand	166TA4355
4		Indicates battery percentage	166TA4356
5		Safety warnings	163TA4206

2.4. Type plate



N°	Explanation
1	Brand
2	Model
3	Input
4	Output
5	Unique code per product.
6	Serial number
7	Additional data of the charger
8	CE marking
9	Address

3. SAFETY INSTRUCTIONS

3.1. Explanation of the safety decals

If the decals are damaged or missing, please replace them.

Decal	Explanation	Reference
<p>1 — I ATTENZIONE: riferirsi al Manuale GB ATTENTION: refer to the Manual 2 — F ATTENTION: se référer au Manuel D VORSICHT: siehe Handbuch 3 — E ATENCIÓN: referirse al Manual NL OPGELET: naar het Handboek</p>	<p>4 — 4</p> <p>5 — 5</p> <ol style="list-style-type: none"> 1. This is an electrical device 2. Be careful when working with electrical equipment 3. This device emits heat 4. Read the manual before using the product 5. Keep the product away from rain or damp places 	163TA4206

3.2. General safety instructions



- TVH Parts Holding NV cannot envisage each possible circumstance that may result in danger. Therefore the warnings given in this publication and which appear on the equipment are not exhaustive.

In the event that equipment, procedures, work methods or working techniques are used that are not specifically advised by the TVH Parts Holding NV company, it is necessary to make sure that there is no danger to the operator or other people.

- Electrical equipment must be installed and maintained in accordance with all the applicable national and local codes. A power disconnect switch must be located near the equipment. Check the data label for voltage and phase requirements
- Always keep sparks, flames, burning cigarettes and other sources of ignition away from the battery charging area.



- The person responsible for the use of the product must make sure that all of the safety rules in force in the country of its use are applied, to guarantee that the equipment is used in conformity with the use for which it is destined and to avoid any dangerous situation for the user.
- Do not operate the product unless you are of age.
- Read this manual carefully. Make sure that the manual is available at all times and store it in a dry, dark place near the unit.
- Do not touch the battery terminals while the equipment is running.
- To prevent damage to the power cord, do not lay anything on the power cord or place it where it will be walked on. If the cord is damaged, consult qualified personnel to replace it immediately.
- The cables must never be tensioned. Make sure there is always a little slack.
- Do not use the high frequency charger if the power cord is damaged, or if the high frequency charger suffered a shock, was dropped, or was damaged in any other way.
- If you are using an extension cord or power strip, make sure that the total amperage required for all equipment on the extension cord is less than the rated value of the extension cord.
- Do not use the high frequency charger on automotive starter batteries with thermal engines.
- Keep the inner parts clean and dry. Dirt and/or moisture can cause insulation failure. This failure can result in high voltage at the charging output.
- The battery produces very high currents when short-circuited and will seriously burn the skin if it comes into contact with a metal conductor carrying this current.
- Under no circumstances should jewellery or conductive material come into contact with the battery terminals or the cell connectors on top of the battery.
- Battery acid is very corrosive. The operator or persons using the discharger and/or battery must always wear protective gloves and eye protection.
- We strongly recommend to wear rubber aprons and face protection as well.. If you do come into contact with battery acid, follow the instructions in chapter 11.5.
- The ventilation system in the room where the batteries are stored should be designed to provide an adequate amount of fresh air for the number of batteries being charged or discharged.
- Do not lay tools or anything metallic on top of any battery.
- Be sure the high-frequency charger is OFF before connecting or disconnecting the battery. The digital display must be completely OFF.
- Do not open the cabinet. Only qualified personnel can open it.

4. TRANSPORT AND STORAGE



Always wear safety shoes and gloves when working with the high frequency charger or battery.

1. Transport

You can find the weight of the high frequency charger in chapter 2.1: Technical data. Determine if it is too heavy for you to carry or not.

If you decide that the high frequency charger is too heavy to carry, you can transport it on a cart with wheels. If you transport it on a cart, lay the high frequency charger flat with the display facing upwards. Make sure that the high frequency charger is fastened with a strap.



Don't tension the strap in such a way that the LED screen and the digital part on the front of the high frequency charger can be damaged.

2. Storage

- Make sure that the high frequency charger is located on a flat surface with the display facing upwards.
- Make sure that there is no direct sunlight on the high frequency charger.
- Do not cover the high frequency charger so that it can cool down sufficiently.
- Do not place the high frequency charger in a humid area or a place where splashes of any kind of liquid can fall on it. The relative humidity must be less than 75%.
- The high frequency charger should be stored in a space between -20°C and 60°C . Anything below or above this temperature will damage the high frequency charger.
- Keep the high frequency charger away from areas where sparks are generated.
- Provide good ventilation to prevent the accumulation of oxyhydrogen.
- Place protection around the high frequency charger so that no one can drive into or collide with it.
- Place the high frequency charger on an elevated platform of at least 50 cm (19 inch) from the floor. This will prevent fire caused by dust.
- Place a fire extinguisher close by.
- Install smoke detectors nearby.
- Do not place any objects on top of the high frequency charger.

5. ASSEMBLY AND INSTALLATION

5.1. Packing list

Description	Amount	Reference
High frequency charger	1	Check your type plate for the correct reference
Input cable	1	166TA3457
Output cable	1	166TA3458
Manual	1	166TA8759

5.2. Safety instructions



- The high frequency charger must be installed by qualified personnel only.
- Use correct mating receptacles. Check the earthing for electrical continuity before using the equipment. The earthing conductor must be a size equal to or larger than the size recommended by code or this manual.



- Always wear safety shoes and gloves when working with the high frequency charger or battery. If you do come into contact with battery acid, follow the instructions in chapter 11.5.
- Check that the unit's operating voltage is identical to your local power supply.
- Check that the unit's maximum input power is available from your power supply.
- To prevent fire or shock hazard, do not expose the unit to rain or moisture.
- The high frequency charger is not for outdoor use.
- Allow adequate air circulation.
- Do not place the unit near materials that may block the ventilation slots.
- Do not install the unit near heat sources such as radiators or air ducts.
- Do not install the unit in a place where there is direct sunlight, excessive dust, mechanical vibration or shock.
- Make sure that the high frequency charger is installed as instructed in this manual and in accordance with any applicable national or local norm.
- Attach the high frequency charger to a stable surface. Make sure you attach the charger correctly by mounting the correct holes in the mounting flanges.
- In case of installation on a vehicle, it is recommended to use anti-vibration brackets.
- The high frequency charger should preferably be installed in a vertical position with the fan facing down. A horizontal installation is allowed.
- For safety and electromagnetic compatibility, the high frequency charger has a 3-way plug as a safety feature and only fits into a grounded socket. If you are unable to insert the plug into the socket, you may have an older, ungrounded socket. Do not continue to use the unit and contact an electrician to have the outlet replaced. Do not use an adapter to bypass the grounding.
- To avoid damaging the power cord, do not put anything on it, and don't place it where it will be walked on. If the cord becomes damaged or frayed, refer to qualified personnel to have it replaced immediately.
- Do not drill additional holes in the high frequency charger or attach the high frequency charger to the wall or to your vehicle by using adhesives of any kind.

5.3. Required material for assembling

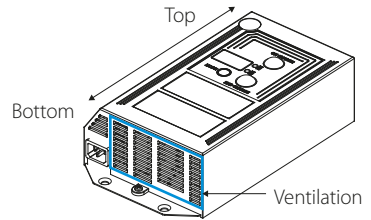


The following supplies are a suggestion and not an instructional obligation.

- levelling scale
- pencil or marker
- 4 plugs (6 mm)
- drilling machine
- drill (6 mm)
- 4 screws (5 mm)

5.4. Installation of the charger

When mounting the high frequency charger, it is important that you attach the high frequency charger upright to the wall or to the vehicle. This means that the ventilation should be at the bottom of the unit.



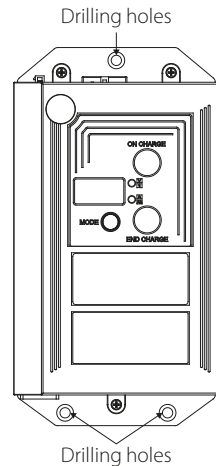
Each high frequency charger has drill holes to attach it to the wall or to your vehicle.

Only use these drill holes to attach the high frequency charger.



The assembly below is a suggestion and not an instructional obligation.

1. Place the high frequency charger in the desired location. Make sure it is level.
2. Mark the drill holes by using a pencil or marker.
3. Take a drill that has the same diameter as your plug.
4. Drill holes in the previously indicated places.
5. Place the plugs in the drilled holes.
6. Put the high frequency charger against the wall. Make sure that the holes in the high frequency charger match the holes in the wall.
7. Drill the high frequency charger to the wall.



6. OPERATION

6.1. Safety instructions for operating the product



- A damaged or malfunctioning machine must never be used. If damage or malfunctions are discovered during pre-operation inspection or function tests, the machine must be tagged and removed from service.
- For safety and electromagnetic compatibility, the high frequency charger has a 3-way plug as a safety feature and only fits into a grounded socket. If you are unable to insert the plug into the socket, you may have an older, ungrounded socket. Do not continue to use the unit and contact an electrician to have the outlet replaced. Do not use an adapter to bypass the grounding.
- A maximum distance of 3 meters between the high frequency charger and the battery is recommended.
- Only people who work with the battery and the high frequency charger may be in the vicinity of the devices. Other people must keep their distance.
- If you want to charge lead-acid batteries, be warned that an explosive gas is released during charging. Avoid flames and sparks. Place the battery in an open, well-ventilated area.
- Battery acid is very corrosive. Always wear the correct eye and body protection when you are near batteries. Always wear safety shoes and gloves when working with the high frequency charger or battery. If you do come into contact with battery acid, follow the instructions in chapter 11.3.
- Check that the available power supply voltage matches the voltage indicated on the equipment's type plate. If in doubt, consult your dealer.
- The battery produces very high currents when short-circuited and any metal conductor that is carrying this current will burn the skin severely if they come into contact.
- Under no circumstances should jewellery or conductive material come into contact with the battery terminals or the cell connectors on top of the battery.
- Do not charge batteries on board of thermal engines.
- Do not charge non-rechargeable batteries.
- Check that the selected charging curve is suitable for the type of battery to be recharged. Take a good look at the rating plate of both the high frequency charger and the battery. If in doubt, contact your dealer.
- Energic Plus is under no circumstances responsible if the charging curve selected was incorrect and caused irreversible damage to the battery or the high frequency charger.
- Don't recharge non-rechargeable batteries.
- If you are using an extension cord or power strip, make sure that the total of the amperes required by all equipment on the extension, is less than the extension's rating.
- To prevent fire or shock hazard, do not expose the unit to rain or moisture.
- The high frequency charger is not for outdoor use.

6.2. Operating instructions

Please see chapter 7 for the daily maintenance schedule.

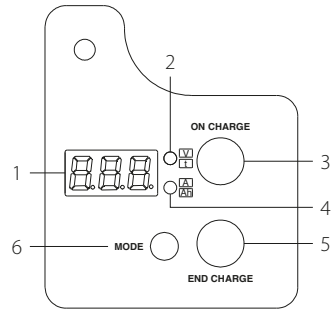


- If any of the following occurs while using the high frequency charger, stop using it immediately by unplugging the power cord.
 - Smoke and/or fire
 - Burnt smell
 - Inflation of the housing of the high frequency charger or battery

For N1–N3

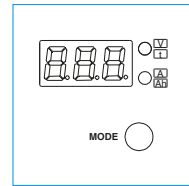
1. Visualisation front high frequency charger

1. LED screen
2. Small LEDs indicating the value
3. LED light showing that the charger is charging
4. Small LEDs indicating the value
5. LED light showing that the charger has stopped
6. Push button to make selections



As soon as you start the charger, the digital LED screen will show the following parameters:

- The battery voltage (two-color upper LED)
- Current supplied by the charger (two-color red bottom LED)
- Time
- Ah that the charger delivers (two-colour green bottom LED)



In CAN bus mode only, pressing the MODE button once will fix the configuration of the parameters and retain the last value displayed.

Pressing the MODE button again, allows you to change the parameter sequence.

During CG mode, pressing the MODE button will pause the charge or desulphation. Pressing the button again will restart the high frequency charger from the last point where it stopped.

If you removed the battery, the high frequency charger will reset and will need to be configured again


2. How to use the high frequency charger?

Depending on how long you press the MODE button, you can perform various actions:

- A. If you press the MODE button for more than 1 second, it means ENTER
- B. If you press the MODE button for less than 1 second, it means ROLL.
 1. Turn on the high frequency charger while pressing the MODE button.
 2. ROLL: Select the CAN Node number.
 3. Press the MODE button for more than 1 second so that the high frequency charger enters. Now you can make a battery selection.
 - Select BA1 for lead-acid batteries
 - Select BA2 for gel electrolyte batteries.
 4. Press ENTER: Confirm your battery type. Now you can make a curve selection.
 5. ROLL: Make a curve selection.

The high frequency charger offers a total of five different charging curves. The available selections are listed below:

 - CU1: IU1a curve plus equalisation and maintenance
 - CU2: IU1U2ob curve
 - CU3: feed curve

- CU4: user programmable curve
 - CU5: desulphurisation curve
6. Press ENTER: Confirmation of your charge curve. Now you can choose a capacity selection.
 7. ROLL: make a capacity selection.
The starting point for capacity selection is the nominal value, but you can choose a value between 50% and 140% of the nominal value in 10% increments.
 8. Press ENTER: Confirm the capacity confirmation. Now you can make a selection of the charging time.
 9. ROLL: Selection of the charging time.
From a suggested charging time (according to the capacity selected in the previous step), this time, expressed in hours, can only be increased to a maximum of 20 hours.
 10. Press ENTER: confirmation of the charging time.
In the CB firmware, the selection of the seasonal thermal compensation starts
 11. ROLL: Seasonal compensation selection
The high frequency charger offers a total of three different seasonal thermal compensations, which add or subtract a fixed amount to the output voltage during charging phases 1 and 2.
 -  Please note that the seasonal thermal compensation only takes place if the thermal compensation via the external probe is not switched on.
The available selections are listed below:
 - Std: Standard compensation; no additional compensations are calculated. This means that if the thermal compensation is enabled via the external probe, the high frequency charger will perform the usual correction algorithm (e.g. 5 mV/(cell °K)), otherwise no correction will be performed at all.
 - Hot: hot season compensation; –40 mV/(cell °K) correction
 - Col: cold season compensation; +100 mV/cell correction
 12. Press ENTER: Confirmation of seasonal thermal compensation.
The high frequency charger goes into standby mode until the output cables are connected to the battery terminals.
If the connections have already been made before the configuration has started, the charging starts immediately.

3. Load delay selection and use

To enter a delay between the connection of your battery and the actual charge:

1. Press and hold the MODE button for a long time during the standby state. Your battery must be disconnected, and the display will show three dots with the message "dLY".
2. ROLL: selection of load delay hours expressed in hours and minutes (e.g. "1.3h" indicates a delay of one hour and thirty minutes).
3. ENTER: confirmation of the load delay.

Each time a battery is connected, the high frequency charger will display a flashing message indicating the hours and tens of minutes until charging begins.

It is also possible to skip the delay and start charging immediately by pressing and holding the MODE button for a while during the delay.

If the battery is disconnected during the delay, the high frequency charger will return to standby status.

4. Compensation setting of the voltage drop on the output cables.

During charging, you can programme the voltage drop of the cables by pressing and holding the MODE button. Perform the following steps while the high frequency charger is at maximum current.

1. Measure the voltage drop at the ends of the output bars of the battery charger (close to the cover).
2. Measure the voltage at the battery terminals.
3. Calculate the difference between the two values to compensate for the voltage drop.
4. Briefly press the MODE button until the voltage value is closest to the desired value: it is possible to adjust the parameters between 0.0 V and 1.5 V in 0.1 V increments.
5. Press and hold the MODE button (ENTER) to confirm.

5. Lights per phase

The charging status and the current charging phase of the high frequency charger are indicated via the LED lights on the front of the high frequency charger.

Below, you can find a table of which lights are on per phase.

Below, you can find a table of which lights are on per phase.

Phase	Red LED	Green LED
Phase 1	On	Off
Phase 2	On with short flashing	Off
Phase 3	On	On with short flashing
Phase 4	On with short flashing	On with short flashing
Phase 5 & 6	Off	On with short flashing
End phase	Off	On

When using the remote display by means of a two-colour LED (AUX F – Pin 1 and 2), the following signals are valid:

Phase	Red LED	Green LED	Yellow LED
Phase 1	On	Off	Off
Phase 2	On with short flashing	Off	Off
Phase 3	Off	Off	On
Phases 4–5–6	Off	On	Off
End phase	Off	On	Off
S/S or alarm	Off	Off	Off

6. Additional feature with air pump

Standard version

The air pump technology generates a remixing of the acid in the battery by means of a pump that pumps air into the battery.

The high frequency charger controls the air pump via an auxiliary contact (usually AUX1).

The air injection cycle will be maintained throughout the charging period according to the requirements of the battery specifications.

Version of the pressure sensor

In addition to the features of the standard version, an electronic circuit with an air pressure sensor is also available.

At the beginning of the charging process, the sensor checks if the pressure in the circuit is included in a certain window between a minimum and a maximum value. If an anomaly occurs, the battery high frequency charger will change the charge factor by performing a charge without detecting and checking the air pump.

For N5-7-9: charging level indicator

RED LED shows that the battery is in the initial charging phase.

YELLOW LED shows that the high frequency charger has reached 80% charge.

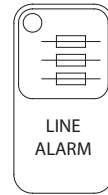
GREEN LED shows that the battery has reached 100% charge.



For N5-7-9: line alarm indicator

This red LED turns on when there is a phase missing on the mains.

In this situation the high frequency charger will not operate and the charging level indicator changes to yellow.



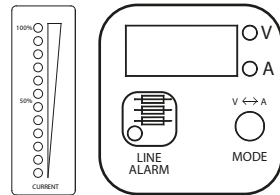
For N5-7-9: LED Bar Graph and Digital Instrument

The LED bar graph is an option that gives a percentage indication of the output current compared to the maximum value.

The digital instrument indicates the output voltage expressed in Volts (V) and the output current expressed in Amperes (A).

The corresponding unit of measurement of the authorized numbers is indicated by the LED 'V' or 'A'.

Using the MODE button (if installed), you can select the 'A' or 'V' to be authorized.



7. MAINTENANCE

7.1. Safety instructions for the repair of the product

The high frequency charger requires a minimum of maintenance.



When carrying out maintenance on the battery or the high frequency charger, it is strongly recommended to wear full body protection such as safety glasses, safety suit, safety shoes and safety gloves. If you do come into contact with battery acid, follow the instructions in chapter 11.5.



- Repairs to the product may only be carried out by a qualified service technician and according to the manufacturer's instructions.
- No modifications or alterations to this high frequency charger which may affect capacity, stability or safety requirements of the high frequency charger but not limited to these examples, shall be made without the prior written approval of the original manufacturer, its authorized representative, or a successor thereof.
- Do not open the cabinet. Only qualified personnel can open this.

7.2. Maintenance schedule

Task	2H	D	W	M	6M	Y
1. Inspect the cables		✓				
2. Check the connections to the battery terminals				✓		
3. Check all the ventilation slots for obstructions				✓		

2H: every 2 hours, D: daily, W: weekly, M: monthly, 6M: every 6 months, Y: yearly

A daily maintenance check can limit wear to a minimum.

- Make sure that the instruction manual is complete, legible and available for reference.
- Check the complete high frequency charger for damage, corrosion or cracks in structural components.

7.3. Maintenance instructions

1. Inspect the cables

If you see that the main line is damaged, carefully remove the plug and remove the product from service.



Continuing to work with the device can lead to electrocution, resulting in serious injury or death.

This maintenance may be carried out by the operator.

2. Check the connections to the battery terminals

Make sure the connections for charging the batteries are tight and clean. Loose connections, scorched or damaged cables and/or pipes must be repaired immediately.

This maintenance may be carried out by the operator.

3. Check all the ventilation slots for obstructions

Remove all dust and dirt if necessary.



Dust and/or dirt prevents the high frequency charger from ventilating optimally.

Make sure that the ventilation slots are open and not obstructed by objects.

This maintenance may be carried out by the operator.

8. TROUBLESHOOTING



When checking the high frequency charger or battery, wear safety shoes and safety gloves. If you do come into contact with battery acid, follow the instructions in chapter 11.5.

When an alarm situation occurs that causes the operation to be stopped, the display will show one of the following codes, depending on the malfunction detected.

You will see a <A> followed by a two-digit code.

Each alarm gives an alarm signal, with the exception of operations that do not stop.

For N1–N3

Alarm code	Problem	Charge stop?	Cause	Action
01	Logic failure #1	Yes	There is a problem on the current circuit	Turn the high frequency charger off, wait 5 seconds and turn the high frequency charger back on. If the problem persists, contact your dealer.
02	CAN bus has stopped working	No	There is a problem with the CAN communication	Verify the CAN bus communication
03	Watchdog	Yes	There is a problem with the logic board	Turn the high frequency charger off, wait 5 seconds and turn the high frequency charger back on. If the problem persists, contact your dealer.
05	High battery temperature	Temporary	The battery temperature is over 55 °C	<ol style="list-style-type: none">1. Place the battery in a cooler place2. Make sure there is nothing on top of the battery such as dust, dirt or an object covering it. The high frequency charger will restart when the battery temperature goes under 50 °C.
07	Overcurrent	Temporary	Abnormal input current recording	The charger will restart after 3 seconds. If the problem persists, contact your dealer.
08	High temperature	Yes	Internal high temperature	Put down your high frequency charger completely. Check that the high frequency charger is in a suitable place where it can cool down sufficiently. Check that the ventilation is not blocked so that the heat can be sufficiently dissipated. If these conditions are OK, restart the high frequency charger after 30 seconds. If the problem persists, contact your dealer.

Alarm code	Problem	Charge stop?	Cause	Action
09	Mismatch voltage	Yes	There are problems in the voltage circuit	Turn the high frequency charger off, wait 5 seconds and turn the high frequency charger back on. If the problem persists, contact your dealer.
10	Timeout	Temporary	End of the first phase as a result of a time-out	Check if the high frequency charger is suitable for the specified battery type – disconnect the battery.
11	Overdischarge	No	The battery is over-discharged	Your battery needs to be regenerated. Please contact your dealer.
12	Deep discharge	No	There's a deeply discharged battery	Please contact your dealer
13	Connection fault	Temporary	There is a connection error in the output cables	Disconnect the battery and wait for the display to show three dots on the LED screen before connecting a new battery
14	Pump mistake	No	The air pump is malfunctioning	Please contact your dealer
15	Th. Sensor ko	No	There is a thermal disturbance in the sensor	Please contact your dealer
16	Logic failure #2	Temporary	There is a decrease in voltage	The high frequency charger restarts after 3 seconds. If the problem persists, contact your dealer.
17	Flash checksum	Yes	An error has occurred in the flash memory	Turn the high frequency charger off, wait 5 seconds and turn the charger back on. If the problem persists, contact your dealer.
18	EEPROM ko	Yes	A problem has occurred in the EEPROM communication	Turn the high frequency charger off, wait 5 seconds and turn the charger back on. If the problem persists, contact your dealer.
21	Logic failure #3	Yes	The output voltage has exceeded the safety threshold	Turn the high frequency charger off, wait 5 seconds and turn the charger back on. If the problem persists, contact your dealer.
29	Clock battery off	No	The clock battery is discharged or removed	Please contact your dealer
30	Node reset	Yes	The CAN Node has been set to 126, which is the reset value	The high frequency charger will force you to enter the 'Changing settings' again

When none of the problems or solutions were helpful, please contact your local dealer or the manufacturer.

For N5–N7–N9

If you hear a two-tone audible alarm with a flashing LED, an alarm situation has occurred.

Displayed colour LED	Problem	Cause	Action
Red Flash	There is a problem with the battery	The battery is disconnected or does not conform with the high frequency charger	Verify the connection
			If the connection is correct, check the nominal voltage of your battery and see if it is compatible with the high frequency charger
Yellow flash	There is a problem with the thermal sensor	The thermal sensor is disconnected during the re-charge	Verify the connection of the sensor
		The thermal sensor is out of range	Measure the temperature of the battery
Green flash	Phase 1 and/or phase 2 shall have a duration in excess of the maximum permitted duration	The battery is not compatible with the high frequency charger	Verify the battery capacity
Red – yellow flash	Control logic error	There is a loss of power supply output power	Please contact your dealer
Red – green flash	Loss of output voltage	The battery is disconnected	Check that the battery is properly connected to the high frequency charger
		There is a failure of the control logic	Please contact your dealer
Yellow – Green flash	An unavailable configuration has been selected	An unavailable configuration has been selected	Check and adjust the selected configuration
Red – yellow – green flash	A thermal problem has been identified	Semiconductors are overheated	Check whether the cooling screw is still working properly

If none of these troubleshooting suggestions or solutions were helpful, please contact your local dealer or the manufacturer.

9. TEMPORARILY OUT OF ORDER

If the high frequency charger will not be operated for more than 14 days straight, take the following points into account:

- Pull out the plug.
- Place a light cloth over the high frequency charger. Do this only when the plug is out of the socket.
- Do not bend or crack the cables! Do not squeeze the cables together using stretchers or quick-release straps.

10. FINAL DECOMMISSIONING AND DISPOSAL

Final, proper decommissioning or disposal of the product must be performed in accordance with the regulations of the country in which the product is used. In particular, regulations governing the disposal of batteries, fuels and electronic and electrical systems must be observed.

Waste packaging should be sorted and put into solid dustbins according to the materials and needs to be collected by the local special environment protection bureau.

To avoid pollution, it's forbidden to throw away the waste randomly. To avoid pollution during the use of the product, the user should prepare some absorbing materials (scraps of wood or dry duster cloth) to absorb leaking fluids in time. To avoid secondary pollution to the environment, the used absorbing materials should be handed in at special departments of local authorities.

11. ANNEXES

11.1. CE-certificate



**EG-VERKLARING VAN OVEREENSTEMMING
DÉCLARATION CE DE CONFORMITÉ
EC DECLARATION OF CONFORMITY
EG-KONFORMITÄTSEKTLÄRUNG
DECLARACIÓN CE DE CONFORMIDAD
DICHIARAZIONE CE DI CONFORMITÀ**

(Low Voltage Directive 2014/35/EU + Electromagnetic Compatibility Directive 2014/30/EU + RoHS Directive 2011/65/EU)

De fabrikant, Le fabricant, The manufacturer, Der Hersteller, El fabricante, Il fabbricante:

TVH Parts Holding NV, Brabantstraat 15, B – 8790 Waregem,

Verklaart met betrekking tot het hierna beschreven TOESTEL :

Déclare, concernant l'APPAREIL décrite ci-dessous :

Declares in connection with the APPLIANCE described below :

Erklärt, hinsichtlich der nachfolgenden GERÄT :

declara, sobre la APARATO designada a continuación :

dichiara, in relazione alla APPARECCHIO di seguito descritta :

Benaming / Dénomination / Denomination /
Bezeichnung / Denominación / Denominazione : Hoogfrequent lader/High Frequency Charger/Chargeur
haute fréquence/Hochfrequenz-Ladegerät/Cargador de
alta frecuencia/Caricabatterie ad alta frequenza

Functie / Fonction / Function / Funktion / Función
/ Funzione : Opladen batterij/Charging battery/Charger la
batterie/Batterie aufladen/Cargando la batería/Caricare
la batteria

Merk / Marque / Brand / Marke / Marca : ENERGIC PLUS

Type / Typ / Tipo : NG *

Modelnummer / N° de modèle / Model number /
Modellnummer / Número de modelo / Numero di
modello : TVH/ *****

- dat het zelf het TECHNISCH DOSSIER samenstelt;
qu'il constitue le DOSSIER TECHNIQUE en personne;
that it draws up the TECHNICAL FILE itself;
dass er selber die TECHNISCHEN UNTERLAGEN zusammenstelt;
que elabora el EXPEDIENTE TECNICO en persona;
che elabora il FASCICOLO TECNICO personalmente;
- dat het toestel voldoet aan alle toepasselijke bepalingen van de hierna vermelde richtlijnen en geharmoniseerde normen;
que l'appareil satisfait à l'ensemble des dispositions pertinentes des directives et normes harmonisées ci-dessous;
that the appliance fulfills all the relevant provisions of the directives and harmonized standards stated herein below;
dass die Gerät allen einschlägigen Bestimmungen der nachstehenden Richtlinien und harmonisierten Normen entspricht;
que la aparato cumple todas las disposiciones aplicables de las Directivas y normas armonizadas citadas abajo;
che la apparecchio è conforme a tutte le disposizioni pertinenti delle direttive e norme armonizzate elencate qui di seguito :
 - Richtlijn EN60335-1:2012+A11:2014;EN60335-2-29:2004+A2:2010;EN61000-6-2:2005;EN61000-6-4:2007+A1:2011;EN55011:2009+A1:2010
 - la Directive EN60335-1:2012+A11:2014;EN60335-2-29:2004+A2:2010;EN61000-6-2:2005;EN61000-6-4:2007+A1:2011;EN55011:2009+A1:2010
 - Directive EN60335-1:2012+A11:2014;EN60335-2-29:2004+A2:2010;EN61000-6-2:2005;EN61000-6-4:2007+A1:2011;EN55011:2009+A1:2010
 - die Richtlinie EN60335-1:2012+A11:2014;EN60335-2-29:2004+A2:2010;EN61000-6-2:2005;EN61000-6-4:2007+A1:2011;EN55011:2009+A1:2010

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ENERGIC Plus[®]

- o la Directiva EN60335-1:2012+A11:2014;EN60335-2-29:2004+A2:2010;EN61000-6-2:2005;EN61000-6-4:2007+A1:2011;EN55011:2009+A1:2010
- o le Direttive EN60335-1:2012+A11:2014;EN60335-2-29:2004+A2:2010;EN61000-6-2:2005;EN61000-6-4:2007+A1:2011;EN55011:2009+A1:2010

Waregem, ** / ** / ****

Guy VANDENDRIESSCHE
Chief Materials Officer
TVH Parts Holding NV

EXAMPLE

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BNP Paribas Fortis 001-6023731-10 • IBAN BE41 0016 0237 3110 • SWIFT/BIC GEBABEBB

11.2. Spare parts lists

NG1

Description	Reference
INPUT FUSE 10 A 5x20 delayed	166TA5397
Fuse schurter plug	166TA5398
Output extra fast fuse 240 V 80 A (for 12 V NG1)	166TA5399
Output extra fast fuse 500 V 20 A (for 48 V NG1)	166TA5400
Output extra fast fuse 500 V 25 A (for 36 V NG1)	166TA5401
Output extra fast fuse 500 V 32 A (for 24 V NG1)	103TA2784
Clips for 500 V output extra fast fuse	166TA5403
Relay 12 V 16 A	136TA1176
Display NG1 label	166TA5404
Fan NG1	166TA5405
Yellow cover Energic Plus NG1 display	166TA5406
12/36/48 V NG1 output cable	166TA4358
24 V NG1 output cable	166TA4357
Input cable	166TA5407

NG3

Description	Reference
24 V 80 A output cable	166TA5408
24 V 60 A – 36/48 V output cable	166TA5409
120/108/80/72 V output cable	166TA5410
Yellow cover Energic Plus NG3 display	166TA5411
Base plate	166TA5412
Fan	166TA5413
Display label	166TA5414
Relay 12 V 16 A	136TA1176
Output extra fast fuse 240 V 80 A (for 24/36/48 V NG3)	166TA5399
Output extra fast fuse 500 V 32 A (for 72/80 V NG3)	103TA2784
Output extra fast fuse 500 V 25 A (for 24/36/108/120 V NG3)	166TA5401
Output extra fast fuse 240 V 125 A (for 12/24 A NG3)	103TA2867
Clips for 500 V input and output extra fast fuse	166TA5403
Input extra fast fuse 500 V 32 A (for 48 V NG3)	103TA2784
Input extra fast fuse 500 V 25 A (for 24/36/72/80/108/120 V NG3)	166TA5401
Input extra fast fuse 500 V 20 A (for 12/24 V NG3)	166TA5400

NG5–7–9

Description	Reference
Input extra fast fuse 500 V 20 A	166TA5400
Input extra fast fuse 500 V 25 A	166TA5401
Clips for 500 V input extra fast fuse	166TA5403
Output extra fast fuse 240 V 125 A	100TA9225
Output extra fast fuse 240 V 180 A	166TA5416

Description	Reference
Relay 12 V 16 A	136TA1176
Plastic rotary handle	166TA3171
3 poles 32 A rotary switch	166TA3172
Plastic base plate for 32 A rotary switch	166TA5417
Display label NG5+ CAN bus	166TA5418
12 V fan NG5–7–9 80x80x25	166TA5419
Yellow cover Energic Plus NG5–7–9 display	166TA5420
NG7/9 input cable	166TA5421
NG5 input cable	166TA5422

11.3. Medical and first-aid treatment



Working with batteries and/or chargers is always a risk.

We strongly advise to always use gloves and eye protection when working with these products.

First-aid facilities and a qualified first-aid person should be available for each shift for immediate treatment.

1. First aid in case of contact with acid

Contact with the skin

Immediately remove any clothing that has been splashed with acid and wash the skin with plenty of cold and fresh water. If you were splashed, a whole body shower is recommended. Don't use warm or hot water as the pores of the skin open and the acid can burn even deeper.

Inhalation of acid

Move to an area with plenty of fresh air and seek medical advice. Don't use a medical inhaler. The lungs will open up further in this way and the acid may cause even more damage.

Contact with eyes

Rinse with fresh, cold water from a running tap for several minutes. When there is no running water available, make sure you always have an eye bath at hand.

In case of swallowing

Do not try to induce vomiting but drink fresh water immediately and ingest activated carbon tablets. Do not drink carbonated (such as cola, lemonade, etc) or flavoured drinks (such as tea, coffee, etc.).

Always seek medical advice afterwards!

2. First aid in case of electrical shock

Never touch a person if he or she is still in contact with charging equipment, batteries, charging leads or other live electrical parts. Disconnect the power at the wall switch. Immediately call an ambulance and start to administer first aid.

If breathing is difficult

Provide extra oxygen by placing the person outside or supply extra oxygen by means of an oxygen balloon.

If the person is not breathing

Start artificial breathing immediately such as mouth to mouth. If available, provide oxygen by means of an oxygen balloon.

If pulse is absent

Begin artificial circulation immediately. Start chest compressions; 30 chest compressions followed by 2 breaths.

Or use an AED if available. Switch on the device and follow the instructions.

NOTES

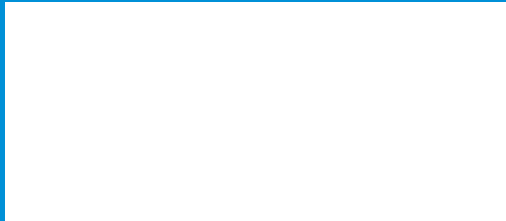
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NOTES

A series of horizontal dotted lines for writing notes.



Your distributor:



Manufactured within the EU for:



info@energicplus.com • www.energicplus.com
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